

HEALTHCARE-ASSOCIATED INFECTIONS IN MICHIGAN HOSPITALS

2011-2012 SEMI-ANNUAL REPORT

Michigan Department of Community Health

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

October 1, 2011-March 31, 2012

Introduction

This report includes statewide healthcare-associated infection (HAI) counts and rates in Michigan from October 2011 through March 2012. Surveillance data were collected from acute care hospitals who have voluntarily agreed to share their NHSN data with the MDCH SHARP Unit. NHSN is a secure online surveillance system developed by the CDC. Hospitals sign a MDCH SHARP data use and confidentiality agreement and confer rights to MDCH SHARP to view their NHSN HAI data. All NHSN data collected from participating hospitals have been aggregated and facility de-identified in this report. Aggregated data have been analyzed for trends and compared with national data where appropriate. In an effort to protect facility identity, data are displayed only when 5 or more facilities are included in the analyses.

The SHARP Unit collects data from all modules within NHSN. 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. This semi-annual report and previous quarterly, semi-annual, and annual reports are published on the MDCH HAI website at www.michigan.gov/hai.

As of the data access date, September 6, 2012, 76 hospitals had signed a data use and confidentiality agreement with MDCH SHARP. At that time, 72 hospitals had conferred rights to SHARP and had a reporting plan in place for at least one month during the inclusive time period. The data from these 72 hospitals were used for development of this 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 that data with MDCH SHARP. For example, although 72 hospitals had conferred rights to their data with a reporting plan in place for the time period between October 1, 2011, and March 31, 2012, at the data access date (see *Table 1* below), only 42 hospitals were using the MDRO/CDI module and 34 were reporting data for *C.diff* LabID events (*Table 6*). The text “n=...” is used to indicate the number of hospitals or units being referenced.

Hospital Descriptives and Surveillance

Table 1 and Figure 1 reflect the number of hospitals who have conferred rights and entered a monthly reporting plan in NHSN for each respective month by the data access 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 may vary by hospital and month, hospitals may not report to NHSN each month. The SHARP Unit has requested at least three consecutive months of data for their NHSN surveillance initiative.

Table 1.

Number of Hospitals with a Reporting Plan in Place

Month	Oct 2011	Nov 2011	Dec 2011	Jan 2012	Feb 2012	Mar 2012
Number of Hospitals	70	70	70	72	72	71

Figure 1 (below) is a graphical representation of the number of facilities who have signed the MDCH SHARP Data Use & Confidentiality Agreement. Figure 2 (below) is a graphical representation of the number of facilities who have conferred rights to MDCH SHARP within NHSN and have a reporting plan in place for at least one month. The number of facilities for each month represents those participating as of September 6, 2012 for the October 2011 through March 2012 time period.

Figure 1. Number of Michigan Hospitals that have a signed Data Use Agreement (DUA) with SHARP

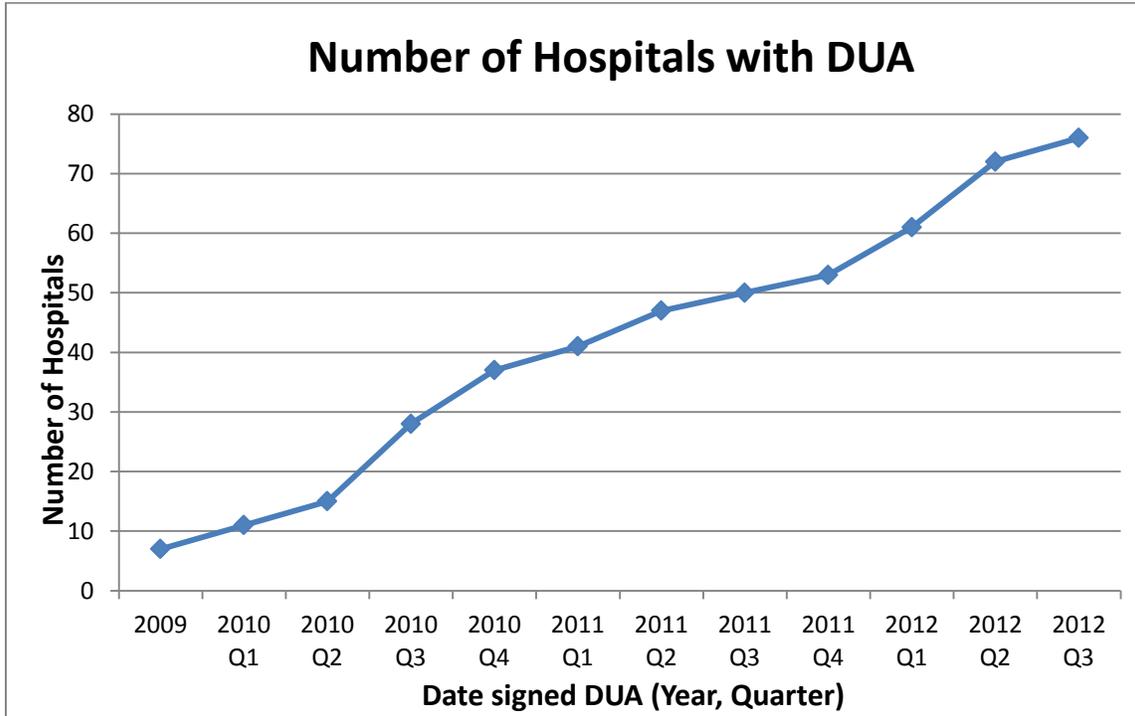
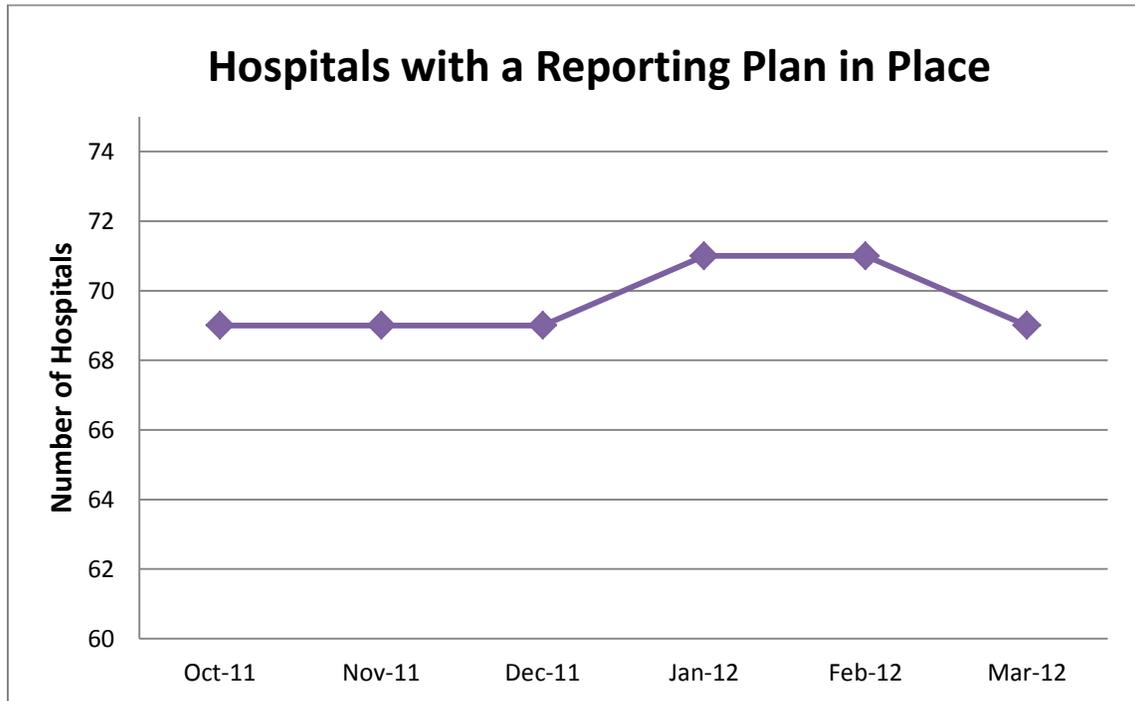


Figure 2. Number of Michigan Hospitals with a Reporting Plan in Place



The data in Table 2 were obtained from the 2011 NHSN Annual Facility Survey completed by participating hospitals. Among the 75 facilities which completed an annual survey, hospital affiliation is relatively evenly split between teaching and non-teaching.

Table 2.

Hospital Affiliation

Hospital Type	Teaching¹	Non-teaching	Unknown	Total
Number of Facilities	40	34	1	75 ²

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

²Although 76 hospitals are included in the report, only 75 completed the annual survey from which hospital affiliation is calculated

To characterize the geographic distribution of the participating hospitals, hospital locations were categorized according to Public Health Preparedness Regions. For the first time, there were enough facilities in each region (≥5) to display each region individually. The number of participating hospitals by region is indicated in Table 3 (below). The Public Health Preparedness Regions and the counties they include are shown on the map in Figure 3, and a map indicating the number of SHARP-participating facilities by region is shown in Figure 4.

Table 3.

Number of Participating Hospitals by Region

Geographic Region	1	2N	2S	3	5	6	7	8
Number of Facilities	6	11	12	12	8	13	7	6

Figure 3. Public Health Preparedness Regions

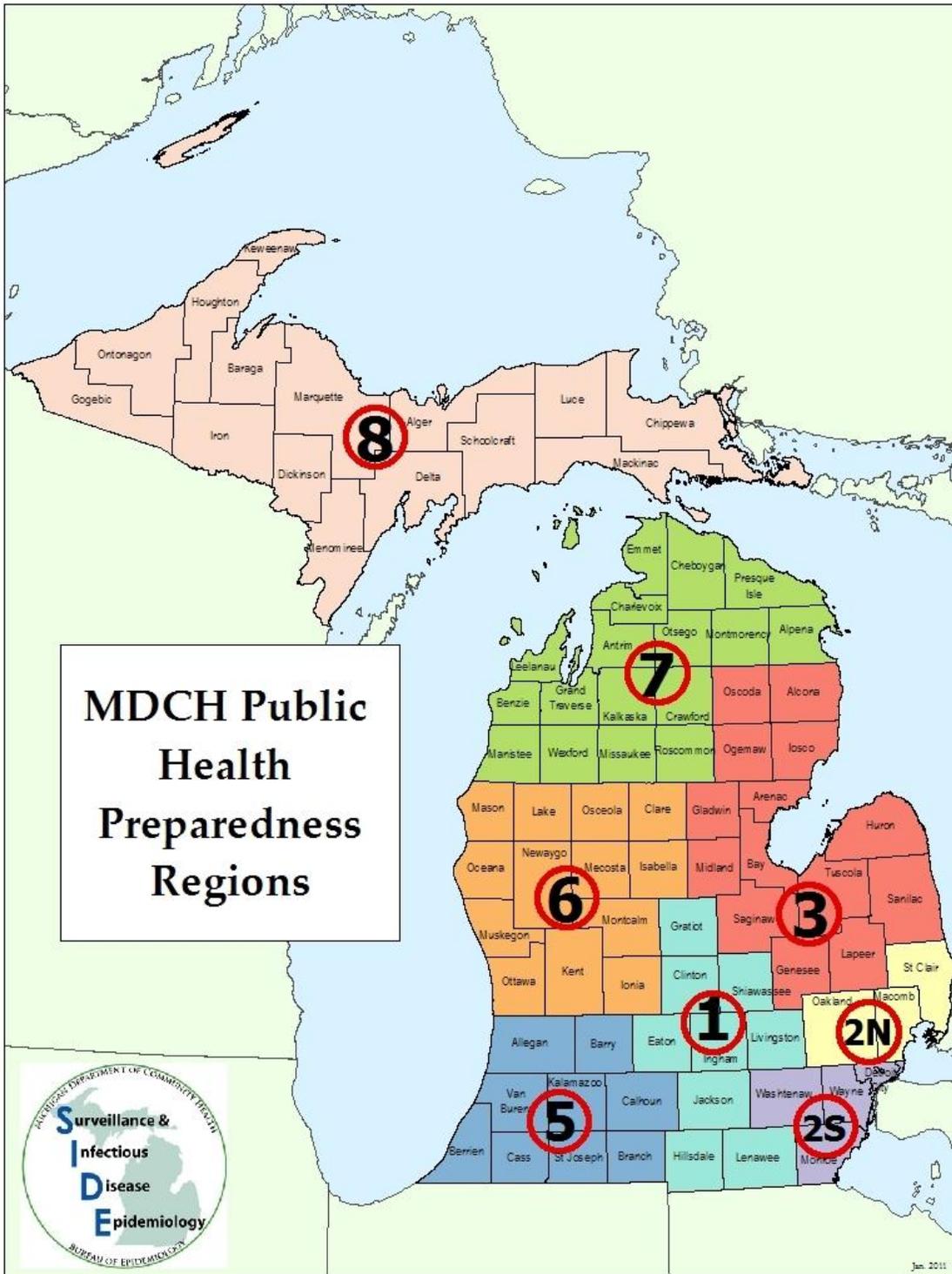
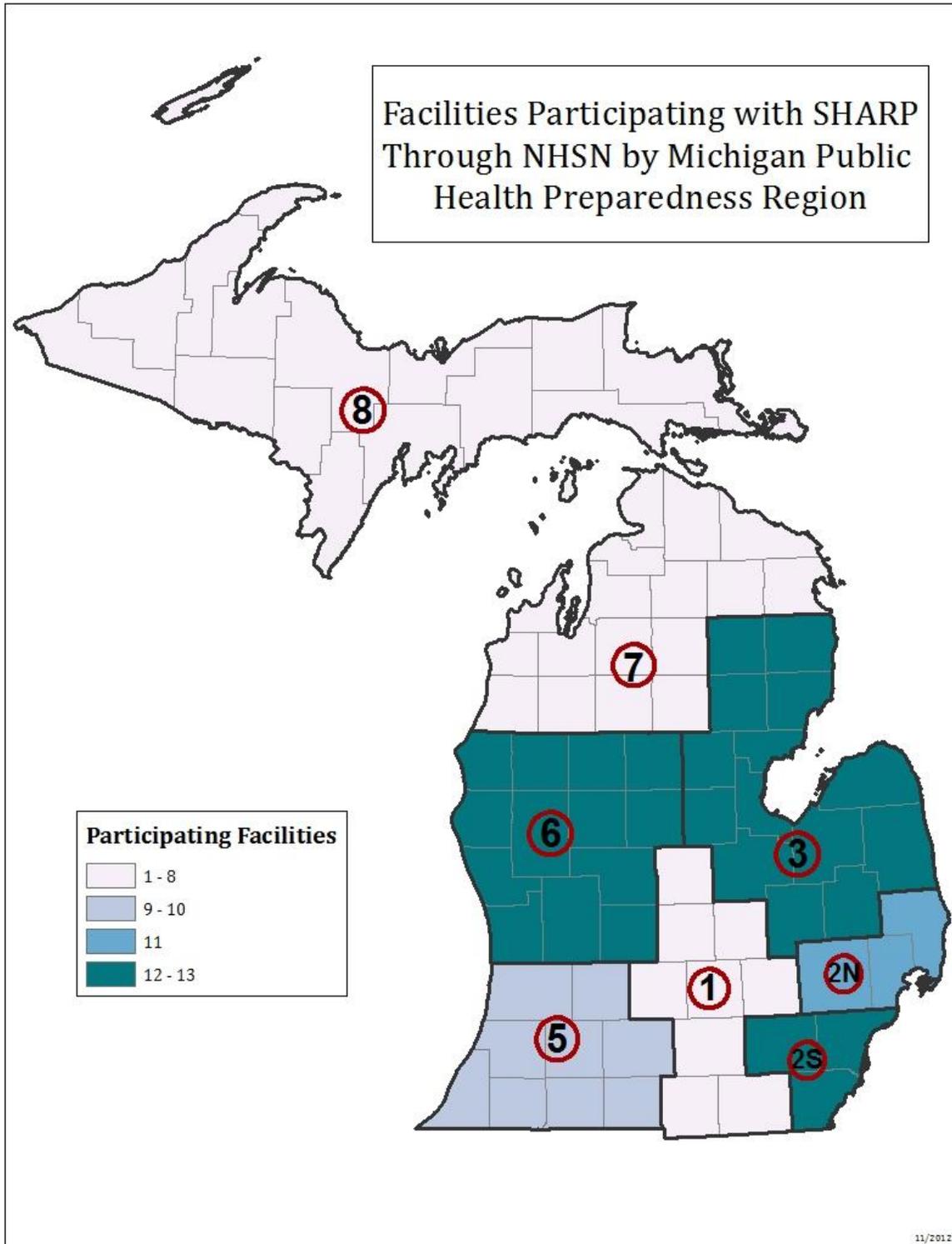


Figure 4. Facilities Participating with MDCH SHARP by Michigan Public Health Preparedness Region



Hospital licensure data, including the number of beds in each hospital, were obtained from the 2010 Michigan Certificate of Need Annual Survey. The Certificate of Need Survey includes all acute care hospitals, long-term acute care (LTAC) hospitals, and critical access hospitals in Michigan. The total number of 174 indicated in Table 4 was calculated by subtracting the number of psychiatric-only hospitals (11) from the total number of hospitals with licensed beds in Michigan (185). There are approximately 19 LTACs using NHSN in Michigan; however, none of these hospitals are sharing data with the SHARP Unit at this time. The number of hospitals enrolled in the SHARP NHSN Group includes acute care hospitals, critical access hospitals, and rehab facilities only. While acute care hospitals and rehab facilities are required to report some infections to NHSN, critical access hospitals are not. This may explain the low participation rate among small facilities in Michigan. The majority (n= 47 or 63%) of participating hospitals have more than 100 licensed beds in their facility. This is in contrast to the proportion of all Michigan hospitals with 100 or more licensed beds (71 of 174, or 41%). Of the 71 MI hospitals with 100 or more beds, 47 (66%) have enrolled in the SHARP surveillance initiative versus 28 of the 103 (27%) hospitals with fewer than 100 beds.

Table 4.

Number of Hospitals by Bed Size

Number of Beds in Hospital	≤100	101 – 200	201 – 500	501 +	TOTAL
Number of hospitals in MI (% of Total)	103 (59)	19 (11)	43 (25)	9 (5)	174
SHARP-enrolled hospitals (% of Total, % of MI)	28 (37, 27)	13 (17, 68)	25 (33, 58)	9 (12, 100)	75(100, 43)¹

¹Although only 73 hospitals had a reporting plan in place for at least one month throughout the reporting period, 75 completed the 2011 facility survey

Figure 5 (below) demonstrates the total number of hospitals in Michigan by bed size and the number of these hospitals that are enrolled in NHSN and sharing data with MDCH.

Figure 5. Hospitals in Michigan by Bedsize

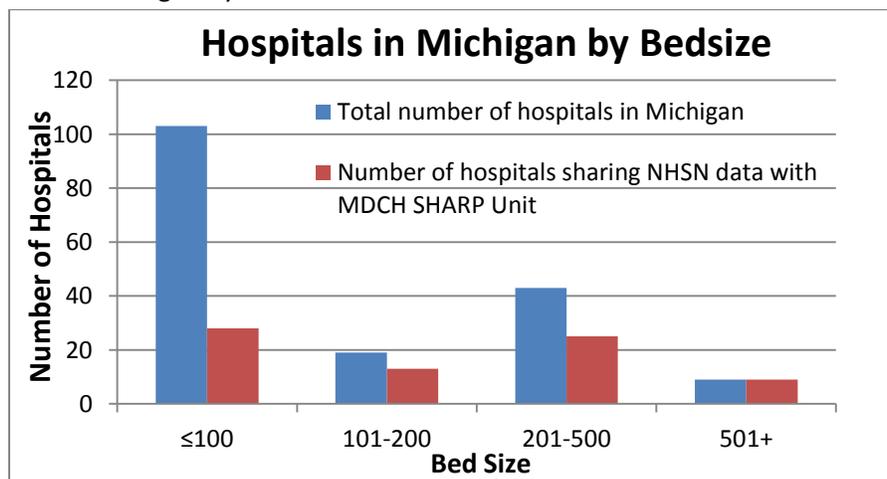


Table 5 indicates that the majority of hospitals participating in SHARP NHSN surveillance are conducting NHSN surveillance in their intensive care units (ICUs). The ICU type is not specified in this report. Many hospitals are also conducting surveillance on one or more patient wards. Ten hospitals are conducting surveillance in a Specialty Care Area (SCA) or a step-down unit (STEP). According to the CDC NHSN Patient Safety Manual, a 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 some hospitals are monitoring multiple unit types within their facility, including 17 hospitals monitoring facility-wide.

Table 5.

Types of Units under Surveillance

Unit Type	FacWideln²	ICU/CCU³	Mixed⁴	SCA/STEP⁵	Wards⁶	Outpatient⁷
Number of Facilities Participating¹	17	66	6	10	35	11

¹These numbers are not mutually exclusive

²FacWideln: All Facility-Wide Inpatient locations

³ICU/CCU: Intensive Care Unit/Critical Care Unit

⁴Mixed: Mixed acuity unit, comprised of patients with varying levels of acuity. These locations are not included in SIR analysis or compared to an NHSN pooled mean.

⁵SCA/STEP: Specialty Care Area/Step-Down Unit

⁶Wards: Inpatient wards

⁷Outpatient: All Outpatient locations

Table 6 indicates the NHSN module(s) in use, as indicated by participating hospitals in their monthly reporting plan. From month to month, the type of module(s) being used can change as some modules require varying periods of use. According to data shared with MDCH SHARP, the most commonly used modules during this reporting period were the CAUTI and CLABSI modules. This is not surprising because of the previous work done by hospitals in conjunction with the MHA Keystone Center for Patient Safety and Quality to reduce these types of infections. Use of the CAUTI, CLABSI, and SSI modules are also consistent with the Centers for Medicare & Medicaid Services (CMS) Hospital Inpatient Prospective Payment System (IPPS) reporting rules. 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. They were required to report CAUTI and SSI beginning January 1, 2012.

The column in Table 6 titled “Number of Hospitals Using Module” displays the number of hospitals that have indicated module use in their reporting plans for at least one month during this report time period. The column titled “Number of Hospitals Sharing Data” displays the number of hospitals that have shared data for this report time period as of the data access date. There is a discrepancy between these two columns in some instances because not all hospitals that indicate module use necessarily report data, and because of the time difference between when reporting plans were observed and the data access date.

Table 6.

NHSN Modules in use

NHSN Module	Number of Hospitals Using Module¹	Number of Hospitals Sharing Data²
Catheter-Associated Urinary Tract Infection (CAUTI)	68	66
Central Line-Associated Bloodstream Infection (CLABSI)	67	66
Surgical Site Infection (SSI)	64	67³
Ventilator-Associated Pneumonia (VAP)	43	48
Clostridium difficile Infection (CDI) Laboratory-identified (LabID) Event	42	34
Methicillin-Resistant Staphylococcus aureus (MRSA) Laboratory-identified (LabID)	32	30
Methicillin-Resistant Staphylococcus aureus (MRSA) Infection Surveillance	14	18
Vancomycin-Resistant Enterococci (VRE) LabID	10	8
Clostridium difficile Infection (CDI) Surveillance	8	15
Post-Procedure Pneumonia (PPP)	7	31
Vancomycin-Resistant Enterococci (VRE) Infection Surveillance	6	7
Acinetobacter LabID	6	7
Cephalosporin Resistant Klebsiella LabID	5	3
Carbapenem-resistant Enterobacteriaceae LabID	5	5
Methicillin-sensitive Staphylococcus aureus (MSSA) LabID	2	30
Acinetobacter Infection Surveillance	2	0
Methicillin-sensitive Staphylococcus aureus (MSSA) Infection Surveillance	1	18
Cephalosporin Resistant Klebsiella Infection Surveillance	1	0
Carbapenem-resistant Enterobacteriaceae Infection Surveillance	1	0

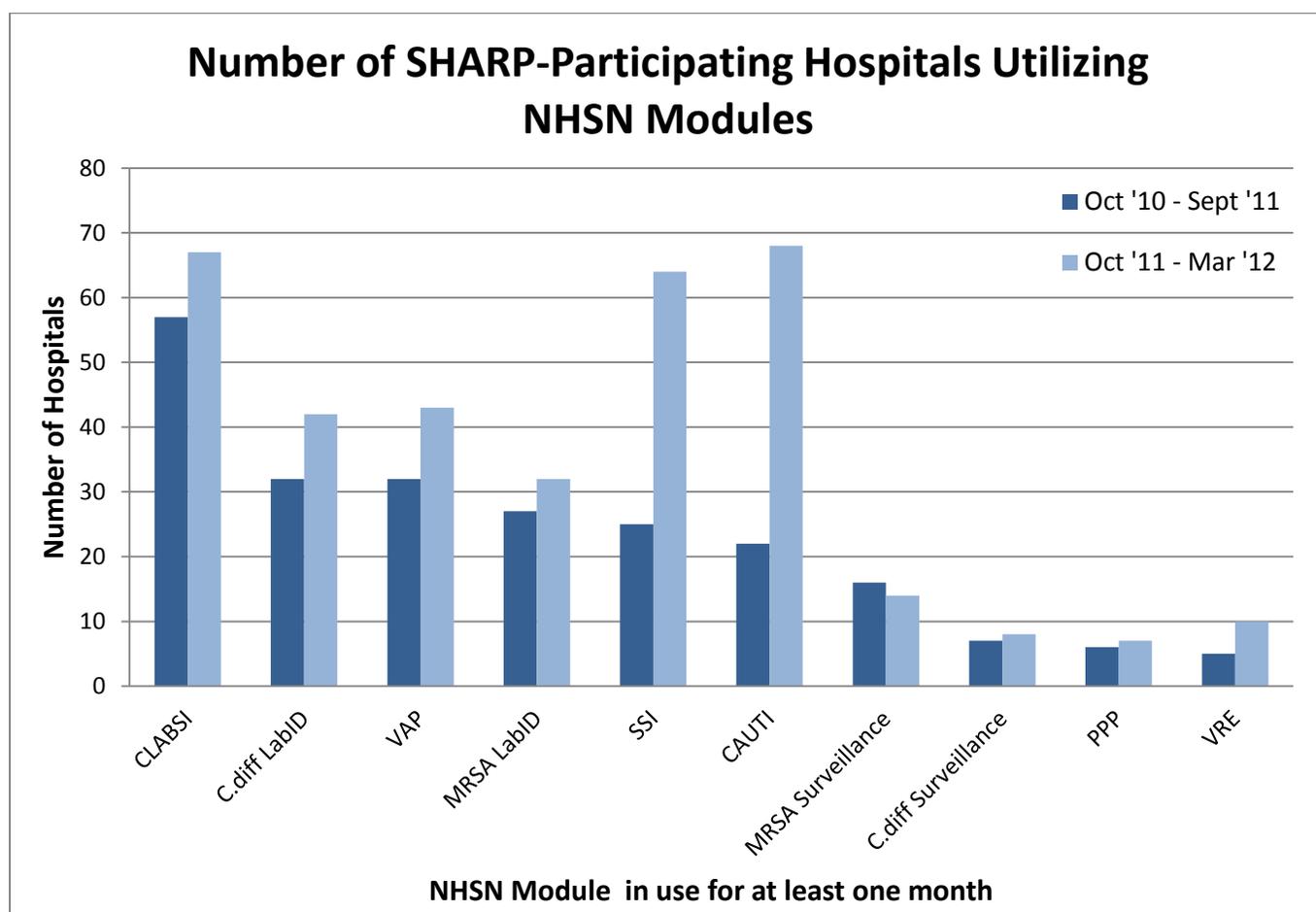
¹This is the number of hospitals that have indicated module use in their reporting plans for at least one month within the six month time period.

²This is the number of hospitals sharing data for the report period, as of the data access date.

³In some instances, the number of hospitals sharing data is greater than the number of hospitals using the module. This is explained by the time difference between when the reporting plans were observed and the data access date. Also, some hospitals are reporting data out-of-plan.

Figure 6 (below) illustrates the number of SHARP-participating hospitals utilizing each of the NHSN modules. The darker blue bar indicates the number of hospitals using the module for at least one month in the time period from October 2010 to September 2011. The lighter blue bars indicate the number of hospitals using the module for at least one month in the time period from October 2011 to March 2012.

Figure 6. SHARP-Participating Hospitals Utilizing NHSN Modules



Cumulative Semi-Annual Aggregate MDRO/CDI Module Reports

Table 7 shows aggregate MRSA LabID Event data by quarter, previously reported in each respective quarterly report, along with cumulative data for the semi-annual time period of October 1, 2011 through March 31, 2012. Due to different abstraction dates and variable data shared during each respective time period, quarterly report values may not sum to semi-annual report values.

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 [MRSA] isolate from blood in a patient with no prior positive blood culture for the same MDRO [MRSA] and location in ≤ 2 weeks, even across calendar months.’ A duplicate MDRO isolate is defined as ‘any MDRO [MRSA] isolate from the same patient and location after an initial isolation of the specific MDRO [MRSA] 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 and are not recorded here.

NHSN defines healthcare-onset (HO) as a ‘LabID Event specimen collected >3 days after admission to the facility (i.e., on or after day 4).’ Community-onset (CO) is defined by NHSN as a ‘LabID Event specimen collected as an outpatient or an inpatient ≤ 3 days after admission to the facility (i.e., days 1, 2, or 3 of admission).’

It should also be noted that LabID Event data do not necessarily indicate infection, but denote a positive lab test result from a specimen collected for clinical purposes. MRSA is known to colonize skin and mucosal membranes without causing infections. LabID data provide a proxy measure for MRSA prevalence.

Table 7.

Cumulative Aggregate Methicillin-Resistant *Staphylococcus aureus* (MRSA) LabID Data

	October – December 2011 Quarterly Report	January – March 2012 Quarterly Report	Cumulative Data October 2011 – March 2012
Frequency, Number			
<i>Hospitals with a DUA</i> ¹	54	73	75
<i>Hospitals reporting MRSA LabID</i> ²	25	33	32
<i>Hospitals sharing MRSA LabID</i>	14	28	30
<i>Aggregated LabID Events</i>	371	1142	2207
Onset, Number (%)			
<i>Healthcare Facility-Onset (HO)</i>	86 (23)	188 (16)	381 (17)
<i>Community-Onset (CO)</i>	285 (77)	954 (84)	1826 (83)
Specimen Source, Number (%HO)³			
<i>Blood</i>	49 (14)	96 (18)	187 (18)
<i>Sputum</i>	84 (42)	163 (42)	296 (40)
<i>Wound</i>	91 (5)	345 (8)	660 (7)
<i>Abcess</i>	13 (0)	44 (9)	86 (6)
<i>Urine</i>	18 (22)	116 (11)	186 (14)
<i>Skin</i>	3 (0)	16 (6)	25 (8)
<i>Other</i>	113 (31)	362 (16)	767 (19)
Surveillance Location, Number (% , %HO)⁴			
<i>Intensive/Critical Care Unit</i>	143 (39) ⁵	244 (21, 39)	479 (22, 41)
<i>Specialty Care Area</i>	----	14 (1, 29)	20 (1, 35)
<i>Wards</i>	192 (52)	487 (43, 18)	881 (40, 20)
<i>Outpatient</i>	36 (10)	397 (35, 0)	827 (37, 0)
<i>Other</i>	----	----	----

¹DUA: Data Use Agreement. This is a document signed between the hospital and the Michigan Department of Community Health which outlines how the data will be shared and used, and how confidentiality will be protected.

²MRSA 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.

³The number in parentheses under "Specimen Source" is the percent of isolates obtained from that source which are healthcare-onset.

⁴The numbers in parentheses under "Surveillance Location" are the percent of isolates from each location, followed by the percent of isolates from each location which are healthcare-onset.

⁵The 2011 Quarter 4 report only displays percent (not percent HO)

The proportions of healthcare facility-onset and community-onset reports have remained fairly consistent throughout the two quarters, along with the overall cumulative percentage. However, the aggregate number of MRSA LabID Events increases dramatically between the fourth quarter of 2011 and the first quarter of 2012. The cumulative Semi-Annual MRSA LabID events is 2207, which likely accounts for an error in reporting 2011 Quarter 4 data. This error has since been fixed. Because the distribution of infections is consistent, it can be concluded that the 2011 Quarter 4 data is accurate, although it is not a complete demonstration of MRSA LabID events.

Table 8 shows aggregate CDI LabID data by quarter, previously reported in each respective quarterly report, along with cumulative data for the semi-annual time period of October 1, 2011 through March 31, 2012. Again, due to different abstraction dates and different amounts of data being shared during each respective time period, quarterly report values may not sum to semi-annual report values.

Table 8 displays the number of positive CDI LabID Events entered by facility per quarter following the NHSN definitions. The NHSN definition for a CDI LabID Event is ‘all non-duplicate MDRO isolates [in this case, CDI detection via stool culture or a positive CDI assay] from any specimen source, including specimens collected during an Emergency Department or other clinic visit, if collected the same day as patient admission’. For CDI, a duplicate MDRO isolate is defined as ‘any MDRO [CDI] isolate [assay] from the same patient and location after an initial isolation [assay] of the specific MDRO [CDI] during a calendar month’. The specimens must be obtained for clinical decision-making purposes to be considered a LabID Event, thus specimens 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 and are not recorded here.

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 ≤3 days after admission to the facility (i.e., days 1, 2, or 3 of admission).’ Community-onset healthcare facility-associated (CO-HCFA) is defined as a ‘CO LabID Event specimen collected from a patient who was discharged from the facility ≤ 4 weeks prior to specimen collection.’

It should also be noted that LabID Event data do not necessarily indicate infection, but denote a positive lab test result from a specimen collected for clinical purposes. LabID data provide a proxy for CDI prevalence.

Table 8.

Cumulative Aggregate Clostridium difficile Infection (CDI)¹ LabID Data

	October – December 2011 Quarterly Report	January – March 2012 Quarterly Report	Cumulative Data October 2011 – March 2012
Frequency, Number			
<i>Hospitals with DUA²</i>	54	73	75
<i>Hospitals Reporting CDI LabID³</i>	31	42	42
<i>Hospitals Sharing CDI LabID</i>	15	37	34
<i>Aggregated LabID Events</i>	291	991	1652
Onset, Number (%)			
<i>Healthcare Facility-Onset (HO)</i>	87 (30)	359 (36)	592 (36)
<i>Community-Onset Healthcare Facility-Associated (CO-HCFA)</i>	45 (15)	183 (18)	306 (19)
<i>Community-Onset (CO)</i>	159 (55)	449 (45)	754 (46)
Previous CDI, Number (%)			
<i>Previously Positive</i>	36 (12)	110 (11)	195 (12)
<i>CDI assay, recurrent</i>	19 (7)	67 (7)	119 (7)
Surveillance Location, Number (% , %HO)⁴			
<i>Intensive/Critical Care Unit</i>	71 (24) ⁵	196 (20, 56)	333 (20, 56)
<i>Specialty Care Area</i>	5 (2)	61 (6, 57)	92 (6, 60)
<i>Wards</i>	159 (55)	548 (55, 39)	886 (54, 40)
<i>Outpatient</i>	59 (19)	186 (19, 0)	341 (21, 0)
<i>Other</i>	-----	-----	-----

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

²DUA: 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.

³CDI 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.

⁴The numbers in parentheses under “Surveillance Location” are the percent of isolates from each location, followed by the percent of isolates from each location which are healthcare-onset.

⁵The 2011 Quarter 4 report only displays percent (not percent HO)

As with MRSA LabID events, there was a dramatic increase in CDI LabID Events from 2011 Quarter 4 to 2012 Quarter 1. This appears to have stabilized and is corrected for the current report. The distributions of onset, previous positive and locations all remained extremely stable from quarter to

quarter, and are represented in the cumulative Semi-Annual report. The majority of CDI LabID events were community-onset, followed closely by healthcare facility-onset. There were few previously positive or recurrent CDI LabID events. The majority of CDI events occurred in wards. In both the intensive/critical care units and specialty care areas, the majority of events were healthcare facility-onset.

Cumulative Semi-Annual Aggregate Rates

In Table 9, the semi-annual Michigan MRSA LabID rate is 2.06 events per 1,000 patient-days. This number is calculated by dividing the number of total inpatient MRSA LabID Events by the number of patient days. The MRSA Prevalence Rate is calculated by dividing the number of inpatient MRSA LabID Events by the number of patient admissions. The semi-annual Michigan MRSA Prevalence Rate is 0.83 per 100 patient admissions. Note that LabID Event data do not necessarily indicate infection, but denote a positive lab test result from a specimen collected for clinical purposes. LabID data provide a proxy measure for MRSA prevalence.

In addition to LabID surveillance, hospitals may also conduct MRSA Infection Surveillance via NHSN. The definition for a MRSA Infection Surveillance event includes *S. aureus* cultured from any specimen that tests oxacillin-resistant, ceftazidime-resistant, or methicillin-resistant by standard susceptibility testing methods or by a laboratory test that is FDA-approved for MRSA detection from isolated colonies; these methods may also include a positive result by any FDA-approved test for MRSA detection from that source. There were 18 hospitals that participated in this option during the time period under study, providing an overall MRSA Infection Surveillance Rate of 0.22 per 1,000 patient days. A MRSA Infection Surveillance Prevalence Rate cannot be calculated because patient admissions are not collected in the infection surveillance module. There are currently no national rates available for MDRO/CDI data.

Table 9.

Cumulative Michigan MRSA Rate

	Number of Facilities	Number of MRSA Events	Number of Patient Days or Encounters	Number of Admissions	MRSA Rate ¹	MRSA Prevalence Rate ²
MRSA Inpatient LabID	30	977 LabID ^{3,4}	474,604 Patient Days	117,842	2.0586	0.8291
MRSA Surveillance	18	11 Infections ⁵	49,315 Patient Days	---- ⁶	0.2231	----
MRSA Outpatient LabID	9	614 LabID	298,142 Encounters	----	2.0594	----

Michigan Data

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

²MRSA Prevalence Rate. This is the number of MRSA LabID Events per 100 patients admitted.

³MRSA 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.

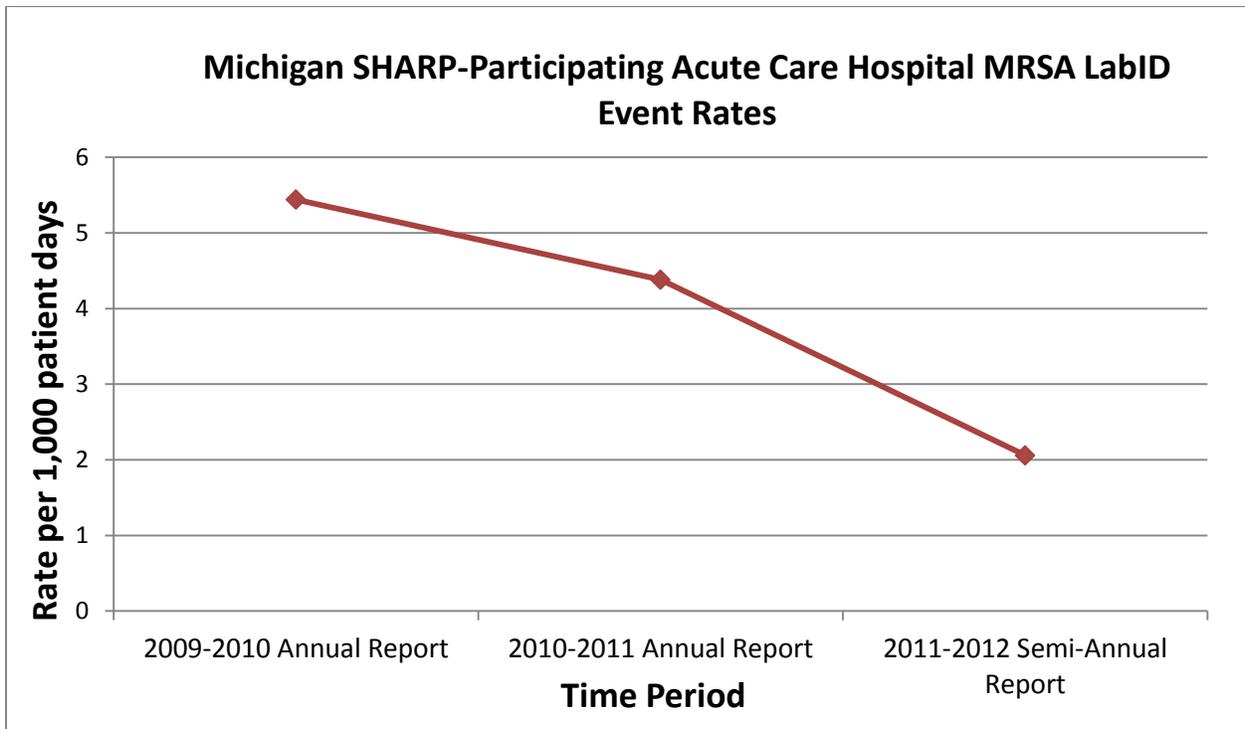
⁴The number of inpatient MRSA LabID Events indicated here is less than the number of MRSA LabID Events indicated in Table 7. This is because events used to calculate a rate required denominator data (patient days and/or admissions). Those without denominator data were excluded from the calculation.

⁵Surveillance 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.

⁶The infection surveillance module does not collect the number of patient admissions; therefore this number is unavailable and a MRSA Infection Surveillance Prevalence Rate cannot be calculated.

Figure 7 is a graphical demonstration of the Michigan MRSA LabID Event Rates from the 2009-2012. The 2010-2011 MRSA LabID Rate was statistically significantly lower than the 2009-2010 LabID Event Rate, and the 2011-2012 Semi-Annual MRSA LabID Event Rate was statistically significantly lower than the 2010-2011 rate.

Figure 7. MRSA LabID Event Rate Trend



In table 10 (below), Michigan inpatient MRSA LabID rates are stratified by onset. Healthcare facility-onset infections occur when the LabID specimen was collected on or after day 4 of admission to the facility. Because they are incident infections, only a MRSA incidence rate can be calculated. The HO MRSA incidence rate is 0.58 per 1,000 patient days. Community-onset infections occur when the LabID specimen was collected ≤ 3 days after admission to the facility. These are prevalent infections, so a MRSA prevalence rate is calculated. The MRSA prevalence rate is 0.60 per 100 admissions.

Table 10.

Michigan MRSA LabID Rate by Onset

Number of Facilities	Onset	Number of Inpatient MRSA Events	Number of Patient Days	Number of Patient Admits	MRSA Rate ¹	MRSA Prevalence Rate ²	Percentage
30	HO ³	275 LabID ⁴	474,604	-----	0.5794	-----	28
30	CO ⁵	702 LabID	-----	117,842	-----	0.5957	72

Michigan Data

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

²MRSA Prevalence Rate. This is the number of MRSA LabID Events per 100 patients admitted.

³HO: Healthcare facility-onset

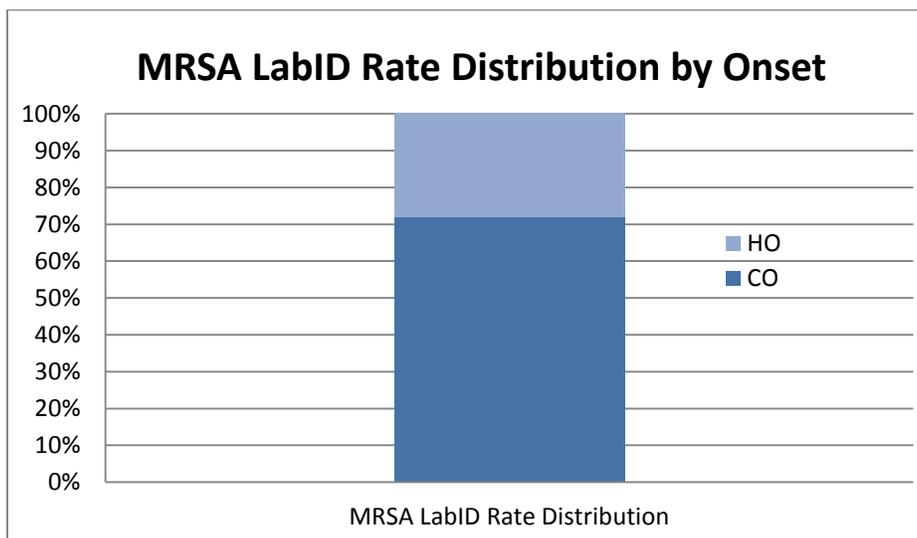
⁴MRSA Lab ID: MRSA Laboratory-Identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking laboratory results without conducting additional surveillance for infections.

⁵CO: Community-onset

The percentage distributions of CO and HO LabID Events in Table 10 are slightly different from the percentage distributions in Table 7. There are fewer LabID events in Tables 9 and 10 than in Table 7 because only LabID events which had corresponding denominators (i.e. patient days) were included in the rate tables. The percentages of CO and HO should be very similar, but may not be identical.

The majority (72%) of inpatient MRSA LabID events were community-onset. The remaining 28% were healthcare facility-onset. The graphical display of this can be seen below in Figure 8. In future reports, this graph will display trend data.

Figure 8. 2011-2012 Semi-Annual MRSA LabID Rate by Onset



In Table 11 (below), the semi-annual Michigan CDI LabID Event rate is 19.55 events for every 10,000 patient days. The CDI *LabID* Prevalence Rate was 0.73 per 100 patient admissions. CDI LabID Event data do not necessarily indicate infection but denote a positive lab test result from a specimen collected for clinical purposes. LabID Event data provide a proxy measure for *C. difficile* prevalence.

Hospitals may also conduct CDI Infection Surveillance via NHSN. The CDI Infection Surveillance Event definition includes cases of CDI (i.e., *C. difficile* pathogen identified with a positive toxin result) that are not present or incubating at the time of admission (i.e., meets criteria for a healthcare-associated infection). There were 9 hospitals that participated in this option during the time period under study, providing an overall CDI Infection Surveillance rate of 4.91 per 10,000 patient days. As with MRSA Infection Surveillance data, a CDI Infection Surveillance Prevalence Rate cannot be determined because the number of patients admitted is not collected with Infection Surveillance data. Again, there are no national MDRO/CDI rates available to make comparisons with Michigan data.

Table 11.

Cumulative Michigan CDI Rate

	Number of Facilities	Number of CDI Events	Number of Patient Days or Encounters	Number of Patient Admits	CDI Rate ¹	CDI Prevalence Rate ²
CDI Inpatient LabID	34	1160 LabID ^{3,4}	593,374 Patient Days	158,117	19.5492	0.7336
CDI Surveillance	15	15 Infections ⁵	30,578 Patient Days	---- ⁶	4.9055	----
CDI Outpatient LabID	11	217 LabID	362,888 Encounters	----	5.9798	----

Michigan Data

¹CDI Rate: *Clostridium difficile* rate. This is the number of CDI LabID events or surveillance infections per 10,000 patient days or encounters.

²CDI Prevalence Rate. This is the number of CDI LabID events per 100 patients admitted.

³CDI 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.

⁴The number of inpatient CDI LabID Events indicated here is less than the number of CDI LabID Events indicated in Table 8. This is because events used to calculate a rate required denominator data (patient days and/or admissions). Those without denominator data were excluded from the calculation.

⁵Infection: CDI event under infection surveillance. This is an option in the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module for tracking infections through surveillance.

⁶The infection surveillance module does not currently provide the number of patient admissions; therefore this number is unavailable and a CDI Prevalence Rate cannot be calculated.

Figure 9 (below) represents the CDI LabID Event Rate trend from 2009-2012. Although the 2010-2011 Annual Report CDI LabID Event Rate was lower than the 2009-2010 Annual Report, it was not statistically significantly different; however, the 2011-2012 Semi-Annual CDI LabID Event Rate was statistically significantly higher than the 2010-2011 rate.

Figure 9. CDI LabID Rate Trends

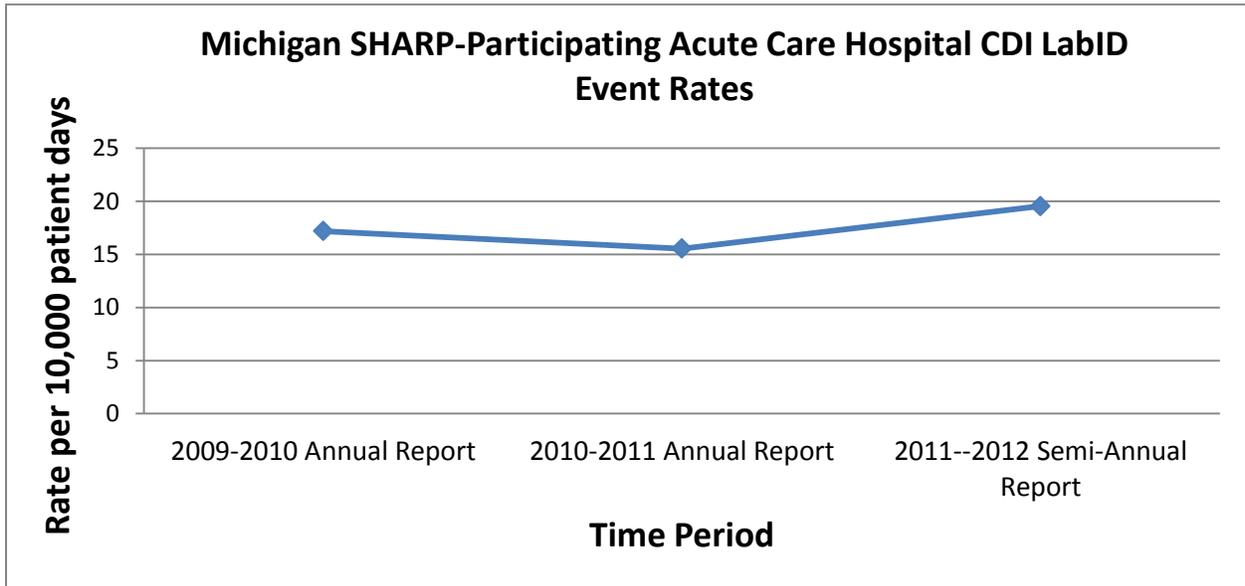


Table 12 (below) provides inpatient CDI LabID rates stratified by onset. The majority (44%) of inpatient CDI LabID events were healthcare facility-onset, with a rate of 8.70 per 10,000 patient days, followed closely by community onset (38%) with a rate of 7.40 per 10,000 patient days. The graphical display of this can be seen in Figure 10.

Table 12.							
Michigan CDI LabID Rate by Onset							
Number of Facilities	Onset	Number of Inpatient LabID CDI Events	Number of Patient Days	Number of Patient Admits	CDI Rate ¹	CDI Prevalence Rate ²	Percentage
34	HO ³	516 LabID ⁴	593,374	----	8.6960	----	44
34	CO-HCF ⁵	205 LabID	----	158,117	----	0.1297	18
34	CO ⁶	439 LabID	----	158,117	----	0.2776	38

Michigan Data

¹CDI Rate: *Clostridium difficile* rate. This is the number of CDI LabID events or surveillance infections per 10,000 patient days.

²CDI Prevalence Rate. This is the number of CDI LabID events per 100 patients admitted.

³HO: Healthcare facility-onset

⁴CDI 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.

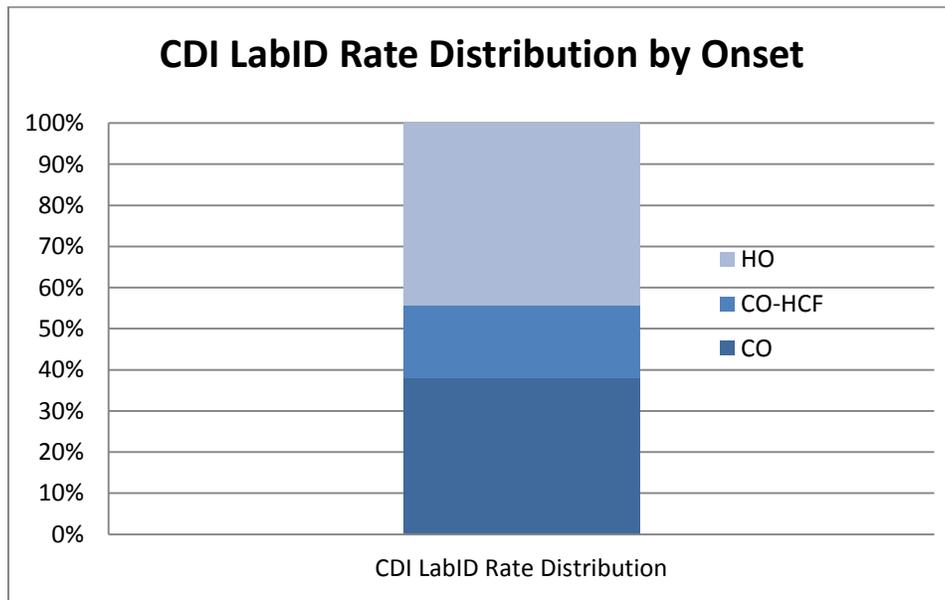
⁵CO-HCF: Community-onset healthcare facility-associated

⁶CO:Community-onset

The percentage distributions of CO, CO-HCF, and HO LabID Events in Table 12 are slightly different from the distributions in Table 8. This can be explained by the greater number of overall LabID events in Table 8. The amount of LabID events in Tables 11 and 12 are lower than in Table 8 because only LabID events which had corresponding denominators (i.e. patient days) were included in the rate table. Therefore, the percentages of CO, CO-HCF, and HO should be very similar, but may not be identical.

The majority (44%) of inpatient CDI LabID events were healthcare-onset, closely followed by community-onset (38%). The remaining 18% were community-onset, healthcare-facility associated. The graphical display of this can be seen below in Figure 10. In future reports, this graph will display trend data.

Figure 10. Semi-Annual CDI LabID Rate by Onset



In Table 13, the VRE LabID rate was 1.11 per 1,000 patient days for eight hospitals sharing VRE data with the SHARP Unit. The VRE LabID Prevalence Rate was 0.46 per 100 patient admissions. Trend data for VRE will be made available in future reports. As with MRSA and CDI, there is no comparative national rate for VRE.

Table 13.

Cumulative Michigan Vancomycin-Resistant Enterobacteriaceae (VRE) Rate

	Number of Facilities	Number of Inpatient VRE Events	Number of Patient Days or Encounters	Number of Patient Admits	VRE Rate ¹	VRE Prevalence Rate ²
VRE Inpatient LabID	8	49 LabID ^{3,4}	44,311 Patient Days	10,597	1.1058	0.4624
VRE Surveillance	7	0 Infections ⁵	15,451 Patient Days	---- ⁶	0.0000	----
VRE Outpatient LabID	<5	----	---- Encounters	----	----	----

Michigan Rate

¹VRE Rate: Vancomycin-Resistant Enterococci (VRE) rate. This is the number of inpatient VRE LabID Events or surveillance infections per 1,000 patient days or encounters.

²VRE Prevalence Rate. This is the number of VRE LabID Events per 100 patients admitted.

³MRSA Lab ID: VRE 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.

⁴The number of inpatient VRE LabID Events indicated here may be less than the total number of VRE LabID Events. This is because events used to calculate a rate required denominator data (patient days and/or admissions). Those without denominator data were excluded from the calculation.

⁵Surveillance Infection: VRE event under infection surveillance. This is an option in the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module for tracking infections through surveillance.

⁶The infection surveillance module does not collect the number of patient admissions; therefore this number is unavailable and a VRE Infection Surveillance Prevalence Rate cannot be calculated.

Device-Associated Module Semi-Annual Aggregated Rates

From the 66 hospitals reporting Catheter-Associated Urinary Tract Infection (CAUTI) data to NHSN and sharing with the MDCH SHARP Unit, there were 257 infections. These infections contributed to the MI CAUTI rate of 1.84 per 1,000 device days, which was statistically significantly greater than the US CAUTI rate of 1.61 per 1,000 device days. However, the Device Utilization (DU) ratio for Michigan was 0.29, which was significantly lower than the US DU ratio of 0.31.

Table 14.

Michigan Catheter-Associated Urinary Tract Infection (CAUTI)¹ Rate

Number of Hospitals	Number of CAUTIs	Number of Patient Days	Number of Catheter Days	MI CAUTI Rate ²	US CAUTI Rate ³	MI DU ⁴	US DU ⁵
66	257	479,533	139,518	1.8421	1.6064	0.2909	0.3072

Michigan Rate
 US Comparative Rate

¹CAUTIs are defined using symptomatic urinary tract infection (SUTI) criteria or Asymptomatic Bacteremic UTI (ABUTI) criteria. UTIs must be catheter-associated (i.e. patient had an indwelling urinary catheter at the time of or within 48 hours before onset of the event).

²MI CAUTI Rate is the number of CAUTIs per 1,000 device days among participating hospitals.

³The US comparative rates were calculated from a pooled mean using data from the national estimate on the National Healthcare Safety Network (NHSN). This is according to 2010 NHSN data (Am J Infect Control 2011;39:798-816). These data are for a descriptive reference only, and do not necessarily represent the true national rate.

⁴DU: 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.

⁵The US comparative DU was calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This is according to 2010 NHSN data (Am J Infect Control 2011;39:798-816).

Hospitals in Michigan have been working diligently with MHA Keystone to reduce Central Line-Associated Bloodstream Infection (CLABSI) rates; this is reflected in the data in Table 15 (below). With data collected from 66 hospitals, Michigan's device utilization ratio is significantly higher than the U.S. ratio (0.35 and 0.26 respectively). However, the Michigan CLABSI rate (0.76) is statistically significantly lower than the national average of 1.09 per 1,000 patient days.

Table 15.

Michigan Central Line-Associated Bloodstream Infection (CLABSI)¹ Rate

Number of Hospitals	Number of CLABSIs	Number of Patient Days	Number of Central Line Days	MI CLABSI Rate ²	US CLABSI Rate ³	MI DU ⁴	US DU ⁵
66	130	489,238	170,525	0.7624	1.0902	0.3486	0.2561

 Michigan Data
 US Comparative Data

¹CLABSIs are laboratory-confirmed bloodstream infections (LCBI) that are not secondary to a community-acquired infection, or an HAI meeting CDC/NHSN criteria at another body site. BSIs must be central line associated (i.e., a central line or umbilical catheter was in place at the time of, or within 48 hours before, onset of the event).

²MI CLABSI Rate is the number of CLABSIs per 1,000 device days among participating hospitals.

³The US comparative rates were calculated from a pooled mean using data from the national estimate on the National Healthcare Safety Network (NHSN). This is according to 2010 NHSN data (Am J Infect Control 2011;39:798-816). These data are for a descriptive reference only, and do not necessarily represent the true national rate.

⁴DU: 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.

⁵The US comparative DU was calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This is according to 2009 NHSN data (Am J Infect Control 2011;39:349-67).

The data below indicate that the Michigan ventilator-associated pneumonia (VAP) rate was 0.91 per 1,000 device days within the 48 hospitals participating in this module and sharing data with the MDCH SHARP Unit. This rate is statistically significantly less than the national rate of 1.43 per 1,000 device days. The Michigan ventilator device utilization (DU) ratio of 0.35 is significantly higher than the national average DU ratio of 0.31.

Table 16.

Michigan Ventilator-Associated Pneumonia (VAP)¹ Rate

Number of Hospitals	Number of VAPs	Number of Patient Days	Number of Ventilator Days	MI VAP Rate ²	US VAP Rate ³	MI DU ⁴	US DU ⁵
48	52	164,909	57,224	0.9087	1.4319	0.3470	0.3144

 Michigan Data
 US Comparative Data

¹VAPs can be identified by using a combination of radiologic, clinical and laboratory criteria. PNEUs must be ventilator-associated (i.e., patient was intubated and ventilated at the time of, or within 48 hours before, the onset of the event).

²MI VAP Rate is the number of VAPs per 1,000 device days among participating hospitals.

³The US comparative rates were calculated from a pooled mean using data from the national estimate on the National Healthcare Safety Network (NHSN). This is according to 2010 NHSN data (Am J Infect Control 2011;39:798-816). These data are for a descriptive reference only, and do not necessarily represent the true national rate.

⁴DU: 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.

⁵The US comparative DU was calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This is according to 2009 NHSN data (Am J Infect Control 2011;39:349-67).

Figures 11 and 12 (below) are a graphical representation of the Device-Associated Infection Rates and Device Utilization Ratios from 2009-2012.

Figure 11. Device-Associated Infection Rates over time

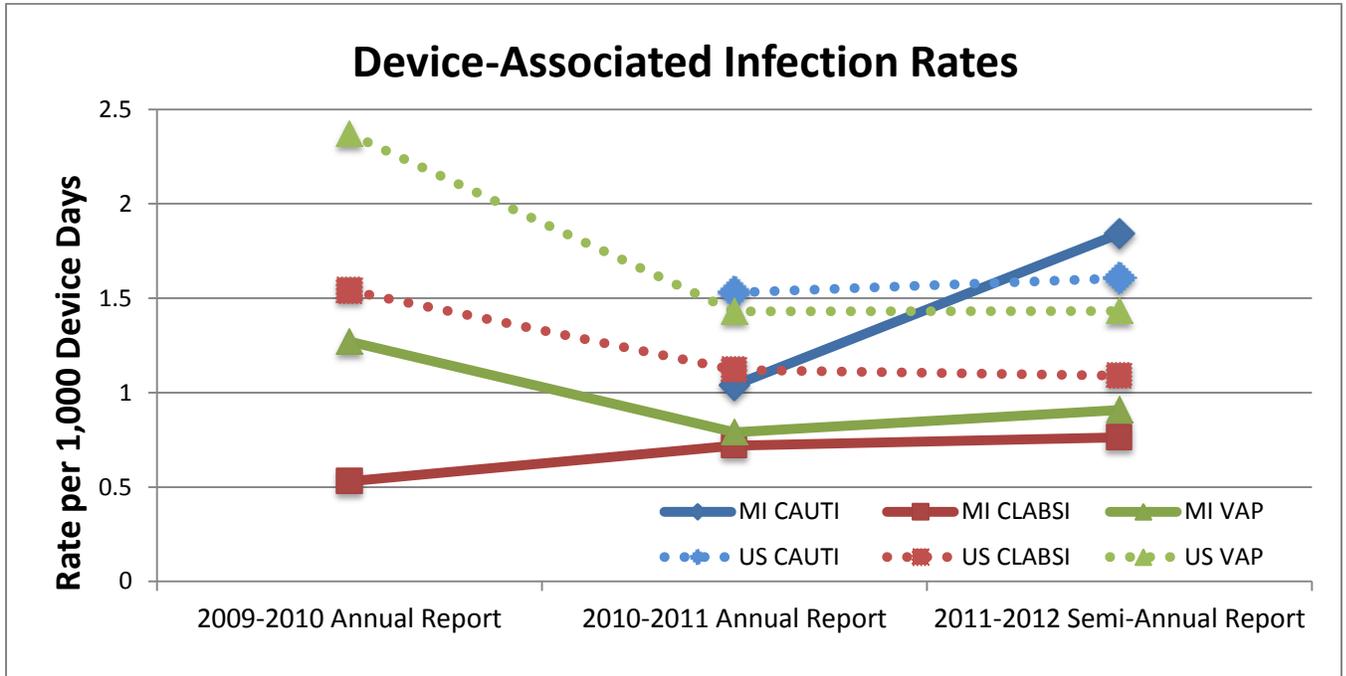


Figure 12. Device Utilization Ratios over time

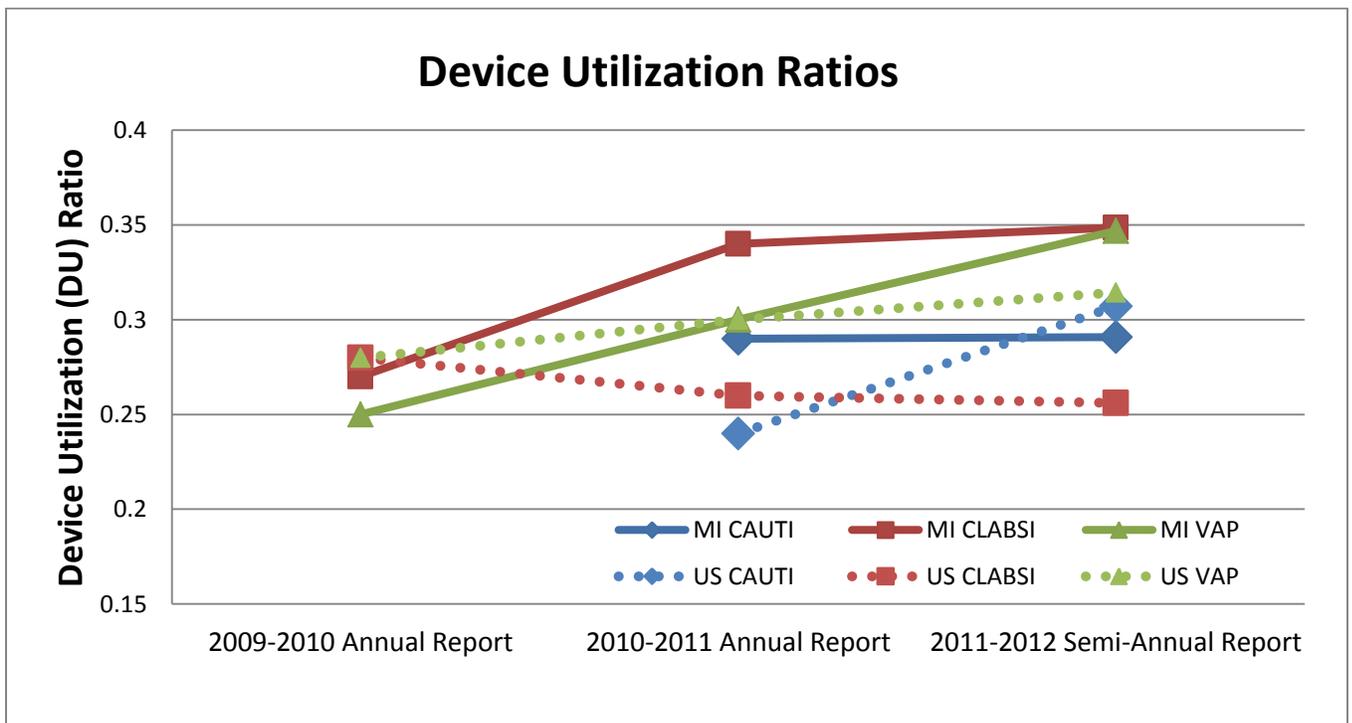


Table 17 provides NICU-specific CLABSI and VAP rates by birth weight. There are 13-16 hospitals sharing CLABSI NICU data, and 7-9 hospitals sharing VAP NICU data (depending on birthweight code). As this is the first time these rates have been calculated, there is no trend data for the present report. This will become available in future reports.

Table 17.

Michigan NICU Device-Associated Rates by Birth Weight

Type of Infection	Birth weight Code	Number of Hospitals	Number of Infections	Number of Patient Days	Number of Device Days	MI Rate ¹	US Rate ²	MI DU ³	US DU ⁴
CLABSI⁵	A ⁶	13	9	9,085	3,183	2.8275	2.6825	0.3504	0.4261
	B ⁷	14	8	9,420	2,462	3.2494	2.2174	0.2614	0.3840
	C ⁸	16	4	15,675	3,583	1.1164	1.2983	0.2286	0.2916
	D ⁹	14	2	19,588	2,608	0.7669	0.9910	0.1331	0.1888
	E ¹⁰	15	1	12,718	2,760	0.3623	0.8112	0.2170	0.2460
VAP¹¹	A	7	0	4,213	1,408	0.0000	1.3479	0.3342	0.3891
	B	8	1	5,691	727	1.3755	0.9303	0.1277	0.2424
	C	8	0	9,282	635	0.0000	0.8849	0.0684	0.1087
	D	9	0	12,171	360	0.0000	0.4271	0.0296	0.0829
	E	9	0	7,228	506	0.0000	0.4378	0.0700	0.1391

 Michigan Data  US Comparative Data

¹MI Rates are the number of device-associated infections per 1,000 device days among participating hospitals.

²The US comparative rates were calculated from a pooled mean using data from the national estimate on the National Healthcare Safety Network (NHSN). This is according to 2010 NHSN data (Am J Infect Control 2011;39:798-816). These data are for a descriptive reference only, and do not necessarily represent the true national rate.

³DU: 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.

⁴The US comparative DU was calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This is according to 2010 NHSN data (Am J Infect Control 2011;39:798-816).

⁵CLABSIs are laboratory-confirmed bloodstream infections (LCBI) that are not secondary to a community-acquired infection, or an HAI meeting CDC/NHSN criteria at another body site. BSIs must be central line associated (i.e., a central line or umbilical catheter was in place at the time of, or within 48 hours before, onset of the event).

⁶A: Birthweight ≤750g

⁷B: Birthweight 751 – 1000g

⁸C: Birthweight 1001 – 1500g

⁹D: Birthweight 1501 – 2500g

¹⁰E: Birthweight >2500g

¹¹VAPs can be identified by using a combination of radiologic, clinical and laboratory criteria. PNEUs must be ventilator-associated (i.e., patient was intubated and ventilated at the time of, or within 48 hours before, the onset of the event).

Device-Associated Standardized Infection Ratios

Table 18.

Device Standardized Infection Ratios (SIR)

Type of Infection	Number Hospitals	Device Days	Observed ¹	Predicted ²	MI SIR ³	MI SIR p-value ⁴	MI 95% CI ⁵	US SIR ⁶	US 95% CI ⁷
CAUTI ⁸	68	119,279	248	245.981	1.008	0.4572	0.887, 1.142	0.930	0.914, 0.945
CLABSI ⁹	68	176,532	149	346.331	0.430	0.0000	0.364, 0.505	0.592	0.583, 0.600

Michigan Data US Data

Highlight: Indicates significantly better than expected

Highlight: Indicates significantly worse than expected

¹Observed: Number of infections (CAUTI or CLABSIs) reported during the time frame.

²Predicted: The number of CAUTIs or CLABSIs predicted based on the type of hospital unit(s) under surveillance.

³SIR: 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.

⁴P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can be either significantly worse (if the SIR is greater than 1 and the p-value is <0.05) or significantly better (if the SIR is less than 1 and the p-value is <0.05).

⁵95% 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.

⁶US SIR taken from the National and State Healthcare-Associated Infections Standardized Infection Ratio Report, January-December 2011

⁷US 95% CI taken from the National and State Healthcare-Associated Infections Standardized Infection Ratio Report, January-December 2011

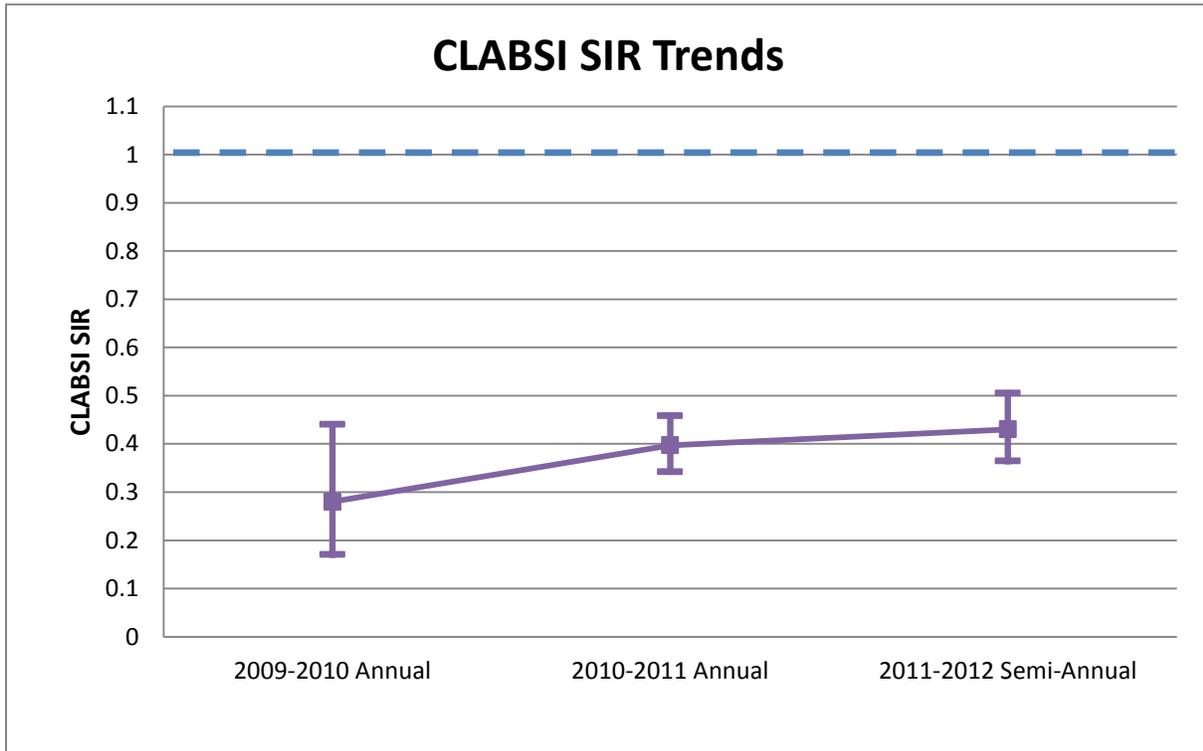
⁸CAUTI: Catheter-Associated Urinary Tract Infection

⁹CLABSI: Central Line-Associated Blood Stream Infection

Michigan's CAUTI Standardized Infection Ratio (SIR) is 1.008 for 68 participating hospitals. This SIR can be interpreted as having approximately the same number of CAUTIs as expected, as determined by national NHSN data. Although this SIR was not significantly different than expected, it was significantly worse than the 2010-2011 Annual Report CAUTI SIR of 0.638. A trend figure will be made available on the next report, when three annual or semi-annual CAUTI SIRs have been calculated.

Michigan's CLABSI SIR, using data from 68 participating hospitals, is 0.430. This SIR can be interpreted as Michigan having 57% fewer CLABSIs than expected, as determined by national NHSN data. This is statistically significantly lower than the expected value. It is not statistically significantly different than the previous annual report's SIR of 0.397. Figure 13 (below) provides a graphical demonstration of the CLABSI SIR trends from the 2009-2010 Annual Report to the present 2011-2012 Semi-Annual Report. A figure will be made available displaying the CAUTI SIR trends in future reports.

Figure 13. CLABSI SIR Trends



Procedure-Associated Module Aggregated Data

Table 19 shows the SSI infection rates and SIRs by procedure type for the time period included. Only procedure types for which five or more hospitals provided data were included in the present report. Beginning January 1, 2012, hospitals were required by CMS to reports all colon surgery (COLO) and abdominal hysterectomy (HYST) procedures through NHSN. Procedures that have a statistically significant SIR based on agreement between p-value and confidence interval are highlighted below in red (significantly more infections than expected) or green (significantly fewer infections than expected). As a reference, the national SSI SIR (from the January – December 2011 SIR Report released by CDC) was 0.827 (95% CI: 0.807, 0.848).

Table 19.

SSI Rates and SIR by Procedure Type

Procedure Type	Number of Hospitals	Number of Procedures	Number of Observed ¹ SSIs	Number of Expected ² SSIs	MI SSI Rate ³	MI SSI SIR ⁴	MI SIR p-value ⁵	MI SIR 95% Confidence Interval ⁶
Overall	67	16,118	350	348.097	2.1714	1.005	0.4665	0.901, 1.119
APPY ⁷	6	170	1	3.079	0.5882	0.325	0.1877	0.008, 1.810
BRST ⁸	6	157	6	1.963	3.8217	3.057	0.0153	1.122, 6.653
CARD ⁹	5	216	5	2.297	2.3148	2.177	0.0834	0.707, 5.080
CBGB ¹⁰	10	780	14	16.978	1.7949	0.825	0.2826	0.451, 1.384
CBGC ¹¹	7	31	2	0.798	6.4516	.	.	.
CHOL ¹²	7	383	6	2.570	1.5666	2.335	0.0469	0.857, 5.082
COLO ¹³	66	2590	142	153.00	5.4826	0.935	0.2229	0.785, 1.105
FUSN ¹⁴	6	799	11	11.532	1.3767	0.954	0.5160	0.476, 1.707
FX ¹⁵	7	367	8	6.498	2.1798	1.231	0.3269	0.532, 2.426
GAST ¹⁶	6	414	5	7.490	1.2077	0.668	0.2425	0.217, 1.558
HER ¹⁷	7	538	8	6.340	1.4870	1.262	0.3040	0.545, 2.486
HPRO ¹⁸	21	2008	33	26.387	1.6434	1.251	0.1190	0.854, 1.767
HYST ¹⁹	62	2106	48	38.664	2.2792	1.216	0.1062	0.887, 1.625
KPRO ²⁰	21	3112	25	29.152	0.8033	0.892	0.3200	0.577, 1.316
LAM ²¹	5	682	8	6.470	1.1730	1.236	0.3229	0.534, 2.436
PVBY ²²	5	144	4	9.946	2.7778	0.402	0.0303	0.110, 1.030
VHYS ²³	9	178	5	1.991	2.8090	2.511	0.0518	0.815, 5.861
XLAP ²⁴	5	133	1	2.071	0.7519	0.483	0.3871	0.012, 2.690

 US Data  Michigan Data

Highlight: Indicates significantly better than expected based on p-value and CI agreement

Highlight: Indicates significantly worse than expected based on p-value and CI agreement

¹Observed: Number of SSIs reported during the time frame.

²Predicted: The number of SSIs predicted for the same number and type of procedures performed based upon 2009 national SSI rates by procedure type.

³MI SSI Rate is the number of SSIs per 100 procedures among participating hospitals.

⁴SIR: 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. SIRs with significant p-values are highlighted in either green (significantly better than expected) or red (significantly worse).

⁵P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can be either significantly worse (if the SIR is greater than 1 and the p-value is <0.05) or significantly better (if the SIR is less than 1 and the p-value is <0.05).

⁶95% 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.

⁷APPY: Appendix surgery

⁸BRST: Breast surgery

⁹CARD: Cardiac surgery

¹⁰CBGB: Coronary artery bypass graft with both chest and donor site incisions

¹¹CBGC: Coronary artery bypass graft with chest incision only

¹²CHOL: Gallbladder surgery

¹³COLO: Colon surgery

¹⁴FUSN: Spinal fusion

¹⁵FX: Open reduction of fracture

¹⁶GAST: Gastric surgery

¹⁷HER: Herniorrhaphy

¹⁸HPRO: Hip prosthesis

¹⁹HYST: Abdominal hysterectomy

²⁰KPRO: Knee prosthesis

²¹LAM: Laminectomy

²²PVBY: Peripheral vascular bypass surgery

²³VHYS: Vaginal hysterectomy

²⁴XLAP: Abdominal surgery

Cumulative Rates and SIRs Aggregated by Specifiers

Table 20.

MDRO Rates¹ by Hospital Type

Hospital Type	MDRO Infection Type	Rate (number of hospitals)	Rate CO ² (%CO)
Teaching	MRSA LabID ³	1.9463 (15 hosp)	1.3671 (70)
	CDI LabID ⁴	20.4349 (17 hosp)	7.8035 (38)
Non-Teaching	MRSA LabID	2.5643 (15 hosp)	1.9842 (77)
	CDI LabID	15.7769 (17 hosp)	5.6726 (36)

Michigan Data

¹Rates were calculated using the number of infections/events per 1,000 (or per 10,000 for CDI) patient days or device days according to the same MI rate shown in Tables 9–14 among hospitals that shared data with MDCH SHARP through the NHSN.

²CO: Community Onset (%CO: Percent of LabID events that were community onset)

³MRSA LabID: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Laboratory-identified (LabID) Event 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.

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

Non-teaching hospitals had higher MRSA Rates than teaching hospitals; they also had a higher percentage of community-onset MRSA LabID events. MRSA LabID Rates decreased from the previous report for teaching hospitals, but increased in non-teaching hospitals (see Figure 14).

Teaching hospitals had a higher rate of CDI LabID events than non-teaching hospitals, as well as a higher percentage of community-onset events. From the 2010-2011 Annual Report to the present report, CDI LabID Event rates increased for both teaching and non-teaching hospitals (see Figure 15).

Figure 14. MRSA LabID Rate Trends by Hospital Type

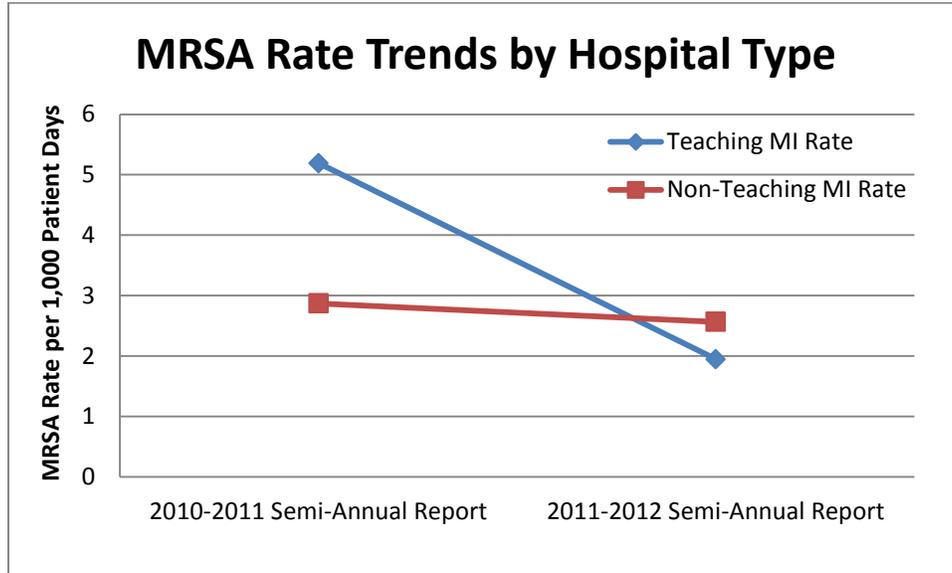


Figure 15. CDI LabID Rate Trends by Hospital Type

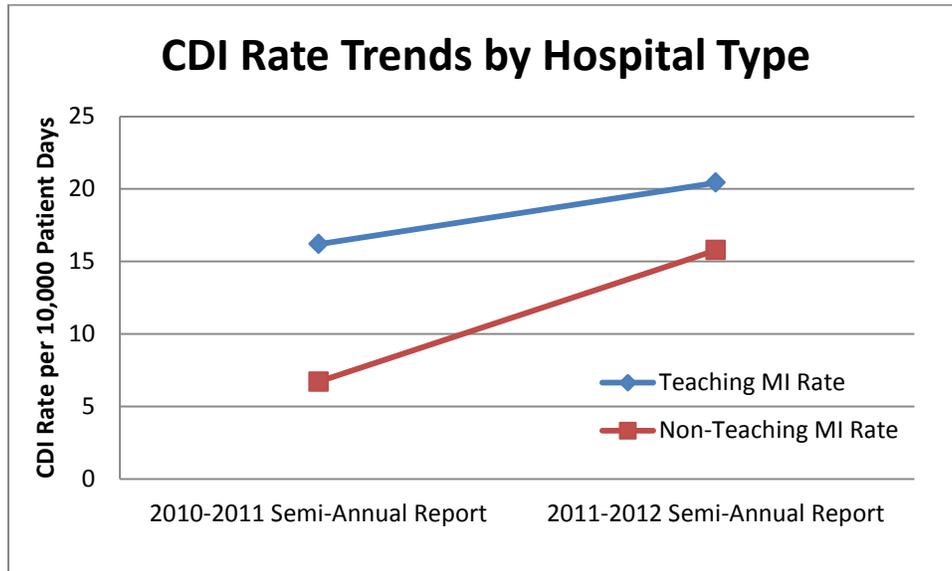


Table 21.

Device Rates¹ and SIR by Hospital Type

Hospital Type	Device-Associated Infection	Rate (Number of Hospitals)	US Rate ²	SIR ³	SIR p-value ⁴	SIR 95% Confidence Interval ⁵
Teaching	CAUTI ⁶	2.1341 (34 hosp)	1.7221	1.160	0.0199	1.007, 1.329
	CLABSI ⁷	0.8101 (34 hosp)	1.1492	0.450	0.0000	0.375, 0.536
	VAP ⁸	0.9170 (25 hosp)	1.6187	-----	-----	-----
Non-Teaching	CAUTI	1.1517 (32 hosp)	1.4687	0.624	0.0006	0.452, 0.841
	CLABSI	0.6049 (32 hosp)	1.0242	0.345	0.0000	0.221, 0.513
	VAP	0.8495 (24 hosp)	1.1344	-----	-----	-----

 US Data  Michigan Data

Highlight: Indicates significantly better than expected

Highlight: Indicates significantly worse than expected

¹Rates were calculated using the number of infections/events per 1,000 device days according to the same MI rate shown in Tables 14-16 among hospitals that shared data with MDCH SHARP through the NHSN.

²The US comparative rates were calculated from a pooled mean using data from the national estimate on the National Healthcare Safety Network (NHSN). This is according to 2010 NHSN data (Am J Infect Control 2011;39:798-816). These data are for a descriptive reference only, and do not necessarily represent the true national rate. Each rate is individually matched to the Michigan data by facility type and unit type, then aggregated into an overall rate.

³SIR: 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.

⁴P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can be either significantly worse (if the SIR is greater than 1 and the p-value is <0.05) or significantly better (if the SIR is less than 1 and the p-value is <0.05).

⁵95% 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.

⁶CAUTI: Catheter-Associated Urinary Tract Infection

⁷CLABSI: Central Line-Associated Blood Stream Infection

⁸VAP : Ventilator-Associated Pneumonia

Michigan teaching hospitals observed a significantly higher number of CAUTIs than expected with an SIR of 1.16, while non-teaching hospitals observed significantly fewer CAUTIs than expected with an SIR of 0.62 (see Figure 16). Both teaching and non-teaching hospitals observed significantly fewer CLABSIs than expected with SIRs of 0.45 and 0.35, respectively (see Figure 17).

With the exception of CAUTI rates, device rates for teaching hospitals remained fairly stable from the previous annual report to the present semi-annual report. Non-teaching rates also remained quite stable, with Michigan CLABSI rates showing the greatest change from the previous report to the present. All VAP rates (Michigan and US) decreased, with the exception of Michigan non-teaching hospitals (see Figure 18).

Figure 16. CAUTI Rates by Hospital Type

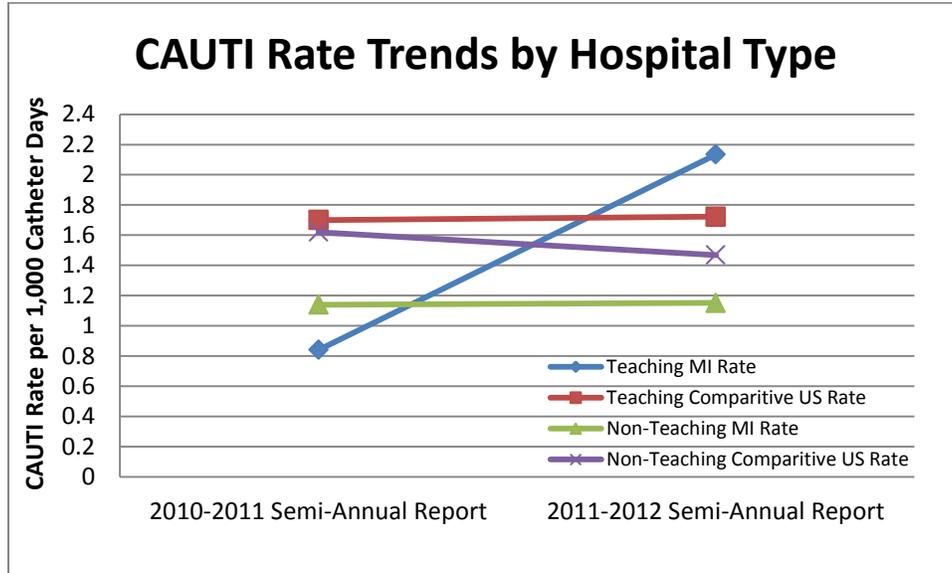


Figure 17. CLABSI Rates by Hospital Type

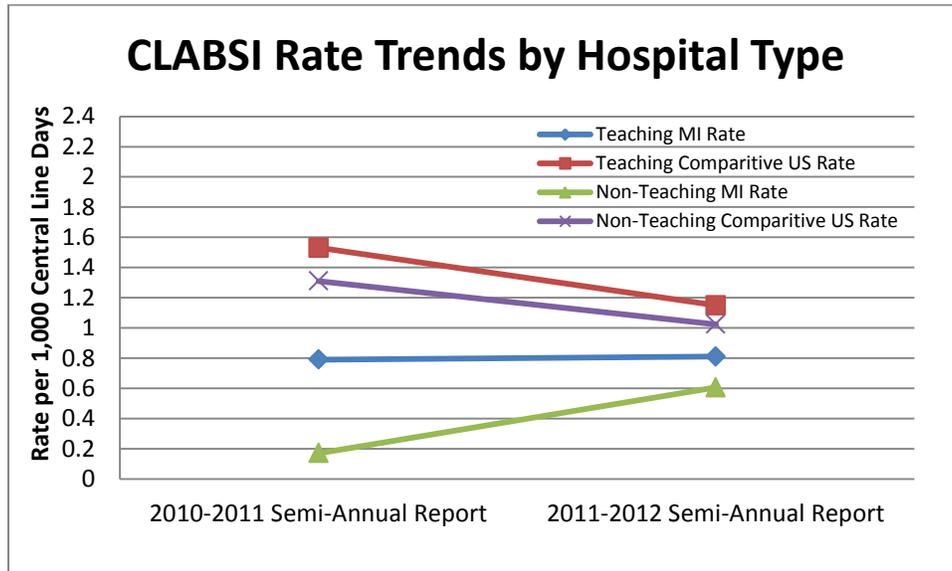


Figure 18. VAP Rates by Hospital Type

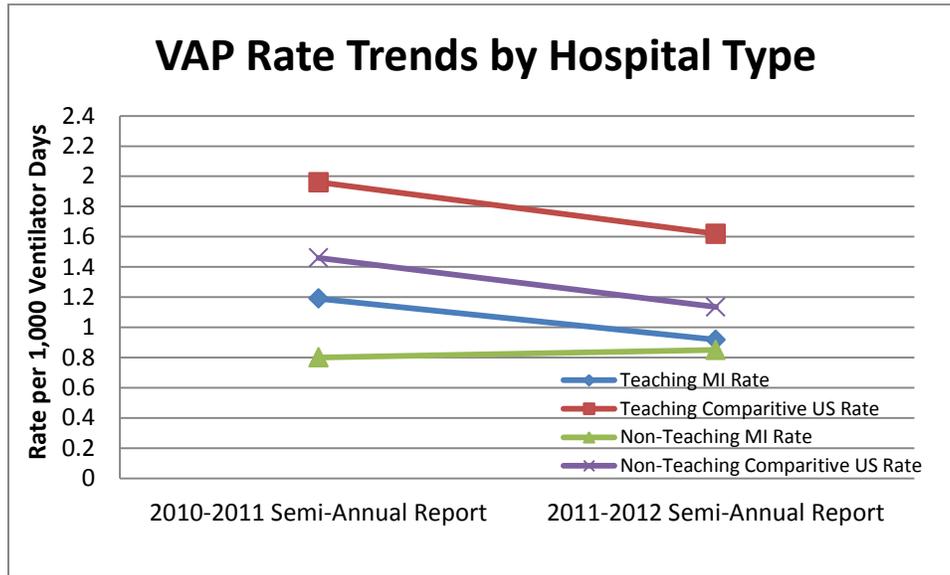


Table 22.

MDRO Rates¹ by Michigan Region

Michigan Region	MDRO Infection Type	Rate (Number of Hospitals)	CO Rate (%CO)
Southeast (Regions 1, 2N, 2S)	MRSA LabID ³	2.3144 (10 hosp)	1.6125 (70)
	CDI LabID ⁴	21.4222 (12 hosp)	6.8770 (32)
Mid/Western (Regions 3, 5, 6)	MRSA LabID	1.8496 (16 hosp)	1.3564 (73)
	CDI LabID	17.8196 (17 hosp)	8.3269 (47)
Northern (Regions 7, 8)	MRSA LabID	----- (4 hosp)	-----
	CDI LabID	11.4016 (5 hosp)	5.2936 (46)

Michigan Data

¹Rates were calculated using the number of infections/events per 1,000 (or per 10,000 for CDI) patient days or device days according to the same MI rate shown in Tables 9–14 among hospitals that shared data with MDCH SHARP through the NHSN.

²CO: Community Onset (%CO: Percent of LabID events that were community onset)

³MRSA LabID: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Laboratory-identified (LabID) Event 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.

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

Southeast Michigan had a higher MRSA LabID rate than Mid/Western Michigan, although a higher percentage of the Mid/Western MRSA LabID events were community-onset. There weren't enough facilities in Northern Michigan to calculate a MRSA rate. From the previous annual report to the present, MRSA LabID event rates remained fairly stable for both Southeast and Mid/Western Michigan. There were not enough data to calculate a trend for Northern Michigan (see Figure 19).

Southeast Michigan also had a higher CDI LabID rate than Mid/Western Michigan. Northern Michigan had the lowest CDI LabID rate. In addition to having the highest rate of CDI LabID events, Southeast Michigan also had the lowest percentage of community-onset events. From the previous annual report to the present, CDI LabID event rates increased for both Southeast and Mid/Western regions. There were not enough data to calculate a trend for Northern Michigan (see Figure 20).

Figure 19. MRSA LabID Rates by Michigan Public Health Preparedness Region

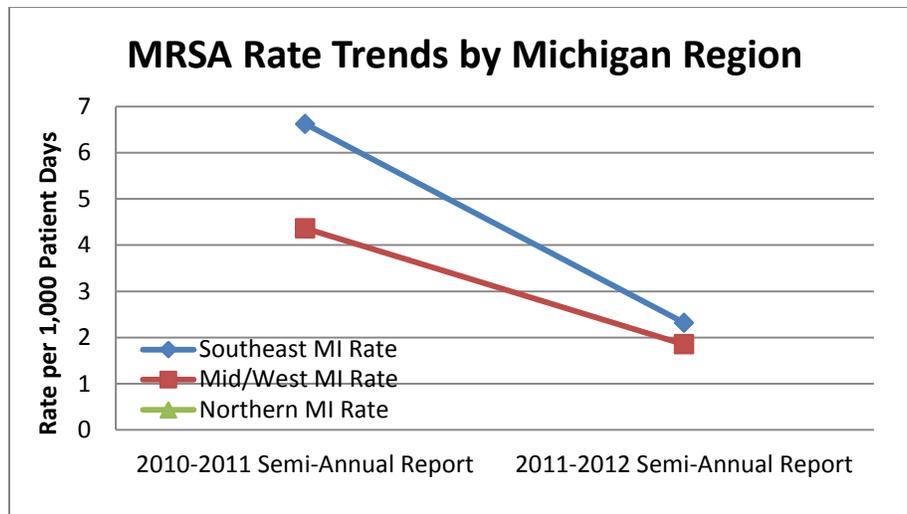


Figure 20. CDI LabID Rates by Michigan Public Health Preparedness Region

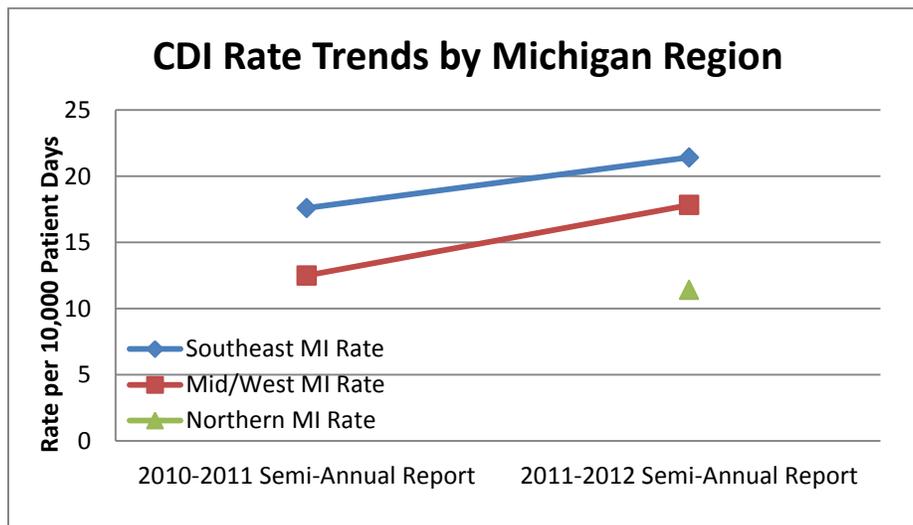


Table 23.

Device Rates¹ and SIR by Michigan Region

Region	Device-Associated Infection	Rate (Number of hospitals)	US Rate ²	SIR ³	SIR p-value ⁴	SIR 95% Confidence Interval ⁵
Southeast (Regions 1, 2N, 2S)	CAUTI ⁶	1.6864 (24)	1.7677	0.868	0.0673	0.716, 1.042
	CLABSI ⁷	0.8968 (23)	1.1386	0.441	0.0000	0.352, 0.544
	VAP ⁸	1.1545 (17)	1.2063	-----	-----	-----
Mid/Western (Regions 3, 5, 6)	CAUTI	2.1362 (33)	1.5713	1.255	0.0076	1.046, 1.494
	CLABSI	0.6151 (33)	1.0809	0.418	0.0000	0.318, 0.540
	VAP	0.3284 (24)	1.2280	-----	-----	-----
Northern (Regions 7, 8)	CAUTI	1.0508 (9)	1.4222	0.623	0.0895	0.285, 1.182
	CLABSI	0.6992 (10)	1.0191	0.398	0.0143	0.129, 0.929
	VAP	0.8483 (8)	1.7351	-----	-----	-----

 US Data Michigan Data

 Highlight: Indicates significantly better than expected

 Highlight: Indicates significantly worse than expected

¹Rates were calculated using the number of infections/events per 1,000 device days according to the same MI rate shown in Tables 14-16 among hospitals that shared data with MDCH SHARP through the NHSN.

²The US comparative rates were calculated from a pooled mean using data from the national estimate on the National Healthcare Safety Network (NHSN). This is according to 2010 NHSN data (Am J Infect Control 2011;39:798-816). These data are for a descriptive reference only, and do not necessarily represent the true national rate. Each rate is individually matched to the Michigan data by facility type and unit type, then aggregated into an overall rate.

³SIR: 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.

⁴P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can be either significantly worse (if the SIR is greater than 1 and the p-value is <0.05) or significantly better (if the SIR is less than 1 and the p-value is <0.05).

⁵95% 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.

⁶CAUTI: Catheter-Associated Urinary Tract Infection

⁷CLABSI: Central Line-Associated Blood Stream Infection

⁸VAP : Ventilator-Associated Pneumonia

Northern Michigan hospitals had significantly fewer CAUTIs than expected, with an SIR of 0.62, while Mid/Western Michigan hospitals had significantly more CAUTIs than expected with an SIR of 1.26. Southeast Michigan hospitals had less CAUTIs than expected, with an SIR of 0.87, but this was not significant.

Southeast and Mid/Western Michigan hospital rates increased for CAUTIs from the previous annual report to the present semi-annual report, while the descriptive comparative US rates remained stable. A trend for Northern Michigan will be made available on the next report (see Figure 21).

Southeast and Mid/Western Michigan hospital CLABSI rates remained fairly stable from the previous report to the present, while their comparative US descriptive rates decreased slightly. The current Northern Michigan rate is lower than the comparative US rate, and a trend will be made available on the next report (see Figure 22).

VAP rates decreased for Mid/Western Michigan hospitals, while they slightly increased for Southeast Michigan hospitals. As with the other modules, not enough data were available to demonstrate a trend (see Figure 23).

Figure 21. CAUTI Rates by Michigan Public Health Preparedness Region

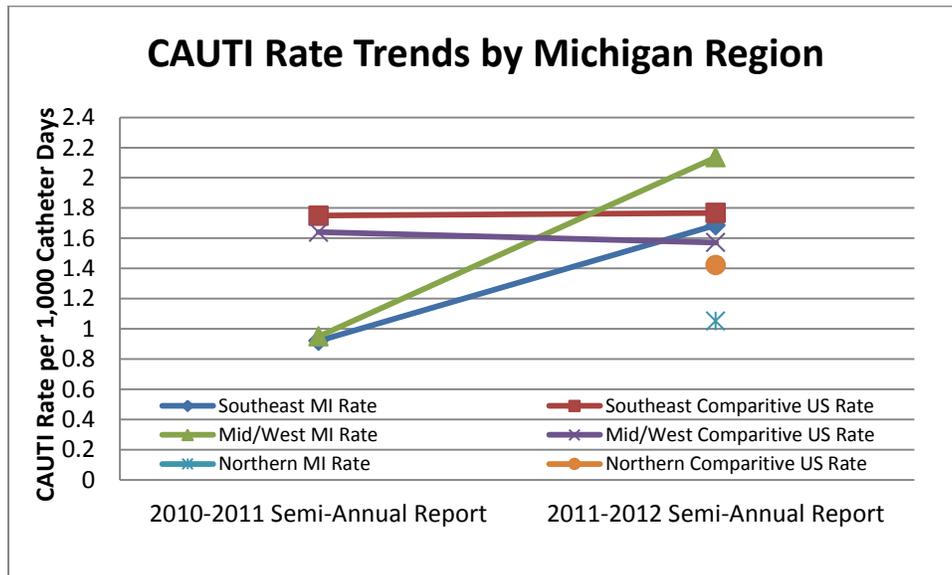


Figure 22. CLABSI Rates by Michigan Public Health Preparedness Region

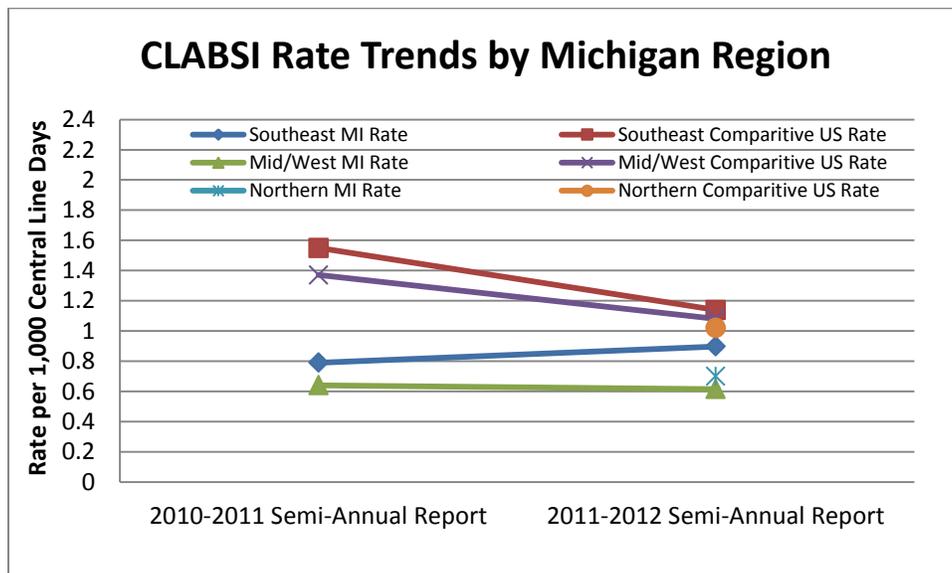


Figure 23. VAP Rates by Michigan Public Health Preparedness Region

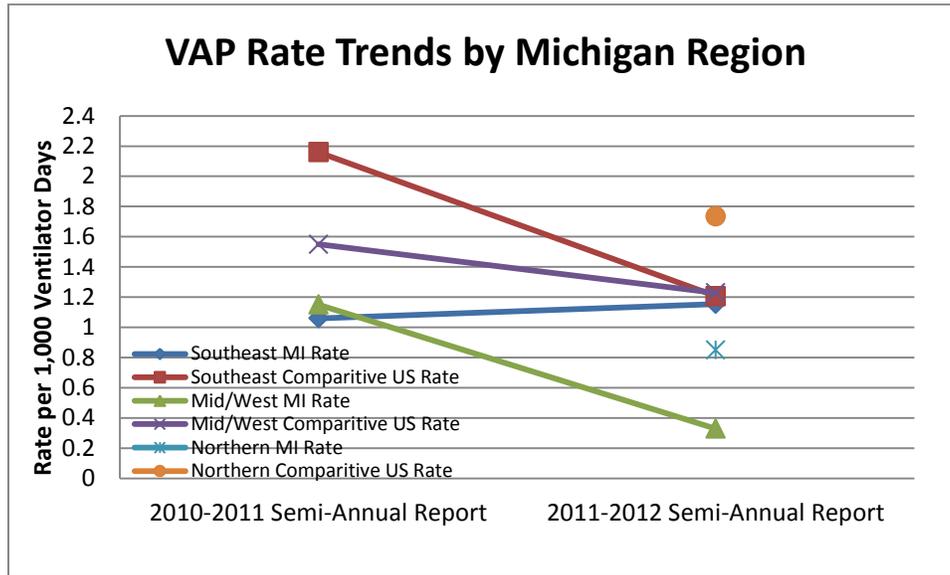


Table 24.

MDRO Rates¹ by Hospital Bed Size

Bed Size	MDRO Infection Type	Rate (Number of Hospitals)	Rate CO ² (%CO)
≤200 Beds	MRSA LabID ³	1.8301 (19 hosp)	1.2441 (68)
	CDI LabID ⁴	21.0017 (19 hosp)	7.7100 (37)
>200 Beds	MRSA LabID ³	3.0974 (11 hosp)	2.5480 (82)
	CDI LabID ⁴	11.9598 (15 hosp)	5.7701 (48)

Michigan Data

¹Rates were calculated using the number of infections/events per 1,000 (or per 10,000 for CDI) patient days or device days according to the same MI rate shown in Tables 9–14 among hospitals that shared data with MDCH SHARP through the NHSN.
²CO: Community Onset (%CO: Percent of LabID events that were community onset)
³MRSA LabID: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Laboratory-identified (LabID) Event 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.
⁴ CDI LabID: *Clostridium difficile* (*C. diff*) Infection (CDI) LabID Event option within the MDRO/CDI Module of NHSN for tracking CDI laboratory results without conducting additional surveillance for infections.

Hospitals with 200 beds or less experienced a lower MRSA LabID rate than those with greater than 200 beds. Larger hospitals also had a higher percentage of community-onset MRSA LabID events. From the

2010-2011 Annual Report to the present semi-annual report, MRSA LabID event rates remained fairly stable for both smaller and larger hospitals (see Figure 24).

Hospitals with 200 beds or less had a CDI LabID event rate that was much larger than those with greater than 200 beds. They also had fewer community-onset CDI LabID events. From the previous annual report to the present, smaller hospitals experienced an increase in CDI LabID events, while larger hospitals experienced a decrease (see Figure 25).

Figure 24. MRSA LabID Rates by Bedsize

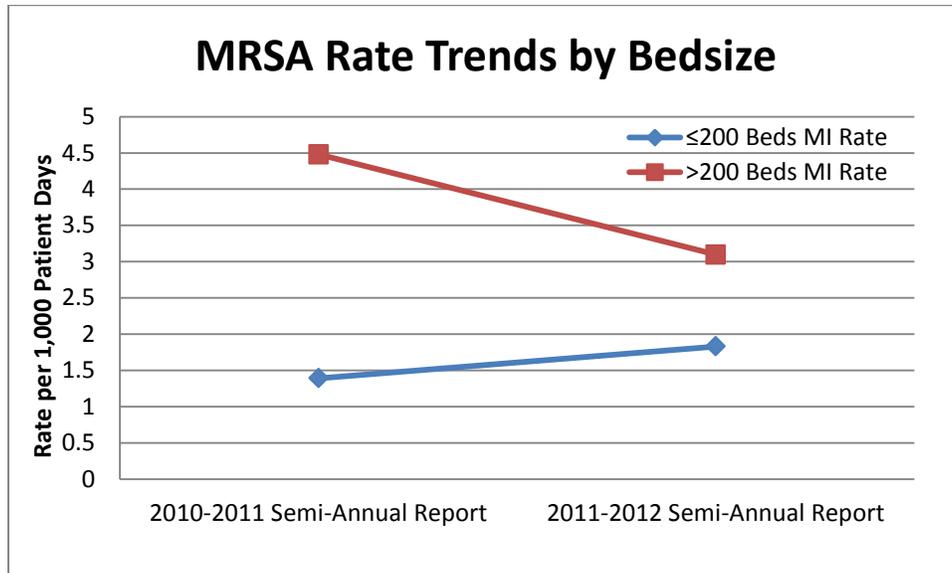


Figure 25. CDI LabID Rates by Bedsize

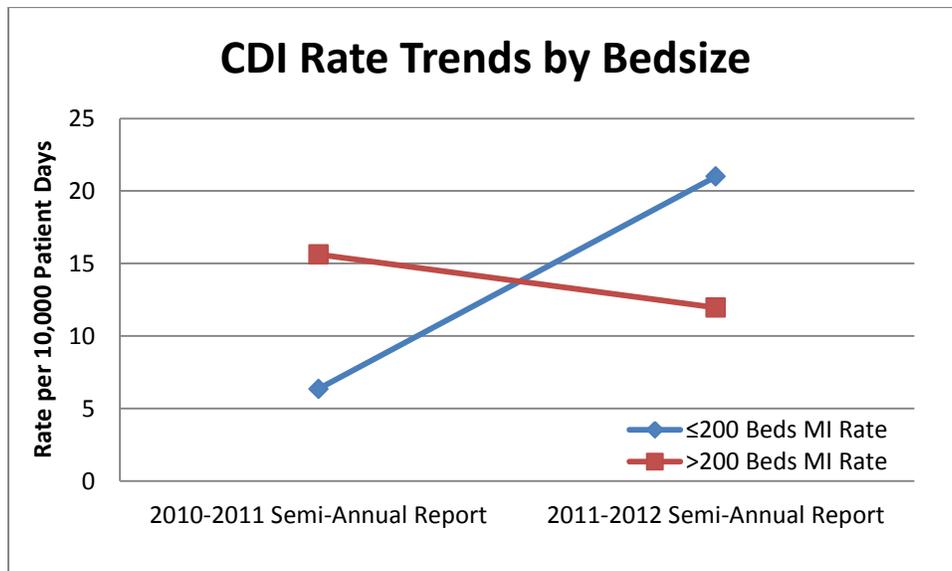


Table 25.

Device Rates¹ and SIR by Hospital Bed Size

Bed Size	Device-Associated Infection	Rate (Number of Hospitals)	US Rate ²	SIR ³	SIR p-value ⁴	SIR 95% Confidence Interval ⁵
≤200 Beds	CAUTI ⁶	1.3748 (32 hosp)	1.4800	0.853	0.2191	0.576, 1.218
	CLABSI ⁷	0.3560 (32 hosp)	1.0351	0.243	0.0000	0.105, 0.478
	VAP ⁸	0.5821 (25 hosp)	1.3125	-----	-----	-----
>200 Beds	CAUTI	1.9287 (34 hosp)	1.6953	1.037	0.3052	0.904, 1.183
	CLABSI	0.8153 (34 hosp)	1.1332	0.450	0.0000	0.379, 0.530
	VAP	0.9664 (24 hosp)	1.5161	-----	-----	-----

 US Data  Michigan Data

Highlight: Indicates significantly better than expected

Highlight: Indicates significantly worse than expected

¹Rates 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 hospitals that shared data with MDCH SHARP through the NHSN.

²The US comparative rates were calculated from a pooled mean using data from the national estimate on the National Healthcare Safety Network (NHSN). This is according to 2010 NHSN data (Am J Infect Control 2011;39:798-816). These data are for a descriptive reference only, and do not necessarily represent the true national rate. Each rate is individually matched to the Michigan data by facility type and unit type, then aggregated into an overall rate.

³SIR: 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.

⁴P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can be either significantly worse (if the SIR is greater than 1 and the p-value is <0.05) or significantly better (if the SIR is less than 1 and the p-value is <0.05).

⁵95% 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.

⁶CAUTI: Catheter-Associated Urinary Tract Infection

⁷CLABSI: Central Line-Associated Blood Stream Infection

⁸VAP : Ventilator-Associated Pneumonia

Hospitals with 200 beds or less had a CAUTI SIR of 0.853, which indicates that they had 14.7% fewer infections than expected. It was not statistically significant, though. Hospitals with greater than 200 beds had approximately as many observed infections as expected (SIR=1.037).

Both smaller and larger hospitals had statistically significantly fewer CLABSI infections than expected, with SIRs of 0.243 and 0.450, respectively.

From the previous annual report to the present semi-annual report, rates for smaller hospitals remained fairly stable. Rates for larger hospitals also remained stable, with the exception of Michigan CAUTIs, which increased substantially (see Figures 26, 27, and 28).

Figure 26. CAUTI Rates by Bedsize

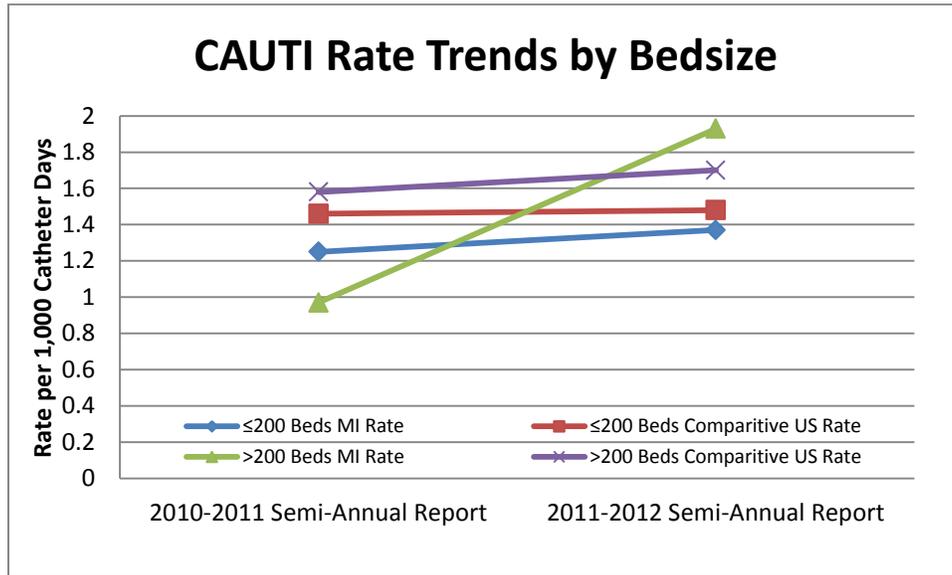


Figure 27. CLABSI Rates by Bedsize

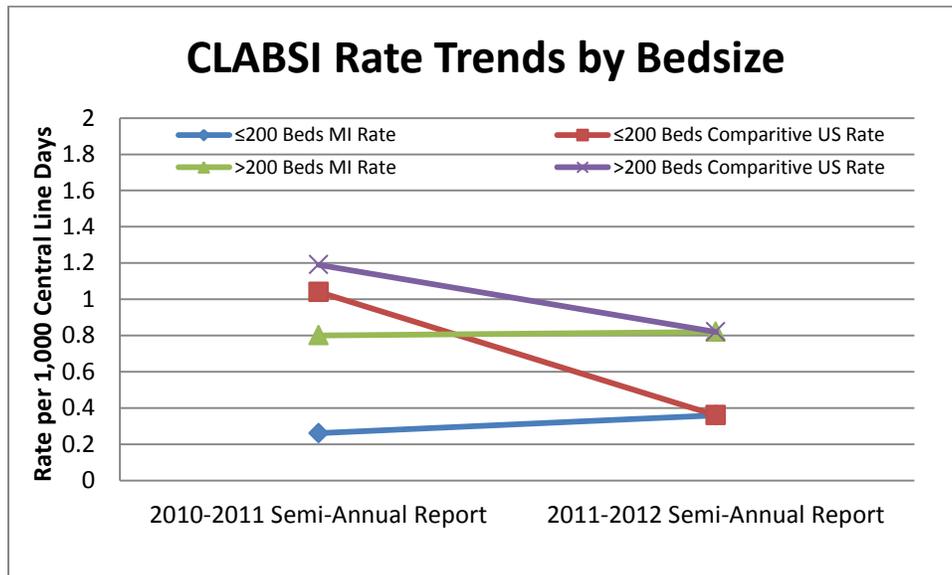


Figure 28. VAP Rates by Bedsize

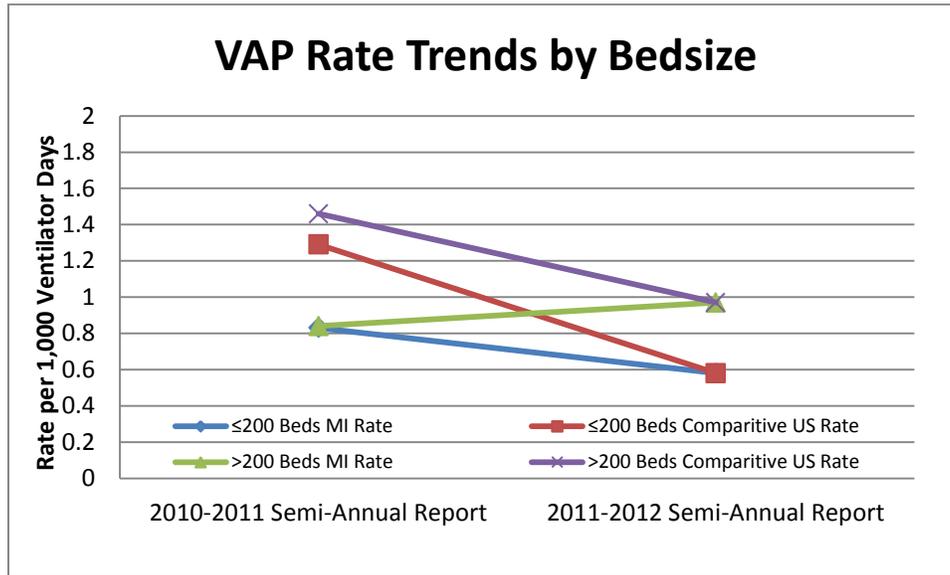


Table 26. *Device-Associated Events by Location*

	Critical Care Infections (% row total)	Neonatal Critical Care Infections (% row total)	Other Infections (% row total)	Specialty Care Area Infections (% row total)	Adult Step Down Infections (% row total)	Inpatient Ward Infections (% row total)	Total Inf.
CAUTI	217 (83) SIR: 1.064 (0.928, 1.216) ¹	0 (0)	2 (1)	2 (1)	7 (3)	34 (13)	262
CLABSI	116 (72) SIR: 0.419 (0.346, 0.502)	24 (15)	0 (0)	1 (1)	6 (4)	14 (9)	161
VAP	53 (98)	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	54

¹Standardized Infection Ratios (SIRs) and 95% Confidence Intervals were made available for location types in which there were enough data provided by NHSN.

Table 26 (above) shows the frequency of device-associated events by location as well as the percent of all infections in that module. The majority all three device-associated event-types (CAUTI, CLABSI, and VAP) occurred in critical care locations. For Critical Care CAUTIs, the SIR was 1.06, indicating a slightly (but not significantly) higher number of CAUTIs than expected. There were significantly fewer Critical Care CLABSIs than expected, with an SIR of 0.419.

Table 27.

MDRO/CDI LabID Events by Location

	Critical Care Inf (% row total)	Clinic Inf (% row total)	Inpatient Rehab Inf (% row total)	Neonatal Critical Care Inf (% row total)	Operating Room Inf (% row total)	Other Inf (% row total)	Specialty Care Area Inf (% row total)	Adult Step Down Inf (% row total)	Inpatient Ward Inf (% row total)	Total Inf
MRSA	398 (18)	546 (25)	0 (0)	5 (0)	3 (0)	318 (14)	20 (1)	76 (3)	841 (38)	2207
CDI	241(15)	193 (12)	4 (0)	0 (0)	0 (0)	143 (9)	90 (6)	92 (6)	862 (53)	1625

Table 27 (above) demonstrates the distribution of MDRO/CDI LabID event frequency by location. It also displays the percent of all infections in that module. These occurred throughout many units, but the highest percentage of both MRSA and CDI occurred in inpatient wards.

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.

It is important to note that the rates provided in this report are unadjusted rates from all participating hospitals. Therefore, comparison of rates throughout time may not be completely accurate, as the demographics of the participating hospitals have been shifting. The present hospital population may not be the same as the hospital population analyzed in previous reports. That is why, wherever possible, an SIR was calculated. An SIR risk-adjusts for the differences between hospitals to provide a fair overall view into the HAIs in Michigan hospitals. It is expected that SIRs will be made available for MRSA bacteremia LabID events and CDI LabID events in February 2013.

This semi-annual report compiled Michigan HAI data voluntarily shared via NHSN with the MDCH SHARP Unit. This report followed the same structure as the previous 2010-2011 Annual Report with a few additional tables and graphs. Note that these data from participating hospitals have not been validated. Validation studies will be conducted as additional funding becomes available. This report contains data from many more facilities than in previous reports. Data will continue to become more reliable as additional Michigan hospitals participate in this surveillance initiative.

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

Appendix

Tests of Significance for Rates and SIRs

	2010-2011 Annual Report			2011-2012 Semi-Annual Report			
Infection Rates	Infection	Denominator	Rate	Infection	Denominator	Rate	p-value
MRSA LabID (per patient days)	993	226757	4.379137	977	474604	2.058558	0.0000
MRSA LabID (per admits)	993	53793	1.845965	977	117842	0.829076	0.0000
CDI LabID (per patient days)	536	344737	15.54808	1160	593374	19.54922	0.0000
CDI LabID (per admits)	536	104751	0.51169	1160	158117	0.733634	0.0000
VRE LabID (per patient days)	93	115978	0.801876	49	44311	1.10582	0.0007
VRE LabID (per admits)	93	29000	0.32069	49	10597	0.462395	0.0001
CAUTI	122	117009	1.042655	257	139518	1.842056	0.0000
CLABSI	176	244289	0.720458	130	170525	0.762352	0.2397
VAP	61	76890	0.793341	52	57224	0.90871	0.1582
SSI	368	19394	1.897494	350	16118	2.171485	0.0045
CBGB	21	775	2.709677	14	780	1.794872	0.0454
CBGC	0	53	0	2	31	6.451613	0.0327
COLO	72	934	7.708779	142	2590	5.482625	0.0035
FUSN	37	1529	2.419882	11	799	1.376721	0.0010
HER	16	385	4.155844	8	538	1.486989	0.0003
HPRO	53	2874	1.84412	33	2008	1.643426	0.2186
HYST	12	601	1.996672	48	2106	2.279202	0.3888
KPRO	35	4149	0.843577	25	3112	0.803342	0.4090
LAM	25	1296	1.929012	8	682	1.173021	0.0129
VHYS	9	367	2.452316	5	178	2.808989	0.4199
Device Utilization (DU) Ratio	Device Days	Patient Days	DU	Device Days	Patient Days	DU	p-value
CAUTI DU	117009	397741	0.294184	139518	479533	0.290946	0.0005
CLABSI DU	244289	719983	0.339298	170525	489238	0.348552	0.0000
VAP DU	76890	259239	0.296599	57224	164909	0.347003	0.0000
SIR	Observed	Expected	SIR	Observed	Expected	SIR	p-value
CAUTI	115	180.23	0.638074	248	245.981	1.008208	0.0000
CLABSI	186	468.94	0.396639	149	346.331	0.430224	0.4727
SSI	377	317.56	1.187177	350	348.097	1.005467	0.0259
	Michigan			United States Comparison			
Infection Rates	Infection	Denominator	Rate	Infection	Denominator	Rate	p-value
CAUTI	257	139518	1.842056	102581	63855764	1.606449	0.0168
CLABSI	130	170525	0.762352	124002	113740511	1.090218	0.0000
VAP	52	57224	0.90871	19996	13964965	1.431869	0.0003
Device Utilization (DU) Ratio	Device Days	Patient Days	DU	Device Days	Patient Days	DU	p-value
CAUTI DU	139518	479533	0.290946	63855764	207884933	0.307169	0.0000
CLABSI DU	170525	489238	0.348552	113740511	444209588	0.256051	0.0000
VAP DU	57224	164909	0.347003	13964965	44414293	0.314425	0.0000



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

Contact us at 517-335-8165

Allison Gibson Murad, MPH, NHSN Epidemiologist

Murada@michigan.gov

Jennie Finks, DVM, M MPH, SHARP Unit Manager

FinksJ@michigan.gov

Jennifer Beggs, MPH, Infectious Disease & Preparedness Epidemiologist

BeggsJ@michigan.gov

Brenda Brennan, MSPH, CRE Prevention Initiative Coordinator

BrennanB@michigan.gov

Bryan Buckley, MPH, Prevention Data Analyst

BuckleyB2@michigan.gov

Gail Denkins, RN, MRSA/CDI Prevention Initiative Coordinator

DenkinsG@michigan.gov

Judy Weber, MPH, Healthcare Facility Liaison

WeberJ4@michigan.gov