

# HEALTHCARE-ASSOCIATED INFECTIONS IN MICHIGAN HOSPITALS

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**2013 QUARTER 3 REPORT**

Michigan Department of Community Health

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

**July 1 – September 30, 2013**

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**July – September 2013**

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## **Introduction**

The Surveillance for Healthcare-Associated & Resistant Pathogens (SHARP) Unit within the Bureau of Disease Control, Prevention, and Epidemiology at the Michigan Department of Community Health (MDCH) provides a quarterly update on healthcare-associated infection (HAI) surveillance activities. This report includes the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network (NHSN) data from Michigan hospitals who have agreed to voluntarily share their data with MDCH SHARP. The main surveillance foci for the SHARP Unit were originally methicillin-resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile* (*C. difficile*, *C. diff*, or CDI) reports collected through the laboratory-identified (LabID) event option of the multidrug-resistant organism and *Clostridium difficile* infection (MDRO/CDI) module of NHSN. The SHARP Unit also reviews device-associated data for central line-associated bloodstream infections (CLABSIs), catheter-associated urinary tract infections (CAUTIs), ventilator-associated events (VAEs), and surgical site infections (SSIs), as well as other MDRO/CDI Module data.

Aggregate data from participating hospitals are used to show infection rates and trends in the incidence and prevalence of specific HAIs and MDROs. Previous quarterly, semi-annual, and annual SHARP NHSN reports are posted on the Michigan HAI website at [www.michigan.gov/hai](http://www.michigan.gov/hai). Additional HAI background information, pertinent HAI definitions, Michigan's HAI Surveillance and Prevention Plan, Michigan's HAI Prevention Advisory Group roster, and details on MDCH SHARP's prevention collaboratives can also be found at this website.

## **Surveillance Initiative Statistics**

Between July 1 and September 30, 2013, 91 of 168 (54%) Michigan acute care, critical access, long-term acute care, or rehab hospitals voluntarily participated in the SHARP Unit HAI surveillance initiative, as demonstrated by signed data use agreements by March 4, 2014. Eighty-four of these hospitals used the LabID Event option of the MDRO/CDI module to monitor both MRSA and *C. difficile* in their reporting plan; 79 shared these data with SHARP. Areas of surveillance within the hospital varied by participating hospital and included the intensive care/critical care unit (ICU/CCU), medical/surgical wards, and outpatient locations. Most hospitals reported facility-wide inpatient MRSA bacteremia LabID and *C. difficile* LabID data due to the Centers for Medicare and Medicaid Services (CMS) requirement for acute care hospitals participating in the Inpatient Prospective Payment System (IPPS), effective January 1, 2013.

Of the 91 hospitals participating this quarter, in addition to LabID data, most collected additional NHSN module data as indicated in Table 1. This is largely due to the CMS requirements already in effect for HAI reporting of CAUTI, CLABSI, and SSI (colon and abdominal hysterectomy procedures only). For example, 84 hospitals this quarter utilized the CAUTI module; of these, 83 shared data with the SHARP Unit. As more hospitals participate with the SHARP Unit and confer rights to these modules, analysis of the data is becoming more complete and accurate. Data from this quarter and previous quarters were used in this report to establish aggregate infection rates among participating Michigan hospitals and to monitor quarterly trends.

**Table 1.*****NHSN Modules in use***

<b>NHSN Module</b>	<b>Number of Hospitals Using Module<sup>1</sup></b>	<b>Number of Hospitals Sharing Data<sup>2</sup></b>
<b>Catheter-Associated Urinary Tract Infection (CAUTI)</b>	84	83
<b>Surgical Site Infection (SSI)</b>	80	76
<b>Central Line-Associated Bloodstream Infection (CLABSI)</b>	81	80
<b>Ventilator-Associated Events(VAE)</b>	38	51 <sup>3</sup>
<b>Clostridium difficile Infection (CDI) Laboratory-identified (LabID) Event</b>	84	79
<b>Methicillin-Resistant Staphylococcus aureus (MRSA) Laboratory-identified (LabID) Event<sup>4</sup></b>	84	79

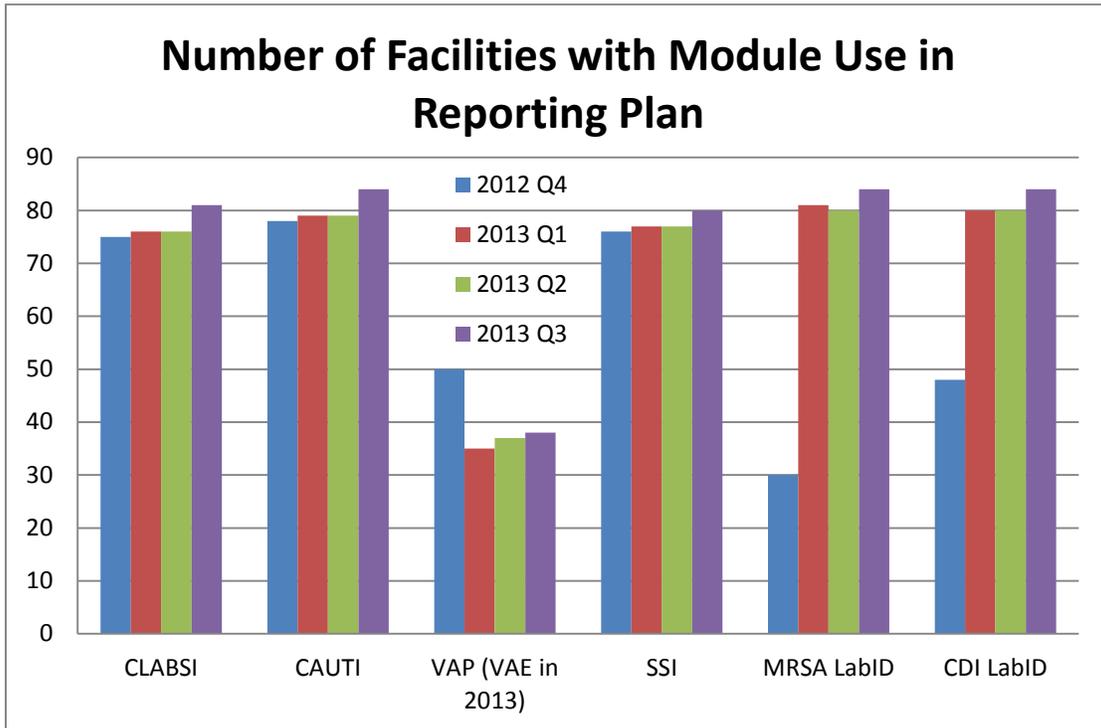
<sup>1</sup>This is the number of hospitals that have indicated module use in each of their reporting plans for at least one month within the three month time period.

<sup>2</sup>This is the number of hospitals sharing data for the report period, as of the data access date, taken from those hospitals contributing to the SIR when available.

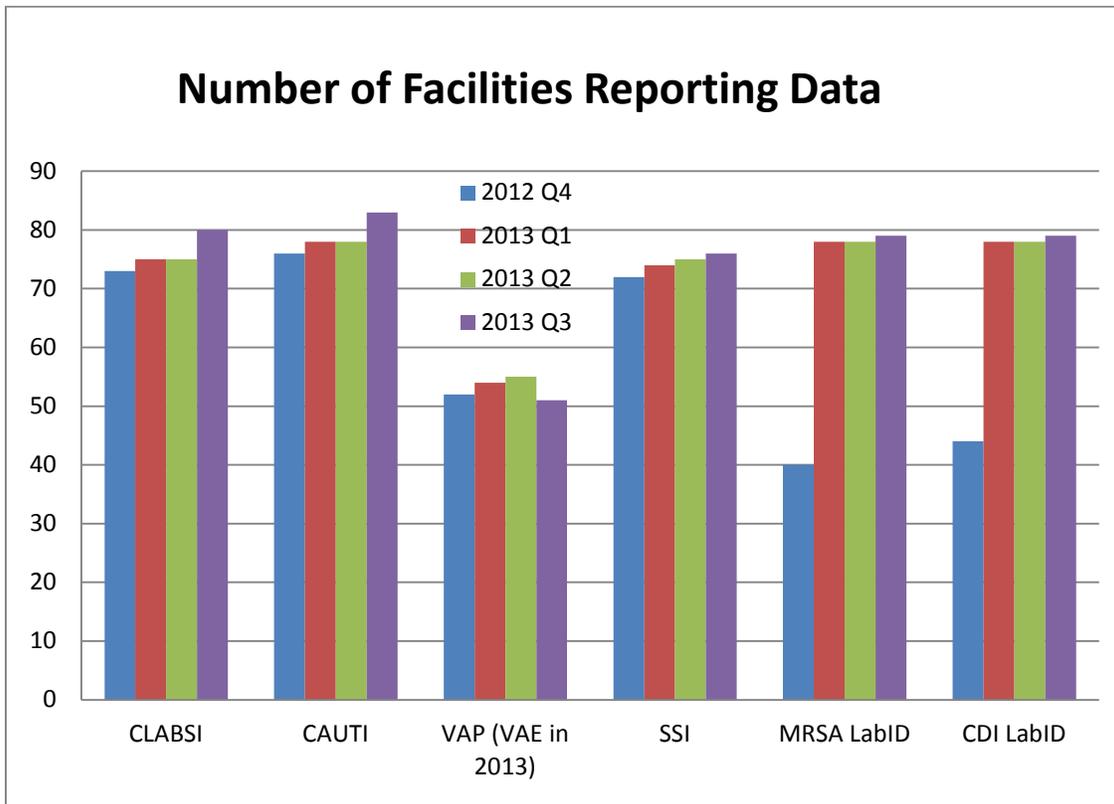
<sup>3</sup>In some instances, the number of hospitals sharing data is greater than the number of hospitals using the module. The option to 'view in-plan only data' is not available for all modules. Therefore, some out-of-plan data have been included when impossible to remove.

<sup>4</sup>MRSA LabID all specimens or bld only specimens

**Figure 1.** Number of Facilities with Module Use in Reporting Plan by Quarter



**Figure 2.** Number of Facilities Reporting Data by Quarter



### **Methicillin-Resistant *Staphylococcus aureus* (MRSA) Data**

Table 2 (below) indicates that between July 1 and September 30, 2013, 1226 MRSA events were reported from 71 participating hospitals using the MDRO/CDI module, LabID Event option. The NHSN definition for MRSA LabID Event includes the first positive MRSA isolate from any specimen per calendar month per patient, or a positive MRSA isolate from a blood source when there haven't been any other positive blood specimens in the previous 2 weeks from that patient. Specimens must be collected for clinical purposes and not for the purpose of active surveillance testing or screening. Note that testing protocol and type of test used (i.e. PCR, assay, culture) vary by facility. Additionally, data from the LabID Event option of the MDRO/CDI module are considered proxy measures of MRSA exposure burden, and do not distinguish between patient colonization and infection.

Seventeen percent of the MRSA LabID Events this quarter were determined to be healthcare facility-onset (HO), and the remaining 83% were determined to be community-onset (CO). NHSN defines 'healthcare facility-onset' as a 'LabID Event specimen collected greater than 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 less than or equal to 3 days after admission to the facility (i.e., days 1, 2, or 3 of admission)'.

The percentage of HO events decreased by 3% from the previous quarter to the present. The percentage of MRSA LabID blood specimens which were HO continued to remain stable. The number of outpatient events reported has decreased, while the number of inpatient LabID events from Wards and ICU/CCU have continued to increase, likely due to inpatient reporting requirements.

Table 2.

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

	October – December 2012 Quarterly Report	January – March 2013 Quarterly Report	April – June 2013 Quarterly Report	July – September 2013 Quarterly Report
<b>Frequency, Number</b>				
<i>Hospitals with a DUA</i> <sup>1</sup>	82	83	86	<b>91</b>
<i>Hospitals reporting MRSA LabID</i> <sup>2</sup>	30	81	80	<b>84</b>
<i>Hospitals sharing MRSA LabID</i>	40	69	61	<b>71</b>
<b>Aggregate LabID Events</b>	1387	1258	1226	<b>1288</b>
<b>Onset, Number (%)</b>				
<i>Healthcare Facility-Onset (HO)</i>	248 (18)	330 (26)	247 (20)	<b>216 (17)</b>
<i>Community-Onset (CO)</i>	1139 (82)	928 (74)	979 (80)	<b>1072 (83)</b>
<b>Specimen Source, Number (% , %HO)<sup>3</sup></b>				
<i>Blood</i>	158 (27)	483 (38, 26)	419 (34, 22)	<b>409 (32, 20)</b>
<i>Sputum</i>	122 (38)	131 (10, 42)	112 (9, 39)	<b>108 (8, 35)</b>
<i>Wound</i>	452 (10)	255 (20, 16)	284 (23, 11)	<b>327 (25, 9)</b>
<i>Abcess</i>	228 (6)	51 (4, 14)	83 (7, 6)	<b>86 (7, 13)</b>
<i>Urine</i>	124 (6)	72 (6, 14)	85 (7, 21)	<b>65 (5, 11)</b>
<i>Skin</i>	8 (0)	2 (0, 0)	8 (1, 13)	<b>7 (1, 0)</b>
<i>Other</i>	295 (32)	264 (21, 34)	235 (19, 23)	<b>286 (22, 17)</b>
<b>Surveillance Location, Number (% , %HO)<sup>4</sup></b>				
<i>Intensive/Critical Care Unit</i>	315 (23, 43)	436 (35, 42)	362 (30, 38)	<b>338 (26, 30)</b>
<i>Specialty Care Area</i>	----	6 (0, 0)	6 (0, 0)	<b>4 (0, 0)</b>
<i>Wards</i>	500 (36, 23)	668 (53, 22)	688 (56, 16)	<b>757 (59, 15)</b>
<i>Outpatient</i>	572 (41, 0)	148 (12, 0)	170 (14, 0)	<b>187 (15, 0)</b>

<sup>1</sup>DUA: 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.

<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.

<sup>3</sup>The numbers in parentheses under "Specimen Source" are the percent of isolates from each specimen source, followed by the percent of isolates from each specimen source which are healthcare-onset. If only one percentage is listed, the number indicates percent HO.

<sup>4</sup>The 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.

### **Clostridium difficile Infection (CDI) Data**

As shown in Table 3 (below), this quarter there were 2305 reports of CDI from 76 hospitals which shared MDRO/CDI LabID Event data with the SHARP Unit. With the CMS requirement for facility-wide reporting of CDI LabID events in Quarter 1, the overall number of events had increased over two-fold in 2013; it remains high this quarter. The NHSN definition for CDI LabID Event includes the first positive *C. diff* test result without a prior positive in the previous 2 weeks. As with MRSA LabID Events, *C. difficile* LabID Event specimens must be collected for clinical purposes, not for the purpose of active surveillance testing or screening. Testing protocol and type of test used (i.e. PCR, assay, culture) may vary by facility. *C. difficile* LabID Event data are considered proxy measures of exposure burden, and do not distinguish between patient colonization and infection.

Thirty-six percent of CDI LabID Events were considered healthcare facility-onset (HO), nineteen percent were considered community-onset healthcare facility-associated (CO-HCFA), and forty-six percent were reported as community-onset (CO). This distribution is very similar to previous quarters, despite an overall increase in the number of events reported in 2013. CO-HCFA is defined as a 'community-onset LabID Event collected from a patient who was discharged from the facility less than or equal to 4 weeks prior to the date the stool specimen was collected.' HO and CO are defined under the MRSA LabID Event data heading.

Twelve percent of CDI LabID Events occurred in patients who had a CDI LabID Event entered in the previous month, which is similar to the previous quarter. In addition, 6% of LabID Events were recurrent CDI assays, also similar to the previous quarter. A recurrent CDI assay is a '*C. difficile* LabID Event specimen obtained greater than 2 weeks and less than or equal to 8 weeks after the most recent LabID Event for that patient.'

Table 3.

### Aggregate *Clostridium difficile* Infection (CDI)<sup>1</sup> LabID Data

	October – December 2012 Quarterly Report	January – March 2013 Quarterly Report	April – June 2013 Quarterly Report	July – September 2013 Quarterly Report
<b>Frequency, Number</b>				
<i>Hospitals with DUA</i> <sup>2</sup>	82	83	86	<b>91</b>
<i>Hospitals Reporting CDI LabID</i> <sup>3</sup>	48	80	80	<b>84</b>
<i>Hospitals Sharing CDI LabID</i>	44	72	78	<b>76</b>
<i>Aggregate LabID Events</i>	1136	2555	2398	<b>2305</b>
<b>Onset, Number (%)</b>				
<i>Healthcare Facility-Onset (HO)</i>	414 (36)	992 (39)	854 (36)	<b>824 (36)</b>
<i>Community-Onset Healthcare Facility-Associated (CO-HCFA)</i>	191 (17)	451 (18)	480 (20)	<b>427 (19)</b>
<i>Community-Onset (CO)</i>	531 (47)	1112 (44)	1064 (44)	<b>1054 (46)</b>
<b>Previous CDI, Number (%)</b>				
<i>Previously Positive</i>	134 (12)	196 (8)	259 (11)	<b>283 (12)</b>
<i>CDI assay, recurrent</i>	49 (4)	116 (5)	127 (5)	<b>137 (6)</b>
<b>Surveillance Location, Number (% , %HO)<sup>4</sup></b>				
<i>Intensive/Critical Care Unit</i>	264 (23, 49)	568 (22, 47)	576 (24, 44)	<b>577 (25, 46)</b>
<i>Specialty Care Area</i>	1 (0, 100)	----	3 (0, 100)	<b>5 (0, 0)</b>
<i>Wards</i>	730 (64, 39)	1856 (73, 39)	1711 (71, 35)	<b>1607 (70, 35)</b>
<i>Outpatient</i>	139 (12, 0)	117 (6, 0)	103 (4, 0)	<b>110 (5, 0)</b>
<i>Other</i>	1 (0,0)	9 (0, 56)	4 (0, 0)	<b>6 (0, 17)</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.

<sup>4</sup>The 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.

**Multidrug-Resistant Organisms (MDRO) Summary Data**

Tables 4 and 5 (below) provide an overview of MRSA LabID and Infection Surveillance event rates. Table 4 provides overall inpatient and outpatient LabID event data, as well as MRSA Infection Surveillance data. Table 5 displays data stratified by onset.

<b>Table 4.</b>						
<b>Cumulative Michigan MRSA Rate</b>						
	<b>Facilities</b>	<b>Number of MRSA Events</b>	<b>Number of Patient Days</b>	<b>Number of Patient Admits/Encounters</b>	<b>MRSA Rate<sup>1</sup></b>	<b>MRSA Prevalence Rate<sup>2</sup></b>
MRSA Inpatient LabID <sup>3</sup>	82	1,065 LabID <sup>4</sup>	1,123,850	268,372 Admits	0.9476	0.3968
MRSA Bacteremia LabID <sup>5</sup>	82	384 LabID	1,123,850	268,372 Admits	0.3417	0.1431↓
MRSA Outpatient LabID <sup>6</sup>	10	139 LabID	----	119,040 Encounters	----	0.1168↓

**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 LabID Events per 100 patients admitted or 100 encounters.

<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>There are fewer MRSA LabID Events indicated here than in Table 2 because events used to calculate a rate require denominator data (patient days and/or admissions). Those without denominator data were excluded from the calculation.

<sup>5</sup>MRSA bacteremia LabID: MRSA LabID event from a blood specimen

<sup>6</sup>MRSA outpatient LabID: MRSA LabID event specimen collected in an outpatient location, and reported only if the hospital is reporting outpatient events. If a patient is then admitted as an inpatient, these events are also reported as inpatient events, and are attributed to the admitting location.

↓ or ↑ Indicates that the rate is statistically significantly lower or higher than previous quarter (respectively).

While the overall MRSA Inpatient LabID rates did not change significantly, the MRSA bacteremia LabID prevalence rate decreased significantly from 0.1473 to 0.1431 per 100 admissions (p<0.0001). The MRSA outpatient LabID prevalence rate also decreased significantly, from 0.1511 to 0.1168 per 100 encounters (p=0.0346). Figure 3 displays the Michigan Inpatient MRSA LabID Rate Trends.

**Figure 3.** Michigan Inpatient MRSA LabID Rate Trends by Quarter

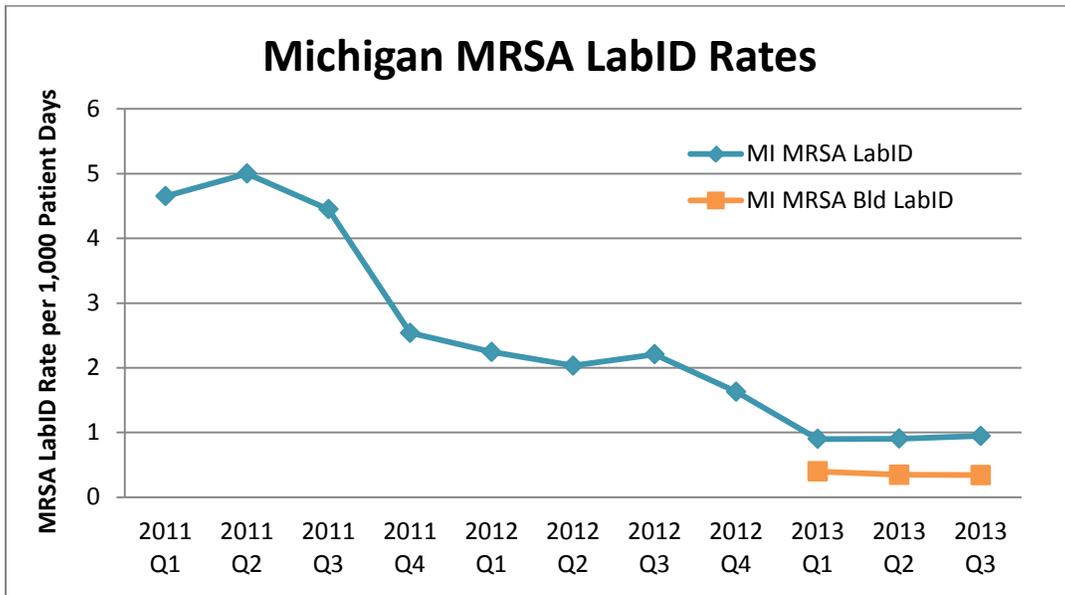


Table 5 (below) provides inpatient MRSA LabID rates stratified by onset. SHARP has now received enough data to stratify MRSA LabID rates by community-onset and healthcare facility-onset for over a year. MRSA bacteremia (bld) LabID rates were stratified by onset for the second time in this report, so they were compared to the previous quarter for the first time.

Table 5.

**Michigan Inpatient MRSA LabID<sup>1</sup> Rate by Onset**

Number of Facilities	Onset	Number (%) <sup>2</sup> of Inpatient MRSA LabID Events	Number of Patient Days	Number of Patient Admits	HO <sup>3</sup> Incidence Rate <sup>4</sup>	CO <sup>5</sup> Prevalence Rate <sup>6</sup>
82	HO	163 (16) LabID	1,123,850	----	0.1450	----
		67 (18) Bld LabID <sup>7</sup>	1,123,850	----	0.0596	----
82	CO	866 (84) LabID	----	268,372	----	0.3227
		312 (82) Bld LabID	----	268,372	----	0.1163

**Michigan Rate**

<sup>1</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.

<sup>2</sup> Percentage of LabID events, or bacteremia LabID events, which are either HO or CO

<sup>3</sup> HO: Healthcare facility-onset

<sup>4</sup> HO Incidence Rate: the number of incident HO MRSA LabID Events per 1,000 patient days. Prior to Quarter 3, 2012, this rate included both prevalent and incident HO MRSA LabID events; currently, prevalent HO MRSA LabID events are not included. Previous positive MRSA events are not included. Incident infections are new infections that occur at the hospital; therefore, HO infections are incident infections. Prevalent infections are those already in existence; therefore, CO infections are prevalent because the patient entered the hospital with the infection. Prevalent HO infections are those that are HO but have already been counted in another location, so they are prevalent upon entering the new location.

<sup>5</sup> CO: Community-onset

<sup>6</sup> CO Prevalence Rate. This is the number of MRSA LabID Events per 100 patients admitted.

<sup>7</sup> Bld LabID: MRSA bacteremia LabID events (LabID events from a blood specimen)

↓ or ↑ Indicates the rate is statistically significantly lower or higher than previous quarter (respectively).

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 decreased from 0.1672 to 0.1450 per 1,000 patient days from the previous quarter to the present, although this was not a statistically significant change. This report only included incident HO LabID events, and excluded prevalent HO LabID events (LabID events that, although they are considered HO based on the date admitted to the facility, are considered prevalent because of the date admitted to a new location within the facility). Previous positive MRSA events are also excluded.

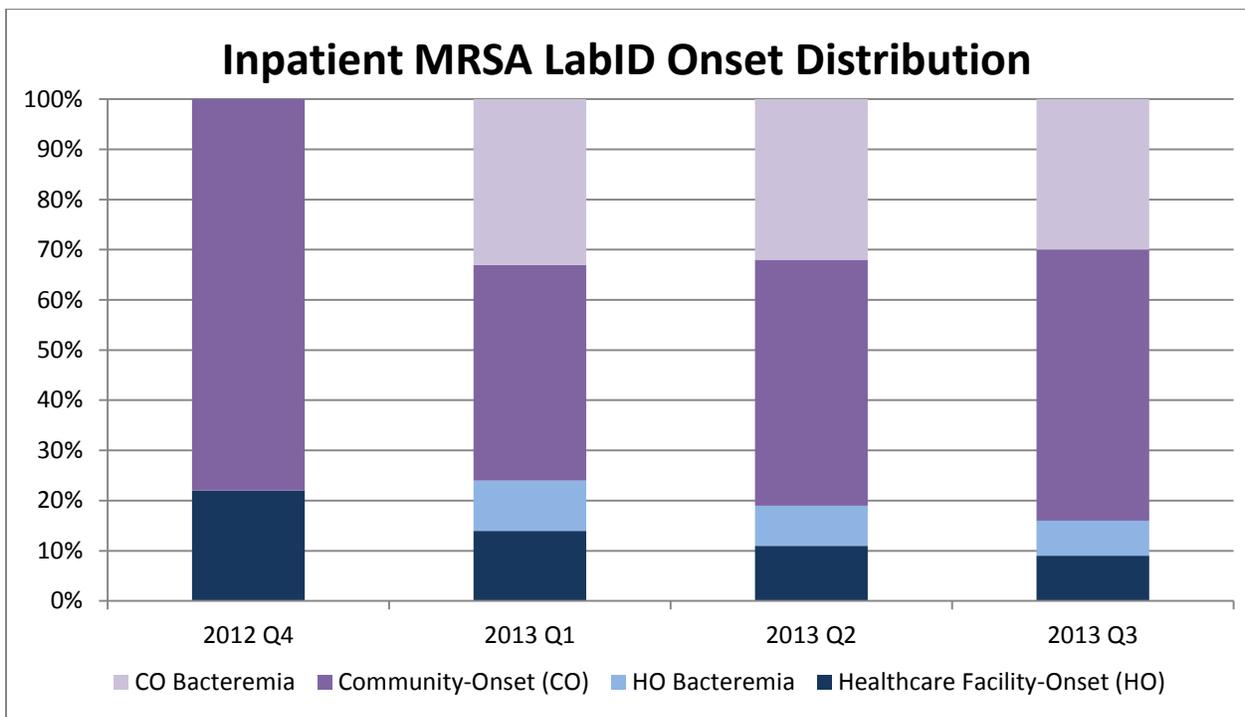
Community-onset infections occur when the LabID specimen was collected 3 days or less after admission to the facility. These are prevalent infections, so a MRSA prevalence rate is calculated. The MRSA prevalence rate this quarter was 0.3227, which is not significantly different from the previous quarter.

The majority (84%) of inpatient MRSA LabID events were community-onset. The remaining 16% were healthcare facility-onset. This distribution was almost the same for MRSA bacteremia LabID events

alone. Of the 163 HO LabID events, 67 (41%) were from blood specimens. Of the 866 CO LabID events, 312 (36%) were from blood specimens. The graphical display of this can be seen below in Figure 4, along with the previous 3 quarters. CO infections are shown in purple, and light purple shows the percentage of CO infections from blood specimens. HO infections are shown in blue, and light blue shows the percentage of HO infections from blood specimens. All quarters showed a generally similar distribution of overall HO and CO events.

The percentage distributions of CO and HO MRSA LabID Events in Table 5 are slightly different from the percentage distributions in Table 2. This is explained by the greater number of overall LabID events in Table 2. There are fewer LabID events in Tables 4 and 5 than in Table 2 because only LabID events which had corresponding denominators (i.e. patient days or admits) were included in Tables 4 and 5; also, previous positive and prevalent HO events were excluded in the rate table.

**Figure 4.** Inpatient MRSA LabID Onset Distribution (percentages)



Tables 6 and 7 (below) provide an overview of CDI LabID and Infection Surveillance event rates. Table 6 provides CDI Infection Surveillance data as well as inpatient and outpatient LabID event data, and Table 7 displays data stratified by onset.

Table 6.

**Cumulative Michigan CDI Rate**

	Facilities	Number of CDI Events	Number of Patient Days	Number of Patient Admits/ Encounters	CDI Rate <sup>1</sup>	CDI Prevalence Rate <sup>2</sup>
CDI Inpatient LabID <sup>3</sup>	82	2,145 LabID <sup>4</sup>	1,042,213	249,272 Admits	20.5812	0.8605
CDI Outpatient LabID <sup>5</sup>	10	85 LabID	----	118,220 Encounters	----	0.0719

**Michigan Rate**

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

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

<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>The number of CDI LabID Events indicated in this table is less than the number of CDI LabID Events indicated in Table 3. 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.

<sup>5</sup>CDI outpatient LabID: CDI LabID event specimen collected in an outpatient location, and reported only if the hospital is reporting outpatient events. If a patient is then admitted as an inpatient, these events are also reported as inpatient events, and are attributed to the admitting location.

↓ or ↑ Indicates statistically significantly lower or higher than previous quarter (respectively).

The CDI Inpatient LabID Event rate did not significantly change this quarter, only increasing slightly from 20.3305 to 20.5812 per 10,000 patient days. The CDI Inpatient Prevalence Rate also remained fairly stable, increasing non-significantly from 0.8587 to 0.8605 per 100 admissions. Overall CDI Inpatient LabID Event rate trends can be seen in Figure 5. The CDI Outpatient LabID prevalence rate also only changed slightly, from 0.0843 to 0.0719 per 100 admissions.

**Figure 5. Michigan Inpatient CDI LabID Rate Trends by Quarter**

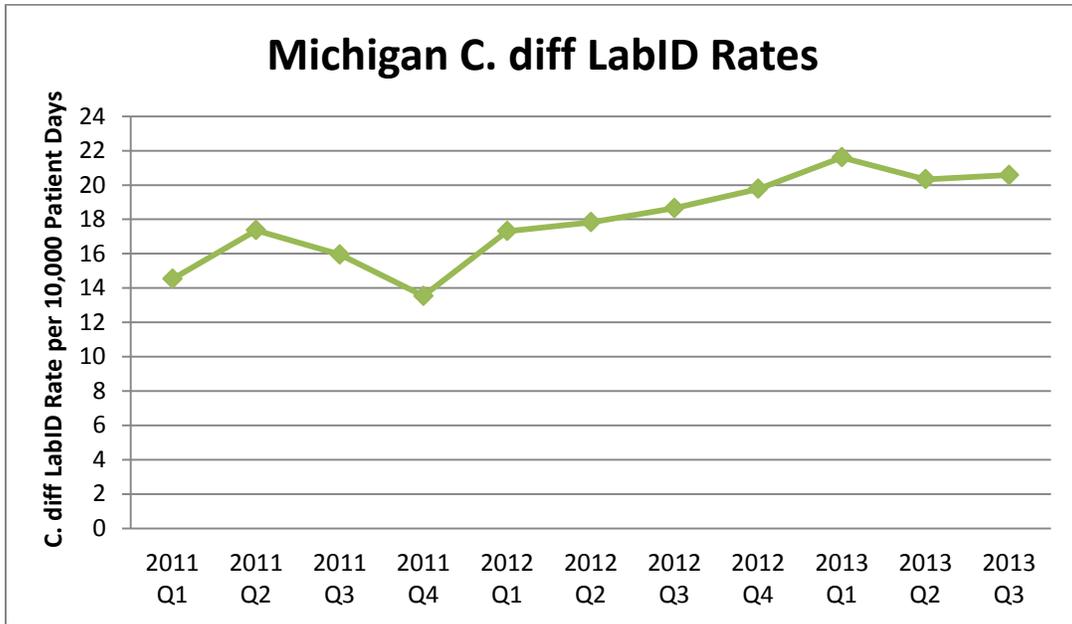


Table 7 (below) provides inpatient CDI LabID Rates stratified by onset. SHARP has now received enough data from reporting hospitals to stratify CDI LabID Rates by healthcare facility-onset, community-onset, and community-onset healthcare facility-associated for over a year and trends are now available for stratified CDI LabID rates.

Table 7.

**Michigan CDI LabID<sup>1</sup> Rate by Onset**

Number of Reporting Facilities	Onset	Number (%) <sup>2</sup> of Inpatient CDI LabID Events	Number of Patient Days	Number of Patient Admits	HO <sup>3</sup> Incidence Rate <sup>4</sup>	CO/CO-HCFA <sup>5</sup> Prevalence Rate <sup>6</sup>	Percentage of Total
82	HO	771 LabID	1,042,213	----	7.3977	----	36
82	CO-HCFA	400 LabID	----	249,272	----	0.1605	19
82	CO	953 LabID	----	249,272	----	0.3823	45

**Michigan Rate**

<sup>1</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>2</sup>Percentage of LabID events which are either HO or CO/CO-HCFA

<sup>3</sup>HO: Healthcare facility-onset

<sup>4</sup>HO Incidence Rate: This is the number of CDI LabID events or surveillance infections per 10,000 patient days. This is the number of incident healthcare facility-onset (HO) CDI LabID Events per 10,000 patient days. Prior to Quarter 3, 2012, this rate included both prevalent and incident HO CDI LabID events; currently, prevalent HO CDI LabID events are not included. Incident infections are new infections that occur at the hospital; therefore, HO infections are incident infections. Prevalent infections are those already in existence; therefore, CO infections are prevalent because the patient entered the hospital with the infection. Prevalent HO infections are those that are HO but have already been counted in another location, so they are prevalent upon entering the new location.

<sup>5</sup>CO/CO-HCFA: Community-onset/Community-onset healthcare facility-associated

<sup>6</sup>CO CO-HCFA Prevalence Rate. This is the number of CDI LabID events per 100 patients admitted.

↓ or ↑ Indicates statistically significantly lower or higher than previous quarter (respectively).

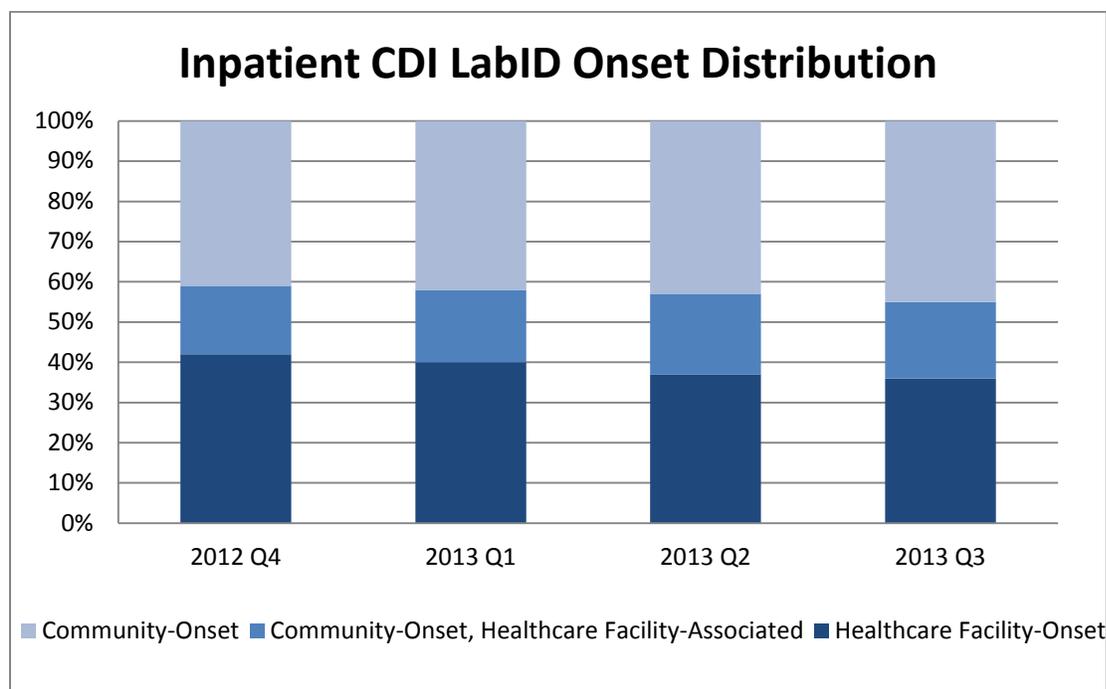
Healthcare facility-onset infections occur when the LabID specimen was collected on or after day 4 of admission to the facility. Because they are incident infections, only a CDI incidence rate can be calculated. The HO CDI incidence rate increased slightly and non-significantly from 7.3686 to 7.3977 per 10,000 patient days from the previous quarter to the present. This report only included incident HO LabID events, and excluded prevalent HO LabID events (LabID events that, although they are considered HO based on the date admitted to the facility, are considered prevalent because of the date admitted to a new location within the facility).

Community-onset infections occur when the LabID specimen was collected 3 days or less after admission to the facility. These are prevalent infections, so a CDI prevalence rate is calculated. The CO CDI prevalence rate only changed slightly from 0.3705 to 0.3823 per 100 admissions from the previous quarter. Community-onset healthcare facility-associated infections occur when the LabID specimen was collected from a patient who was discharged from the facility 4 weeks or less prior to the date the current stool specimen was collected. The CO-HCFA prevalence rate also did not change significantly, decreasing from 0.1705 to 0.1605.

The majority (45%) of inpatient CDI LabID events were community-onset, followed by healthcare-onset (36%). The remaining infections were community-onset healthcare facility-associated (19%). The graphical display of this from the previous quarters and the present quarter can be seen in Figure 6. Distribution by onset remains fairly stable.

The percentage distributions of CO, CO-HCFA, and HO LabID Events in Table 7 are slightly different from the distributions in Table 3. This is explained by the greater number of overall LabID events in Table 3. The number of LabID events in Tables 6 and 7 are lower than in Table 3 because only LabID events which had corresponding denominators (i.e. patient days) were included in the rate table; HO prevalent cases were also excluded.

**Figure 6. Inpatient CDI LabID Onset Distribution**



**Device-Associated Summary Data**

Table 8 (below) provides a summary of Device-Associated Infection Rates as well as the Device Utilization (DU) Ratios for each device: urinary catheters, central lines, and ventilators. Beginning in 2013, adult ventilator-associated pneumonia (VAP) surveillance transitioned to ventilator-associated events (VAE) surveillance. See <http://www.cdc.gov/nhsn/acute-care-hospital/vae/index.html> for VAE surveillance information. In all device-associated rate analyses, facilities reporting zero patient days or zero device days were excluded.

Note: although there were only 38 hospitals that had VAE in their reporting plan, 51 shared data. We are unable to exclude out-of-plan data for the VAE rate calculation for the present report. This will be fixed for future reports.

Table 8.

**Michigan Device-Associated Rates**

Type of Infection	Number of Hospitals	Number of Infections	Number of Patient Days	Number of Device Days	MI Rate <sup>1</sup>	US Rate <sup>2</sup>	MI DU <sup>3</sup>	US DU <sup>4</sup>
CAUTI <sup>5</sup>	85	273	304,203	103,931	2.6267	1.7081	0.3417↓	0.3227
CLABSI <sup>6</sup>	79	75	259,155	83,880	0.8941	0.9429	0.3237↓	0.2591
VAC <sup>7</sup>	51	72	68,851	22,309	3.2274	N/A	0.3240	N/A
IVAC <sup>8</sup>	51	23	68,851	22,309	1.0310	N/A	0.3240	N/A
Possible VAP <sup>9</sup>	51	17	68,851	22,309	0.7620	N/A	0.3240	N/A
Probable VAP <sup>10</sup>	51	5	68,851	22,309	0.2241	N/A	0.3240	N/A
<b>Total VAE<sup>11</sup></b>	51	117	68,851	22,309	5.2445	N/A	0.3240↑	N/A

  Michigan Rate
   US Comparative Rate

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

<sup>2</sup>The US comparative rates were 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). These data are for a descriptive reference only, and do not necessarily represent the true national rate. US data were not available this quarter for the CAUTI or VAE modules.

<sup>3</sup>MI DU: Device Utilization. The proportion of days spent using a device divided by the total number of patient days reported for the unit. The device could be a catheter, central line, or ventilator.

<sup>4</sup>The US comparative DU was calculated using data from the national estimate 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 DU ratio.

<sup>5</sup>CAUTIs 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).

<sup>6</sup>CLABSIs 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).

<sup>7</sup>VAC: Ventilator-Associated Condition

<sup>8</sup>IVAC: Infection-related Ventilator-Associated Condition

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

<sup>10</sup>Probable VAP: Probable Ventilator-Associated Pneumonia

<sup>11</sup>Total VAE: Total Ventilator-Associated Events: Cumulative VAEs including VAC, IVAC, Probable/Possible VAPs. For VAE definitions, see [http://www.cdc.gov/nhsn/PDFs/pscManual/10-VAE\\_FINAL.pdf](http://www.cdc.gov/nhsn/PDFs/pscManual/10-VAE_FINAL.pdf).

↓ or ↑ Indicates statistically significantly lower or higher than previous quarter (respectively).

There were no statistically significant rate changes between the second and third quarter of 2013. The MI CAUTI DU ratio decreased significantly from 0.3565 to 0.3417 (p<0.0001) and the MI CLABSI DU ratio decreased significantly from 0.3362 to 0.3237 (p<0.0001). However, the MI DU ratio for VAE's increased significantly from 0.2673 to 0.3240 (p<0.0001). Figures 7 and 8 below demonstrate the Michigan and U.S. Device-Associated Infection Rates and Device Utilization Ratios, respectively, for the past four quarters.

Figure 7. Device-Associated Infection Rate Trends by Quarter

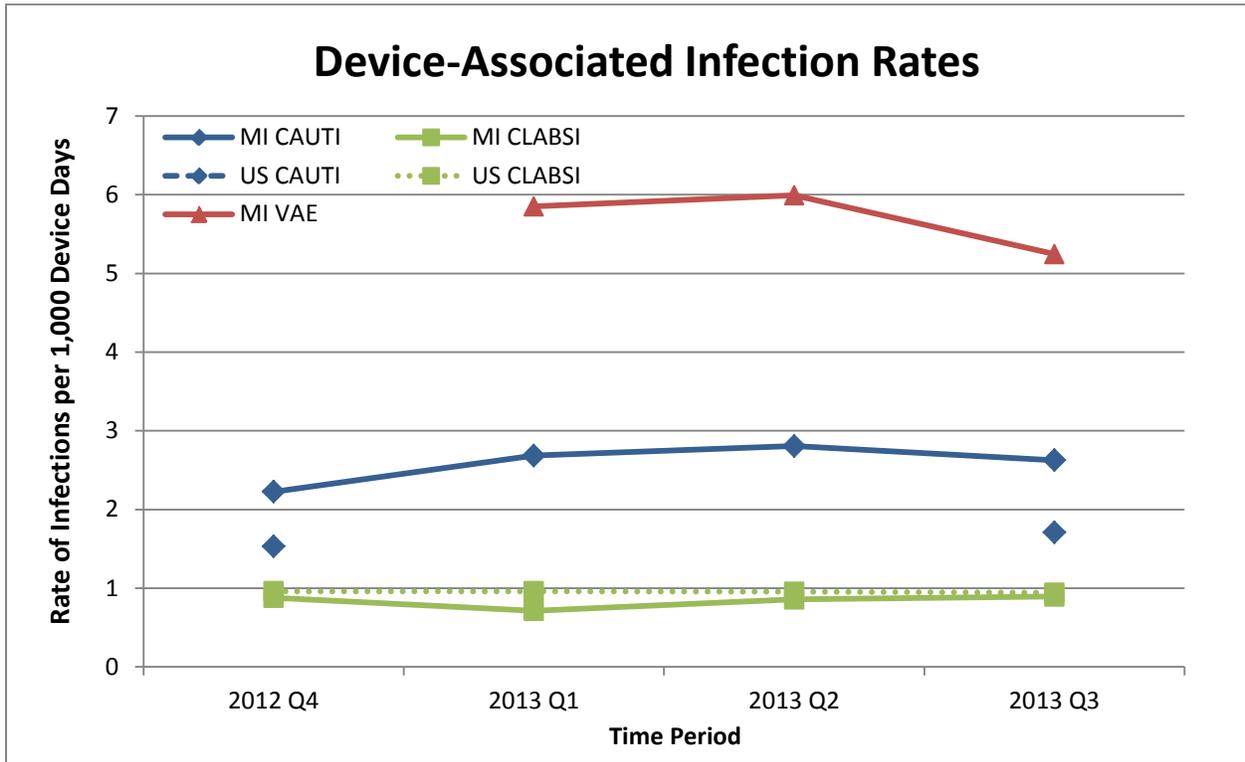


Figure 8. Device Utilization Ratio Trends by Quarter

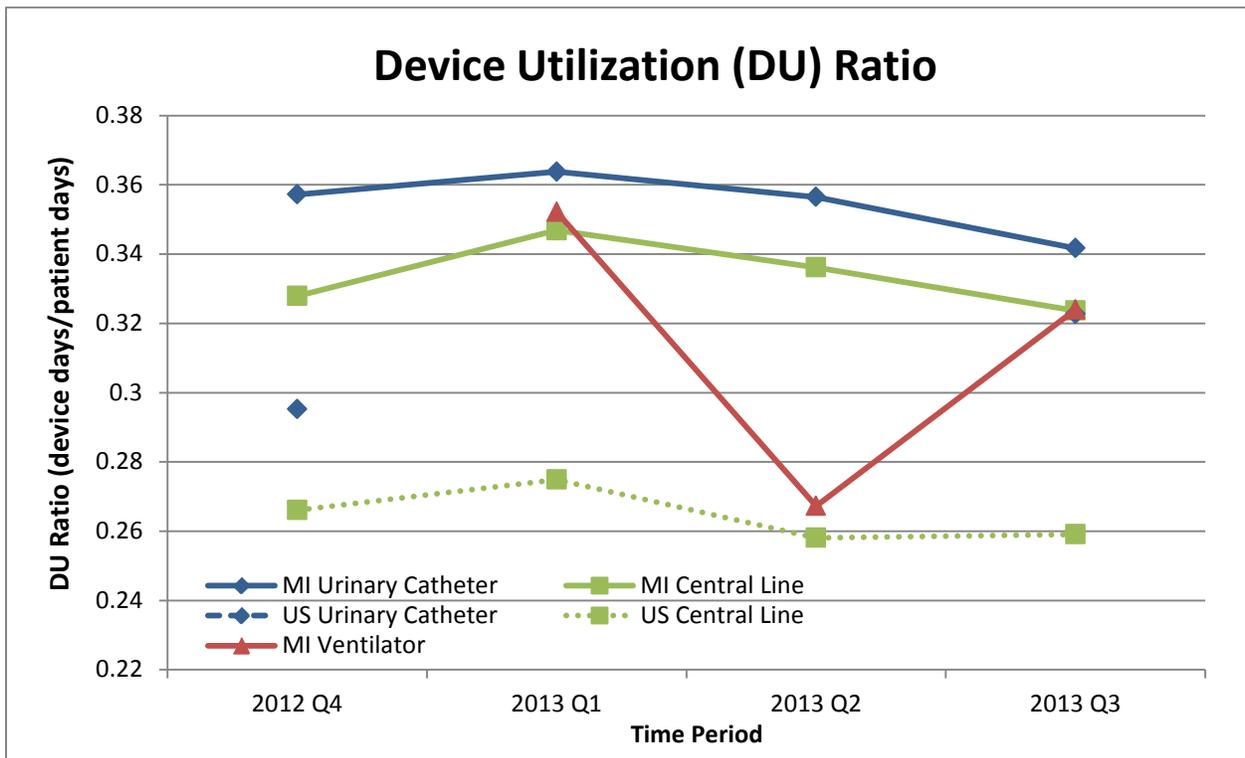


Table 9.

Michigan NICU<sup>1</sup> Device-Associated Rates by Birth Weight

Type of Infection	Birth weight Code	Number of Reporting Hospitals	Number of Infections	Number of Patient Days	Number of Device Days	MI Rate <sup>2</sup>	US Rate <sup>3</sup>	MI DU <sup>4</sup>	US DU <sup>5</sup>
<b>CLABSI<sup>6</sup></b>	<b>OVERALL</b>	<b>16</b>	<b>12</b>	<b>43,355</b>	<b>8,287</b>	<b>1.4481</b>	<b>1.2868</b>	<b>0.1911</b> ↓	<b>0.2563</b>
	A <sup>7</sup>	14	4	7,284	1,991	2.0090	2.3169	0.2733↓	0.4025
	B <sup>8</sup>	14	5	6,836	2,045	2.4450	1.6687	0.2992↑	0.3464
	C <sup>9</sup>	14	1	8,263	1,719	0.5817	1.0847	0.2080↓	0.2621
	D <sup>10</sup>	14	0	11,186	1,210	0	0.6381	0.1082↓	0.1692
	E <sup>11</sup>	16	2	9,786	1,322	1.5129	0.7326	0.1351↓	0.2239
<b>VAP<sup>12</sup></b>	<b>OVERALL</b>	<b>7</b>	<b>1</b>	<b>22,212</b>	<b>2,527</b>	<b>0.3957</b>	<b>0.9013</b>	<b>0.1138</b> ↑	<b>0.1580</b>
	A	6	0	4,155	1,219	0	1.3110	0.2934↓	0.3789
	B	6	0	3,655	629	0	1.1842	0.1721↑	0.2308
	C	6	1	4,315	255	3.9216	0.6167	0.0591	0.1006
	D	6	0	5,426	185	0	0.1910	0.0341	0.0679
	E	7	0	4,661	239	0	0.3300	0.0513↑	0.1111

Michigan Rate US Comparative Rate

<sup>1</sup>NICU: Neonatal Intensive Care Unit

<sup>2</sup>MI Rates are the number of device-associated infections per 1,000 device days among participating hospitals.

<sup>3</sup>The US comparative rates were 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). These data are for a descriptive reference only, and do not necessarily represent the true national rate.

<sup>4</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.

<sup>5</sup>The US comparative DU was calculated using data from the national estimate 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 DU ratio.

<sup>6</sup>CLABSIs 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).

<sup>7</sup>A: Birthweight ≤750g

<sup>8</sup>B: Birthweight 751 – 1000g

<sup>9</sup>C: Birthweight 1001 – 1500g

<sup>10</sup>D: Birthweight 1501 – 2500g

<sup>11</sup>E: Birthweight >2500g

<sup>12</sup>VAPs 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).

↓ or ↑ Indicates statistically significantly lower or higher than previous quarter (respectively).

Table 9 (above) displays the Michigan NICU Device-Associated rates stratified by birth weight. The VAP module is still used in populations under 18, so this was included in the report. The rates and DU ratios with a red up arrow or green down arrow in Table 9 demonstrate significant changes since the previous report.

### **Standardized Infection Ratios**

Table 10 (below) provides information on the Standardized Infection Ratio (SIR) for CAUTIs, CLABSIs, SSIs, MRSA bacteremia LabID, and CDI LabID in the third quarter of 2013. An SIR is defined as the ratio of observed events compared to the number of predicted events, while accounting for unit type, procedure type, and other variables of influence. 83 hospitals provided CAUTI data to the SHARP Unit valid for SIR calculations, and 80 shared CLABSI SIR data; 16 of 80 hospitals sharing CLABSI SIR data also shared CLABSI NICU data. 76 hospitals shared SSI SIR data with the majority of hospitals reporting SSIs for colon surgeries (74 hospitals) and abdominal hysterectomies (68 hospitals). Finally, 79 hospitals shared MRSA bacteremia LabID SIR data and 79 shared CDI LabID SIR data.

Table 10.

### Standardized Infection Ratios (SIR)

Type of	Number of	Procedures	Device Days or	Observed <sup>1</sup>	Predicted <sup>2</sup>	MI SIR <sup>3</sup>	MI p-value <sup>4</sup>	MI 95% CI <sup>5</sup>
CAUTI <sup>6</sup>	83	N/A	95,159 DD	266	210.102	<b>1.266</b>	0.0002	1.121, 1.425
CLABSI <sup>7</sup>	80	N/A	89,238 DD	91	188.6229	<b>0.482</b>	<0.0001	0.391, 0.590
CLABSI ICU <sup>8</sup>	80	N/A	81,058 DD	79	168.0667	<b>0.470</b>	<0.0001	0.375, 0.583
CLABSI NICU <sup>9</sup>	16	N/A	8,180 DD	12	20.5563	<b>0.584</b>	0.0464	0.316, 0.992
SSI <sup>10</sup>	76	11,995	N/A	287	277.701	1.033	0.3173	0.919, 1.158
SSI COLO <sup>11</sup>	74	2,139	N/A	140	128.865	1.086	0.3477	0.917, 1.278
SSI HYST <sup>12</sup>	68	1,971	N/A	40	36.954	1.082	0.6033	0.784, 1.460
MRSA Bac LabID <sup>13</sup>	79	N/A	1,111,185 PD	66	80.1519	0.823	0.1076	0.642, 1.041
<i>C.diff</i> LabID <sup>14</sup>	79	N/A	1,032,385 PD	765	851.0855	<b>0.899</b>	0.0029	0.837, 0.964

  Michigan Data
   US Data

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

<sup>2</sup>Predicted: The number of CAUTIs or CLABSIs predicted based on the type of hospital unit(s) under surveillance, or the number of SSIs predicted based upon 2009 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>P-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).

<sup>5</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>6</sup>CAUTI: Catheter-Associated Urinary Tract Infection. CAUTIs 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).

<sup>7</sup>CLABSI: Central Line-Associated Blood Stream Infection. CLABSIs 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).

<sup>8</sup>CLABSI ICU: CLABSIs from ICU locations only

<sup>9</sup>CLABSI NICU: CLABSIs from NICU locations only

<sup>10</sup>SSI: Surgical Site Infection. Includes any superficial incisional, deep incisional, or organ/space SSI.

<sup>11</sup>SSI COLO: Inpatient Colon surgeries

<sup>12</sup>SSI HYST: Inpatient Abdominal Hysterectomies

<sup>13</sup>MRSA Bacteremia LabID: Inpatient facility-wide MRSA bacteremia Laboratory-identified Event

<sup>14</sup>Clostridium difficile LabID: Inpatient facility-wide Clostridium difficile Laboratory-identified Event

↓ or ↑ Indicates statistically significantly lower or higher than previous quarter (respectively).

Green Text or Red Text indicates significantly fewer or greater infections than expected (respectively).

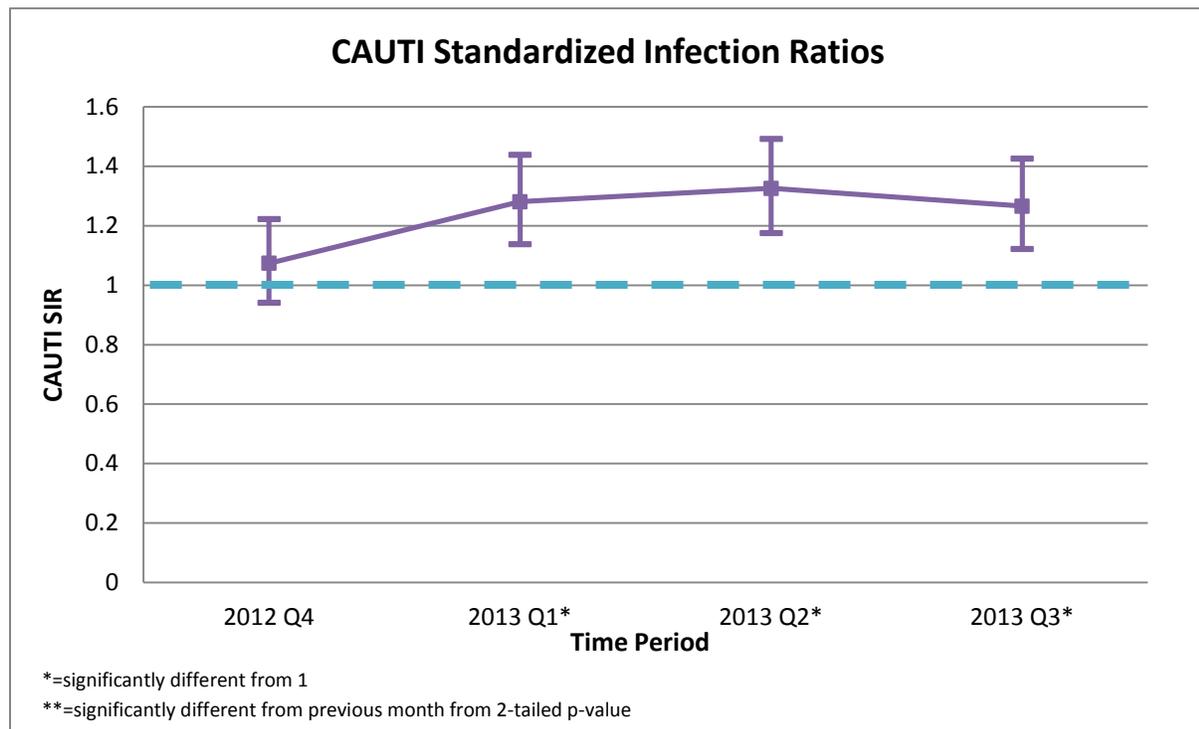
The CAUTI SIR this quarter was 1.266, which indicates significantly more infections than expected ( $p=0.0002$ ). However, this has decreased slightly from the previous quarter's SIR of 1.326. This quarter's CLABSI SIR demonstrates that Michigan facilities again had significantly fewer CLABSIs than predicted based on national averages. An SIR of 0.482 indicates that Michigan had 51.8% fewer CLABSIs than expected. When stratified into ICU and NICU, the CLABSI ICU-only SIR was even lower at 0.470 and the CLABSI NICU-only SIR was 0.584.

The overall SSI SIR was 1.033, which demonstrates approximately the same number of infections as expected. The SSI colon surgery (COLO) SIR was 1.086 and the SSI abdominal hysterectomy (HYST) SIR was 1.082, which also demonstrated similar infections as were expected.

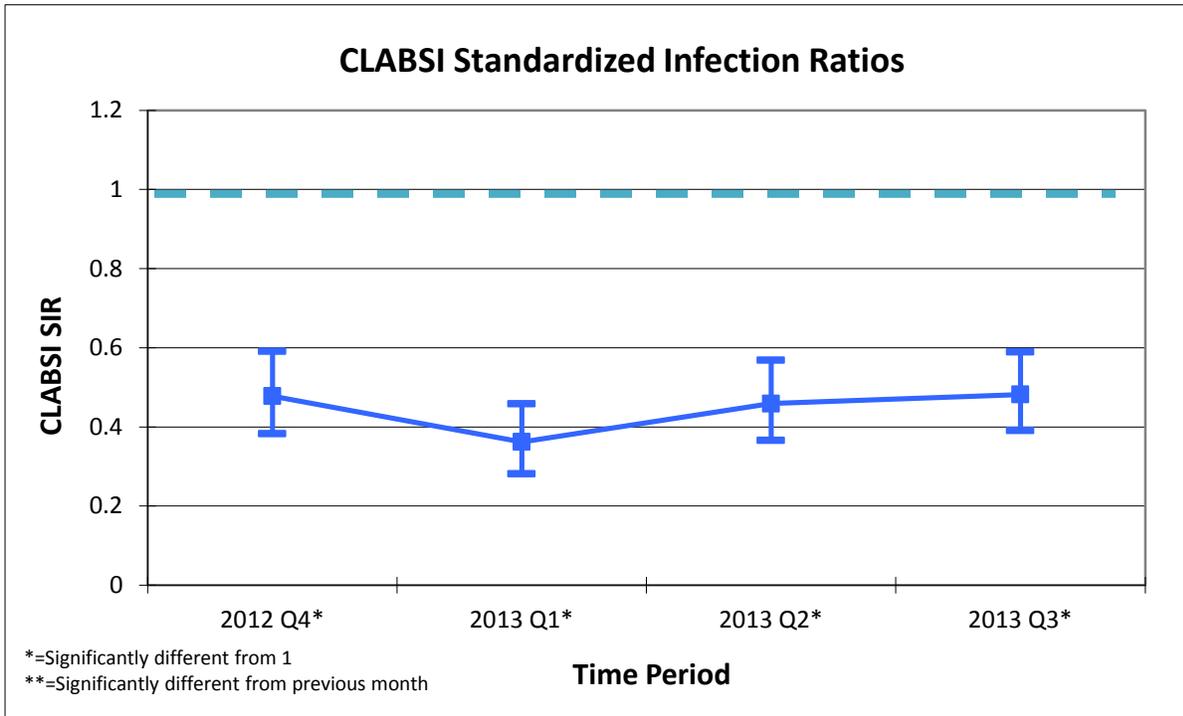
The MRSA Bacteremia LabID SIR was 0.823, which indicates that there were 17.7% fewer infections than expected. The CDI LabID SIR was 0.899, which indicates that there were 10.1% fewer infections than expected, and this was significant ( $p=0.0029$ ).

Figures 9-15 (below) display SIRs for the CAUTI, CLABSI, SSI (overall, COLO and HYST), and LabID (MRSA bacteremia and CDI) modules over time. The center dot on each point represents the calculated SIR for the respective time period. The upper and lower marks represent the upper and lower ends of the 95% Confidence Interval (CI) surrounding the SIR. A 95% CI means that 95% of the time, the true SIR will be located within this interval. If the interval does not cross 1, then the calculated SIR is statistically significantly different from the predicted value. The number 1, or the null value, is indicated by the dashed line.

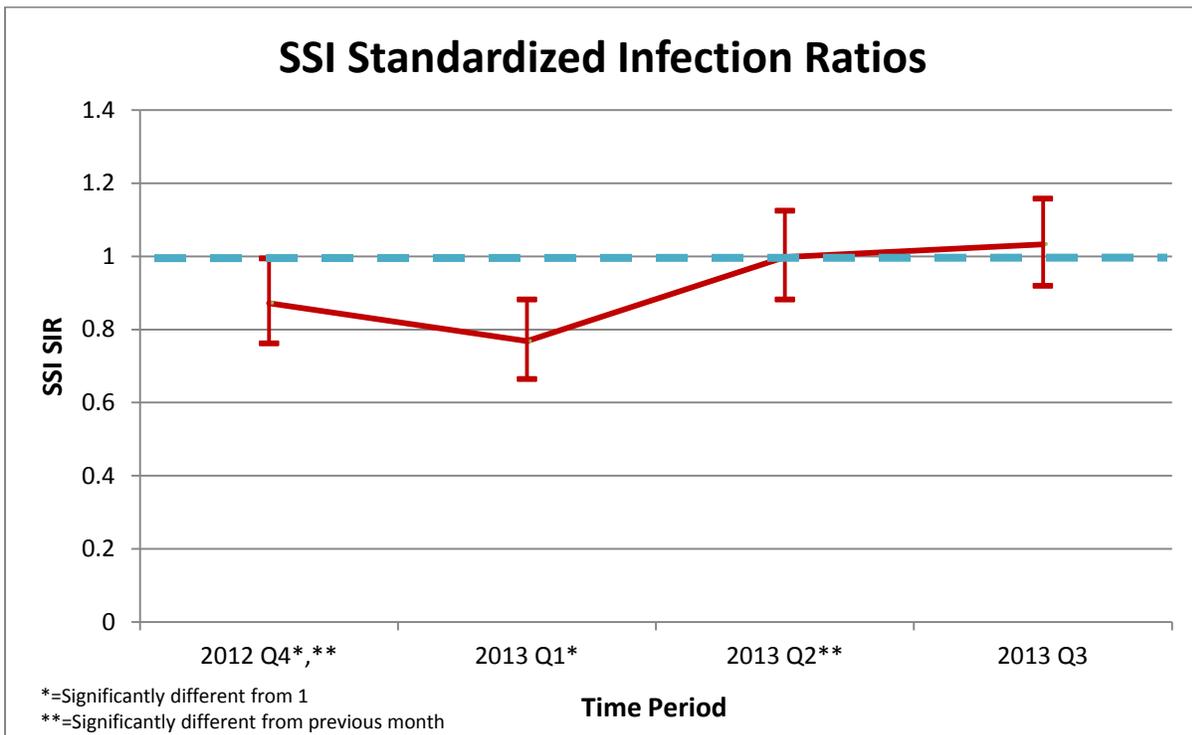
**Figure 9. CAUTI Standardized Infection Ratios**



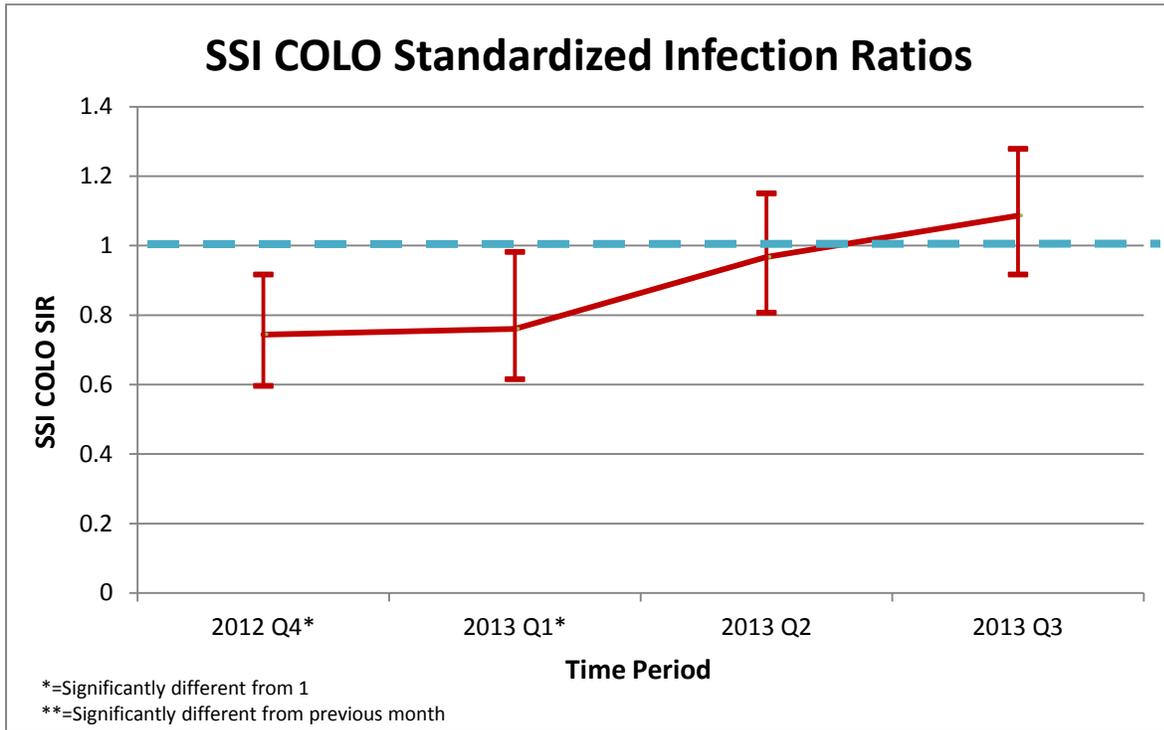
**Figure 10.** CLABSI Standardized Infection Ratios



**Figure 11.** Overall SSI Michigan Standardized Infection Ratios



**Figure 12.** SSI Colon Surgery Standardized Infection Ratios



**Figure 13.** SSI Abdominal Hysterectomy Standardized Infection Ratios

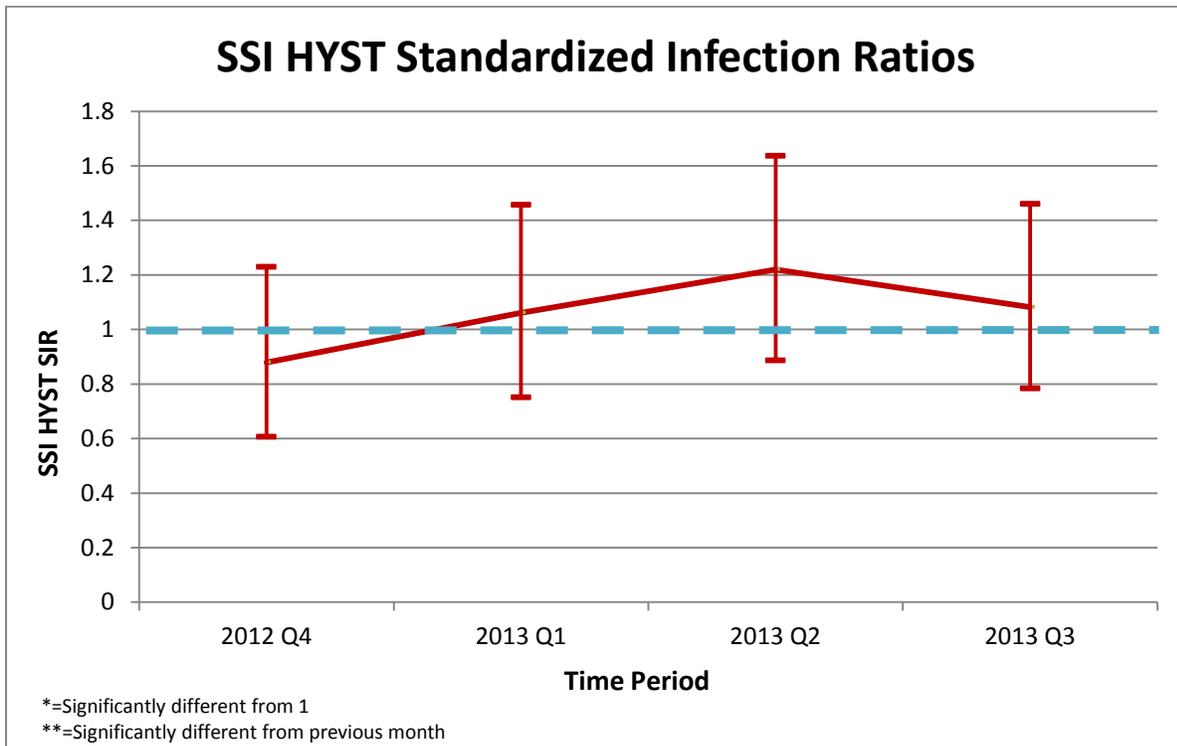


Figure 14. MRSA bacteremia LabID Standardized Infection Ratios

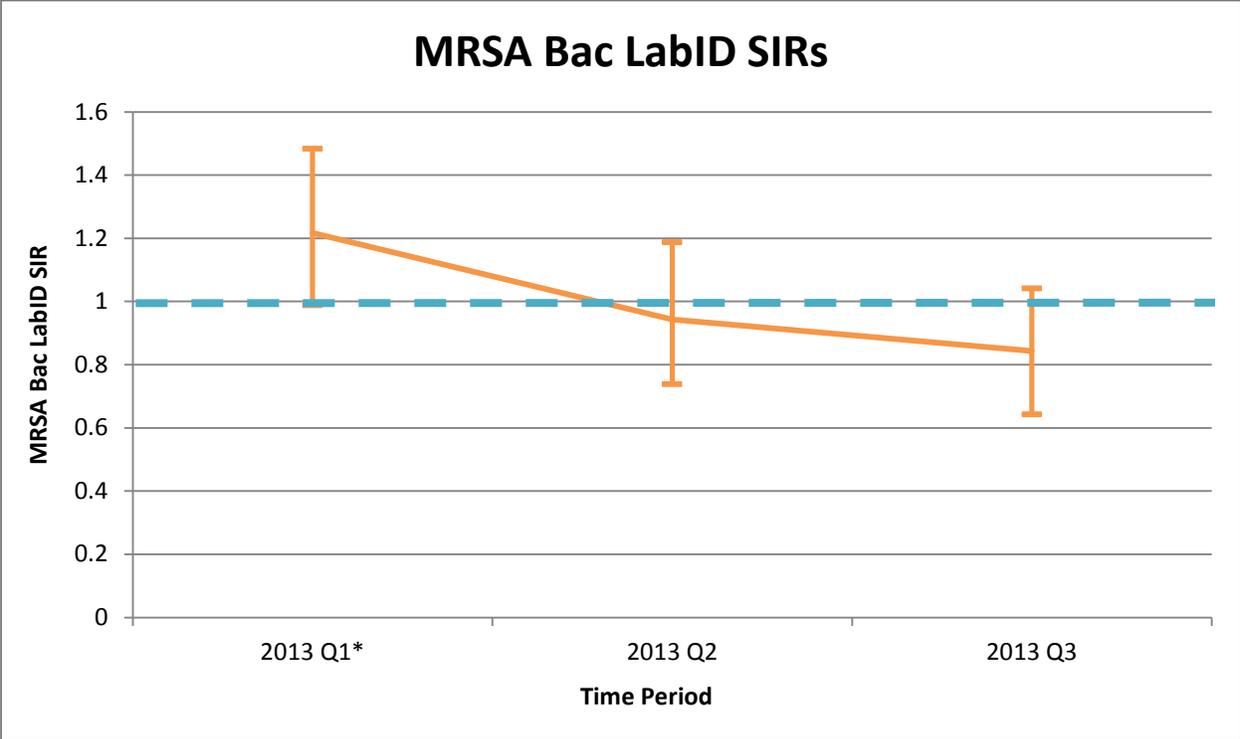
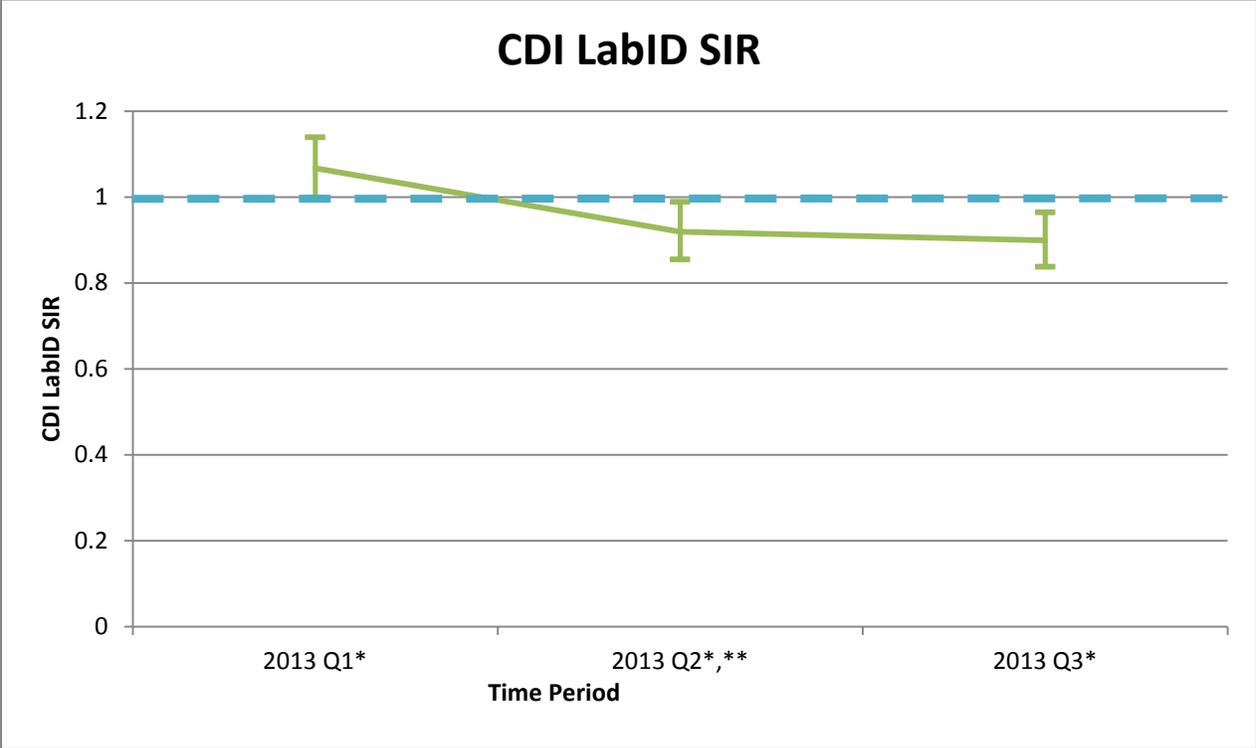


Figure 15. CDI LabID Standardized Infection Ratios



## Conclusions

This quarter, hospital participation increased from 86 hospitals sharing data to 91 hospitals. The majority of participating hospitals are using and sharing data from the CAUTI, CLABSI, SSI, MRSA LabID (all specimens or blood only) and CDI LabID modules. These are the modules currently required for reporting by CMS.

The number of MRSA LabID events continues to remain stable despite a large increase in hospitals participating in the LabID modules in early 2013. The percent of HO events decreased from 20% last quarter to 17% this quarter. The number and distribution of CDI LabID events remained similar to the previous quarter despite a large increase of overall LabID events in early 2013 due to the CMS requirement.

The MRSA inpatient overall and overall prevalence rates remained stable from the previous quarter to the present. The MRSA bacteremia and outpatient LabID event prevalence rates decreased significantly. In the stratified rates, there were no significant changes. Forty-one percent of the HO MRSA LabID specimens were from blood sources, and 36% of the CO MRSA LabID specimens were from blood sources. No overall or HO, CO, or CO-HCFA CDI LabID rates changed significantly this quarter.

No overall or NICU-only device rates changed significantly. However, the device utilization (DU) ratios for CAUTI and CLABSI decreased significantly and the DU ratio for VAE increased significantly. Many NICU DU ratios changed significantly.

The CAUTI SIR continues to demonstrate significantly more infections than expected at 1.266 ( $p=0.0002$ ), however there was a non-significant decrease from last quarter. The overall CLABSI SIR remained significantly less than 1 at 0.482 ( $p<0.0001$ ) and the CLABSI SIR for ICU locations only (excluding all NICU data) was significantly lower than one at 0.470. All SSI SIRs (Overall, COLO, and HYST) showed similar infections as what was expected. Finally, both the MRSA bacteremia and *C.diff* LabID SIRs were less than 1, and the *C.diff* LabID SIR of 0.899 was significantly less than 1 ( $p=0.0029$ ).

We will continue to add modules to these reports as they become required by CMS or based on feedback from the hospitals contributing data to the SHARP Unit. Increased surveillance activities will lead to more prevention activities and hopefully further decrease Michigan HAI rates in the future.

### Acronyms Used in Quarterly Reports

CAUTI	Catheter-Associated Urinary Tract Infection
CDC	Centers for Disease Control & Prevention
CDI	<i>Clostridium difficile</i> Infection
CLABSI	Central Line-Associated Bloodstream Infection
CMS	Centers for Medicare & Medicaid Services
CO	Community Onset
CO-HCFA	Community Onset, Healthcare Facility-Associated
COLO	Colon Surgery
DUA	Data Use Agreement
HAI	Healthcare-Associated Infection
HYST	Abdominal Hysterectomy
HO	Healthcare-Facility Onset
ICU/CCU	Intensive Care Unit/Critical Care Unit
LabID	Laboratory-Identified (Event)
MDCH	Michigan Department of Community Health
MDRO	Multidrug-Resistant Organism
MHA	Michigan Health & Hospital Association
MPRO	Michigan's Quality Improvement Organization
MRSA	Methicillin-Resistant <i>Staphylococcus aureus</i>
NHSN	National Healthcare Safety Network
SCA	Specialty Care Area
SHARP	Surveillance for Healthcare-Associated & Resistant Pathogens Unit
SSI	Surgical Site Infection
VAE	Ventilator-Associated Event
VAP	Ventilator-Associated Pneumonia
WARD	Medical/Surgical Ward (now also includes SCA)



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