

# HEALTHCARE-ASSOCIATED INFECTIONS IN MICHIGAN HOSPITALS

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**2013 QUARTER 1 REPORT**

Michigan Department of Community Health

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

**January 1 – March 31, 2013**

**January - March 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.

Aggregated 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 January 1 and March 31, 2013, a total of 83 of 169 (49%) 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 as of September 25, 2013. Eighty-one of these hospitals used the LabID Event option of the MDRO/CDI module to monitor MRSA in their reporting plan; 78 shared these data with SHARP. Eighty hospitals monitored and 78 shared *C. difficile* LabID Events. 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) mandate for acute care hospitals participating in the Inpatient Prospective Payment System (IPPS), effective January 1, 2013.

Of the 83 hospitals participating this quarter, most collected additional NHSN module data as indicated in Table 1. This is largely due to the CMS mandates already in effect for HAI reporting of CAUTI, CLABSI, and SSI (colon and abdominal hysterectomy procedures only). For example, 79 of the 83 hospitals during this quarter utilized the CAUTI module; of these, 78 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>	79	78
<b>Surgical Site Infection (SSI)</b>	77	74
<b>Central Line-Associated Bloodstream Infection (CLABSI)</b>	76	75
<b>Ventilator-Associated Events(VAE)</b>	35	54 <sup>3</sup>
<b>Clostridium difficile Infection (CDI) Laboratory-identified (LabID) Event</b>	80	78
<b>Methicillin-Resistant Staphylococcus aureus (MRSA) Laboratory-identified (LabID) Event<sup>4</sup></b>	81	78
<b>Methicillin-Resistant Staphylococcus aureus (MRSA) Infection Surveillance</b>	7	9
<b>Clostridium difficile Infection (CDI) Surveillance</b>	6	8

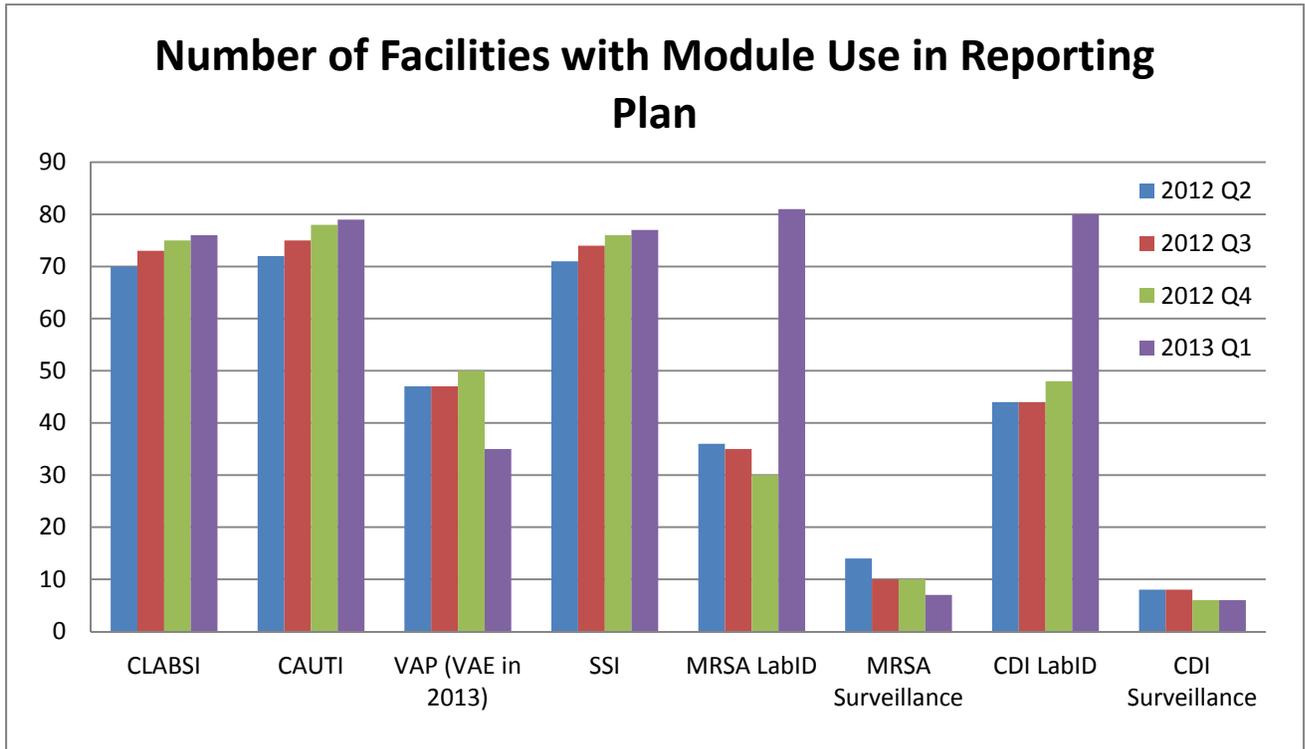
<sup>1</sup>This is the number of hospitals that have indicated module use in each of their reporting plans for at least one month within the three month time period.

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

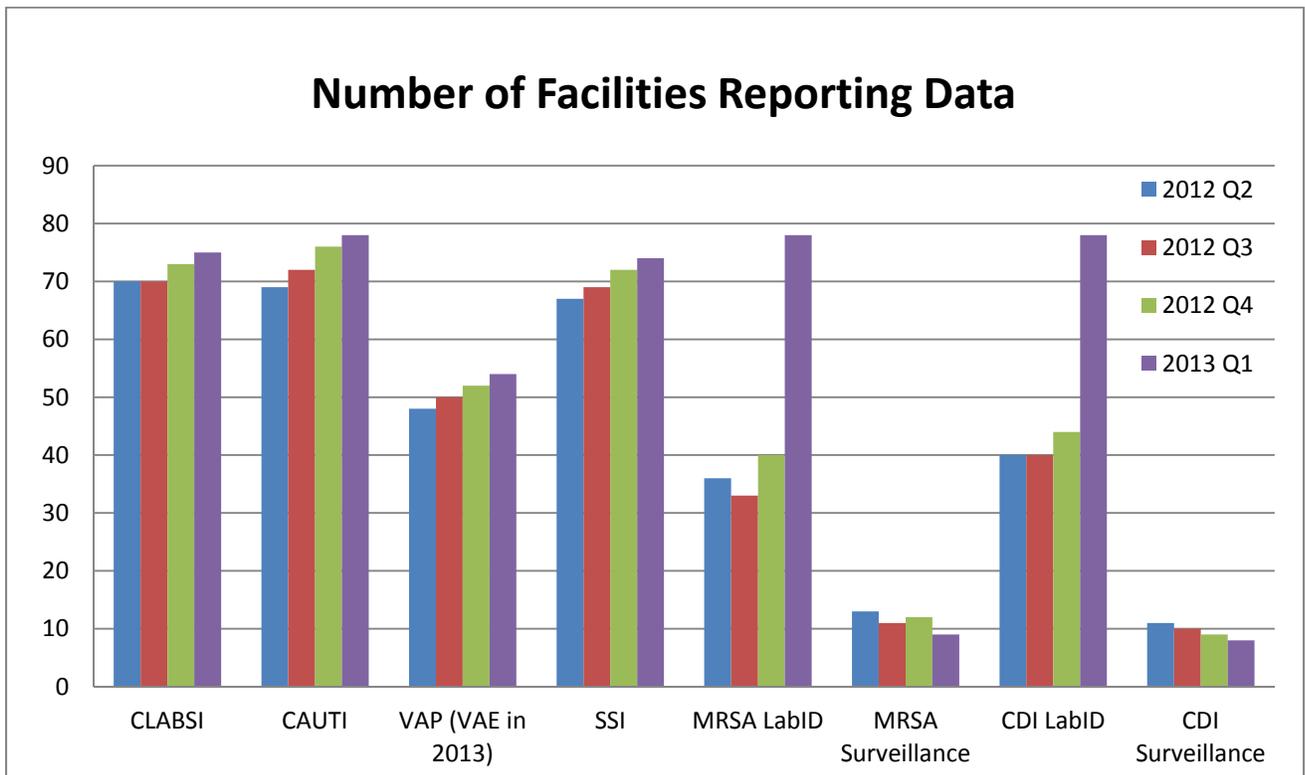
<sup>3</sup>In some instances, the number of hospitals sharing data is greater than the number of hospitals using the module. The option to ‘view in-plan only data’ is not available for all modules. Therefore, some out-of-plan data have been included when impossible to remove.

<sup>4</sup>Includes both MRSA LabID and MRSA LabID (blood only) reporting options

**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 January 1 and March 31, 2013, 1258 MRSA isolates were reported from 69 participating hospitals using the MDRO/CDI module, LabID Event option. Although this is the first quarter with the new CMS mandate for facility-wide reporting of MRSA bacteremia LabID events, the number of events per quarter has remained relatively stable. 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.

Twenty-six percent of the MRSA LabID Events this quarter were determined to be healthcare facility-onset (HO), and the remaining 74% 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 increased by 8% from the previous quarter to the present. Although the overall number of LabID events from blood specimens increased as expected with the new CMS mandate, the percentage MRSA LabID blood HO remained stable. The percentage of HO skin specimens remained at 0%, and the percentage of HO wound specimens increased again this quarter, this time from 10% to 16%. The percentage of "other" HO specimen sources had been gradually increasing for each quarter in 2012, and the trend continued in early 2013.

Table 2.

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

	April – June 2012 Quarterly Report	July – September 2012 Quarterly Report	October –December 2012 Quarterly Report	January – March 2013 Quarterly Report
<b>Frequency, Number</b>				
<i>Hospitals with a DUA</i> <sup>1</sup>	76	79	82	<b>83</b>
<i>Hospitals reporting MRSA LabID</i> <sup>2</sup>	36	35	30	<b>81</b>
<i>Hospitals sharing MRSA LabID</i>	36	29	40	<b>69</b>
<i>Aggregated LabID Events</i>	1289	1322	1387	<b>1258</b>
<b>Onset, Number (%)</b>				
<i>Healthcare Facility-Onset (HO)</i>	230 (18)	196 (15)	248 (18)	<b>330 (26)</b>
<i>Community-Onset (CO)</i>	1059 (82)	1126 (85)	1139 (82)	<b>928 (74)</b>
<b>Specimen Source, Number (% , %HO)<sup>3</sup></b>				
<i>Blood</i>	98 (31)	121 (22)	158 (27)	<b>483 (38, 26)</b>
<i>Sputum</i>	153 (39)	128 (39)	122 (38)	<b>131 (10, 42)</b>
<i>Wound</i>	404 (11)	480 (5)	452 (10)	<b>255 (20, 16)</b>
<i>Abcess</i>	102 (10)	161 (8)	228 (6)	<b>51 (4, 14)</b>
<i>Urine</i>	127 (9)	111 (9)	124 (6)	<b>72 (6, 14)</b>
<i>Skin</i>	6 (0)	6 (17)	8 (0)	<b>2 (0, 0)</b>
<i>Other</i>	399 (19)	315 (22)	295 (32)	<b>264 (21, 34)</b>
<b>Surveillance Location, Number (% , %HO)<sup>4</sup></b>				
<i>Intensive/Critical Care Unit</i>	280 (22, 37)	272 (21, 34)	315 (23, 43)	<b>436 (35, 42)</b>
<i>Specialty Care Area</i>	21 (2, 52)	----	----	<b>6 (0, 0)</b>
<i>Wards</i>	528 (41, 22)	544 (41, 19)	500 (36, 23)	<b>668 (53, 22)</b>
<i>Outpatient</i>	460 (36, 0)	506 (38, 0)	572 (41, 0)	<b>148 (12, 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 when available. If not available, 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 2555 reports of CDI from 72 hospitals which shared MDRO/CDI LabID Event data with the SHARP Unit. With the CMS mandate for facility-wide reporting of CDI LabID events, the overall number of events increased over two-fold from the previous 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-nine percent of CDI LabID Events were considered healthcare facility-onset (HO), eighteen percent were considered community-onset healthcare facility-associated (CO-HCFA), and forty-four percent were reported as community-onset (CO). This distribution is nearly identical to previous quarters, despite an overall increase in the number of events reported. Community-onset healthcare facility-associated 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.' Healthcare facility-onset and community-onset are defined under the MRSA LabID Event data heading.

Eight percent of CDI LabID Events occurred in patients who had a prior CDI LabID Event entered in a previous month, which is down 4% from the previous quarter. In addition, 5% of LabID Events were recurrent CDI assays. 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**

	April – June 2012 Quarterly Report	July – September 2012 Quarterly Report	October – December 2012 Quarterly Report	January – March 2013 Quarterly Report
<b>Frequency, Number</b>				
<i>Hospitals with DUA<sup>2</sup></i>	76	79	82	<b>83</b>
<i>Hospitals Reporting CDI LabID<sup>3</sup></i>	44	44	48	<b>80</b>
<i>Hospitals Sharing CDI LabID</i>	40	40	44	<b>72</b>
<i>Aggregated LabID Events</i>	934	955	1136	<b>2555</b>
<b>Onset, Number (%)</b>				
<i>Healthcare Facility-Onset (HO)</i>	270 (29)	341 (36)	414 (36)	<b>992 (39)</b>
<i>Community-Onset Healthcare Facility-Associated (CO-HCFA)</i>	178 (19)	163 (17)	191 (17)	<b>451 (18)</b>
<i>Community-Onset (CO)</i>	486 (52)	451 (47)	531 (47)	<b>1112 (44)</b>
<b>Previous CDI, Number (%)</b>				
<i>Previously Positive</i>	109 (12)	136 (14)	134 (12)	<b>196 (8)</b>
<i>CDI assay, recurrent</i>	66 (7)	80 (8)	49 (4)	<b>116 (5)</b>
<b>Surveillance Location, Number (% , %HO)<sup>4</sup></b>				
<i>Intensive/Critical Care Unit</i>	175 (19, 41)	171 (18, 60)	264 (23, 49)	<b>568 (22, 47)</b>
<i>Specialty Care Area</i>	65 (7, 43)	4 (0, 50)	1 (0, 100)	----
<i>Wards</i>	524 (56, 33)	624 (65, 38)	730 (64, 39)	<b>1856 (73, 39)</b>
<i>Outpatient</i>	170 (18, 0)	155 (16, 0)	139 (12, 0)	<b>117 (6, 0)</b>
<i>Other</i>	-----	1 (0,0)	1 (0,0)	<b>9 (0, 56)</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.

Table 4.

### Cumulative Michigan MRSA Rate

	Facilities	Number of MRSA Events	Number of Patient Days	Number of Patient Admits/Encounters	MRSA Rate <sup>1</sup>	MRSA Prevalence Rate <sup>2</sup>
MRSA Inpatient LabID <sup>3</sup>	78	1066 LabID <sup>4</sup>	1,182,696	267,589 Admits	0.9013↓	0.3984↓
MRSA Bacteremia LabID <sup>5</sup>	78	438 LabID	1,182,696	267,589 Admits	0.3703	0.1637
MRSA Outpatient LabID <sup>6</sup>	6	35 LabID	----	34,629 Encounters	----	0.1011↓
MRSA Surveillance <sup>7</sup>	9	5 Infection <sup>8</sup>	15,619	---- <sup>9</sup>	0.3201	----

#### 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>The number of MRSA LabID Events indicated in this table is less than the number of MRSA LabID Events indicated in Table 2. 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>MRSA bacteremia LabID: MRSA LabID event from a blood specimen

<sup>6</sup>MRSA outpatient LabID: MRSA LabID event taken in an outpatient location, and reported only if the hospital is reporting outpatient events. These events are also reported in inpatient location, and are attributed to the admitting location.

<sup>7</sup>MRSA Surveillance data were pulled on August 23, 2013 instead of July 30, 2013.

<sup>8</sup>Infection: MRSA event under infection surveillance. This is an option in the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module for tracking infections through surveillance.

<sup>9</sup>The 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.

↓ or ↑ Indicates statistically significantly less than or greater than previous quarter (respectively).

Both the MRSA Inpatient LabID Event and Prevalence rates decreased significantly this quarter, from 1.6292 to 0.9013 per 1,000 patient days ( $p < 0.0001$ ) and from 0.7532 to 0.3984 per 100 admissions ( $p < 0.0001$ ), respectively. MRSA Inpatient LabID Event Rate trends are displayed in Figure 3. For the first time, MRSA Bacteremia LabID Event and Prevalence rates were provided and the Event rate is also included in Figure 3. These infections are also included in the overall inpatient LabID rates. This quarter, the MRSA Outpatient rate decreased significantly from 0.2779 to 0.1011 per 100 encounters ( $p < 0.0001$ ). The MRSA Surveillance rate increased from the previous quarter, but this change was not significant. Outpatient and Surveillance trends will continue to be monitored; however, we are not monitoring them as closely as inpatient LabID events.

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

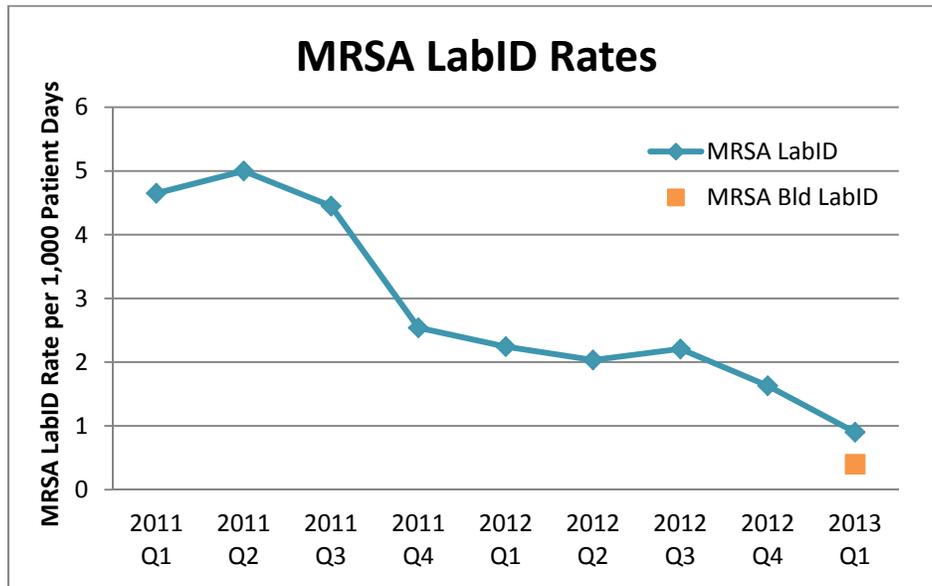


Table 5 (below) provides inpatient MRSA LabID rates stratified by onset. SHARP has now received enough data to stratify MRSA LabID rates by community-onset and healthcare facility-onset for over a year. MRSA bacteremia (bld) LabID rates were stratified by onset for the first time in this report.

Table 5.

**Michigan Inpatient MRSA LabID Rate by Onset**

Number of Facilities	Onset	Number (%) <sup>1</sup> of Inpatient MRSA LabID <sup>2</sup> Events	Number of Patient Days	Number of Patient Admits	HO Incidence Rate <sup>3</sup>	CO Prevalence Rate <sup>4</sup>
78	HO <sup>5</sup>	247 (24) LabID	1,182,696	----	0.2088↓	----
		102 (24) Bld LabID <sup>6</sup>	1,182,696	----	0.0862	----
78	CO <sup>7</sup>	765 (76) LabID	----	267,589	----	0.2859↓
		331 (76) Bld LabID	----	267,589	----	0.1237

**Michigan Rate**

- <sup>1</sup> Percentage of LabID events, or bacteremia LabID events, which are either HO or CO
  - <sup>2</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>3</sup> MRSA HO Incidence Rate: Methicillin-Resistant *Staphylococcus aureus* (MRSA) rate. This is 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>4</sup> MRSA CO Prevalence Rate. This is the number of MRSA LabID Events per 100 patients admitted.
  - <sup>5</sup> HO: Healthcare facility-onset
  - <sup>6</sup> Bld LabID: MRSA bacteremia LabID events (LabID events from a blood specimen)
  - <sup>7</sup> CO: Community-onset
- ↓ or ↑ Indicates statistically significantly less than or greater 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 significantly from 0.3296 to 0.2088 per 1,000 patient days from the previous quarter to the present (p<0.0001). 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.

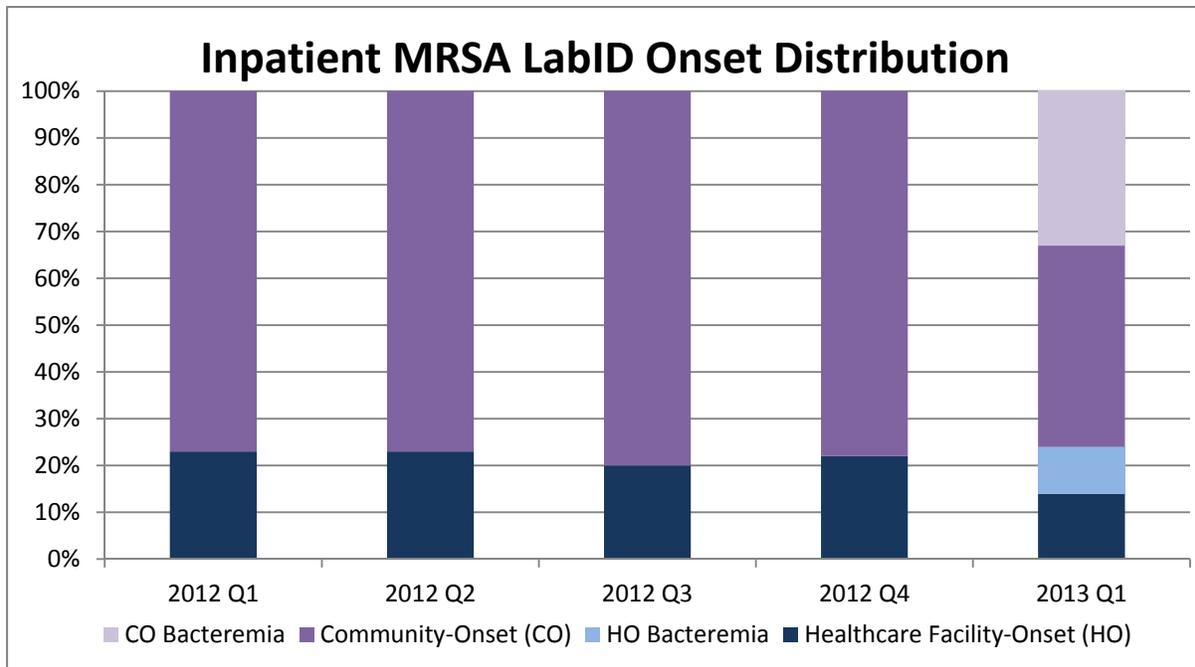
Community-onset infections occur when the LabID specimen was collected 3 days or less after admission to the facility. These are prevalent infections, so a MRSA prevalence rate is calculated. The MRSA prevalence rate last quarter was 0.5290 per 100 admissions; it significantly decreased to 0.2859 this quarter (p<0.0001).

The majority (76%) of inpatient MRSA LabID events were community-onset. The remaining 24% were healthcare facility-onset. This distribution was the same for MRSA bacteremia LabID events alone. The HO MRSA bacteremia LabID incidence rate is available in this report for the first time. Of the 247 HO

LabID events, 102 (41%) were from blood specimens. Of the 756 CO LabID events, 331 (43%) were from blood specimens. The graphical display of this can be seen below in Figure 4, along with 2012 data. 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. The numbers of LabID events in Tables 4 and 5 are lower than in Table 2 because only LabID events which had corresponding denominators (i.e. patient days or admits) were included in the table; 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>	78	2384 LabID <sup>4</sup>	1,103,200	248,518 Admits	21.6099↑	0.9593↑
CDI Outpatient LabID	6	51 LabID	----	33,837 Encounters	----	0.1507↑
CDI Surveillance <sup>5</sup>	8	3 Infection <sup>6</sup>	8,668	---- <sup>7</sup>	3.4610	----

## 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 Surveillance data were pulled on August 23, 2013 instead of July 30, 2013.

<sup>6</sup>Infection: *C. diff* event under infection surveillance. This is an option in the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module for tracking infections through surveillance.

<sup>7</sup>The infection surveillance module does not currently provide the number of patient admissions; therefore this number is unavailable and a *C. diff* Prevalence Rate cannot be calculated.

↓ or ↑ Indicates statistically significantly less than or greater than previous quarter (respectively).

The CDI Inpatient LabID Event rate increased significantly this quarter, from 19.7716 to 21.6099 per 10,000 patient days ( $p=0.0032$ ). Overall CDI Inpatient LabID Event rate trends can be seen in Figure 5. The CDI Outpatient LabID prevalence rate increased significantly from 0.0635 to 0.1507 ( $p<0.0001$ ). The CDI surveillance rate increased from the previous quarter; this was not significant.

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

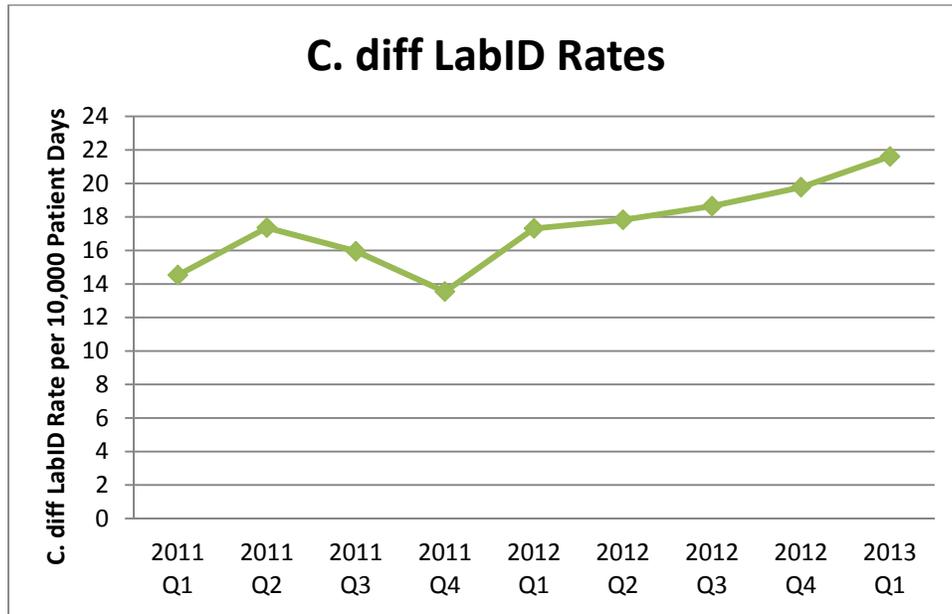


Table 7 (below) provides inpatient CDI LabID Rates stratified by onset. SHARP has now received enough data from reporting hospitals to stratify CDI LabID Rates by healthcare facility-onset, community-onset, and community-onset healthcare facility-associated for over a year and trends are now available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

Table 7.

## Michigan CDI LabID Rate by Onset

Number of Reporting Facilities	Onset	Number of Inpatient CDI LabID <sup>1</sup> Events	Number of Patient Days	Number of Patient Admits	HO Incidence Rate <sup>2</sup>	CO/CO-HCFA Prevalence Rate <sup>3</sup>	Percentage of Total
78	HO	948 LabID	1,103,200	----	8.5932	----	40
78	CO-HCFA <sup>4</sup>	416 LabID	----	248,518	----	0.1674↑	18
78	CO <sup>5</sup>	1008 LabID	----	248,518	----	0.4056↑	42

## 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>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>3</sup>CO or CO-HCFA Prevalence Rate. This is the number of CDI LabID events per 100 patients admitted.

<sup>4</sup>CO-HCFA: Community-onset healthcare facility-associated

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

↓ or ↑ Indicates statistically significantly less than or greater 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 8.0581 to 8.5932 per 10,000 patient days from the previous quarter to the present. The present 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).

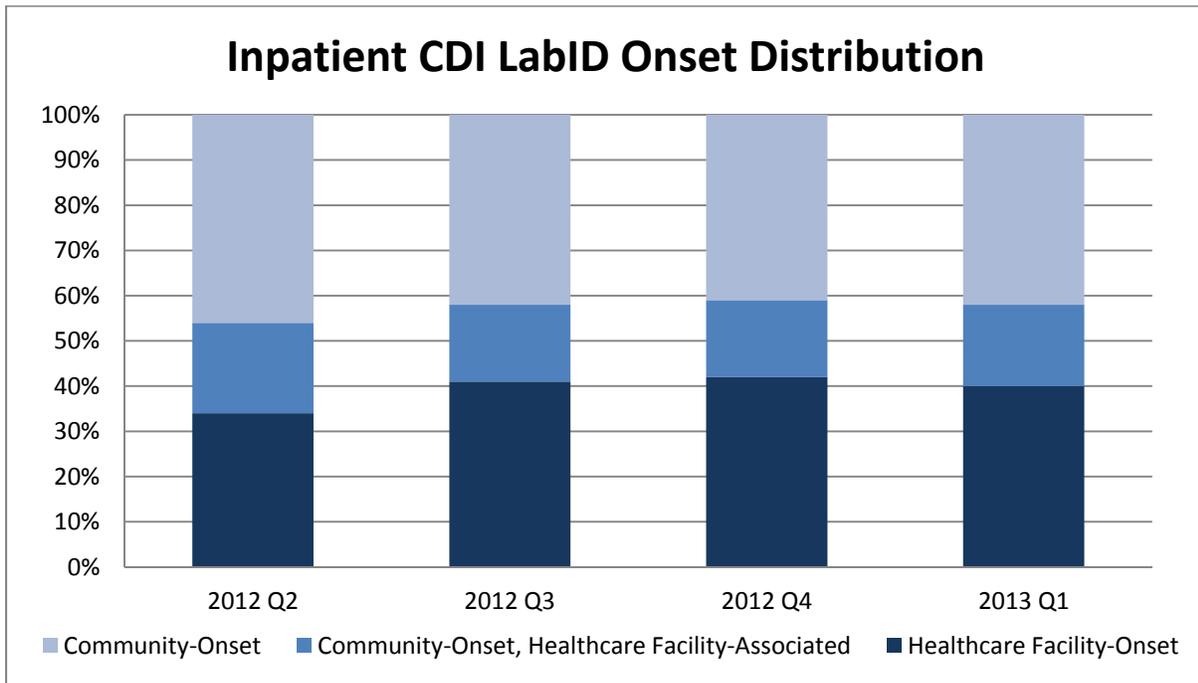
Community-onset infections occur when the LabID specimen was collected 3 days or less after admission to the facility. These are prevalent infections, so a CDI prevalence rate is calculated. The CO CDI prevalence rate increased significantly from 0.3419 to 0.4056 per 100 admissions from the previous quarter ( $p=0.0003$ ). 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 increased significantly (from 0.1378 to 0.1674 per 100 admissions) ( $p=0.0063$ ).

The majority (42%) of inpatient CDI LabID events were community-onset, followed closely by healthcare-onset (40%). The remaining infections were community-onset healthcare facility-associated (18%). 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. Note: 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.

Of the 79 hospitals with CAUTI in their reporting plans, 78 shared data for at least one month. Of the 76 hospitals with CLABSI in their reporting plan, 72 shared data. Although there were only 35 hospitals that had VAE in their reporting plan, 54 shared data. We are unable to exclude out-of-plan data for the VAE rate calculation.

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>	79	301	308,197	112,136	2.6842↑	N/A	0.3638↑	N/A
CLABSI <sup>6</sup>	72	64	259,441	89,999	0.7111↓	0.9601	0.3469↓	0.2749
P/P VAP <sup>7</sup>	54	27	77,630	27,345	0.9874	N/A	0.3522	N/A
Total VAE <sup>8</sup>	54	160	77,630	27,345	5.8512	N/A	0.3522	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>DU: Device Utilization. The proportion of days on a device divided by 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>4</sup>The 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). 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>P/P VAP: Possible or Probable VAPs occur when the patient meets all criteria for a Ventilator-Associated Condition (VAC), an Infection-Related Ventilator-Associated Condition (IVAC), plus additional criteria.

<sup>8</sup>Total VAE: All patients meeting the criteria for VAC, IVAC, or Possible/Probable VAP.

↓ or ↑ Indicates statistically significantly less than or greater than previous quarter (respectively).

There was a significant increase in the Michigan CAUTI rate from 2.2264 to 2.6842 per 1,000 device days (p=0.0016). There was also a significant decrease in the MI CLABSI rate (0.8773 to 0.7111 per 1,000 device days) (p=0.0397). The first possible/probable VAP rate is 0.9874 per 1,000 device days, and the first total VAE rate is 5.8512 per 1,000 device days. The Michigan DU ratio significantly increased for CAUTI and CLABSI. 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

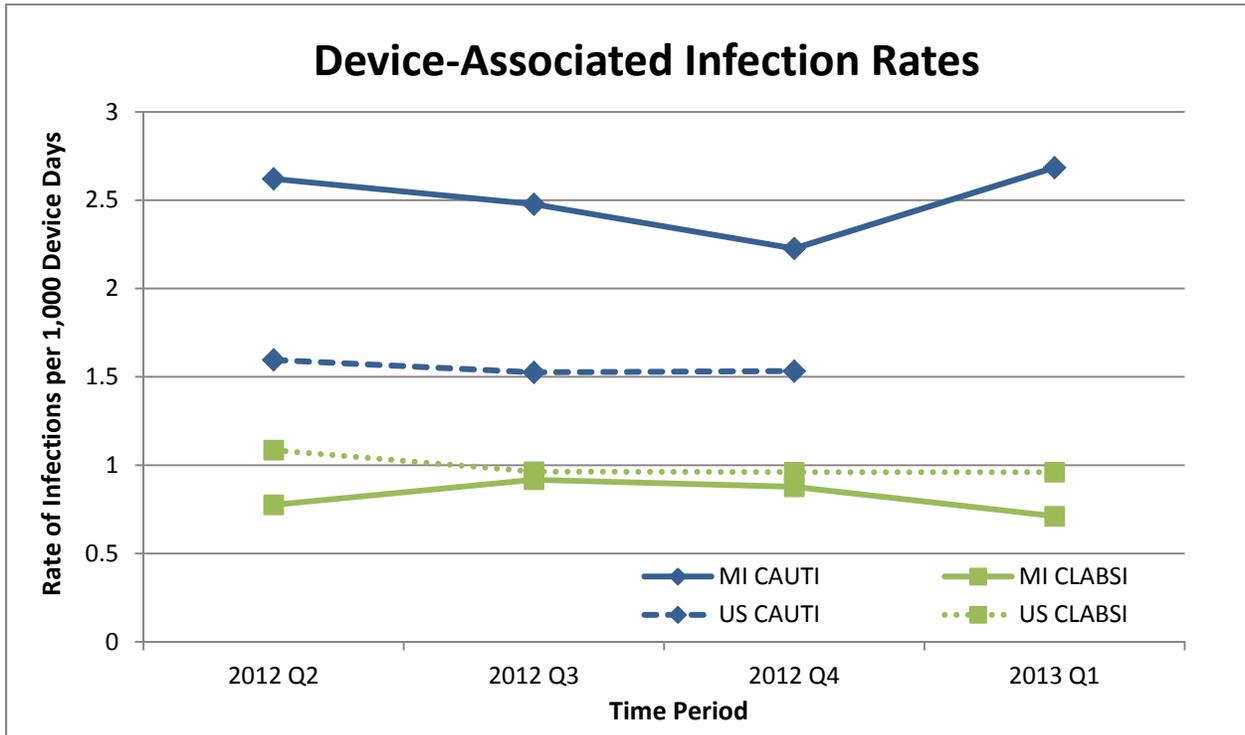


Figure 8. Device Utilization Ratio Trends by Quarter

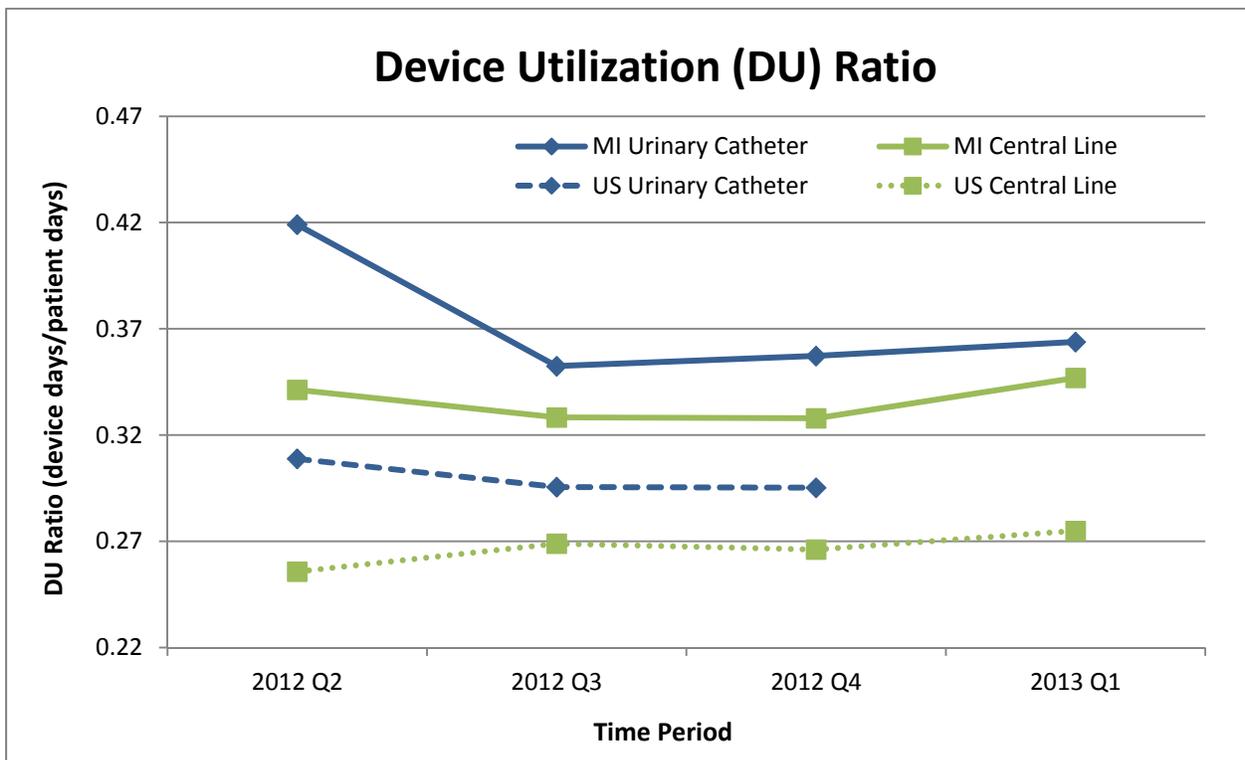


Table 9.

*Michigan NICU 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>1</sup>	US Rate <sup>2</sup>	MI DU <sup>3</sup>	US DU <sup>4</sup>
<b>CLABSI<sup>5</sup></b>	<b>OVERALL</b>	<b>15</b>	<b>7</b>	<b>39,320</b>	<b>7,914</b>	<b>0.8845</b>	<b>1.5076</b>	<b>0.2013</b> ↑	<b>0.2715</b>
	A <sup>6</sup>	14	3	5,540	1,797	1.6694↓	2.5672	0.3244↑	0.4307
	B <sup>7</sup>	13	2	5,695	1,484	1.3477	1.9839	0.2606↓	0.3730
	C <sup>8</sup>	14	1	8,683	1,829	0.5467	1.2786	0.2106↑	0.2825
	D <sup>9</sup>	15	1	11,648	1,330	0.7519	0.8712	0.1142↑	0.1769
	E <sup>10</sup>	14	0	7,754	1,474	0.0000	0.8130	0.1901↑	0.2369
<b>VAP<sup>11</sup></b>	<b>OVERALL</b>	<b>7</b>	<b>2</b>	<b>20,971</b>	<b>2,109</b>	<b>0.9483</b>	<b>1.0404</b>	<b>0.1006</b>	<b>0.1493</b>
	A	5	0	2,511	718	0.0000	1.5578	0.2859↓	0.3862
	B	5	1	3,158	621	1.6103	1.4461	0.1966	0.2233
	C	7	1	4,731	372	2.6882	1.0013	0.0786↑	0.1078
	D	7	0	6,258	219	0.0000	0.5217	0.0350	0.0681
	E	6	0	4,313	179	0.0000	0.2062	0.0415	0.1265

  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.

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

<sup>4</sup>The 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). These data are for a descriptive reference only, and do not necessarily represent the true national DU ratio.

<sup>5</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>6</sup>A: Birthweight ≤750g

<sup>7</sup>B: Birthweight 751 – 1000g

<sup>8</sup>C: Birthweight 1001 – 1500g

<sup>9</sup>D: Birthweight 1501 – 2500g

<sup>10</sup>E: Birthweight >2500g

<sup>11</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 less than or greater 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.

### **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 first 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, and other variables of influence. Of the 79 hospitals participating in the CAUTI reporting module, 78 provided data to the SHARP Unit valid for SIR calculations. Of the 76 hospitals participating in the CLABSI reporting module, 75 shared CLABSI SIR data. Of the 77 hospitals participating in the SSI module, 74 shared SSI SIR data. The majority of hospitals reporting SSIs were for colon surgeries (71 hospitals) and abdominal hysterectomies (67 hospitals). Finally, of the 81 hospitals participating in MRSA LabID (all specimens or blood only), 74 shared MRSA bacteremia LabID SIR data, and of the 80 hospitals participating in the CDI LabID module, 74 shared CDI SIR data.

Table 10.

## Standardized Infection Ratios (SIR)

Type of Infection	Number of Hospitals	Procedures Done	Device Days or Patient Days	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>	78	N/A	104,127 DD	287	223.99	1.281↑	<0.0001	1.137, 1.438
CLABSI <sup>7</sup>	75	N/A	93,809 DD	69	190.455	0.362	<0.0001	0.282, 0.459
SSI <sup>8</sup>	74	11,535	N/A	206	268.339	0.768	<0.0001	0.664, 0.882
SSI COLO <sup>9</sup>	71	2,132	N/A	96	126.376	0.760	0.0029	0.615, 0.982
SSI HYST <sup>10</sup>	67	1,852	N/A	38	35.808	1.061	0.3788	0.751, 1.457
MRSA Bac LabID <sup>11</sup>	74	N/A	1,170,028 PD	102	83.816	1.217	0.0296	0.988, 1.483
<i>C.diff</i> LabID <sup>12</sup>	74	N/A	1,091,566 PD	939	880.269	1.067	0.0258	0.998, 1.139

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

<sup>9</sup>SSI COLO: Colon surgeries

<sup>10</sup>SSI HYST: Abdominal Hysterectomies

<sup>11</sup>MRSA Bacteremia LabID: Inpatient facility-wide MRSA bacteremia Laboratory-identified Event

<sup>12</sup>Clostridium difficile LabID: Inpatient facility-wide Clostridium difficile Laboratory-identified Event

↓ or ↑ Indicates statistically significantly less than or greater than previous quarter (respectively).

The CAUTI SIR this quarter was 1.281, which indicates significantly more infections than expected ( $p < 0.0001$ ). This was a slightly significant increase from the SIR of 1.074 in the previous quarter ( $p = 0.0481$ ). This quarter's CLABSI SIR demonstrates that Michigan facilities again had significantly fewer

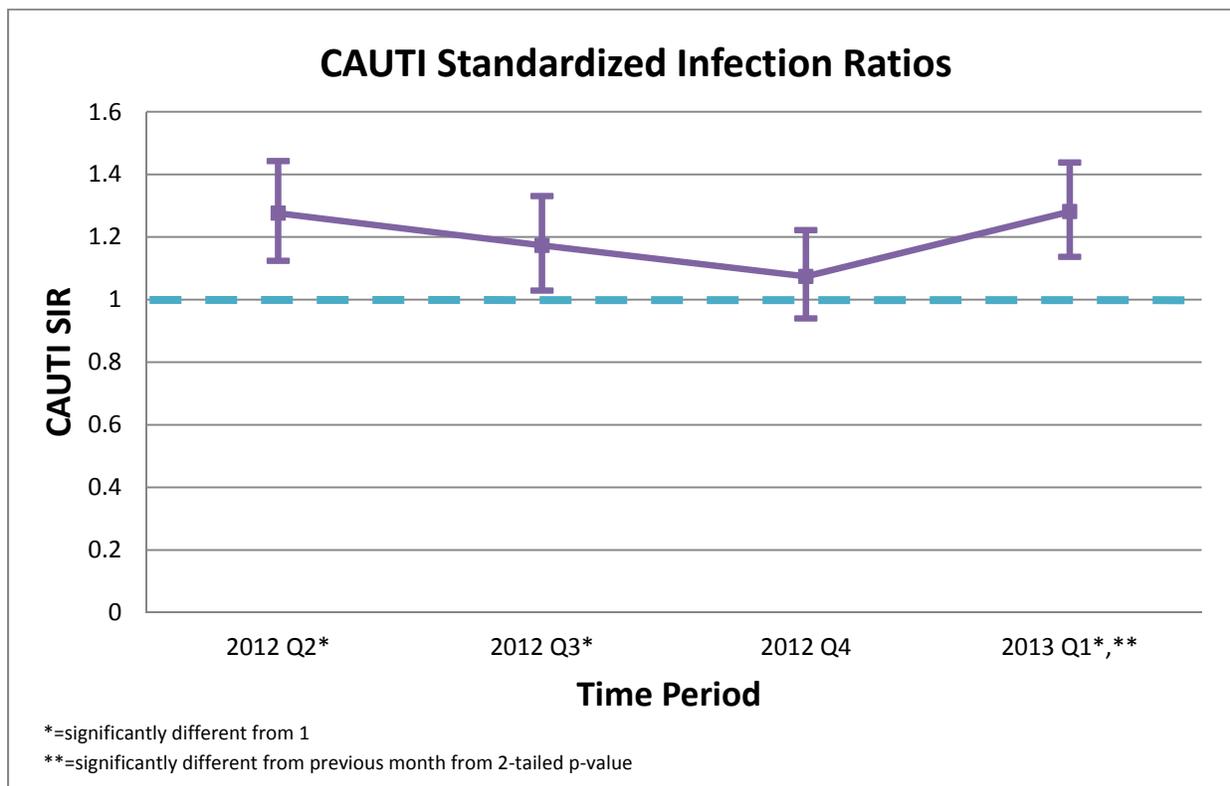
CLABSIs than predicted based on national averages. An SIR of 0.362 indicates that Michigan had 63.8% fewer CLABSIs than expected. This was a non-significant reduction from the previous quarter.

The overall SSI SIR was 0.768, which demonstrates significantly fewer infections than expected. The SSI colon surgery (COLO) SIR was 0.760, which also demonstrated significantly fewer infections than expected, and SSI abdominal hysterectomy (HYST) SIR was 1.061, which demonstrates approximately the same number of infections as expected. While the overall SSI SIR decreased, both the COLO and HYST SSI SIRs increased. None of these changes were statistically significant.

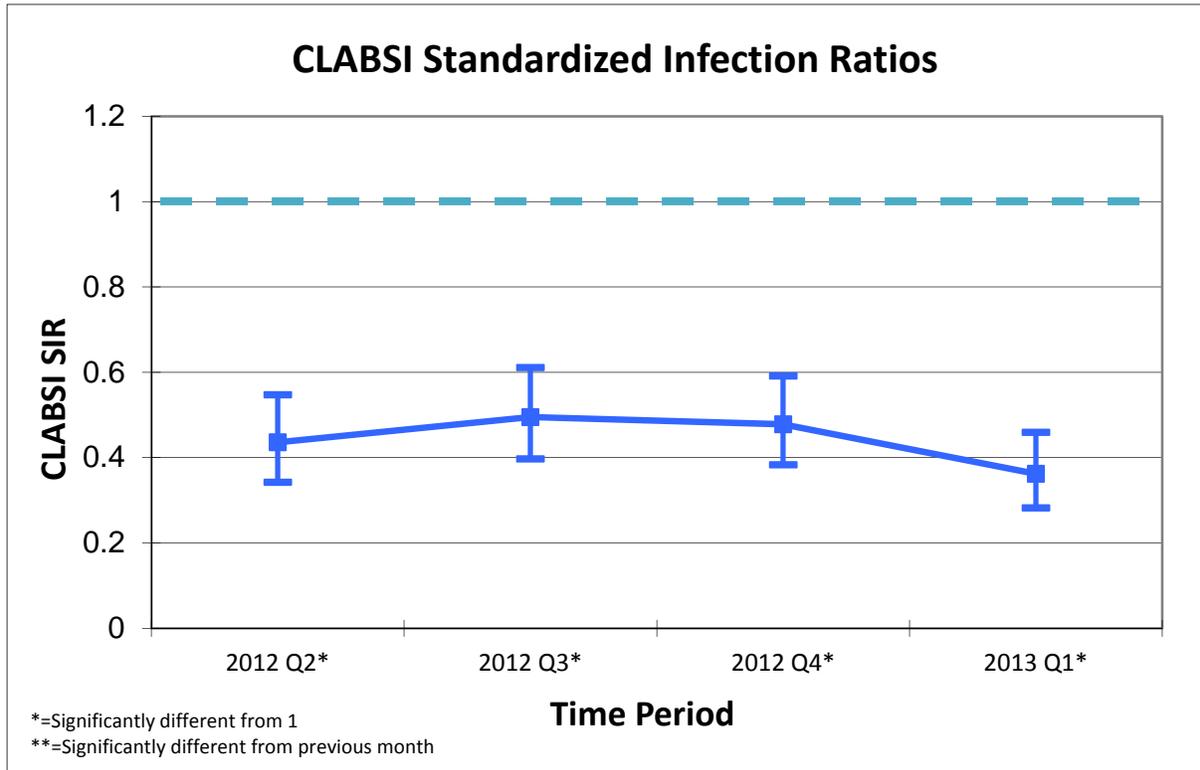
Both the MRSA bacteremia LabID and CDI LabID SIRs were calculated for the first time this quarter, and were 1.217 and 1.067, respectively. Both of these SIRs demonstrated significantly more infections than expected. As this was the first time calculating this SIR, we hope this number will decrease below one for future reports.

Figures 9-13 (below) display the SIR for the CAUTI, CLABSI, and SSI (overall, COLO and HYST) modules over time. MRSA bacteremia LabID and CDI LabID SIR trends will be available next quarter. 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.

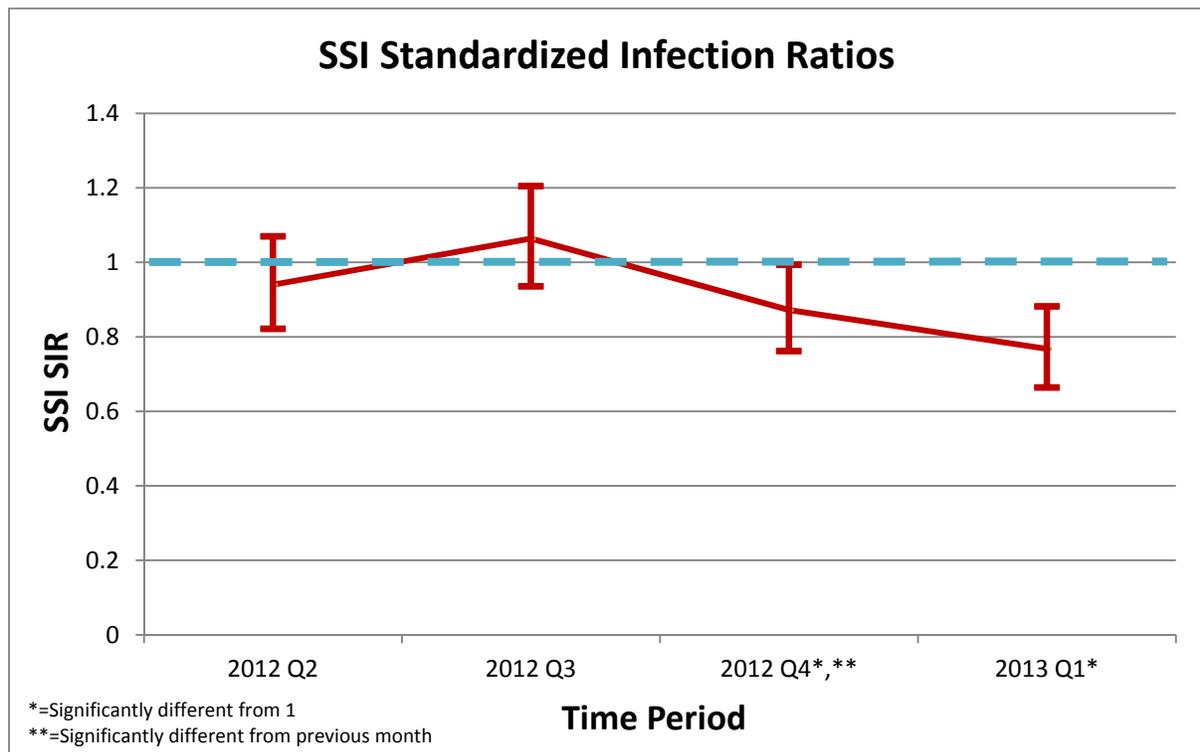
**Figure 9. CAUTI Standardized Infection Ratios**



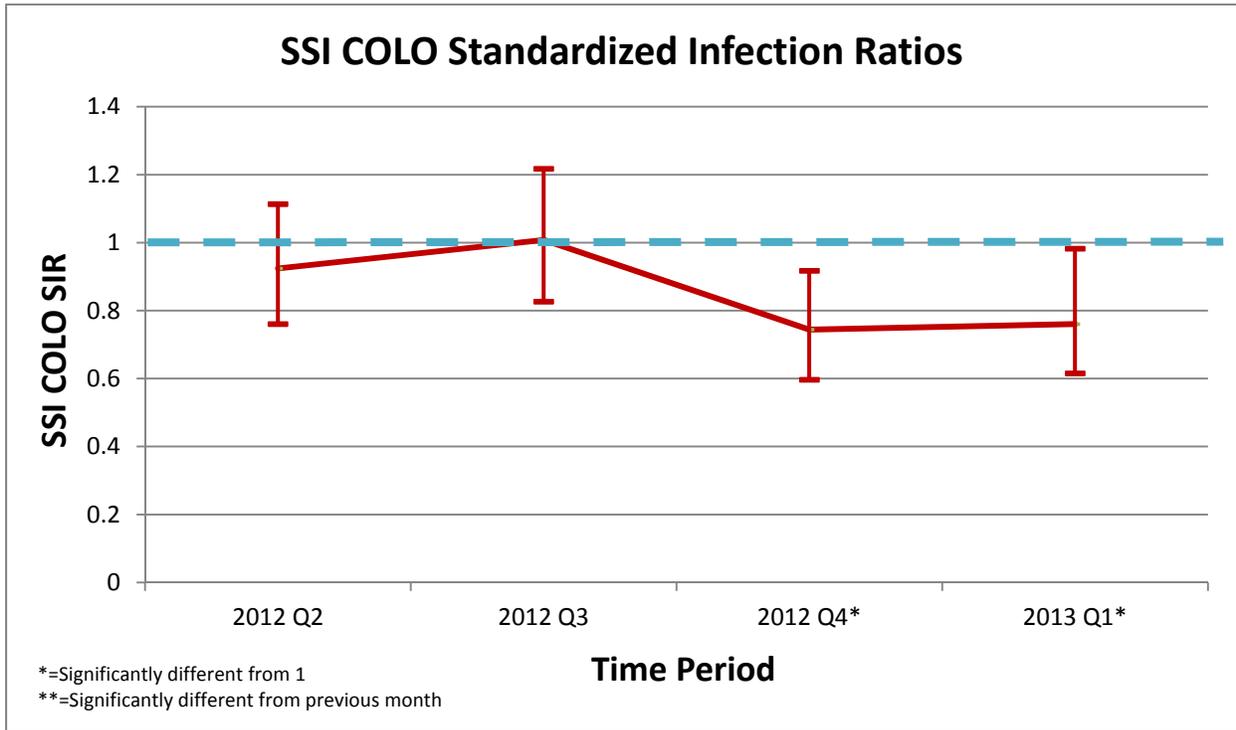
**Figure 10.** CLABSI Standardized Infection Ratios



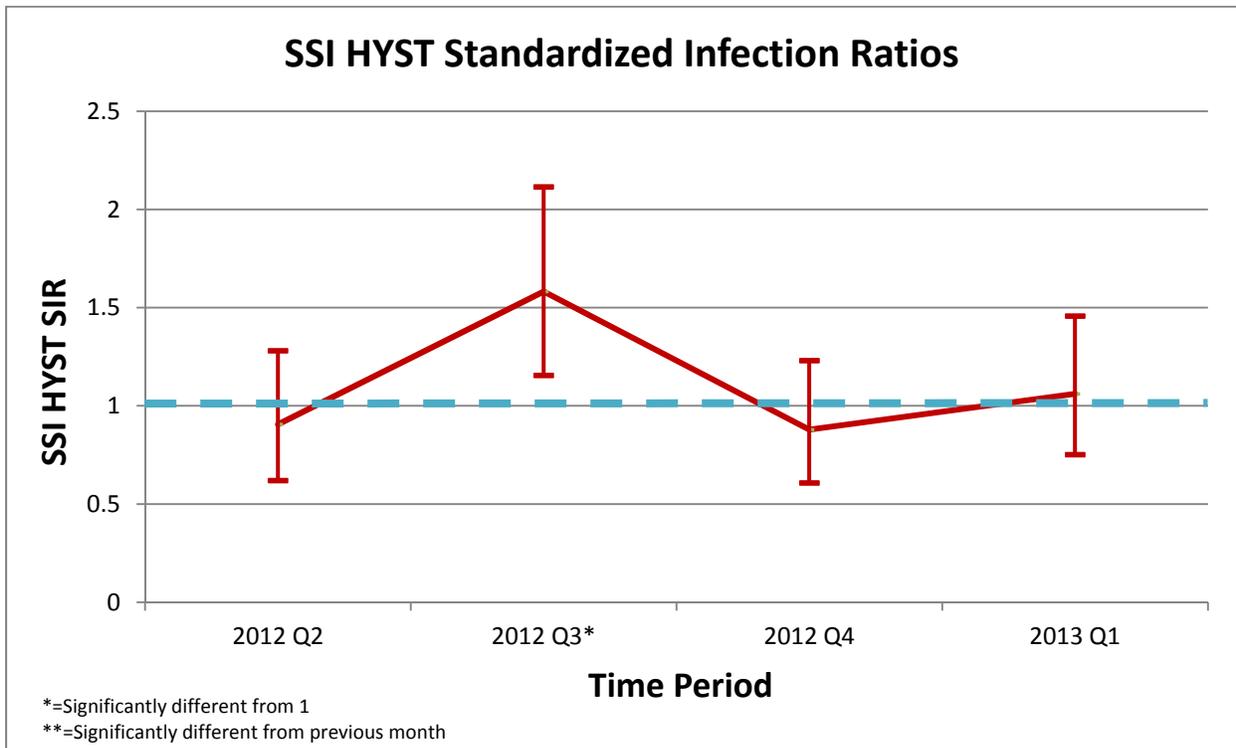
**Figure 11.** SSI Overall Michigan Standardized Infection Ratios



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



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



## Conclusions

This quarter, hospital participation remained relatively stable, increasing slightly from 82 hospitals sharing data in the previous quarter to 83 hospitals sharing data in the present quarter. 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 remained stable despite a large increase in participating hospitals. The percent of HO events increased from 18% to 26%, and the overall percentage of MRSA LabID specimens increased in ward locations while decreasing substantially from outpatient reporting. The number of CDI LabID events more than doubled this quarter; however, the onset distribution remained stable.

The MRSA inpatient overall and overall prevalence rates along with the outpatient rate decreased significantly from the previous quarter. We were able to calculate a MRSA bacteremia rate and SIR for the first time this quarter. The SIR showed significantly more infections than expected. We will continue to monitor and show trends in future reports. Both the HO MRSA incidence and CO MRSA prevalence rates decreased significantly. 41% of the HO MRSA LabID specimens were from blood sources, and 43% of the CO MRSA LabID specimens were from blood sources. The CDI LabID rate increased significantly this quarter from the previous quarter. Within this overall rate, the CO and CO-HCFA CDI LabID prevalence rates increased significantly, while the HO CDI incidence rate increased non-significantly. We were also able to calculate a CDI LabID SIR for the first time this quarter; it demonstrated significantly more infections than expected.

CAUTI rates this quarter increased significantly, and the CAUTI SIR was significantly greater than one. This trend has been occurring both in Michigan hospitals and nationally; we will continue to monitor these trends closely. The CLABSI rate decreased significantly this quarter, and the CLABSI SIR remained significantly less than one. The CLABSI SIR decreased from the previous quarter, but this was not significant. The overall SSI SIR and the SSI COLO SIR both demonstrated significantly fewer infections than expected.

There were a number of new calculations included in this report, both due to new CMS reporting mandates and surveillance definition changes within NHSN. In addition to the new MRSA and CDI LabID SIRs, we were also able to calculate a Possible/Probable VAP rate along with a total VAE rate for the first time this quarter. We will continue to add modules as they become required by CMS or based on feedback from the hospitals contributing data to these reports. 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)



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

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