Healthcare-Associated Infections

2015 Annual Report

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

Michigan Department of Health and Human Services

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Introduction

This report includes statewide healthcare-associated infection (HAI) counts, rates, and ratios in Michigan from January through December, 2015. Surveillance data were collected from Michigan facilities which voluntarily agreed to share their National Healthcare Safety Network (NHSN) data with the Michigan Department of Health and Human Services (MDHHS) Surveillance for Healthcare-Associated and Resistant Pathogens (SHARP) Unit. NHSN is a secure online surveillance system developed by the Centers for Disease Control and Prevention (CDC). Facilities sign a MDHHS SHARP data use and confidentiality agreement (DUA) and confer rights to MDHHS SHARP to view their NHSN HAI data. All NHSN data collected from participating facilities have been aggregated and facility de-identified in this report. Aggregated data have been analyzed for trends and compared with national data where appropriate. Data are displayed only when five or more facilities are included in the analyses. Please note that, for the purpose of this report, "hospital", "healthcare facility" and "facility" are used interchangeably and may include acute care hospitals, critical access hospitals, inpatient rehabilitation hospitals, and long-term acute care facilities, unless otherwise noted. Long-term care facilities, or skilled nursing facilities, are excluded from this report.

The SHARP Unit collects data from all modules within NHSN. In this annual report, participating hospitals are characterized by hospital affiliation, geographic region, and bed size. This report also describes units under surveillance by participating hospitals and the modules used. This annual report and previous quarterly, semi-annual, and annual reports are posted on the MDHHS HAI website at www.michigan.gov/hai. Prior to 2012, annual and semi-annual reports followed the MDHHS fiscal year (October through September). Beginning in 2012, annual reports are issued based upon the calendar year.

As of the data access date (June 27th, 2016) 105 hospitals had signed a data use and confidentiality agreement (DUA) with MDHHS SHARP. At that time, 99 hospitals had conferred rights to SHARP and had a reporting plan in place for at least one month during the inclusive time period. The data from these hospitals were used for development of this report; however, not all participating hospitals provided data for every module. The number of hospitals providing data for analysis is indicated in each table throughout this report and reflects the number of hospitals contributing data to NHSN and sharing that data with MDHHS SHARP. For example, although 99 hospitals had conferred rights to their data with at least one monthly reporting plan in place for the time period between January 1 and December 31, 2015, as of the data access date (see Table 1 below), 98 hospitals had the Catheter-Associated Urinary Tract Infection (CAUTI) module in their reporting plan; of these, 97 shared data (Table 6). The text "n=…" is used to indicate the number of hospitals or units being referenced.

Hospital Descriptives and Surveillance Overview

Figure 1 (below) is a graphical representation of the number of facilities who have signed the MDHHS SHARP DUA. Hospitals that have agreed to share data with the SHARP Unit are shown by the blue trend line, labeled "Master Agreement." The MDHHS SHARP Unit DUA also provides an option to share data with the Michigan Health & Hospital Association (MHA) Keystone Center for Patient Safety & Quality. Hospitals who have agreed to share these data are shown by the red trend line labeled "MHA Data

Release". Hospitals can also share Central Line-Associated Bloodstream Infection (CLABSI) data from neonatal intensive care units (NICUs) with the Vermont Oxford Network (VON) via the SHARP Unit. These are represented by the green line labeled "VON Data Release."

Table 1 and Figure 2 reflect the number of hospitals who have signed a DUA and conferred rights to the SHARP Unit by hospital type compared to the total of each hospital type in Michigan. Seventy-nine percent of Michigan hospitals shared data with the SHARP Unit as of the data access date; 82% of participating hospitals were acute care hospitals. Hospital licensure data were obtained from a list generated by the Michigan Department of Licensing and Regulatory Affairs (LARA) on October 13, 2013. There are 19 LTACs in Michigan; however, none of these hospitals are sharing data with the SHARP Unit at this time. Therefore, the number of hospitals enrolled in the SHARP NHSN Group includes acute care hospitals, critical access hospitals, and rehab facilities only. As a requirement of some Centers for Medicare & Medicaid Services (CMS) programs, acute care hospitals, LTAC, and rehab facilities must report certain infections to NHSN; critical access hospitals had no such requirements in 2015.

Table 1. *Facilities Sharing Data with MDHHS SHARP Unit*

	Acute Care	Critical Access	Long Term Acute Care	Rehab	**Total**
Number of Facilities (% of MI, % of Total)	86 (79, 82)	18 (50, 17)	0 (0, 0)	1 (25, 0)	**105 (63,100)**
Michigan Total	109	36	19	4	**168**

The data in Table 2 were obtained from the 2014 NHSN Annual Facility Survey completed by participating hospitals. Among the 100 facilities which completed an annual survey, more facilities are teaching hospitals than non-teaching hospitals.

Table 2. *Medical School Affiliation*

Hospital Type	Teaching[1]	Non-teaching	Unknown	Total
Number of Facilities	57	43	0	100[2]

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

[2]Hospitals who have filled out a 2015 facility survey

To characterize the geographic distribution of the participating hospitals, hospital locations were categorized according to Public Health Preparedness Regions. The number of participating hospitals by region is indicated in Table 3 (below). Figure 3 is a map indicating the percentage of SHARP-participating facilities by Public Health Preparedness Region. These facilities include acute care, critical access, long-term acute care, and inpatient rehab. More than 50% of facilities in each region are participating.

Table 3. *Number of Participating Facilities by Region*								
Geographic Region	**1**	**2N**	**2S**	**3**	**5**	**6**	**7**	**8**
# Facilities (% of Region)	12 (71)	16 (62)	16 (57)	14 (52)	13 (68)	18 (72)	7 (64)	9 (60)
Michigan Total	17	26	28	27	19	25	11	15

Figure 3.

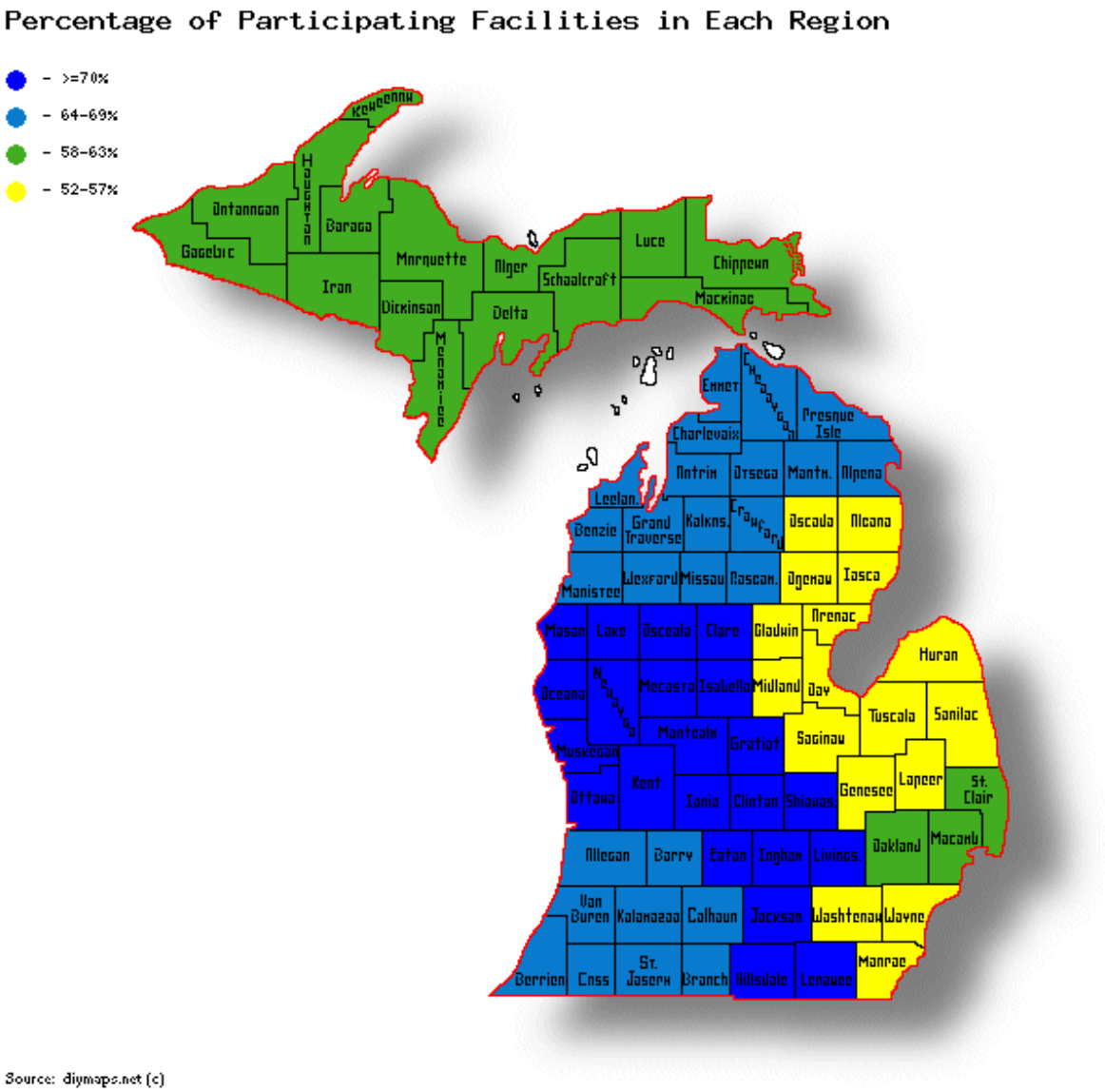


Table 4 (below) shows the number of hospitals participating in SHARP NHSN surveillance by bed size. Forty-five percent of participating hospitals had 100 beds or fewer.

Table 4. *Number of Facilities by Bed Size*

Number of Licensed Beds in Facility	≤100	101–200	201–500	≥501	TOTAL
Number of Facilities (% of Total)	45 (45)	17 (17)	29 (29)	9 (9)	**100[1]**

[1]Hospitals who have filled out a 2015 facility survey

Table 5 indicates that the majority of hospitals participating in SHARP NHSN surveillance are conducting NHSN surveillance facility-wide and in their intensive care units (ICUs). The ICU type is not specified in this report. Most hospitals are also conducting surveillance on one or more patient wards. Twenty-three hospitals are conducting surveillance in a step-down unit (STEP). MDRO/CDI Module surveillance is typically conducted facility-wide, while surveillance for device-associated infections is typically conducted in ICUs and wards.

Table 5. *Types of Units in Reporting Plan*

Unit Type	FacWideIn[1]	ICU/CCU[2]	NICU[3]	STEP[4]	Wards[5]	Other Inpatient[6]	Outpatient[7]
Number of Facilities[8]	95	90	17	23	96	17	84

[1]FacWideIn: All Facility-Wide Inpatient locations
[2]ICU/CCU: Intensive Care Unit/Critical Care Unit
[3]NICU: Neonatal Intensive Care Unit
[4]STEP: Step-Down Unit
[5]Wards: Inpatient wards
[6]Other: All other inpatient locations, including inpatient rehab facilities, operating rooms, and locations designated as "other"
[7]Outpatient: All outpatient locations
[8]These numbers are not mutually exclusive

Table 6 indicates the NHSN module(s) in use, as indicated by monthly reporting plans developed by each participating hospital. From month to month, the type of module(s) being used can change as some modules require varying periods of use. According to data shared with MDHHS SHARP, the most commonly used modules during this reporting period were the CAUTI and laboratory-identified (LabID) modules. Use of the CAUTI, CLABSI, Surgical Site Infection (SSI), and LabID modules are consistent with the CMS Hospital Inpatient Prospective Payment System (IPPS) reporting rules. Beginning January 1, 2011, hospitals were required to use NHSN to report CLABSIs in adult, pediatric, and neonatal ICUs in order to receive full Medicare reimbursements in 2013. They were required to report CAUTIs in adult and pediatric ICUs, and SSI following colon surgeries (COLO) and abdominal hysterectomies (HYST) beginning January 1, 2012. Beginning January 1, 2013, acute care hospitals were also required to report methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia LabID and *Clostridium difficile* (CDI) LabID data facility-wide.

The column in Table 6 titled "Number of Hospitals Using Module" displays the number of hospitals that have indicated module use in their reporting plans for at least one month during this report time period. A monthly reporting plan identifies which NHSN modules and surveillance activities a hospital will be participating in during a given month. Because surveillance targets and monthly reporting plans may vary by hospital and month, hospitals may not report to NHSN each month. The SHARP Unit has requested at least three consecutive months of data for the NHSN surveillance initiative.

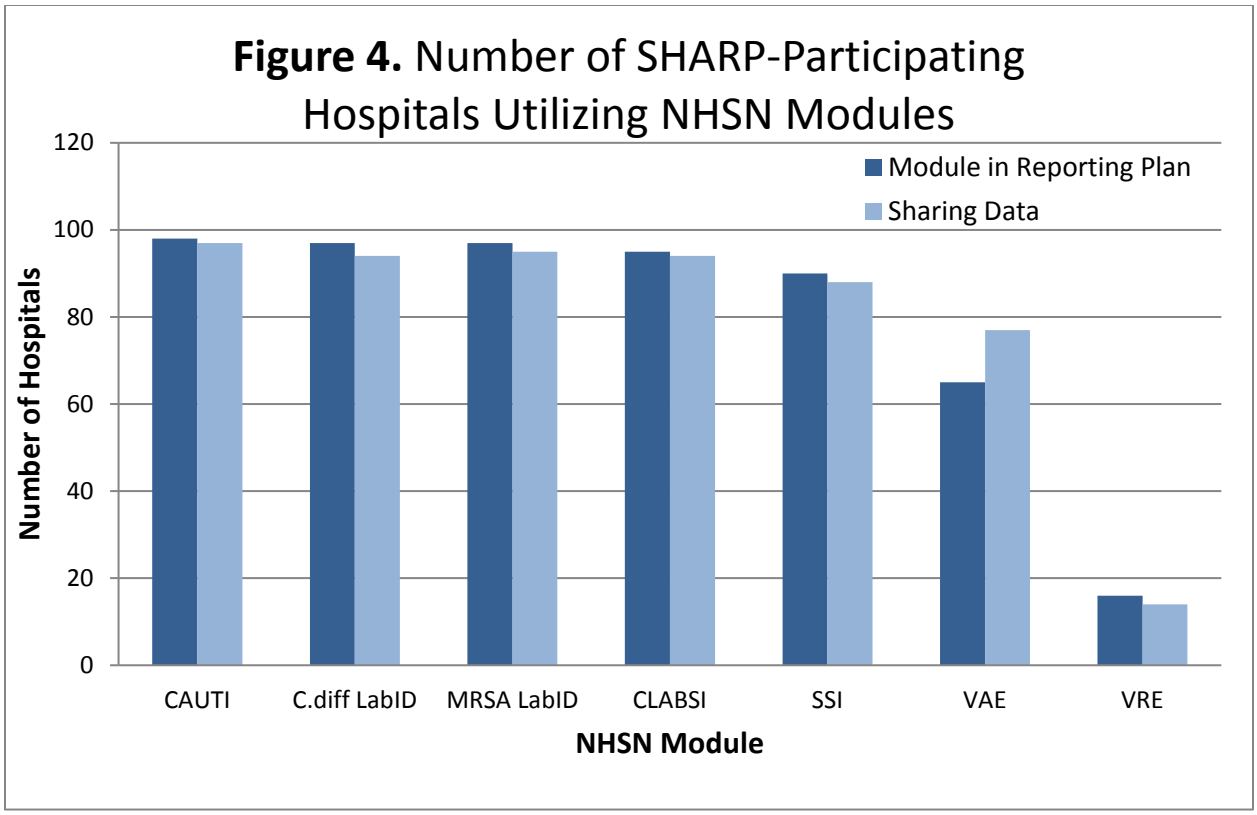
The column titled "Number of Hospitals Sharing Data" displays the number of hospitals that have shared data for this report time period as of the data access date. There is a discrepancy between these two columns in some instances because not all hospitals that indicate module use necessarily report data and some hospitals report out-of-plan data which cannot be excluded from certain calculations. The SHARP Unit excludes out-of-plan data when possible because it may not follow NHSN definitions as closely as in-plan data.

Table 6. *NHSN Modules in use*

NHSN Module	Number of Facilities Using Module[1]	Number of Facilities Sharing Data[2]
Catheter-Associated Urinary Tract Infection (CAUTI)	98	97
Clostridium difficile Infection (CDI) Laboratory-identified (LabID) Event	97	94
Methicillin-Resistant Staphylococcus aureus (MRSA) LabID[3]	97	95
Central Line-Associated Bloodstream Infection (CLABSI)	95	94
Surgical Site Infection (SSI)	90	88
Ventilator-Associated Events (VAE)	65	77[4]
Vancomycin-Resistant Enterococci (VRE) LabID	16	14
Acinetobacter LabID	8	N/A
Carbapenem-resistant Enterobacteriaceae (CRE) LabID	7	N/A
Cephalosporin Resistant Klebsiella LabID	4	N/A

[1]This is the number of hospitals that have indicated module use in each of their reporting plans for at least one month.
[2]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.
[3]MRSA LabID all specimens or blood (bld) only specimens
[4]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.

Figure 4 (below) illustrates the number of SHARP-participating hospitals utilizing each of the NHSN modules. The dark blue bar indicates the number of hospitals using the module for at least one month in the time period from January to December 2015. The light blue bar indicates the number of hospitals actually providing data within NHSN per module.



Cumulative Annual Aggregate MDRO/CDI Module Reports

Table 7 shows aggregate MRSA LabID Event cumulative data for the annual time period.
The NHSN definition for MDRO LabID Event is 'all non-duplicate MDRO isolates [in this case MRSA isolates] from any specimen source and unique blood source MDRO [MRSA] isolates, including specimens collected during an Emergency Department or other clinic visit, if collected the same day as patient admission'. A unique blood source is defined as 'a MDRO [MRSA] isolate from blood in a patient with no prior positive blood culture for the same MDRO [MRSA] and location in ≤2 weeks, even across calendar months.' A duplicate MDRO [MRSA] isolate is defined as 'any MDRO [MRSA] isolate from the same patient and location after an initial isolation of the specific MDRO [MRSA] during a calendar month, regardless of specimen source except unique blood source'. The specimens must be obtained for clinical decision-making purposes to be considered a LabID Event; thus, isolates obtained for 'surveillance purposes only' will not be reflected in this data. Additionally, testing protocol and type of test used (i.e. PCR, assay, culture) vary by facility and are not recorded here.

NHSN defines healthcare-onset (HO) as a 'LabID Event specimen collected >3 days after admission to the facility (i.e., on or after day 4).' Community-onset (CO) is defined by NHSN as a 'LabID Event specimen collected as an outpatient or an inpatient ≤3 days after admission to the facility (i.e., days 1, 2, or 3 of admission).' It should also be noted that LabID Event data do not necessarily indicate infection, but

denote a positive lab test result from a specimen collected for clinical purposes. MRSA is known to colonize skin and mucosal membranes without causing infections. LabID data provide a proxy measure for MRSA prevalence.

Table 7. *Cumulative Aggregate Methicillin-Resistant Staphylococcus aureus (MRSA) LabID Data*

	Cumulative Data January–December 2014	Cumulative Data January–December 2015
Frequency, Number		
Facilities with a DUA[1]	**104**	**105**
Facilities reporting MRSA LabID[2]	**92**	**97**
Facilities sharing MRSA LabID	**85**	**95**
Aggregated LabID Events	**4931**	**6084**
Onset, Number (%)		
Healthcare Facility-Onset (HO)	**1044 (21)**	**1003 (16)**
Community-Onset (CO)	**3887 (79)**	**5081 (84)**
Specimen Source, Number (%, %HO)[3]		
Blood	**1804 (37, 22)**	**2193 (36, 19)**
Sputum	**434 (9, 38)**	**436 (7, 37)**
Wound	**974 (20, 13)**	**1450 (24, 8)**
Abcess	**415 (8, 8)**	**620 (10, 5)**
Urine	**263 (5, 14)**	**304 (5, 10)**
Skin	**22 (0, 9)**	**49 (1, 10)**
Other	**1019 (21, 28)**	**1032 (17, 24)**
Surveillance Location, Number (%, %HO)[4]		
Intensive/Critical Care Unit	**1419 (29, 33)**	**1154 (19, 41)**
Specialty Care Area	**15 (0, 20)**	**5 (0, 20)**
Wards	**3038 (62, 19)**	**2318 (38, 22)**
Outpatient	**449 (9, 0)**	**2513 (42, 0)**
Other, LTC, Mixed Adult, etc…	**5 (0, 60)**	**94 (2, 28)**

[1]DUA: Data Use Agreement. This is a document signed between the hospital and the Michigan Department of Health and Human Services which outlines how the data will be shared and used, and how confidentiality will be protected.
[2]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.
[3]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.
[4]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.

Sixteen percent of the aggregate events were considered HO, and 84% were determined to be CO. The majority of specimens were from blood sources (36%), followed by wound (24%), and then other (17%). Nineteen percent of the blood specimens were healthcare facility-onset. Thirty-eight of MRSA LabID events came from wards, although only 22% of these were HO. The location with the greatest percentage of HO events was ICU/CCU (41%), followed by the Other (28%).

Table 8 shows aggregate CDI LabID cumulative data for 2015 following the NHSN definitions.
The NHSN definition for a CDI LabID Event is 'all non-duplicate MDRO isolates [in this case, CDI detection via stool culture or a positive CDI assay] from any specimen source, including specimens collected during an Emergency Department or other clinic visit, if collected the same day as patient admission'. For CDI, a duplicate MDRO isolate is defined as 'any MDRO [CDI] isolate [assay] from the same patient and location after an initial isolation [assay] of the specific MDRO [CDI] during a calendar month'. The specimens must be obtained for clinical decision-making purposes to be considered a LabID Event, thus specimens obtained for 'surveillance purposes only' will not be reflected in this data. Additionally, testing protocol and type of test used (i.e. PCR, assay, culture) vary by facility and are not recorded here.

NHSN defines Community-onset healthcare facility-associated' (CO-HCFA) as a 'CO LabID Event specimen collected from a patient who was discharged from the facility ≤4 weeks prior to specimen collection.' HO and CO as described previously in the MRSA LabID section. It should also be noted that LabID Event data do not necessarily indicate infection, but denote a positive lab test result from a specimen collected for clinical purposes. LabID data provide a proxy for CDI prevalence.

Table 8. *Cumulative Aggregate Clostridium difficile Infection (CDI)[1] LabID Data*		
	Cumulative Data January–December 2014	**Cumulative Data January–December 2015**
Frequency, Number		
Facilities with DUA[2]	**104**	**105**
Facilities Reporting CDI LabID[3]	**92**	**97**
Facilities Sharing CDI LabID	**90**	**94**
Aggregated LabID Events	**10170**	**11202**
Onset, Number (%)		
Healthcare Facility-Onset (HO)	**3720 (37)**	**3468 (31)**
Community-Onset Healthcare Facility-Associated (CO-HCFA)	**1769 (17)**	**1881 (17)**
Community-Onset (CO)	**4681 (46)**	**5853 (52)**
Previous CDI, Number (%)		
Previously Positive	**1437 (14)**	**1605 (14)**
CDI assay, recurrent	**575 (6)**	**633 (6)**
Surveillance Location, Number (%, %HO)[4]		
Intensive/Critical Care Unit	**2426 (24, 45)**	**2204 (20, 50)**
Specialty Care Area	**25 (0, 48)**	**28 (0, 39)**
Wards	**7311 (72, 36)**	**6278 (56, 36)**
Outpatient	**385 (4, 0)**	**2371 (21, 0)**
Other, LTC, Mixed Adult, etc…	**14 (0, 36)**	**321 (3, 32)**

[1]The specimen source of all *C.difficile* isolates is stool (100%)
[2]DUA: Data Use Agreement. This is a document signed between the facility and the Michigan Department of Health and Human Services which outlines how the data will be shared and used.
[3]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.
[4]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.

The distributions of CDI LabID events increased from the end of 2014 to the end of 2015. Thirty-one percent of events were HO, 17% CO-HCFA, and 52% CO. Fourteen percent of events were previously positive, and 6% were considered recurrent (defined as 'any CDI LabID event from a specimen obtained >2 weeks and ≤8 weeks after the most recent CDI LabID event for that patient). The greatest percentage of events came from wards; however, only 36% of these events were HO. As with MRSA LabID events, the surveillance location with the greatest percentage (50%) of HO events was the ICU/CCU.

Cumulative Annual Aggregate Rates

Table 9 provides the 2015 annual Michigan MRSA inpatient LabID rates, MRSA bacteremia inpatient LabID rates, and outpatient LabID rate. There are currently no national rates available for MDRO/CDI data.

Table 9. *Cumulative Michigan MRSA Rate*

	Facilities	Number of MRSA Events	Number of Patient Days	Number of Patient Admits/Encounters	MRSA Rate[1]	MRSA Prevalence Rate[2]
MRSA Inpatient LabID[3]	96	3,378 LabID	4,801,904	1,121,072 Admits	0.703↓	0.301↓
MRSA Bacteremia LabID[5]	96	1,157 LabID	4,801,904	1,121,072 Admits	0.241↓	0.103↓
MRSA Outpatient LabID[6]	90	1,462 LabID	-----	4,067,162 Encounters	-----	0.0359↓
MRSA Rehab LabID[7]	37	19 LabID	221,595	18,579 Admits	0.086	0.1023

Michigan Data

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

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

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

[3]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.

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

[5]MRSA bacteremia LabID: MRSA LabID event from a blood specimen

[6]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.

[7]MRSA rehab LabID: MRSA LabID event taken in rehab locations reported under a differing CCN number from a facility's inpaitent location.

The 2015 annual Michigan MRSA inpatient LabID rate was 0.703 events per 1,000 patient-days, which showed a significant decrease from the last annual report LabID rate of 0.878 ($p<0.001$). This number is calculated by dividing the number of total inpatient MRSA LabID Events by the number of patient days. The MRSA prevalence rate is calculated by dividing the number of inpatient MRSA LabID Events by the number of patient admissions. The annual Michigan MRSA prevalence rate was 0.301 per 100 patient admissions, significantly less than the previous annual inpatient MRSA prevalence rate of 0.378 per 100 patient days ($p<0.001$). The annual Michigan Outpatient MRSA prevalence rate significantly decreased from 0.0859 to 0.0359 ($p<0.001$), and MRSA bacteremia LabID event rates significantly decreased ($p<0.001$) when compared to 2014. Beginning in 2015, inpatient rehabilitation facilities were reported separately if the CCN number differed from the original facility's CCN number; subsequent reports will show a calculated trend figure. Note that LabID event data do not necessarily indicate infection, but denote a positive lab test result from a specimen collected for clinical purposes. LabID data provide a proxy measure for MRSA prevalence.

Figure 5 is a graphical demonstration of the Michigan MRSA inpatient LabID event rates from the 2009–2010 annual report through the 2015 annual report. The MRSA bacteremia LabID event rate has only been available since the 2013 annual report.

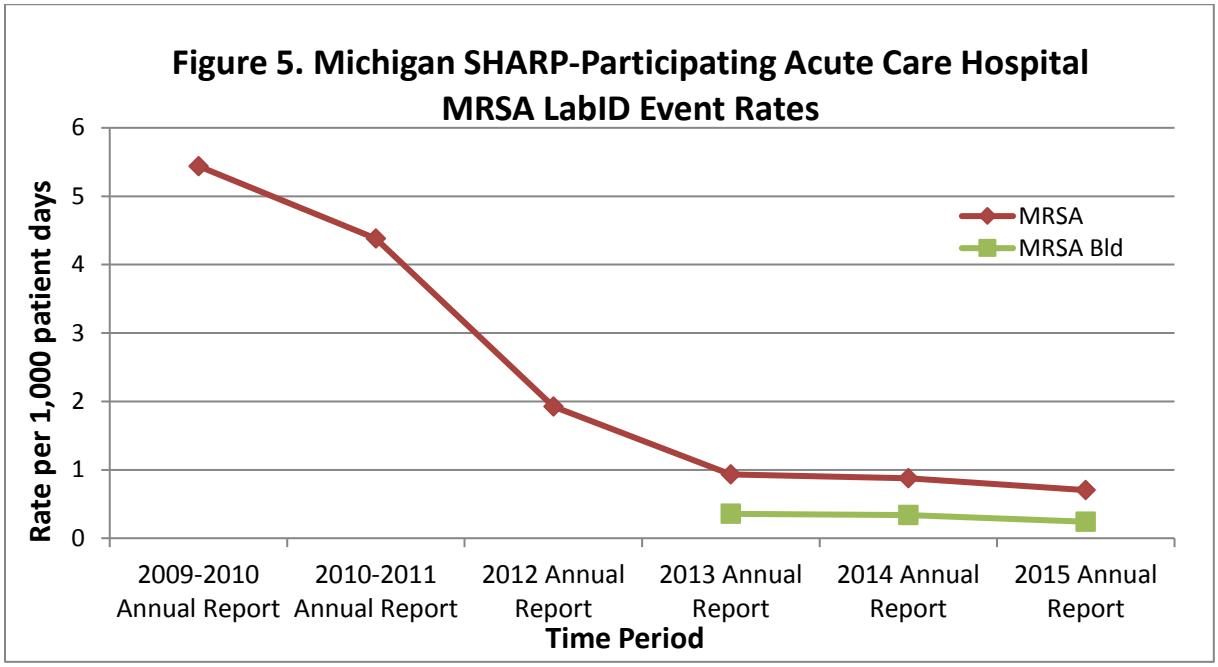


Table 10 stratifies Michigan inpatient MRSA LabID rates by onset for all specimens as well as bacteremia specimens. HO events occur when the LabID specimen was collected on or after day 4 of admission to the facility. Because they are incident events, only a MRSA incidence rate can be calculated. CO events occur when the LabID specimen was collected ≤3 days after admission to the facility. These are prevalent events, so a MRSA prevalence rate is calculated.

Table 10. *Michigan Inpatient MRSA LabID[1] Rate by Onset*

Number of Facilities	Onset	Number (%)[2] of Inpatient MRSA LabID[2] Events	Number of Patient Days	Number of Patient Admits	HO[3] Incidence Rate[4]	CO[5] Prevalence Rate[6]
90	HO	726 LabID	4,801,904	-----	0.151	-----
		297 Bld LabID[7]	4,801,904	-----	0.0619	-----
90	CO	2,494 LabID	-----	1,121,072	-----	0.222↓
		772 Bld LabID	-----	1,121,072	-----	0.0689↓

Michigan Data

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

[1] 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.

[2] Percentage of LabID events, or bacteremia LabID events, which are either HO or CO
[3]HO: Healthcare facility-onset
[4]HO Incidence Rate: the number of incident HO MRSA LabID Events per 1,000 patient days. Incident events are those that occur at the hospital. Prevalent HO events are those that are HO but have already been counted in another location, so they are prevalent upon entering the new location. Prior to Quarter 3, 2012, the HO incidence rate included both prevalent and incident HO MRSA LabID events; currently, prevalent HO MRSA LabID events and previous positive MRSA events are not included.
[5]CO: Community-onset
[6]CO Prevalence Rate. This is the number of CO MRSA LabID Events per 100 patients admitted. Prevalent events are those which have already occurred; CO events are prevalent because they occurred within 3 days of the patient entering the hospital.
[7]Bld LabID: MRSA bacteremia LabID events (LabID events from a blood specimen)

The annual HO incidence rate was 0.151 per 1,000 patient days and the annual HO bacteremia incidence rate was 0.0619 per 1,000 patient days. Prior to the Quarter 3, 2012 report, the MRSA incidence rate included both prevalent and incident HO MRSA LabID events. 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.

The CO prevalence rate was 0.222 per 100 admissions, which was significantly lower than the previous annual CO prevalence rate of 0.295 ($p<0.001$). The annual CO bacteremia prevalence rate was 0.0689 per 100 admissions, which was significantly lower than the bacteremia prevalence rate in 2014 ($p<0.001$). The percentage distributions of CO and HO LabID Events in Table 10 are slightly different from the percentage distributions in Table 7; there are fewer LabID events in Tables 9 and 10 than in Table 7 because only LabID events which had corresponding denominators (i.e. patient days and/or admissions) were included in the rate tables. The percentages of CO and HO should be very similar, but may not be identical. The majority (74%) of inpatient MRSA LabID events were CO. The graphical display of the annual distributions can be seen in Figure 6 (below). From the 2014 annual report to the 2015 annual report, the ratio of HO to CO events remained similar. Within HO events, the number of bacteremia specimens has increased as the total number of specimens increased. An opposite trend is seen in CO events.

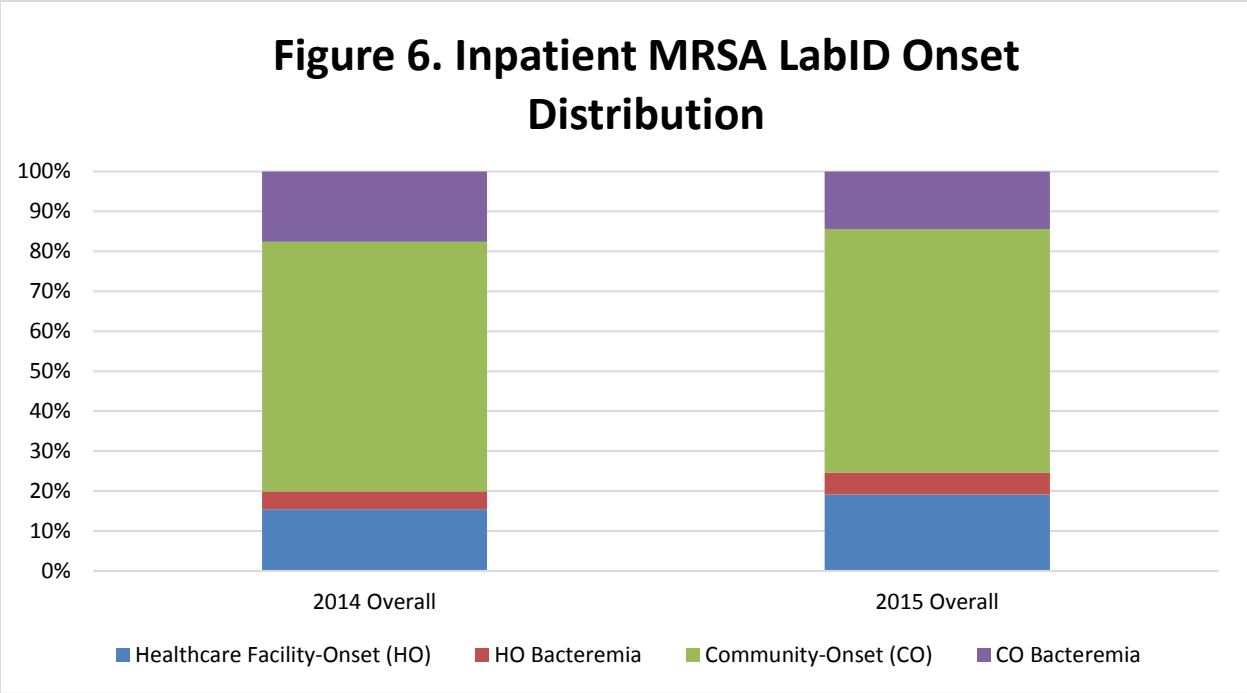


Table 11. *Cumulative Michigan CDI Rate*

	Facilities	Number of CDI Events	Number of Patient Days	Number of Patient Admits/Encounters	CDI Rate[1]	CDI Prevalence Rate[2]
CDI Inpatient LabID[3]	97	8,595 LabID	4,475,687	1,042,733 Admits	19.20↓	0.824↓
CDI Outpatient LabID[5]	90	2,308 LabID	-----	4,109,781 Encounters	-----	0.056↓
CDI Rehab LabID[6]	35	125 LabID	218,075	18,295 Admits	5.73	0.683

Michigan Data

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

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

[2]CDI Prevalence Rate. This is the number of *C. diff* LabID events per 100 patients admitted or per 100 encounters.

[3]CDI Inpatient 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.

[4]There are fewer CDI LabID Events indicated in this table than in Table 8 because events used to calculate a rate require denominator data (patient days and/or admissions). Those without denominator data were excluded from the calculation.

[5]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.

[6]MRSA rehab LabID: MRSA LabID event taken in rehab locations reported under a differing CCN number from a facility's inpaitent location.

The 2015 annual CDI rate significantly decreased from 20.901 to 19.20 ($p<0.001$) per 10,000 patient days versus the 2014 annual rate, and the prevalence rate significantly decreased from 0.911 to 0.824 ($p<0.001$) per 100 admissions. The CDI outpatient prevalence rate decreased significantly from 0.100 to 0.056 per 100 admissions ($p<0.001$). Beginning in 2015, inpatient rehabilitation facilities were reported separately if the CCN number differed from the original facility's CCN number; subsequent reports will show a calculated trend figure.

Figure 7 shows the overall CDI LabID event rate trends from the last five annual reports. From the 2009–2010 annual report to the 2010–2011 annual report, there was not a significant change. However, from the 2010–2011 annual report to the 2012 annual report, and from the 2013 annual report to the 2014 annual report, the CDI LabID rate increased. From the 2014 annual report to the 2015 annual report, the incidence rate decreased significantly.

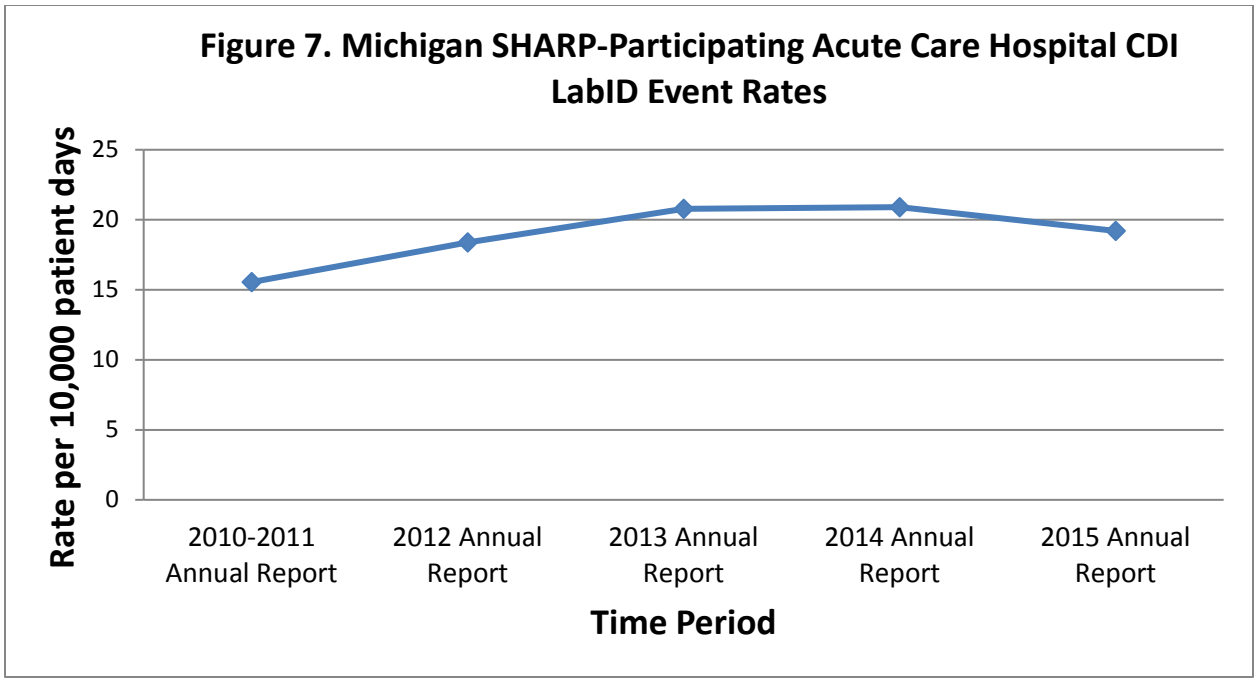


Table 12 provides inpatient CDI LabID rates stratified by onset.

Table 12. *Michigan CDI LabID[1] Rate by Onset*

Number of Reporting Facilities	Onset	Number of Inpatient CDI LabID[1] Events	Number of Patient Days	Number of Patient Admits	HO[2] Incidence Rate[3]	CO/CO-HCFA[4] Prevalence Rate[5]	Percentage of Total
90	HO	3,205 LabID	4,475,687	-----	7.161↓	-----	31
90	CO-HCFA	1,363 LabID	-----	1,042,733	-----	0.131↓	17
90	CO	3,960 LabID	-----	1,042,733	-----	0.380↓	52

Michigan Rate

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

[1] 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.

[2]HO: Healthcare facility-onset

[3]HO Incidence Rate: the number of incident HO CDI LabID Events per 10,000 patient days. Incident events are those that occur at the hospital. Prevalent HO events are those that are HO but have already been counted in another location, so they are prevalent upon entering the new location. Prior to Quarter 3, 2012, the HO incidence rate included both prevalent and incident HO CDI LabID events; currently, prevalent HO CDI LabID events and previous positive CDI events are not included.

[4]CO/CO-HCFA: Community-onset/Community-onset healthcare facility-associated

[5]CO/CO-HCFA Prevalence Rate. This is the number of CO or CO-HCFA CDI LabID Events per 100 patients admitted. Prevalent events are those which have already occurred; CO events are prevalent because they occurred within 3 days of the patient entering the hospital, CO-HCFA events are prevalent because they occurred within 3 days of the patient entering the hospital and was discharged from the same facility ≤4 weeks prior to admission.

The CDI HO Incidence Rate was 7.161 per 10,000 patient days, which was a significant decrease (p=0.003) from the previous annual report. 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). The CDI CO Prevalence rate decreased significantly from 0.4104 to 0.380 per 100 admissions (p<0.001), and the CDI CO-HCFA Prevalence rate was 0.131 per 100 admissions, which was significantly lower (p<0.001) from the previous annual report.

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

The majority (52%) of inpatient CDI LabID events were CO, followed by HO (31%). The remaining 17% were CO-HCFA. Compared to the 2014 annual report, there was an increase in the percentage of CO CDI LabID events and a subsequent decrease in the percentage of HO CDI LabID events. The graphical display of this can be seen below in Figure 8.

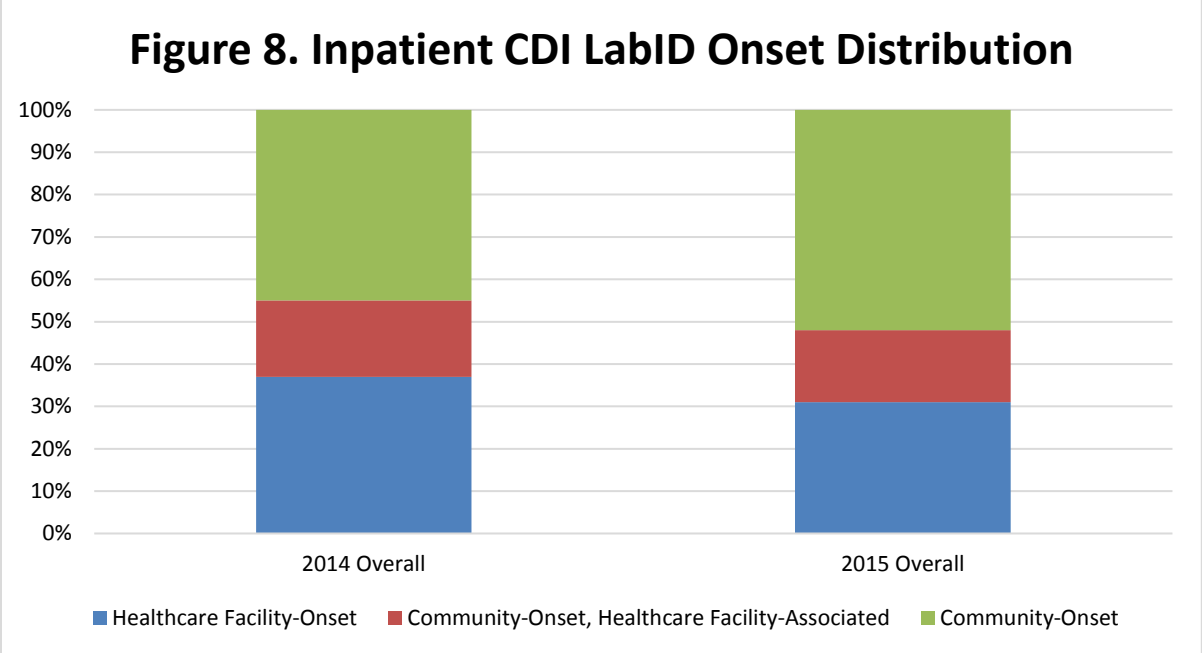


Table 13 shows the inpatient Vancomycin-Resistant Enterococcus (VRE) LabID rates and the outpatient VRE LabID rate. As with MRSA and CDI, there is no comparative national rate for VRE.

Table 13. *Cumulative Michigan Vancomycin-Resistant Enterococcus (VRE) Rate*

	Number of Facilities	Number of Inpatient VRE Events	Number of Patient Days	Number of Patient Admits/Encounters	VRE Rate[1]	VRE Prevalence Rate[2]
VRE Inpatient LabID[3]	17	589 LabID	679,458	180,586 Admits	0.867↓	0.326↓
VRE Outpatient LabID	18	213 LabID	-----	677,566 Encounters	-----	0.0314
VRE Rehab LabID	2	4 LabID	12,582	829 Admits	0.318	0.483

Michigan Rate

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

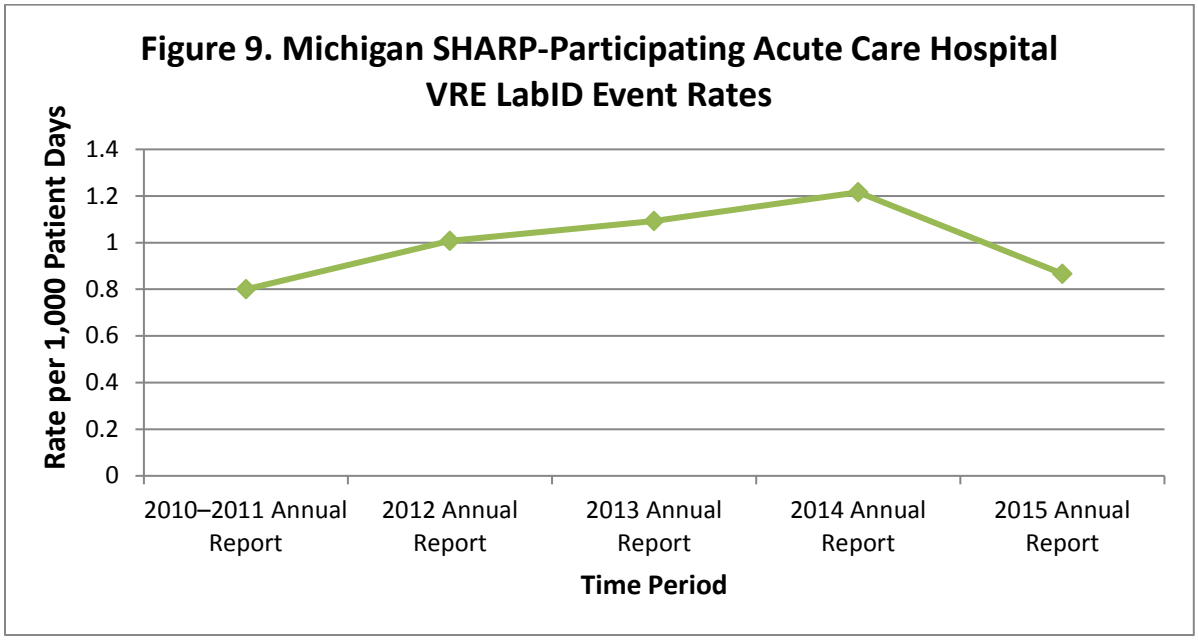
[1]VRE Rate: Vancomycin-Resistant Enterococci (VRE) rate. This is the number of inpatient VRE LabID Events or surveillance infections per 1,000 patient days or encounters.

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

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

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

The VRE Inpatient Rate significantly decreased from 1.216 to 0.867 per 1,000 patient days ($p<0.001$), and the prevalence rate significantly decreased as well from 0.523 to 0.326 per 100 admissions ($p<0.001$). The VRE Outpatient prevalence rate was 0.0314 per 100 admissions; this was not significantly different from the 2014 rate. Beginning in 2015, inpatient rehabilitation facilities were reported separately if the CCN number differed from the original facility's CCN number; subsequent reports will show a calculated trend figure. The trend graph for VRE can be found in Figure 9.



LabID Standardized Infection Ratios (SIRs)

Table 14 shows the 2015 annual standardized infection ratios (SIRs) for facilities sharing data with the SHARP Unit. The table displays the number of observed and predicted infections for both MRSA bacteremia LabID and CDI LabID. NHSN underwent a rebaselining in 2015; SIRs have been calculated utilizing both old and new baselines. **Note: these SIRs included all data viewable by MDHHS, and are not limited to the facilities included in CMS reporting.**

Table 14. *MDRO/CDI Standardized Infection Ratios (SIR)*

Type of Infection	Facilities	Patient Days	Observed[1]	Predicted[2]	MI SIR[3]	MI p-value	MI 95% CI[4]
MRSA Bac LabID[5] 2010 baseline	95	4,760,709	296	326.13	0.908	0.0975	0.809, 1.016
MRSA Bac LabID[5] 2015 baseline - ACH	86	4,771,927	297	299.67	0.991	0.9080	0.883, 1.109
MRSA Bac LabID[5] 2015 baseline - CAH	10	36,835	0	0.77	.	.	.
***C.diff* LabID[6] 2010 baseline**	95	4,417,649	3,151	3,754.64	0.839↓	<0.0001	0.810, 0.869
***C.diff* LabID[6] 2015 baseline - ACH**	86	4,404,789	3,165	3,446.23	0.918	<0.0001	0.887, 0.951
***C.diff* LabID[6] 2015 baseline - CAH**	10	36,592	9	11.88	0.758	0.4168	0.370, 1.391

Michigan Data **US Data**

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

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

[1]Observed: Number of infections reported during the time frame.

[2]Predicted: The number of infections predicted based on the type of hospital unit(s) under surveillance.

[3]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.

[4]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.

[5]MRSA Bac LabID: Inpatient facility-wide MRSA bacteremia Laboratory-identified Event

[6]Clostridium difficile LabID: Inpatient facility-wide Clostridium difficile Laboratory-identified Event

The annual MRSA bacteremia LabID SIR was 0.908, which means that there were 9.2% fewer blood specimen MRSA LabID events than expected, based on the national 2010–2011 baseline. The CDI LabID SIR was 0.839, which indicates that there were 16.1% fewer CDI LabID events than expected; this was statistically significant (p<0.001). Shown below is the trend figure for MDRO/CDI SIR.

Device-Associated Module Annual Aggregated Rates

Table 15 shows both the Michigan rate and device-utilization (DU) ratio for the CAUTI, CLABSI, and ventilator-associated event (VAE) modules.

Table 15. *Michigan Device-Associated Rates*

Type of Infection	Number of Facilities	Number of Infections	Number of Patient Days	Number of Device Days	MI Rate[1]	MI DU[2]
CAUTI[3]	98	907	3,432,827	703,220	1.290↓	0.205↓
CLABSI[4]	95	581	3,258,496	601,351	0.966↑	0.185↓
VAC[5]	77	612	675,664	129,483	4.726	0.192↓
IVAC[6]	77	252	675,664	129,483	1.946↑	0.192↓
Possible VAP[7]	77	0	675,664	129,483	0↓	0.192↓
Probable VAP[8]	77	0	675,664	129,483	0↓	0.192↓
Total VAE[9]	77	998	675,664	129,483	7.708↑	0.192↓

Michigan Rate

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

[1]MI Rate: The number of device-associated infections per 1,000 device days among participating hospitals.

[2]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 Michigan patient days that are spent using a device.

[3]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).

[4]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).

[5]VAC: Ventilator-Associated Condition

[6]IVAC: Infection-related Ventilator-Associated Condition

[7]Possible VAP: Possible Ventilator-Associated Pneumonia

[8]Probable VAP: Probable Ventilator-Associated Pneumonia

[9]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.

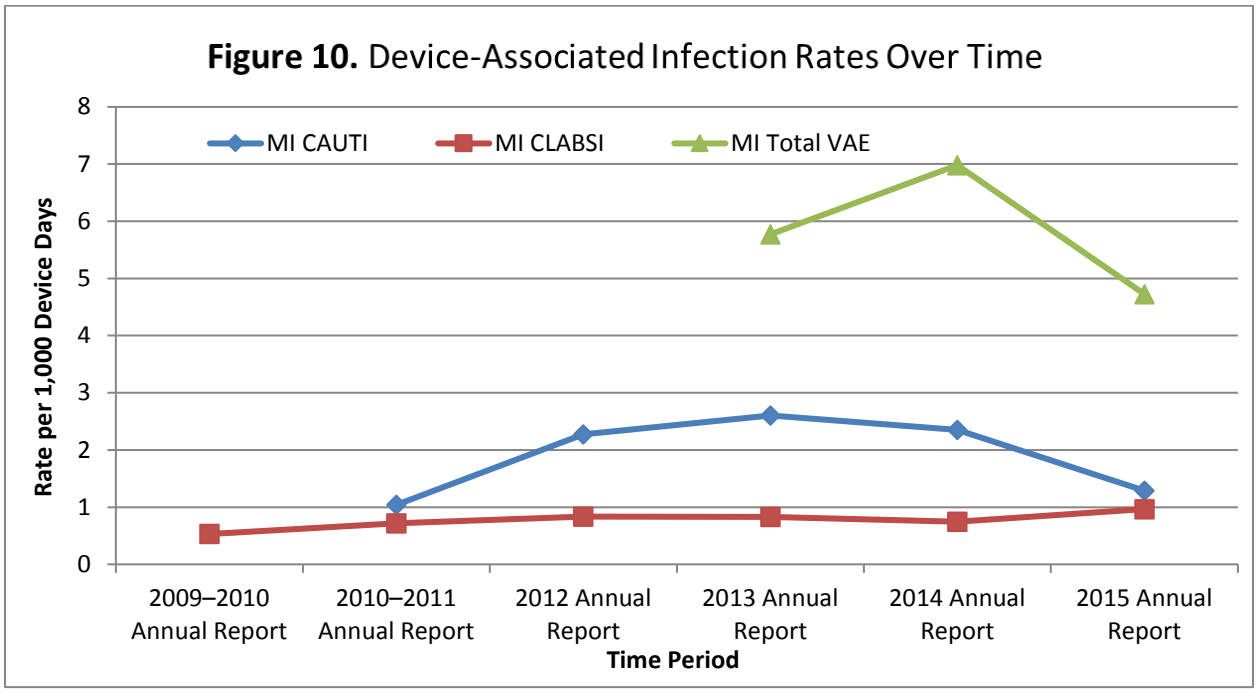
The Michigan CAUTI rate decreased significantly this year from 2.350 to 1.290 per 1,000 catheter days ($p<0.001$). The Michigan DU ratio decreased significantly from 0.271 to 0.205 ($p<0.001$).

The Michigan CLABSI rate, however, significantly increased from 2014 to 2015 ($p<0.001$) even though the Michigan DU ratio significantly decreased from 0.2664 to 0.185 ($p<0.001$).

The Total VAE rate was 7.703 per 1,000 ventilator days. This rate includes ventilator-associated conditions (VACs), infection-related ventilator-associated conditions (IVACs), possible ventilator-associated pneumonias (VAPs), and probable VAPs. The Total VAE rate increased significantly from 6.981 to 7.730 ($p=0.035$), while the DU rate decreased from 0.3371 to 0.192 ($p<0.001$) from the 2014 annual

report. IVAC saw a significant rate increase from 1.363 to 1.946 per 1,000 device days ($p<0.001$) from the previous report, but there was a significant decrease in the number of Possible VAP and Probable VAP events (1.119 to 0, $p<0.0001$ and 0.252 to 0, $p<0.0001$, respectively). There was no significant change in the incidence of VAC.

Figures 10 and 11 (below) show device-associated infection rates and DU ratios from 2009–2015.



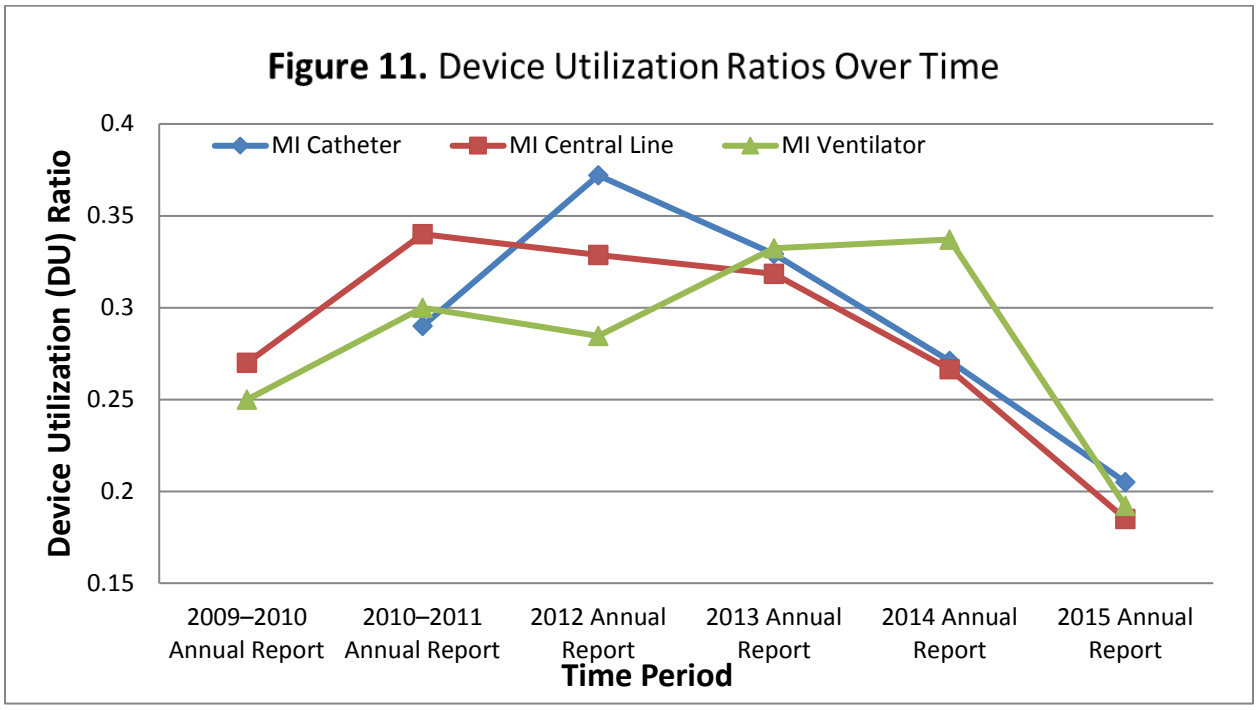


Table 16 provides NICU-specific CLABSI and VAP rates by birth weight. Up to 17 hospitals share and have CLABSI NICU data, and up to 10 hospitals share and have VAP NICU data (depending on birthweight code). If device days were recorded as '0', those data were excluded.

Table 16. *Michigan NICU Device-Associated Rates by Birth Weight*

Type of Infection	Birth weight Code	Number of Facilities	Number of Infections	Number of Patient Days	Number of Device Days	MI Rate[1]	MI DU[2]
CLABSI[3]	**Overall**	**17**	**31**	**166,500**	**34,370**	**0.902**	**0.206↑**
	A[4]	17	13	21,602	7,641	1.701	0.354↑
	B[5]	17	11	22,356	6,812	1.615	0.305↑
	C[6]	17	5	35,496	7,312	0.684	0.206↑
	D[7]	17	2	50,274	6,105	0.328	0.121
	E[8]	17	0	36,772	6,500	0	0.177
VAP[9]	**Overall**	**10**	**2**	**56,624**	**5,912**	**0.338**	**0.104**
	A	9	2	7,555	2,934	0.682	0.389
	B	9	0	7,397	959	0	0.130↓
	C	8	0	13,701	780	0	0.057↓
	D	8	0	16,267	475	0	0.029↓
	E	9	0	11,704	764	0	0.065↑

Michigan Data

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

[1]MI Rate: The number of device-associated infections per 1,000 device days among participating Michigan hospitals.

[2]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 Michigan patient days that are spent using a device.

[3]Central Line-Associated Bloodstream Infections (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).

[4]A: Birthweight ≤750g

[5]B: Birthweight 751–1000g

[6]C: Birthweight 1001–1500g

[7]D: Birthweight 1501–2500g

[8]E: Birthweight >2500g

[9]Ventilator-Associated Pneumonias (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).

Device-Associated Standardized Infection Ratios (SIRs)

The 2015 device-associated standardized infection ratios (SIRs) are shown in Table 17. The table shows the number of observed and predicted infections for both CAUTI and CLABSIs; CLABSIs are also stratified by ICU- and NICU-only. The 2015 US SIR will be added to this report upon CDC's release of these data. NHSN is underwent a rebaselining in 2015; new SIRs have been included with aggregate data. **Note: the Michigan SIRs included all device data reported, and are not limited to the locations included in CMS reporting.**

Table 17. Device Standardized Infection Ratios (SIR)

Type of Infection	Number Facilities	Device Days	Observed[1]	Predicted[2]	MI SIR[3]	MI SIR p-value[4]	MI 95% CI[5]	US SIR[6]	US 95% CI[7]
CAUTI[8] 2009 Baseline	97	650,904	864	1333.618	**0.648↓**	<0.0001	0.606, 0.692	TBD	TBD
CAUTI[8] 2015 Baseline - ACH	86	710,112	893	894.145	0.999	0.9872	0.935, 1.066	TBD	TBD
CAUTI[8] 2015 Baseline - CAH	12	3,845	1	2.511	0.398	0.3661	0.020, 1.964	TBD	TBD
CLABSI[9] 2006-2008 Baseline	94	603,782	624	1148.332	**0.543↑**	<0.0001	0.502, 0.587	TBD	TBD
CLABSI[9] 2015 Baseline - ACH	86	678,988	658	703.844	0.935	0.0851	0.865, 1.008	TBD	TBD
CLABSI[9] 2015 Baseline - CAH	10	1,122	0	0.306	.	.	.	TBD	TBD
CLABSI ICU 2006-2008 Baseline	91	280,831	319	610.887	**0.522↑**	<0.0001	0.467, 0.582	TBD	TBD
CLABSI ICU 2015 Baseline	84	280,590	309	310.376	0.996	0.968	0.889, 1.111	TBD	TBD
CLABSI NICU 2006-2008 Baseline	17	34,370	31	82.742	**0.375**	<0.0001	0.259, 0.525	TBD	TBD
CLABSI NICU 2015 Baseline	18	35,846	35	51.329	**0.682**	0.017	0.482, 0.938	TBD	TBD

Michigan Data **US Data**

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

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

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

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

[3]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.

[4]P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can show either significantly more infections (if the SIR is greater than 1 and the p-value is <0.05) or significantly fewer infections (if the SIR is less than 1 and the p-value is <0.05).

[5]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.

[6]US SIR taken from the National and State Healthcare-Associated Infections Standardized Infection Ratio Report, January–December 2015

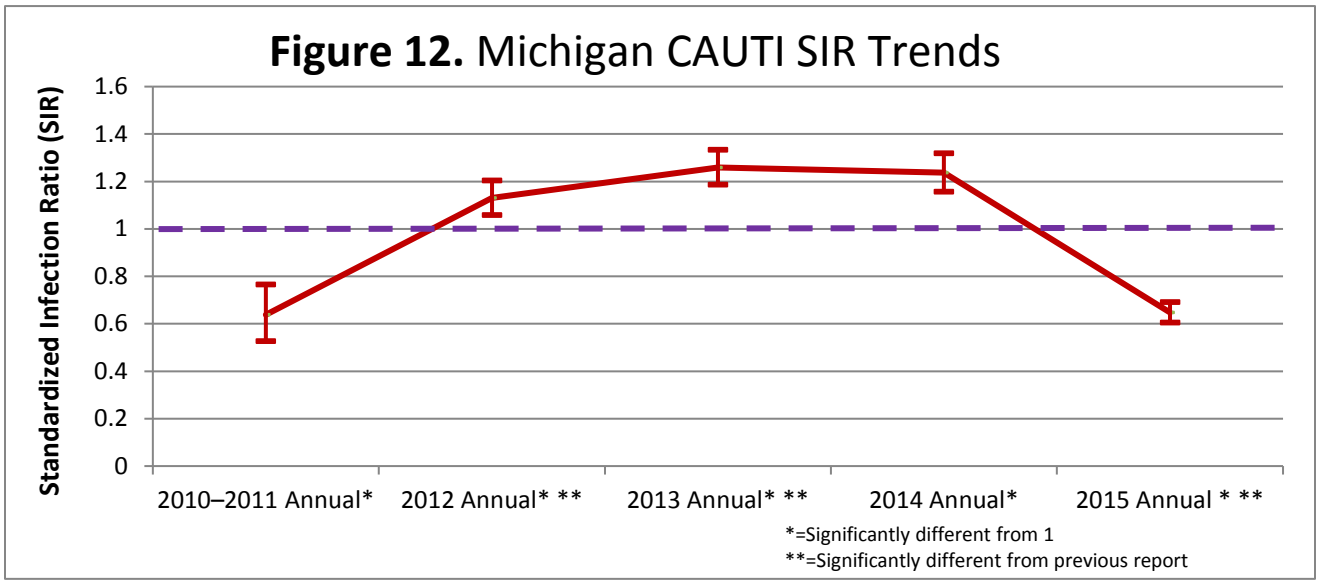
[7]US 95% CI taken from the Nation and State Healthcare-Associated Infections Standardized Infection Ratio Report, January–December 2015

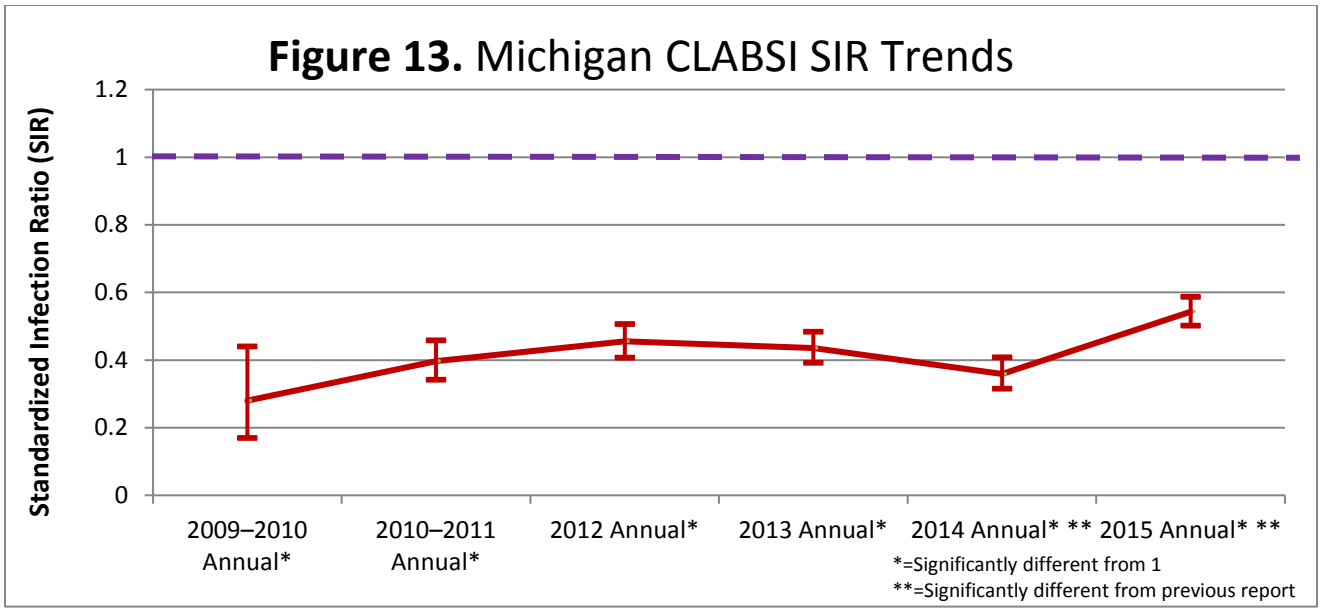
[8]CAUTI: Catheter-Associated Urinary Tract Infection
[9]CLABSI: Central Line-Associated Blood Stream Infection

Michigan's CAUTI SIR was 0.648 for 97 participating hospitals. This SIR can be interpreted as having approximately 35.2 percent less CAUTIs than expected, as determined by national NHSN data. This was statistically significantly lower than the expected value and significantly lower than the previous 2014 annual report of 1.237 ($p<0.001$).

Michigan's CLABSI SIR, using data from 94 participating hospitals, was 0.543. This SIR can be interpreted as Michigan having 45.7% fewer CLABSIs than expected, as determined by national NHSN data. This is statistically significantly lower than the expected value and statistically significantly higher than the previous annual report's SIR of 0.359.

Figures 12 and 13 show the CLABSI and CAUTI SIR trends from the 2009–2010 annual report (CLABSI) and 2010–2011 annual report (CAUTI) to the present 2015 annual report.





Procedure-Associated Module Aggregated Data

Table 18 shows the 2015 annual SSI infections rates and SIRs by procedure type. Only procedure types for which five or more hospitals provided data were included in this report. Beginning January 1, 2012, hospitals were required by CMS to report all colon surgery (COLO) and abdominal hysterectomy (HYST) procedures through NHSN. Rates are taken from the rate table calculation within NHSN and may not match the numbers in the SIR exactly. NHSN underwent a rebaselining in 2015; SIRs have been calculated utilizing both old and new baselines.

Table 18. 2015 Annual SSI Rates and SIR by Procedure Type

Procedure Type	Number of Facilities[1]	Number of Procedures[1]	Number of Observed[1,2] SSIs	Number of Expected[1,3] SSIs	MI SSI Rate[4]	MI SSI SIR[5]	MI SIR p-value[6]	MI SIR 95% Confidence Interval[7]
Overall 2006-2008 Baseline	**88**	**57,137**	**1,178**	**1,283.039**	**2.062**	**0.92**	**0.003**	**0.867, 0.972**
Overall 2015 Baseline	**89**	**54,163**	**1,069**	**1,001.769**	**1.974**	**1.067**	**0.0366**	**1.005, 1.133**
APPY[8] 2006-2008 Baseline	<5	----	----	----	----	----	----	----
APPY[8] 2015 Baseline	<5	----	----	----	----	----	----	----
BRST[9] 2006-2008 Baseline	<5	----	----	----	----	----	----	----
BRST[9] 2015 Baseline	<5	----	----	----	----	----	----	----
CARD[10] 2006-2008 Baseline	<5	----	----	----	----	----	----	----

CARD[10] 2015 Baseline	<5	----	----	----	----	----	----	----
CBGB[11] 2006-2008 Baseline	9	1,217	22	26.835	1.808	0.82	0.355	0.527, 1.221
CBGB[11] 2015 Baseline	9	1,217	22	23.964	1.808	0.918	0.711	0.590, 1.367
CBGC[12] 2006-2008 Baseline	9	155	1	2.891	0.645	0.346	0.272	0.002, 1.706
CBGC[12] 2015 Baseline	9	155	1	2.559	0.645	0.391	0.3528	0.020, 1.927
CHOL[13] 2006-2008 Baseline	5	1,247	9	8.56	0.722	1.051	0.84	0.513, 1.929
CHOL[13] 2015 Baseline	5	762	7	5.085	0.919	1.377	0.3928	0.602, 2.723
COLO[14] 2006-2008 Baseline	86	10,063	588	591.499	5.843↓	0.994↓	0.907	0.916, 1.077
COLO[14] 2015 Baseline	87	10,138	520	507.436	5.129	1.025	0.5886	0.940, 1.116
CSEC[15] 2006-2008 Baseline	7	2,272	41	45.105	1.805	0.909	0.553	0.661, 1.221
CSEC[15] 2015 Baseline	8	2,971	53	33.294	1.784	1.592	0.0016	1.204, 2.066
FUSN[16] 2006-2008 Baseline	6	2,398	20	39.779	0.834	0.503	0.001	0.316, 0.763
FUSN[16] 2015 Baseline	6	2,361	20	28.892	0.847	0.692	0.0872	0.435, 1.050
FX[17] 2006-2008 Baseline	5	875	8	16.471	0.914	0.486	0.025	0.226, 0.922
FX[17] 2015 Baseline	5	697	6	6.442	0.861	0.931	0.9132	0.378, 1.937
GAST[18] 2006-2008 Baseline	6	1,197	10	20.121	0.835	0.497	0.015	0.252, 0.886
GAST[18] 2015 Baseline	6	1,113	7	10.009	0.629	0.699	0.349	0.306, 1.383
HER[19] 2006-2008 Baseline	7	1,562	13	18.137	0.832	0.717	0.223	0.399, 1.195
HER[19] 2015 Baseline	7	892	12	10.848	1.345	1.106	0.6973	0.599, 1.881
HPRO[20] 2006-2008 Baseline	34	7,921	94	102.768	1.187	0.915	0.390	0.743, 1.114
HPRO[20] 2015 Baseline	34	7,894	91	85.652	1.153	1.062	0.5559	0.860, 1.298
HYST[21] 2006-2008 Baseline	82	10,421	204	200.606	1.958	1.017	0.829	0.884, 1.164
HYST[21] 2015 Baseline	83	9,212	175	151.846	1.900	1.152	0.0705	0.991, 1.333

KPRO[22] 2006-2008 Baseline	33	10,770	88	99.29	0.817	0.886	0.256	0.715, 1.087
KPRO[22] 2015 Baseline	33	10,682	84	61.159	0.786	1.373	0.0055	1.102, 1.692
LAM[23] 2006-2008 Baseline	6	2,123	12	22.149	0.565	0.542	0.021	0.294, 0.921
LAM[23] 2015 Baseline	6	1,906	11	13.400	0.577	0.821	0.5327	0.432, 1.427
OVRY[24] 2006-2008 Baseline	<5	----	----	----	----	----	----	----
OVRY[24] 2015 Baseline	<5	----	----	----	----	----	----	----
PVBY[25] 2006-2008 Baseline	<5	----	----	----	----	----	----	----
PVBY[25] 2015 Baseline	<5	----	----	----	----	----	----	----
RFUSN[26] 2006-2008 Baseline	<5	----	----	----	----	----	----	----
RFUSN[26] 2015 Baseline	<5	----	----	----	----	----	----	----
VHYS[27] 2006-2008 Baseline	8	494	5	5.762	1.012	0.868	0.803	0.318, 1.924
VHYS[27] 2015 Baseline	8	332	5	2.828	1.506	1.768	0.2243	0.648, 3.919
XLAP[28] 2006-2008 Baseline	<5	----	----	----	----	----	----	----
XLAP[28] 2015 Baseline	<5	----	----	----	----	----	----	----

US Data **Michigan Data**

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

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

[1]The number of facilities, procedures, SSIs observed, and SSI expected is taken from the SIR calculation table within NHSN and may not match the numbers in the rate table exactly.

[2]Observed: Number of SSIs reported during the time frame.

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

[4]MI SSI Rate: The number of SSIs per 100 procedures among participating hospitals. This number is taken from the rate table calculation within NHSN and may not match the numbers in the SIR exactly.

[5]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.

[6]P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can show either significantly more infections (if the SIR is greater than 1 and the p-value is <0.05) or significantly fewer (if the SIR is less than 1 and the p-value is <0.05).

[7]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.

[8]APPY: Appendix surgery

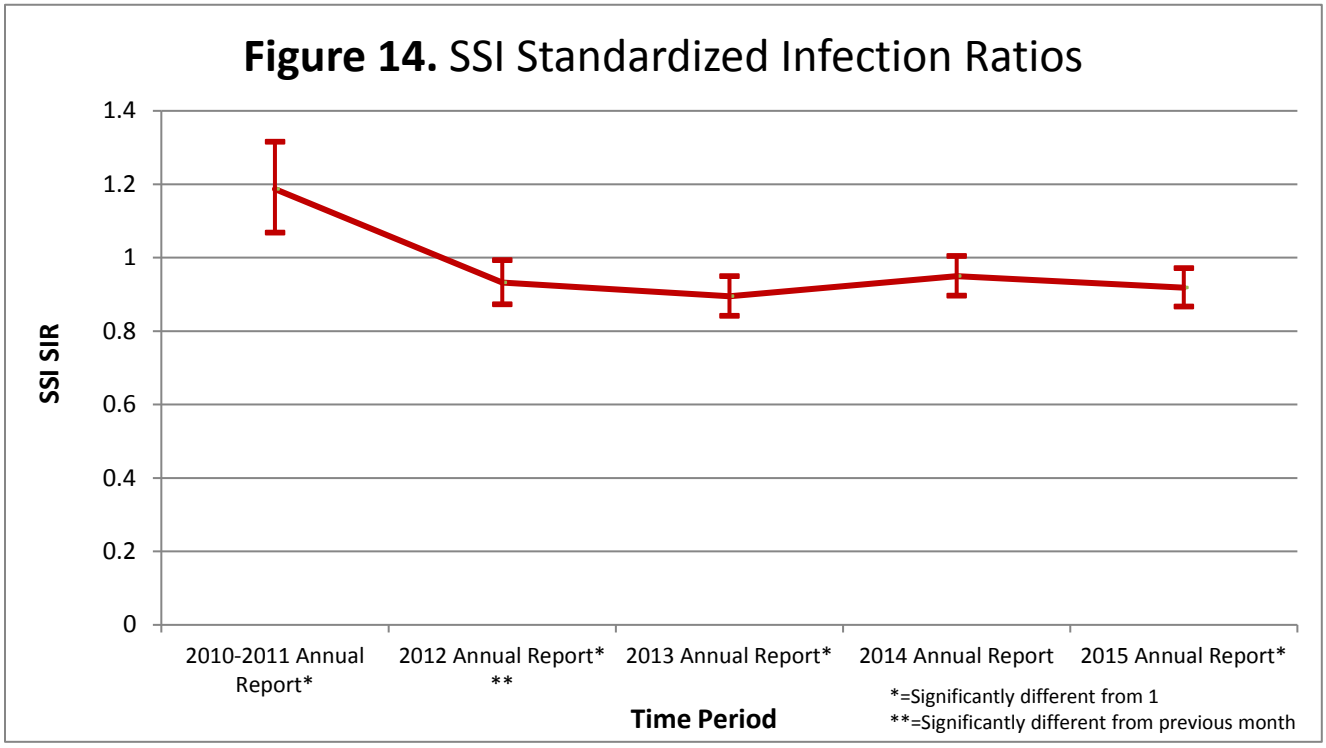
[9]BRST: Breast surgery

[19]HER: Herniorrhaphy

[20]HPRO: Hip prosthesis

[10]CARD: Cardiac surgery
[11]CBGB: Coronary artery bypass graft with both chest and donor site incisions
[12]CBGC: Coronary artery bypass graft with chest incision only
[13]CHOL: Gallbladder surgery
[14]COLO: Colon surgery
[15]CSEC: Cesarean Section
[16]FUSN: Spinal fusion
[17]FX: Open reduction of fracture
[18]GAST: Gastric surgery
[21]HYST: Abdominal hysterectomy
[22]KPRO: Knee prosthesis
[23]LAM: Laminectomy
[24]OVRY: Ovarian Surgery
[25]PVBY: Peripheral vascular bypass surgery
[26]RFUSN: Small Bowel Surgery
[27]VHYS: Vaginal hysterectomy
[28]XLAP: Exploratory Laparotomy

The Overall SSI SIR was 0.92 (95% CI: 0.867, 0.972), which demonstrated fewer infections than expected. Only colon surgery had statistically significantly less infections than 2014. Several procdure types had significantly fewer infections than expected: spinal fusion (SIR: 0.503, 95% CI: 0.316, 0.763), open reduction of fracture (SIR: 0.486, 95% CI: 0.226, 0.922), gastric surgery (SIR: 0.497, 95% CI: 0.252, 0.886), and laminectomy (SIR: 0.542, 95% CI: 0.294, 0.921). No procedure types had statistically more infections than expected or than 2014, under the 2006-2008 baseline.



Stratified Cumulative Rates and SIRs

MRSA bacteremia and CDI LabID rates and SIRs were calculated on an aggregate level by hospital type (teaching or non-teaching), region group (based on Michigan emergency preparedness region), and bed size (≤200 beds or >200 beds). Device-associated infection rates and CAUTI and CLABSI SIRs were also calculated. NHSN underwent a rebaselining in 2015; SIRs have been calculated utilizing both old and new baselines. Rates and SIRs were provided when five or more hospitals shared data for that particular

module. Significance testing was performed comparing previous annual rates and SIRs to present rates and SIRs. Trend graphs are made available for rates and SIRs.

Table 19. *MDRO Rates[1] and SIR by Facility Type*

Facility Type	MDRO Infection Type (number of hospitals)	Rate	CO Rate[2] (%CO)	SIR[3]	SIR p-value[4]	SIR 95% Confidence Interval[5]
Teaching	**MRSA LabID[6] (57)** 2010 Baseline	0.677↓	0.215 (72)↓	0.933	0.253	0.830, 1.046
	MRSA LabID[6] (58) 2015 Baseline	0.667	0.210 (72)	1.004	0.963	0.893, 1.125
	CDI LabID[7] (57) 2010 Baseline	18.759↓	0.365 (44) ↓	0.834↓	<0.0001	0.804, 0.865
	CDI LabID[7] (58) 2015 Baseline	18.909	0.370 (45)	0.912	<0.0001	0.879, 0.945
Non-Teaching	**MRSA LabID (38)** 2010 Baseline	0.927↓	0.277 (86) ↓	0.441	0.015	0.193, 0.873
	MRSA LabID (38) 2015 Baseline	0.992	0.290 (86)	0.649	0.2452	0.284, 1.284
	CDI LabID (37) 2010 Baseline	22.534	0.469 (59)	0.930	0.310	0.811, 1.062
	CDI LabID (38) 2015 Baseline	23.126	0.488 (61)	1.050	0.5335	0.904, 1.213

Michigan Data

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

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

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

[2]CO Rate: Community Onset Rate per 100 admissions, (%CO): Percent of LabID events that were community onset

[3]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.

[4]P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can show either significantly more infections (if the SIR is greater than 1 and the p-value is <0.05) or significantly fewer (if the SIR is less than 1 and the p-value is <0.05).

[5]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.

[6]MRSA LabID: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Laboratory-identified (LabID) Event option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking MRSA laboratory results without conducting additional surveillance for infections. Note: MRSA LabID rates include all specimen types and MRSA SIRs only include blood specimens.

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

In the 2015 annual data, teaching hospitals had significantly fewer CDI LabID events than expected, with SIR of 0.834 (95% CI: 0.804, 0.865). Non-teaching hospitals had significantly fewer MRSA LabID events than expected with an SIR of 0.441 (95% CI: 0.193, 0.873). Rate trends can be seen in Figures 15-16, below.

Figure 15. MDRO/CDI Rate Trends for Teaching Hospitals

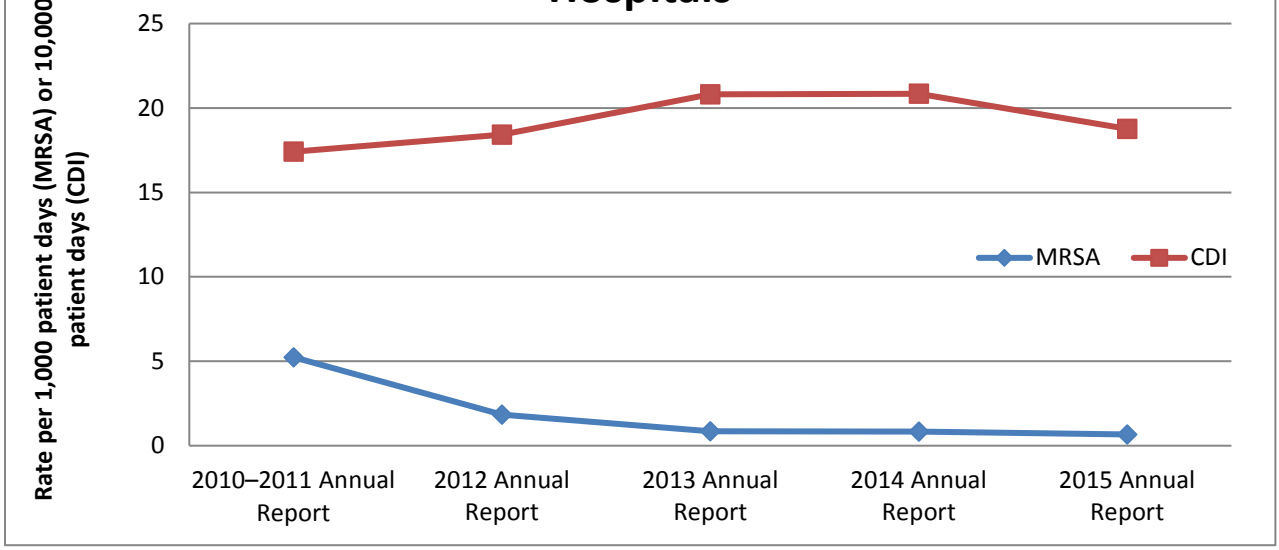


Figure 16. MDRO/CDI Rate Trends for Non-Teaching Hospitals

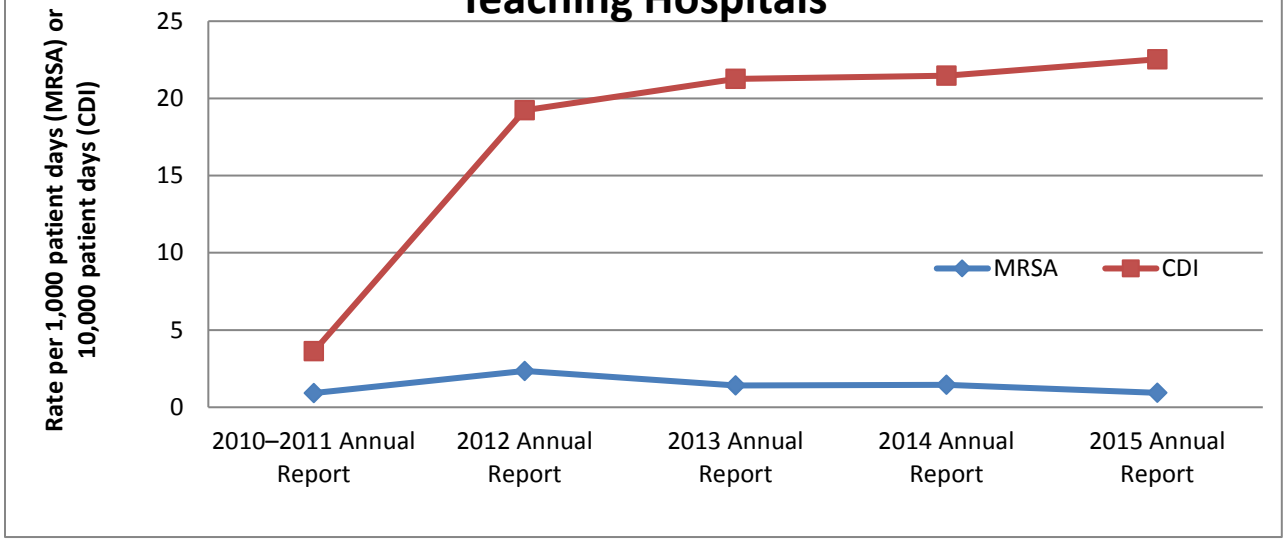


Figure 17. MDRO/CDI SIR Trends for Teaching Hospitals

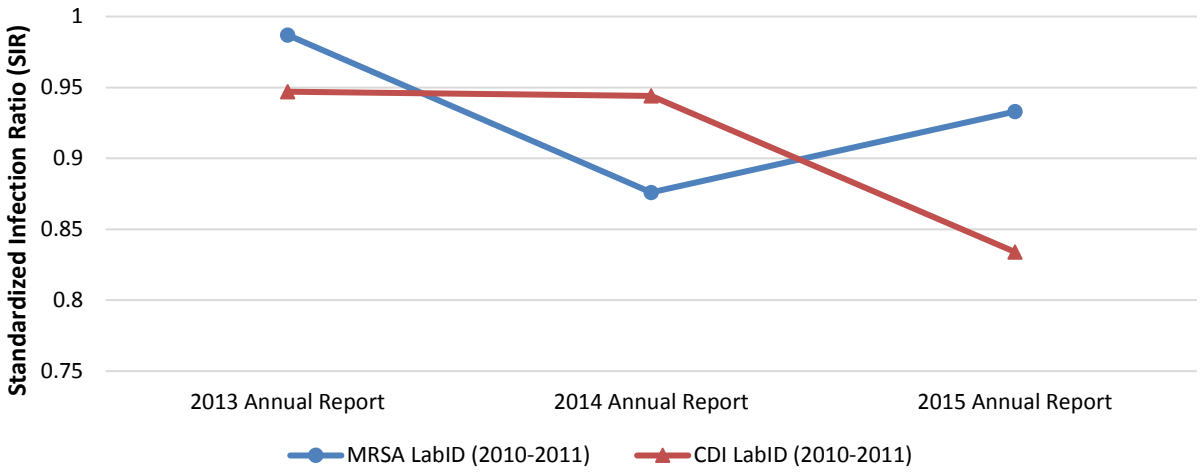


Figure 18. MDRO/CDI SIR Trends for Non-teaching Hospitals

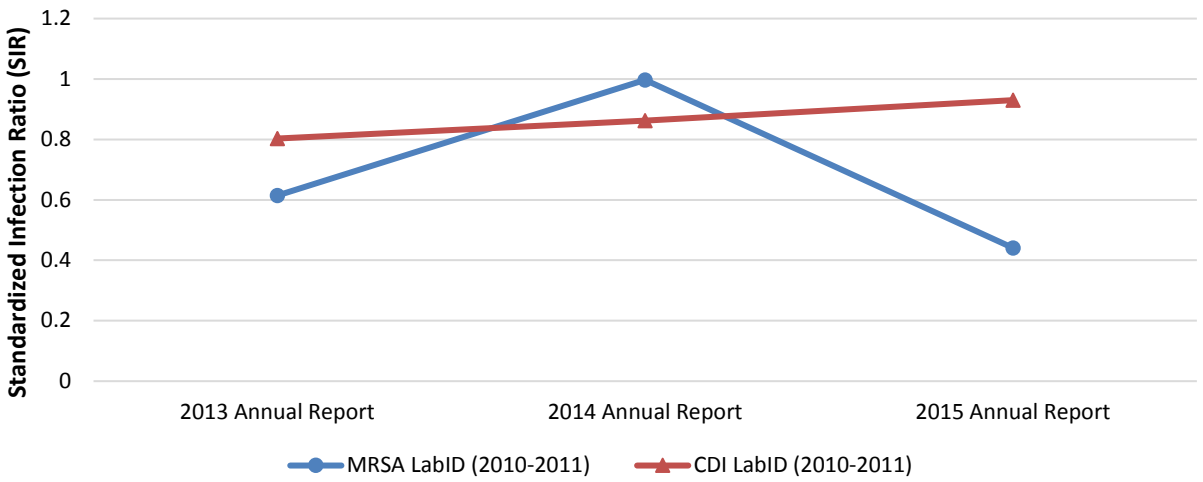


Table 20. *Device-Associated Infection Rates[1] and SIR by Facility Type*

Facility Type	Device-Associated Infection (Number of Hospitals)	Rate[1]	SIR[2]	SIR p-value[3]	SIR 95% Confidence Interval[4]
Teaching	**CAUTI**[5] (56) 2009 Baseline	1.397↓	0.665↓	<0.0001	0.620, 0.711
	CAUTI[5] (58) 2015 Baseline	1.307	0.999	0.995	0.934, 1.067
	CLABSI[6] (56) 2006-2008 Baseline	1.062↑	0.551↑	<0.0001	0.509, 0.596
	CLABSI[6] (58) 2015 Baseline	0.990	0.943	0.1346	0.872, 1.017
	Total VAE[7] (47)	7.787	----	----	----
	Total VAE[7] (47) 2015 Baseline	8.591	1.228	0.0001	1.112, 1.352
Non-Teaching	**CAUTI** (39) 2009 Baseline	0.666↓	0.431↓	<0.0001	0.307, 0.591
	CAUTI (28) 2015 Baseline	0.633	0.991	0.980	0.693, 1.375
	CLABSI (38) 2006-2008 Baseline	0.461	0.326	<0.0001	0.181, 0.543
	CLABSI (27) 2015 Baseline	0.430	0.646	0.1529	0.328, 1.152
	Total VAE (30) 2015 Baseline	5.983↑	----	----	----
	Total VAE[7] (47) 2015 Baseline	5.536	0.979	1.0	0.397, 2.037

Michigan Data

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

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

[1]Rates were calculated using the number of infections/events per 1,000 device days according to the same MI rate shown in Tables 9–14 among hospitals that shared data with MDHHS SHARP through the NHSN.

[2]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.

[3]P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can show either significantly more infections (if the SIR is greater than 1 and the p-value is <0.05) or significantly fewer (if the SIR is less than 1 and the p-value is <0.05).

[4]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.

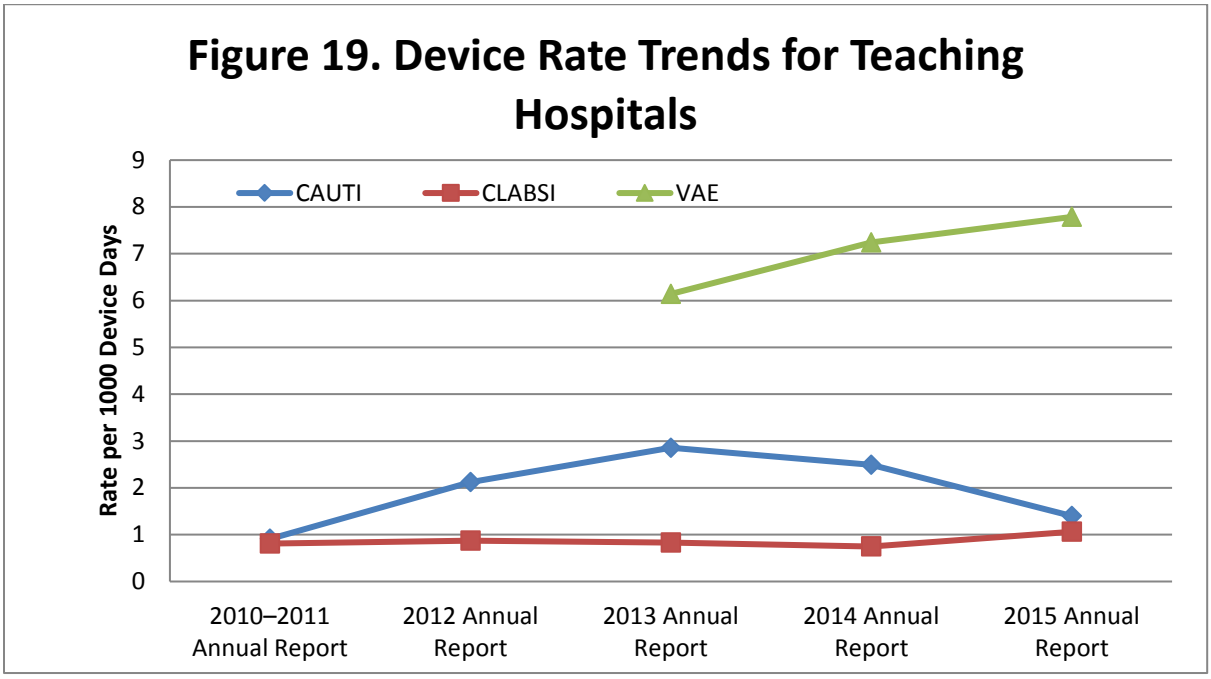
[5]CAUTI: Catheter-Associated Urinary Tract Infection

[6]CLABSI: Central Line-Associated Blood Stream Infection

[7]VAE: Ventilator-Associated Event

In the 2015 annual data, Michigan teaching hospitals had 33.5% fewer CAUTIs than expected and 44.9% fewer CLABSIs than expected, though there was a statistically significant decrease in incidence and SIR in

CAUTIs (p<0.001) and a statically significant increase in incidence and SIR in CLABSIs (p<0.001) when compared to 2014. In non-teaching hospitals, there were 56.9% fewer CAUTIs than expected and a statistically significant increase in VAE incidence (p=0.04).



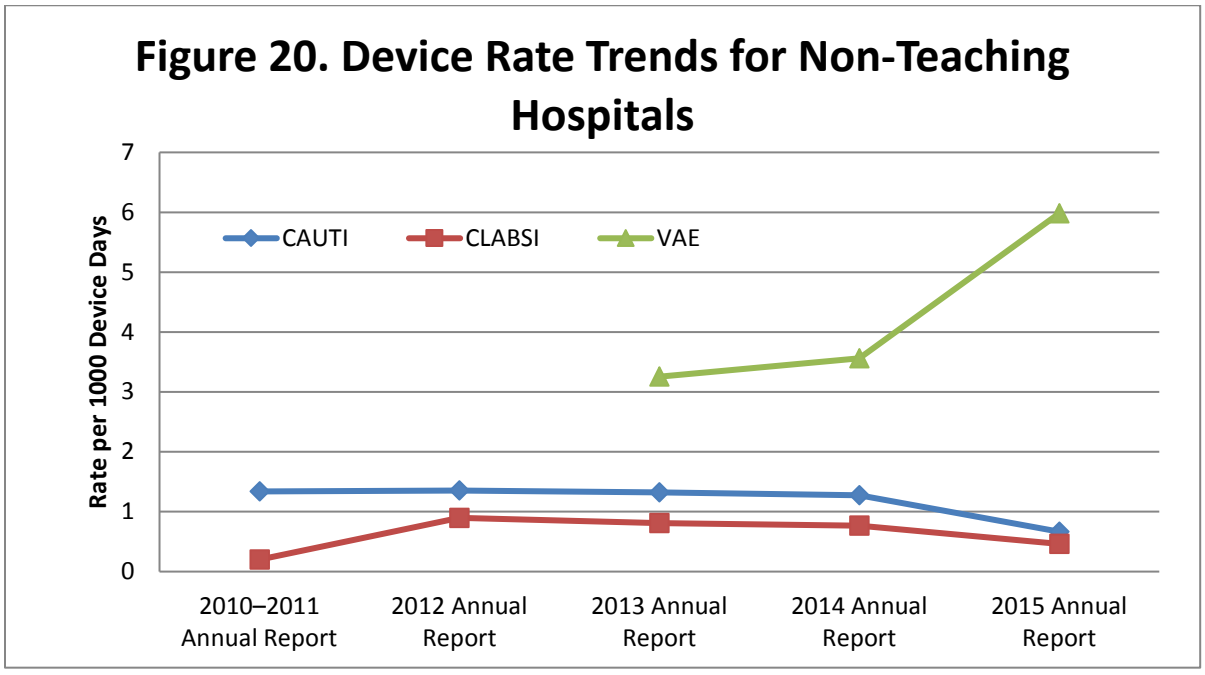


Figure 21. Device SIR Trends for Teaching Hospitals

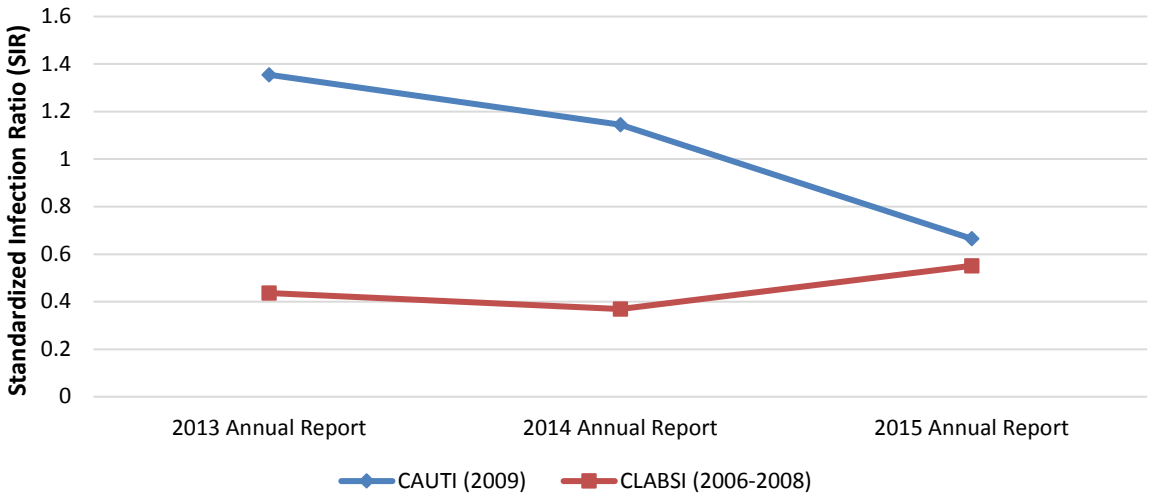


Figure 22. Device SIR Trends for Non-teaching Hospitals

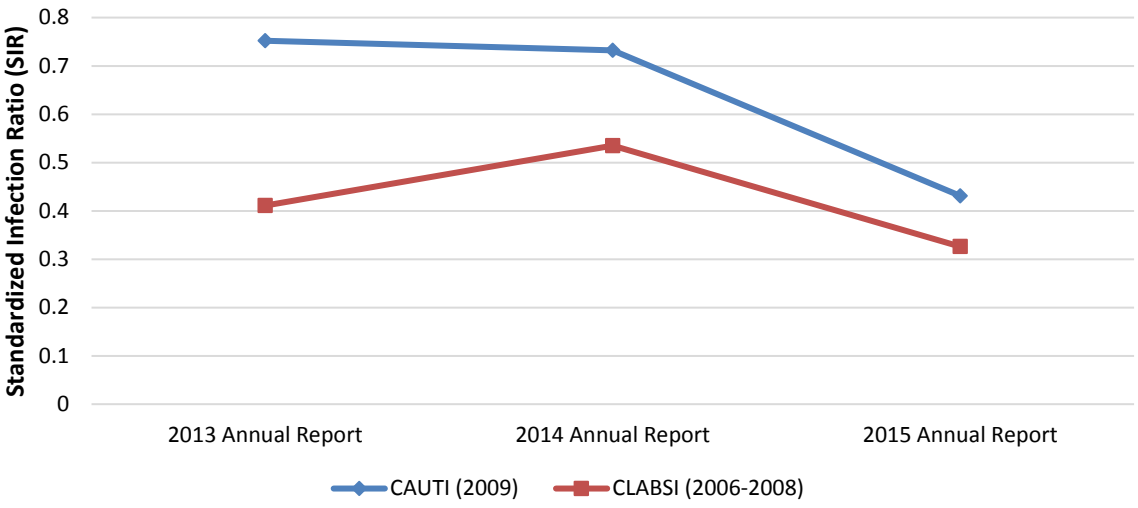


Table 21. *MDRO Rates[1] and SIR by Michigan Region*						
Michigan Region	**MDRO Infection Type (Number of Facilities)**	**Rate**	**CO Rate[2] (%CO)**	**SIR[3]**	**SIR p-value[4]**	**SIR 95% Confidence Interval[5]**
1	**MRSA LabID[6] (9)** 2010-2011 Baseline	0.713↓	0.279 (85)↓	0.466	0.005	0.245, 0.809
	MRSA LabID[6] (10) 2015 Baseline	0.709	0.277 (85)	0.624	0.1008	0.328, 1.084
	CDI LabID[7] (10) 2010-2011 Baseline	15.473↓	0.381 (54)	0.595	<0.0001	0.512, 0.687
	CDI LabID[7] (10) 2015 Baseline	15.471	0.381 (54)	0.705	<0.0001	0.607, 0.815
2N	**MRSA LabID (16)** 2010-2011 Baseline	0.624↓	0.240 (73)	1.029	0.774	0.835, 1.254
	MRSA LabID (15) 2015 Baseline	0.622	0.239 (73)	1.011	0.8991	0.821, 1.233
	CDI LabID (15) 2010-2011 Baseline	19.724↓	0.456 (44)	0.842↓	<0.0001	0.787, 0.899
	CDI LabID (15) 2015 Baseline	19.724	0.456 (44)	0.863	<0.0001	0.807, 0.921
2S	**MRSA LabID (16)** 2010-2011 Baseline	0.602↑	0.144 (63)↓	1.089	0.388	0.902, 1.304
	MRSA LabID (16) 2015 Baseline	0.602	0.144 (63)	1.176	0.1032	0.972, 1.411
	CDI LabID (15) 2010-2011 Baseline	21.675↓	0.323 (41)↓	0.990↓	0.758	0.933, 1.049
	CDI LabID (16) 2015 Baseline	20.479	0.316 (40)	1.113	0.0004	1.049, 1.179
3	**MRSA LabID (14)** 2010-2011 Baseline	1.153↓	0.369 (72)↓	0.976	0.890	0.718, 1.298
	MRSA LabID (14) 2015 Baseline	1.153	0.369 (72)	1.073	0.6273	0.789, 1.427
	CDI LabID (14) 2010-2011 Baseline	17.324↓	0.370 (47)↓	0.734	<0.0001	0.662, 0.812
	CDI LabID (14) 2015 Baseline	17.324	0.370 (47)	0.856	0.0024	0.771, 0.946
5	**MRSA LabID (11)** 2010-2011 Baseline	0.307	0.095 (87)	0.571	0.056	0.290, 1.018
	MRSA LabID (11) 2015 Baseline	0.307	0.095 (87)	0.752	0.3732	0.382, 1.340
	CDI LabID (11) 2010-2011 Baseline	22.383↑	0.453 (57)↑	0.704	<0.0001	0.598, 0.824
	CDI LabID (11) 2015 Baseline	22.383	0.453 (57)	0.823	0.0119	0.704, 0.957

6	**MRSA LabID (16)** 2010-2011 Baseline	0.318↓	0.102 (78)↓	0.612	0.022	0.379, 0.938
	MRSA LabID (17) 2015 Baseline	0.314	0.101 (78)	0.786	0.255	0.505, 1.170
	CDI LabID (16) 2010-2011 Baseline	17.840	0.369 (51)	0.769	<0.0001	0.684, 0.862
	CDI LabID (17) 2015 Baseline	18.130	0.379 (52)	0.781	<0.0001	0.695, 0.874
7 and 8	**MRSA LabID (14)** 2010-2011 Baseline	1.810↓	0.656 (86)↓	0.352	0.012	0.112, 0.849
	MRSA LabID (14) 2015 Baseline	1.605	0.575 (85)	0.358	0.0176	0.114, 0.863
	CDI LabID (14) 2010-2011 Baseline	19.129	0.414 (52)	0.877	0.100	0.749, 1.021
	CDI LabID (14) 2015 Baseline	19.129	0.414 (52)	0.994	0.9829	0.847, 1.160

Michigan Data

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

↓ or ↑ Indicates statistically significantly less than or greater than previous year (respectively). Note: this is the first annual report to obtain rates and a SIR for each individual region and thus significance testing with the prior 2013 annual report was not completed.

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

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

[3]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.

[4]P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can show either significantly more infections (if the SIR is greater than 1 and the p-value is <0.05) or significantly fewer (if the SIR is less than 1 and the p-value is <0.05).

[5]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.

[6]MRSA LabID: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Laboratory-identified (LabID) Event option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking MRSA laboratory results without conducting additional surveillance for infections. Note: MRSA LabID rates include all specimen types and MRSA SIRs only include blood specimens.

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

In the 2015 annual data, regions 1,6, and 7/8 had significantly fewer MRSA LabID events than expected. Regions 1, 2N, 3, 5, and 6 had significantly fewer CDI LabID events than expected; no regions had significantly higher MRSA and CDI LabID events than expected. The combined regions 7 and 8 had a CDI LabID SIR of 0.877 (95% CI: 0.749, 1.021), which indicates 12.3% fewer events than expected. Trend graphs for rates/SIRs will be presented when three data points are available.

Table 22. *Device-Associated Infection Rates[1] and SIR by Michigan Region*					
Michigan Regions	**Device-Associated Infection**	**Rate (Number of facilities)**	**SIR[2]**	**SIR p-value[3]**	**SIR 95% Confidence Interval[4]**
1	**CAUTI[5]** 2009 Baseline	0.932 (11)↓	0.456↓	<0.0001	0.329, 0.617
	CAUTI[5] 2015 Baseline	0.926 (9)	0.791	0.1302	0.573, 1.067
	CLABSI[6] 2006-2008 Baseline	0.680 (10)	0.369	<0.0001	0.246, 0.532
	CLABSI[6] 2015 Baseline	0.697 (9)	0.672	0.0326	0.448, 0.970
	Total VAE[7]	8.453 (9)↓	----	----	----
	Total VAE[7] 2015 Baseline	12.451 (8)	1.484	<0.0001	1.248, 1.752
2N	**CAUTI[5]** 2009 Baseline	1.245 (15)↓	0.600↓	<0.0001	0.523, 0.686
	CAUTI[5] 2015 Baseline	1.161 (15)	0.900	0.1344	0.784, 1.029
	CLABSI[6] 2006-2008 Baseline	1.163 (15)↑	0.668↑	<0.0001	0.566, 0.783
	CLABSI[6] 2015 Baseline	1.136 (15)	1.113	0.2089	0.945, 1.302
	Total VAE	4.217 (11)↓	----	----	----
	Total VAE[7] 2015 Baseline	6.347 (11)	0.899	0.1201	0.761, 1.056
2S	**CAUTI[5]** 2009 Baseline	1.637 (15)↓	0.758↓	<0.0001	0.678, 0.845
	CAUTI[5] 2015 Baseline	1.571 (16)	1.136	0.0245	1.018, 1.264
	CLABSI[6] 2006-2008 Baseline	1.130 (15)↑	0.577↑	<0.0001	0.513, 0.648
	CLABSI[6] 2015 Baseline	1.125 (16)	1.025	0.6839	0.913, 1.147
	Total VAE	5.567 (12)	----	----	----
	Total VAE[7] 2015 Baseline	8.332 (14)	0.999	1.00	0.891, 1.116
3	**CAUTI[5]** 2009 Baseline	1.199 (13)↓	0.579↓	<0.0001	0.484, 0.687
	CAUTI[5] 2015 Baseline	1.116 (11)	0.826	0.0308	0.691, 0.980
	CLABSI[6] 2006-2008 Baseline	0.610 (13)	0.380	<0.0001	0.295, 0.482

	CLABSI[6] 2015 Baseline	0.623 (11)	0.625	<0.0001	0.491, 0.785
	Total VAE	6.173 (11)	----	----	----
	Total VAE[7] 2015 Baseline	6.219 (10)	0.919	0.3433	0.775, 1.083
5	**CAUTI**[5] 2009 Baseline	1.224 (12)↓	0.636↓	0.0003	0.485, 0.820
	CAUTI[5] 2015 Baseline	1.172 (10)	1.034	0.7803	0.799, 1.316
	CLABSI[6] 2006-2008 Baseline	0.670 (12)	0.438	<0.0001	0.292, 0.633
	CLABSI[6] 2015 Baseline	0.616 (10)	0.643	0.0168	0.429, 0.929
	Total VAE	7.192 (9)	----	----	----
	Total VAE[7] 2015 Baseline	7.499 (7)	1.085	0.5046	0.843, 1.377
6	**CAUTI**[5] 2009 Baseline	1.327 (16)↓	0.704↓	0.003	0.549, 0.890
	CAUTI[5] 2015 Baseline	1.249 (14)	1.223	0.0828	0.973, 1.518
	CLABSI[6] 2006-2008 Baseline	1.198 (16)	0.556↑	<0.0001	0.424, 0.716
	CLABSI[6] 2015 Baseline	1.139 (14)	1.132	0.305	0.887, 1.424
	Total VAE	7.471 (13)↑	----	----	----
	Total VAE[7] 2015 Baseline	12.773 (11)	1.627	<0.0001	1.410, 1.868
7 and 8	**CAUTI**[5] 2009 Baseline	1.071 (14)↓	0.615	0.0002	0.460, 0.807
	CAUTI[5] 2015 Baseline	0.997 (11)	1.072	0.6127	0.804, 1.401
	CLABSI[6] 2006-2008 Baseline	0.828 (13)	0.569	0.003	0.373, 0.834
	CLABSI[6] 2015 Baseline	0.667 (11)	0.746	0.1697	0.474, 1.121
	Total VAE	11.040 (12)	----	----	----
	Total VAE[7] 2015 Baseline	9.063 (10)	1.704	0.001	1.321, 2.166

Michigan Data

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

↓ or ↑ Indicates statistically significantly less than or greater than previous year (respectively). Note: this is the first annual report to obtain rates and a SIR for each individual region and thus significance testing with the prior 2013 annual report was not completed.

[1]Rates were calculated using the number of infections/events per 1,000 device days according to the same MI rate shown in Tables 9-14 among hospitals that shared data with MDHHS SHARP through the NHSN.
[2]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.
[3]P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can show either significantly more infections (if the SIR is greater than 1 and the p-value is <0.05) or significantly fewer (if the SIR is less than 1 and the p-value is <0.05).
[4]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.
[5]CAUTI: Catheter-Associated Urinary Tract Infection
[6]CLABSI: Central Line-Associated Blood Stream Infection
[7]VAE: Ventilator-Associated Event

From the 2015 annual data, all regions had significantly fewer CAUTIs and CLABSIs than expected.

Table 23. *MDRO Rates[1] by Bed Size*

Bed Size	MDRO Infection Type (Number of Facilities)	Rate	CO Rate[2] (%CO)	SIR[3]	SIR p-value[4]	SIR 95% Confidence Interval[5]
≤200 Beds	**MRSA LabID[6] (57)** 2010-2011 Baseline	1.012	0.337 (84)	0.725	0.068	0.498, 1.023
	MRSA LabID[6] (58) 2015 Baseline	0.998	0.332 (84)	0.875	0.4732	0.601, 1.233
	CDI LabID[7] (57) 2010-2011 Baseline	20.576	0.468 (55)	0.860	0.002	0.779, 0.948
	CDI LabID[7] (58) 2015 Baseline	20.748	0.474 (56)	0.960	0.418	0.873, 1.055
>200 Beds	**MRSA LabID (38)** 2010-2011 Baseline	0.641↓	0.197 (71) ↓	0.934	0.278	0.827, 1.052
	MRSA LabID (38) 2015 Baseline	0.628	0.192 (70)	1.006	0.9368	0.891, 1.132
	CDI LabID (38) 2010-2011 Baseline	18.904↓	0.360 (44) ↓	0.838↓	<0.0001	0.807, 0.870
	CDI LabID (38) 2015 Baseline	18.904	0.360 (44)	0.912	<0.0001	0.878, 0.947

Michigan Data

Green Text or **Red Text** indicates significantly fewer or greater infections than expected (respectively).
↓ or ↑ Indicates statistically significantly less than or greater than previous year (respectively).
[1]Rates were calculated using the number of infections/events per 1,000 (or per 10,000 for CDI) patient days or device days according to the same MI rate shown in Tables 9–14 among hospitals that shared data with MDHHS SHARP through the NHSN.
[2]CO: Community Onset (%CO: Percent of LabID events that were community onset)

[3]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.
[4]P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can show either significantly more infections (if the SIR is greater than 1 and the p-value is <0.05) or significantly fewer (if the SIR is less than 1 and the p-value is <0.05).
[5]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.
[6]MRSA LabID: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Laboratory-identified (LabID) Event option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking MRSA laboratory results without conducting additional surveillance for infections. Note: MRSA LabID rates include all specimen types and MRSA SIRs only include blood specimens.
[7]CDI LabID: *Clostridium difficile (C. diff)* Infection (CDI) LabID Event option within the MDRO/CDI Module of NHSN for tracking CDI laboratory results without conducting additional surveillance for infections.

From the annual 2015 data, both smaller (≤200 beds) hospitals and larger hospitals (>200 beds) had significantly fewer CDI LabID events than expected with SIRs of 0.860 (95% CI: 0.779, 0.948) and 0.838 (95% CI: 0.807, 0.870). There was a statistically significant decrease in both MRSA and CDI LabID rates in larger hospitals from the 2014 annual report. Rate trends can be seen in Figures 19-20, below.

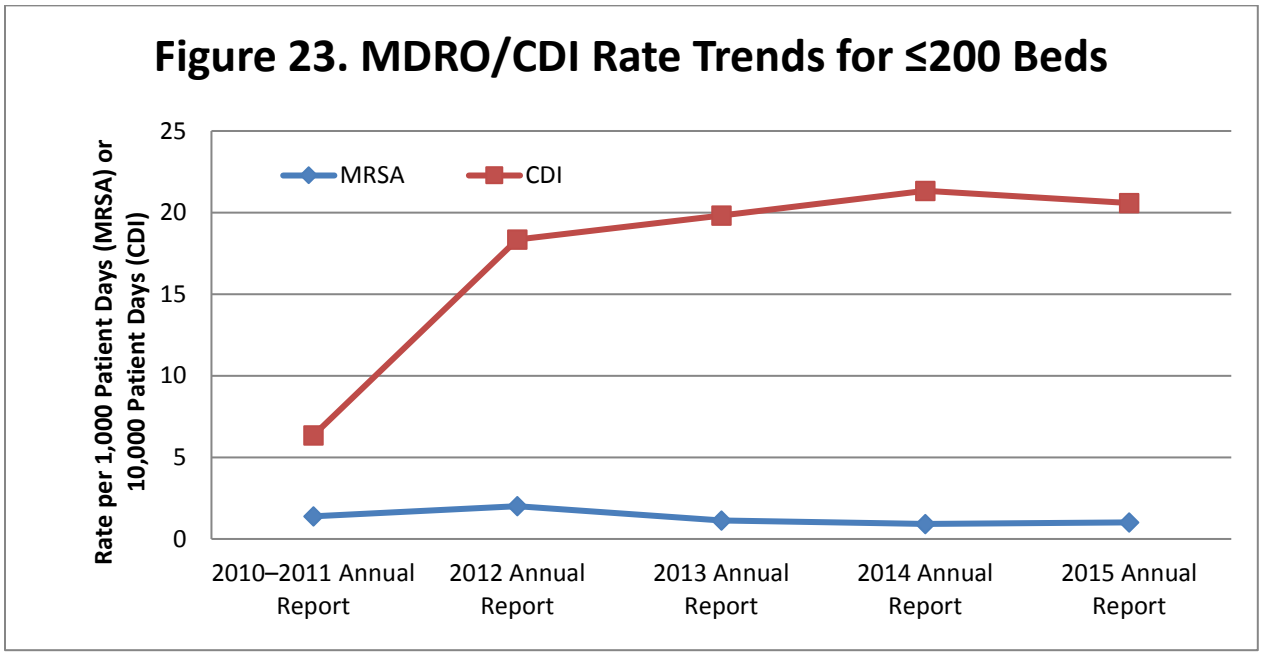


Figure 24. MDRO/CDI Rate Trends for >200 Beds

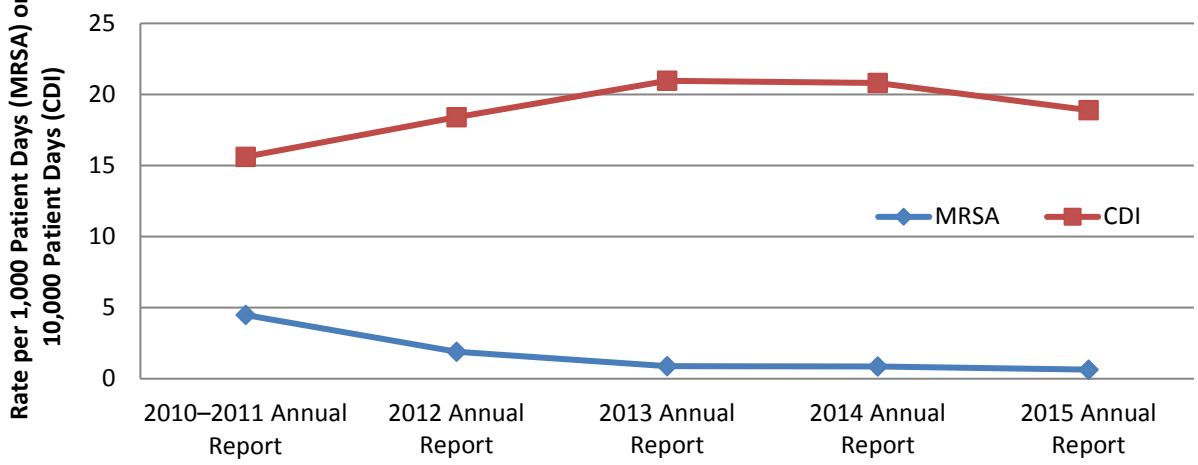


Figure 25. MDRO/CDI SIR Trends for ≤200 Beds

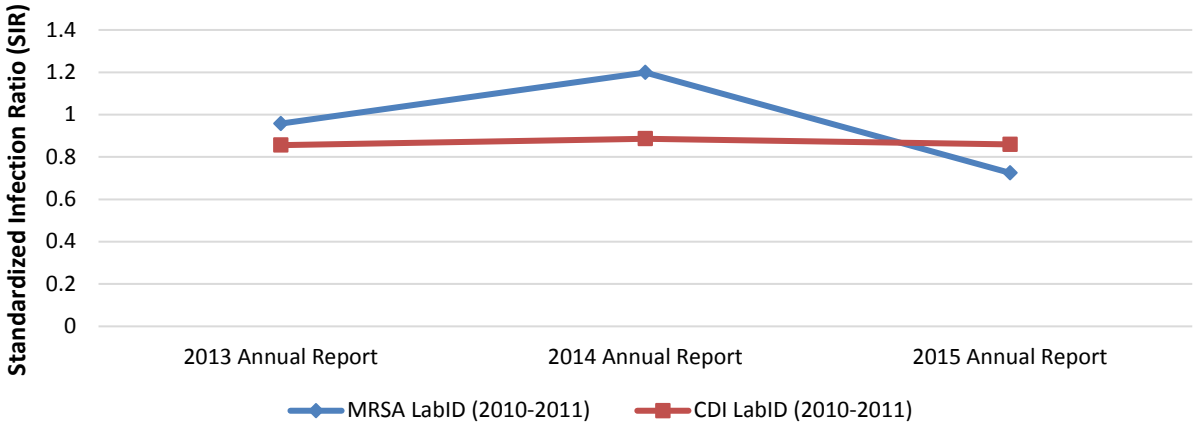


Figure 26. MDRO/CDI SIR Trends for >200 Beds

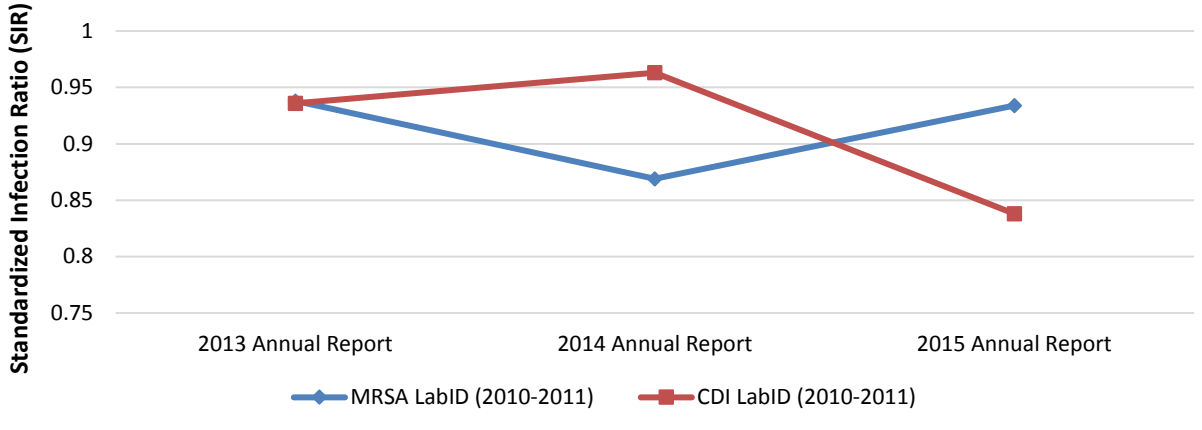


Table 24. *Device-Associated Infection Rates[1] and SIR by Facility Bed Size*					
Bed Size	**Device-Associated Infection**	**Rate (Number of Facilities)**	**SIR[2]**	**SIR p-value[3]**	**SIR 95% Confidence Interval[4]**
≤200 Beds	**CAUTI[5]** 2009 Baseline	0.837 (59) ↓	0.500 ↓	<0.0001	0.411, 0.603
	CAUTI[5] 2015 Baseline	0.824 (48)	1.01	0.9399	0.835, 1.212
	CLABSI[6] 2006-2008 Baseline	0.934 (57) ↑	0.480	<0.0001	0.373, 0.609
	CLABSI[6] 2015 Baseline	0.850 (48)	0.998	1.00	0.787, 1.250
	Total VAE[7]	2.956 (47)	----	----	----
	Total VAE[7] 2015 Baseline	4.122 (38)	0.777	0.036	0.605, 0.984
>200 Beds	**CAUTI[5]** 2009 Baseline	1.447 (38) ↓	0.675 ↓	<0.0001	0.629, 0.725
	CAUTI[5] 2015 Baseline	1.359 (38)	0.997	0.9544	0.929, 1.069
	CLABSI[6] 2006-2008 Baseline	0.995 (35) ↑	0.555 ↑	<0.0001	0.510, 0.602
	CLABSI[6] 2015 Baseline	0.986 (38)	0.928	0.0697	0.855, 1.005
	Total VAE	8.617 (27) ↑	----	----	----
	Total VAE[7] 2015 Baseline	9.126 (33)	1.167	<0.0001	1.096, 1.242

Michigan Data

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

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

[1]Rates were calculated using the number of infections/events per 1,000 patient days or device days according to the same MI rate shown in Tables 15–17 among hospitals that shared data with MDHHS SHARP through the NHSN.

[2]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.

[3]P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can show either significantly more infections (if the SIR is greater than 1 and the p-value is <0.05) or significantly fewer (if the SIR is less than 1 and the p-value is <0.05).

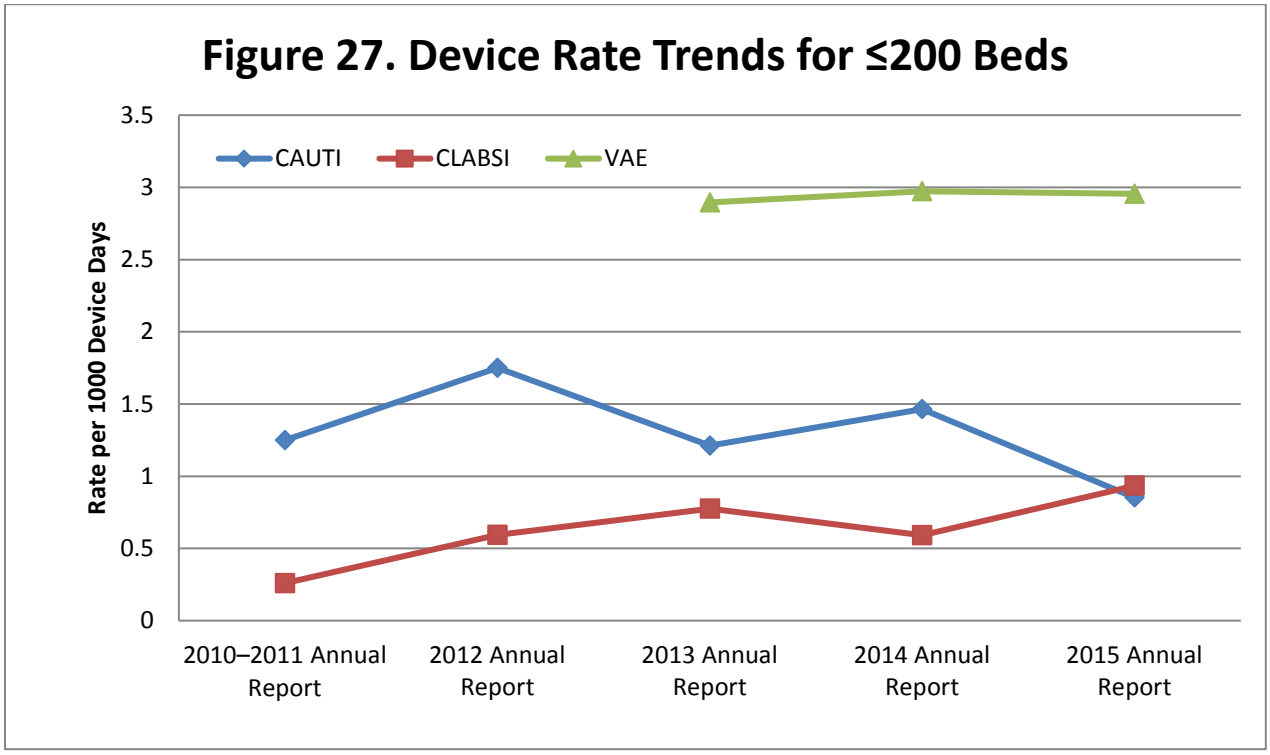
[4]95% CI: 95% confidence interval around the SIR estimate. A 95% CI indicates that 95% of the time, the actual SIR will fall within this interval.

[5]CAUTI: Catheter-Associated Urinary Tract Infection

[6]CLABSI: Central Line-Associated Blood Stream Infection

[7]VAE: Ventilator-Associated Event

According to 2015 annual data, both larger (>200 beds) and smaller hospitals (≤200 beds) had significantly less CAUTIs and CLABSIs than expected. The rate of CLABSIs for both size hospital groups has increased from the 2014 annual report. Rate trends can be seen in Figures 27-28, below.



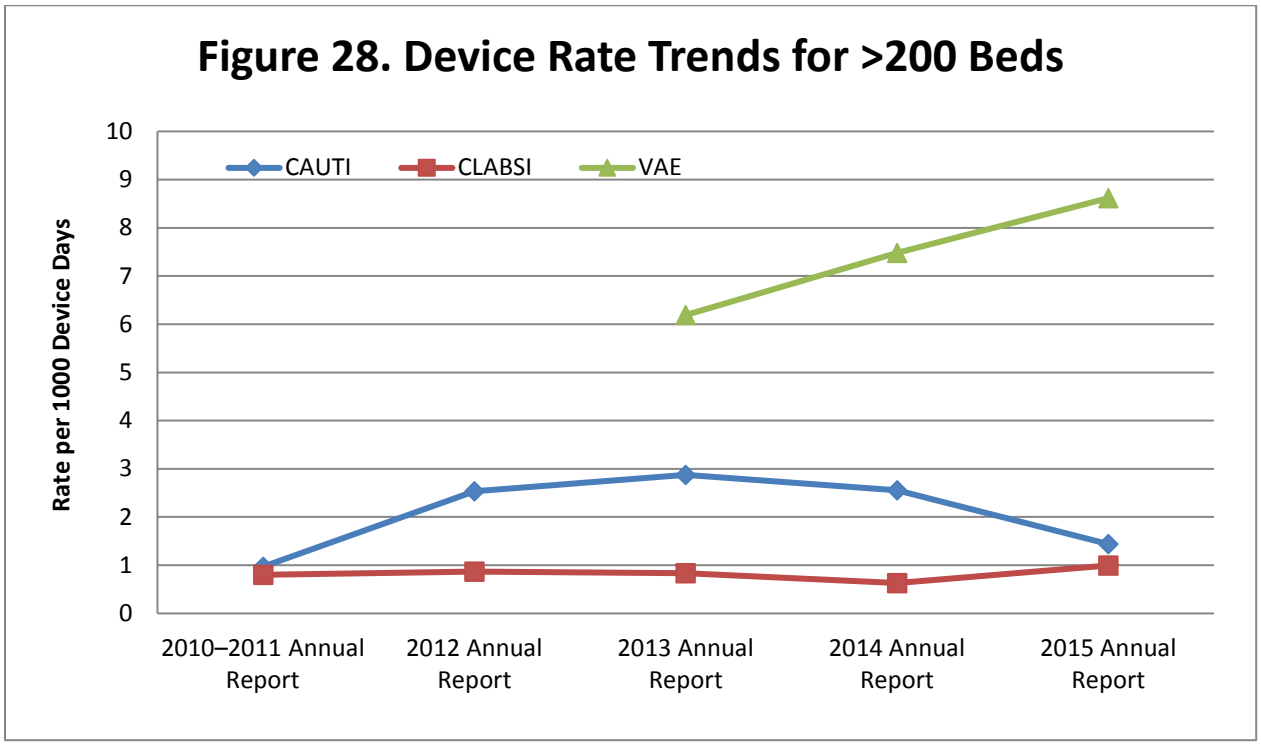


Figure 29. Device SIR Trends for ≤200 Beds

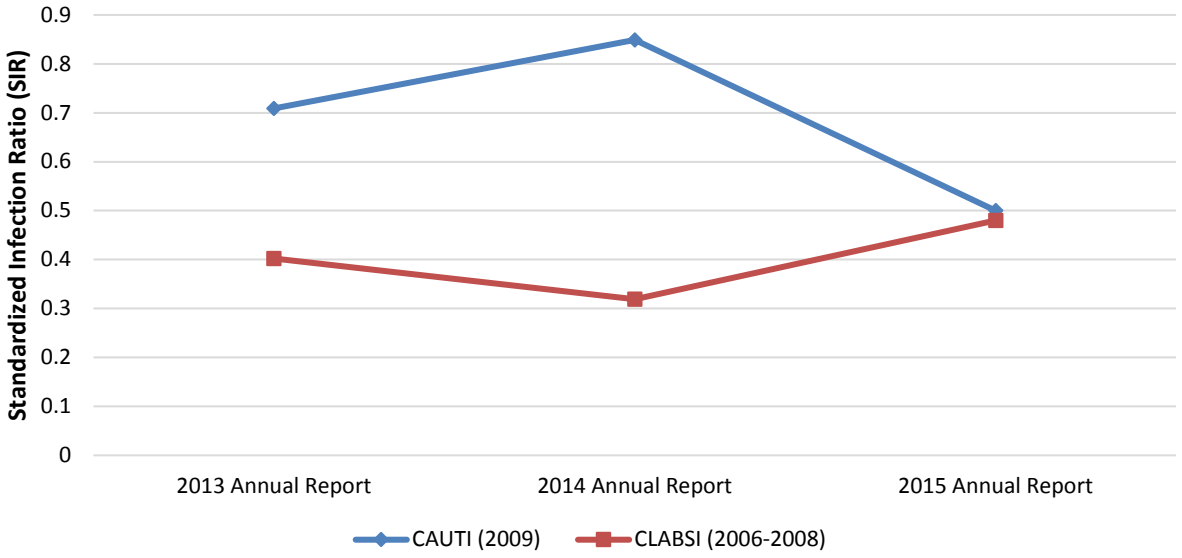
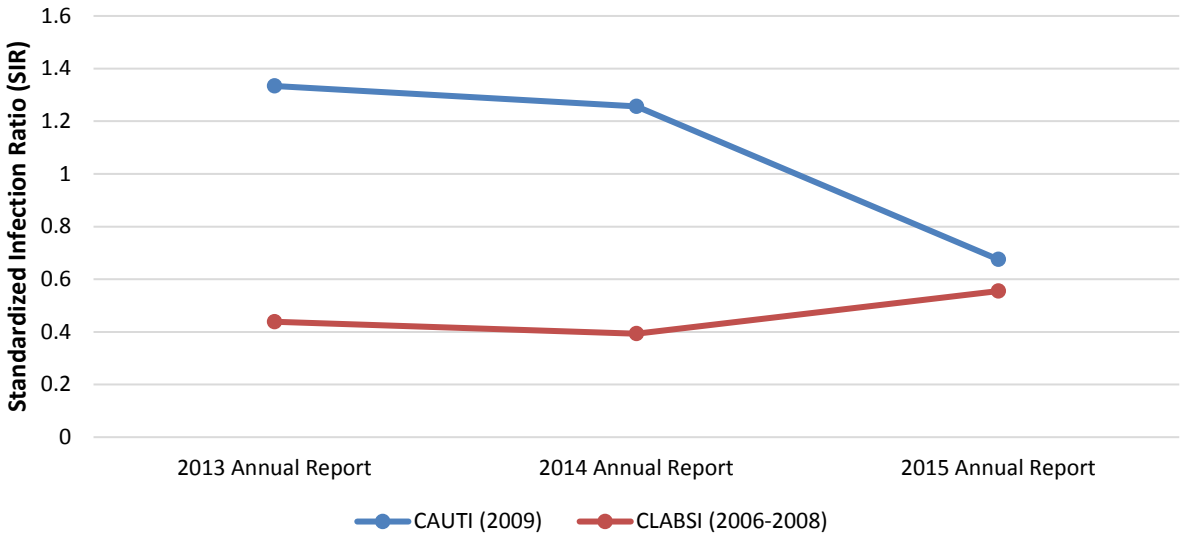


Figure 30. Device SIR Trends for >200 Beds



Conclusions

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

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

This report compiled Michigan HAI data voluntarily shared via NHSN with the MDHHS SHARP Unit for the calendar year 2015 reporting period. This report followed the same structure as the previous 2014 Annual Report with a few alterations in tables and graphs. Note that these data from participating hospitals have not been validated. Validation studies will be conducted as additional funding becomes available. This report contains data from many more facilities than in previous reports. Data will continue to become more reliable as additional Michigan hospitals participate in this surveillance initiative.

Acronyms

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

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

Appendix: Targeted Assessment for Prevention (TAP) Reports

The following graphs show the Cumulative Attributable Difference (CAD) for participating facilities, which is the difference between expected infections and observed infections, taken from the Standardized Infection Ratio (SIR). This is provided overall as well as location-specific when available; all graphs are based on the ***original baseline data***. A CAD greater than zero indicates the number of infections a facility needs to prevent to achieve the HHS Target SIR for that module. A number less than zero indicates the number of infections a facility prevented beyond what was expected based on the HHS Target SIR. Participating hospitals have been assigned a letter which will be provided to the contact(s) on file with the SHARP Unit. Graphs are provided for each CAUTI (Overall, ICU, Ward), CLABSI (Overall, ICU, NICU, Ward), CDI LabID (inpatient facility-wide), MRSA bacteremia LabID (inpatient facility-wide), and SSIs (colon surgeries and abdominal hysterectomies). Due to the large number of facilities participating, graphs are split into smaller groups to improve readability.

Table A1. *HHS Target SIR*

CAUTI	CLABSI	CDI	MRSA bacteremia	SSI COLO	SSI HYST
0.75	0.50	0.70	0.75	0.75	0.75

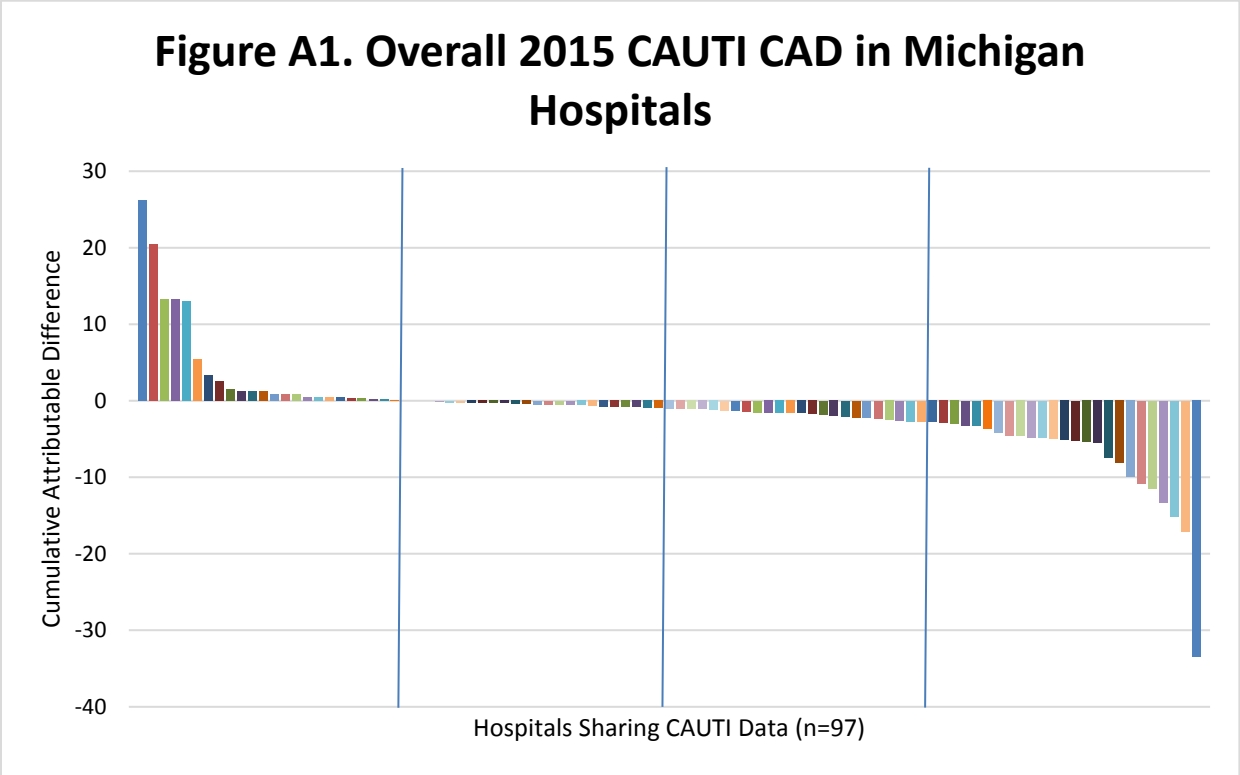


Figure A2. CAUTI CAD Group 1: Facilities with the most infections needed to prevent

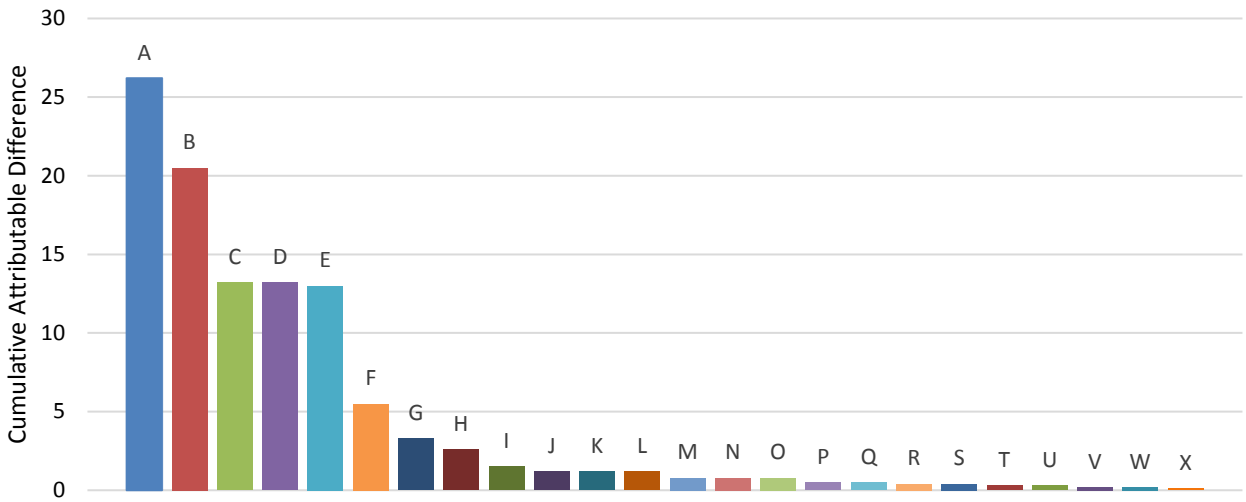


Figure A3. CAUTI CAD Group 2: Facilities with the fewest infections prevented beyond expected

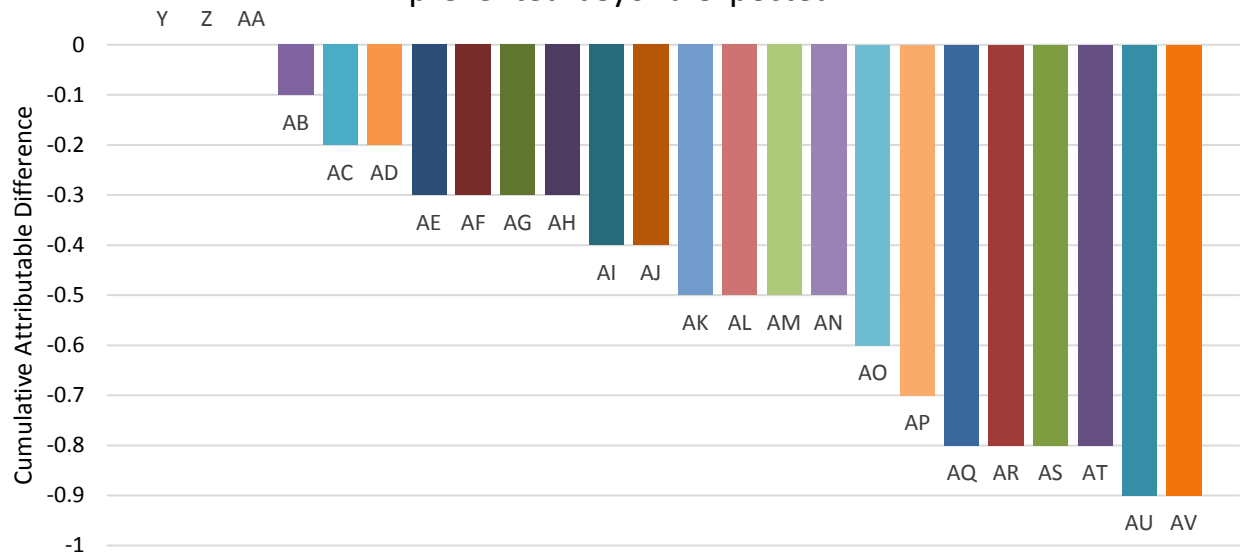


Figure A4. CAUTI CAD Group 3: Facilities with the second most infections prevented beyond expected

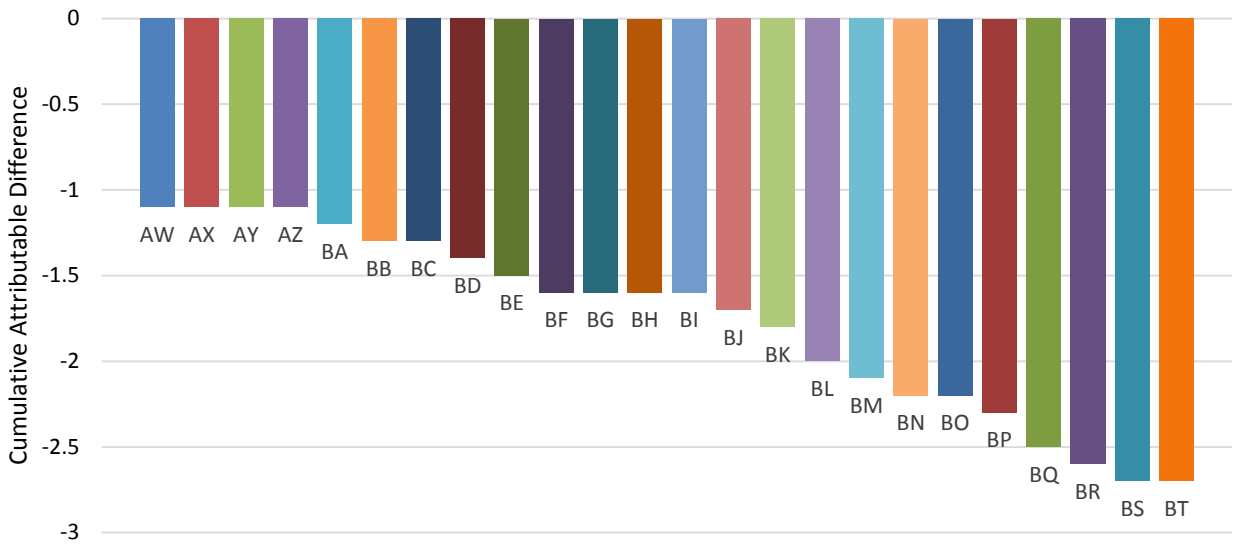


Figure A5. CAUTI CAD Group 4: Facilities with the most infections prevented beyond expected

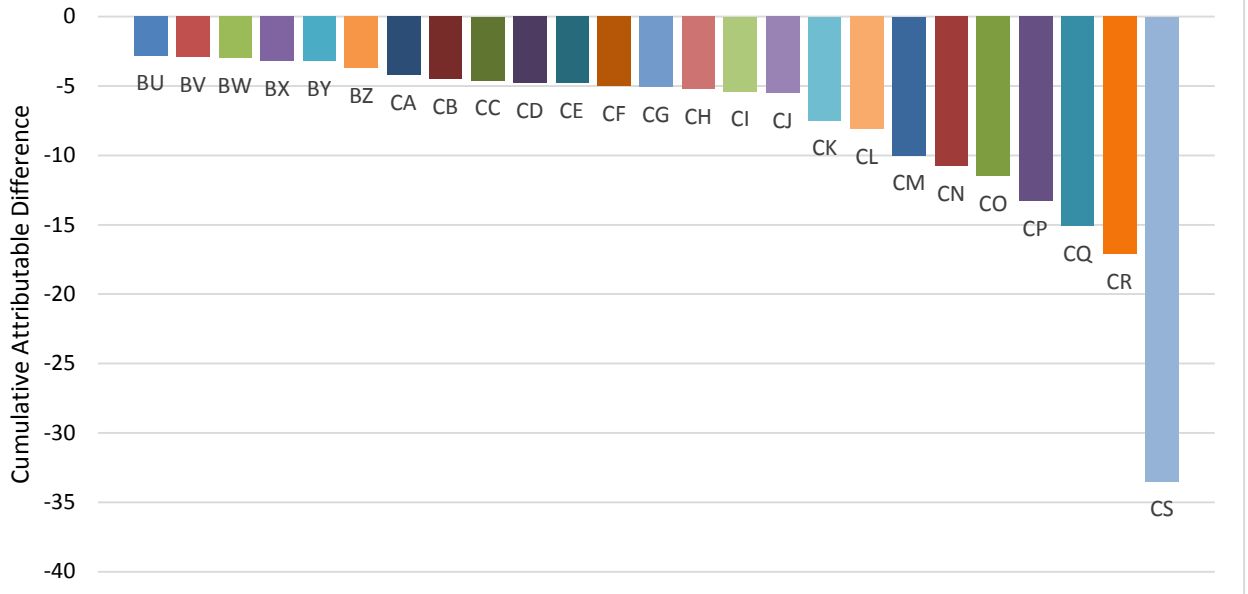


Figure A6. 2015 CAUTI ICU CAD in Michigan Hospitals

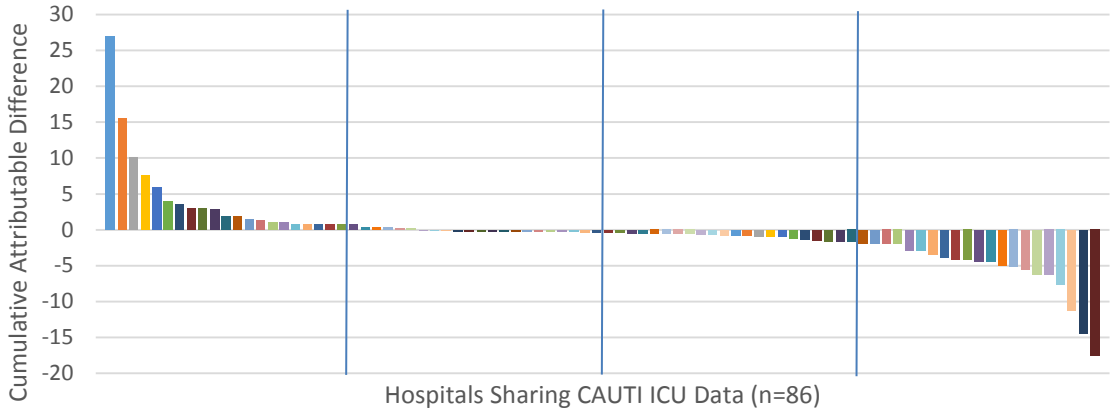


Figure A7. ICU CAUTI CAD Group 1: Facilities with the most infections needed to prevent

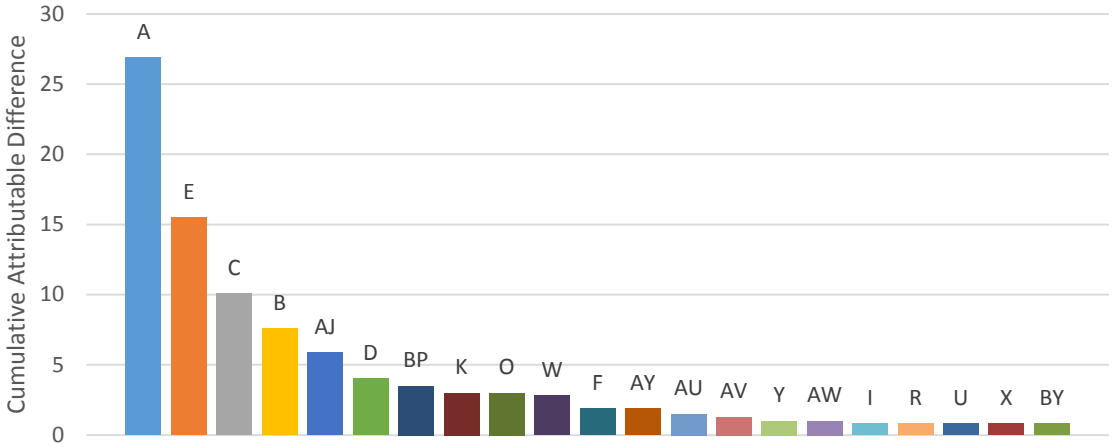


Figure A8. ICU CAUTI CAD Group 2: Facilities with the second most infections needed to prevent or the fewest infections prevented beyond expected

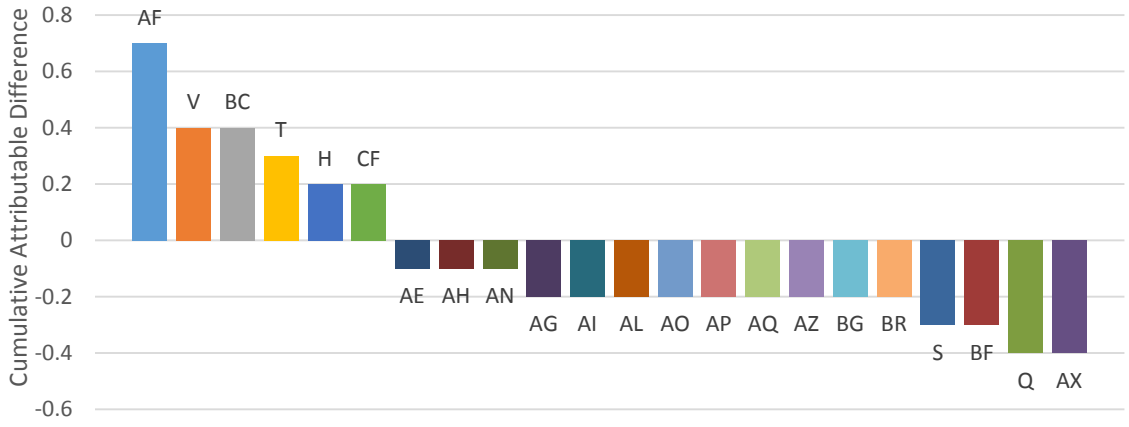


Figure A9. ICU CAUTI CAD Group 3: Facilities with the second most infections prevented beyond expected

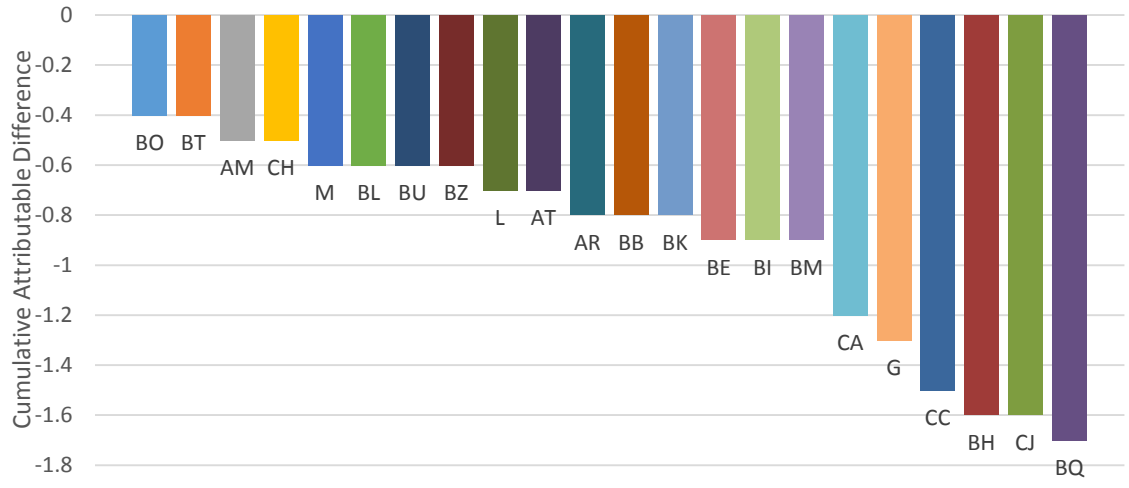


Figure A10. ICU CAUTI CAD Group 4: Facilities with the most infections prevented beyond expected

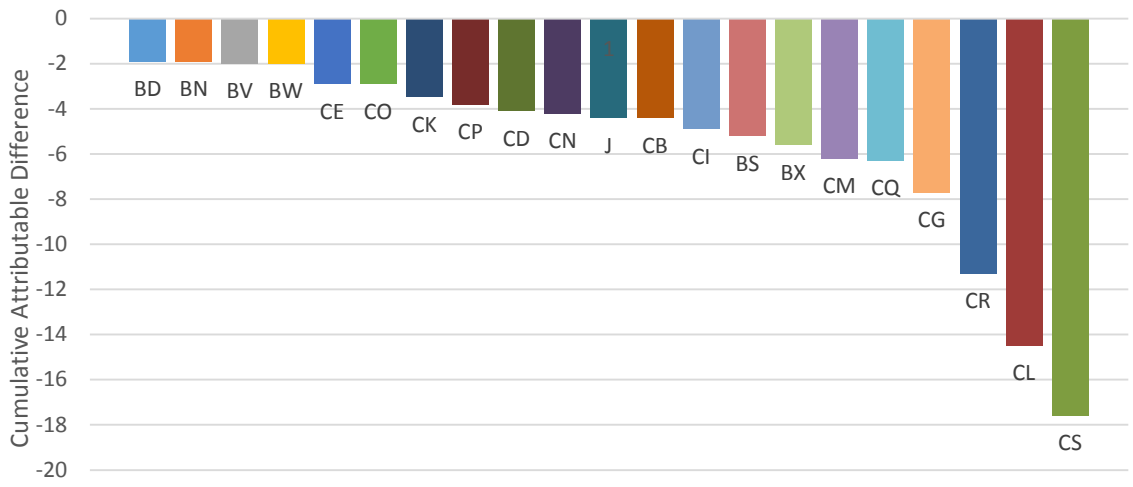


Figure A11. 2015 CAUTI Ward CAD in Michigan Hospitals

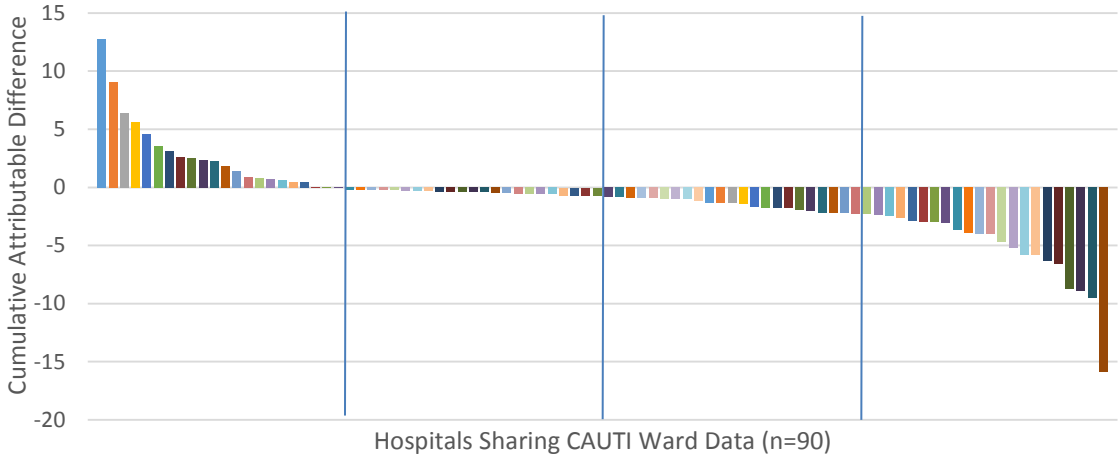


Figure A12. Ward CAUTI CAD Group 1: Facilities with the most infections needed to prevent or the fewest infections prevented beyond expected

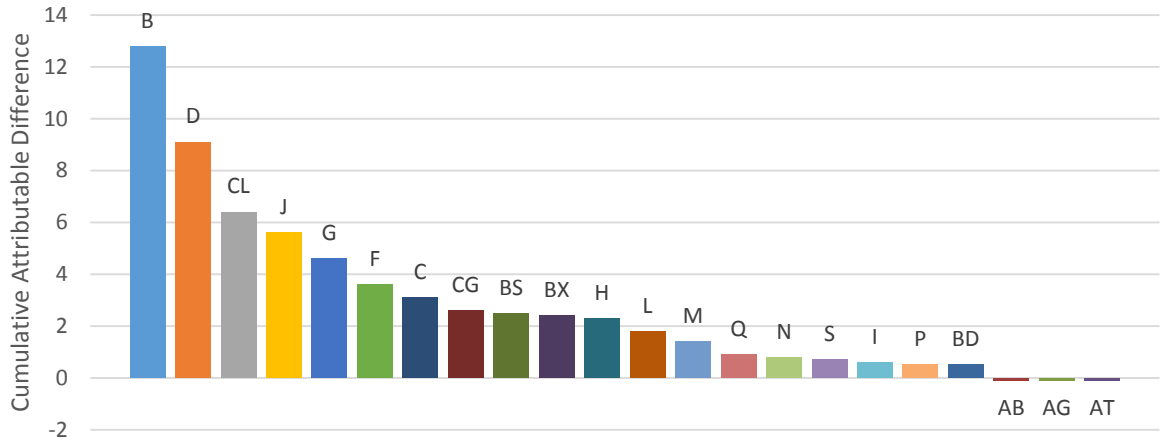


Figure A13. Ward CAUTI CAD Group 2: Facilities with the fewest infections prevented beyond expected

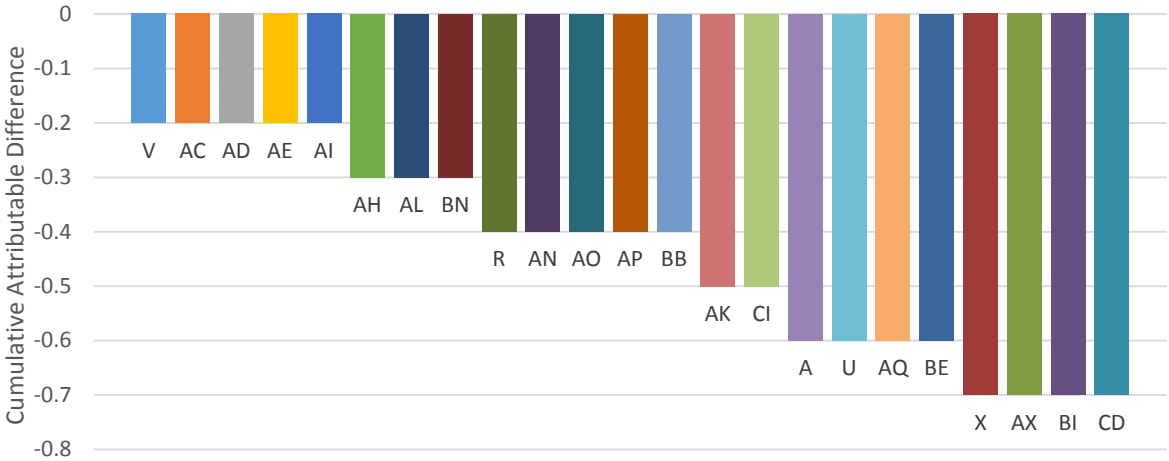


Figure A14. Ward CAUTI CAD Group 3: Facilities with the second most infections prevented beyond expected

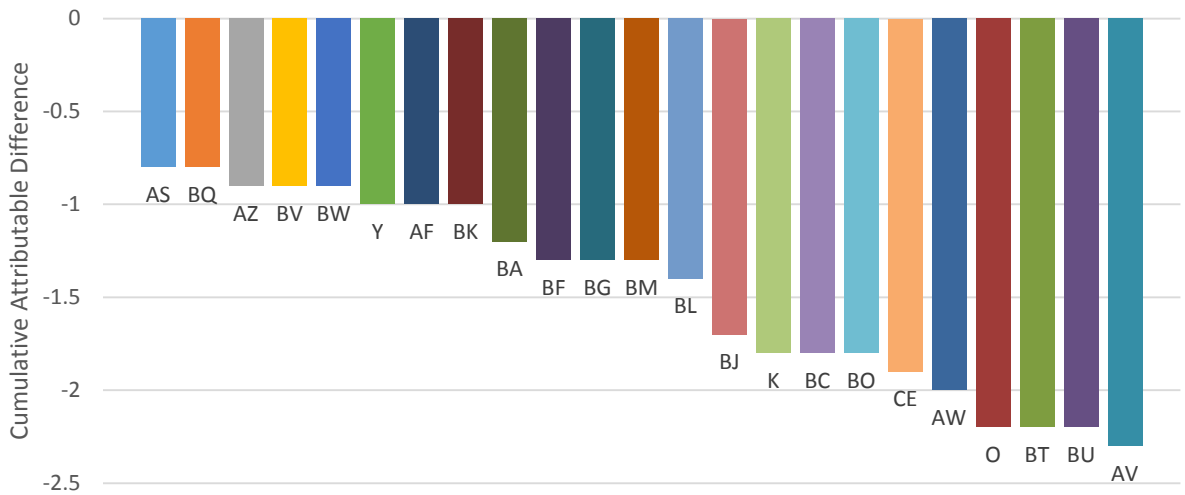


Figure A15. Ward CAUTI CAD Group 2: Facilities with the most infections prevented beyond expected

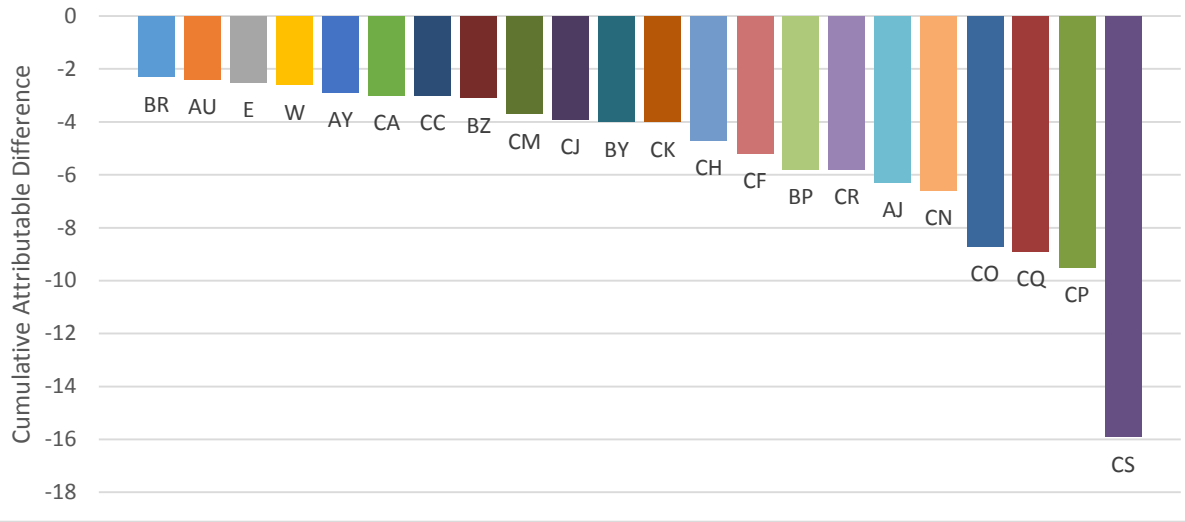


Figure A16. Overall 2015 CLABSI CAD in Michigan Facilities

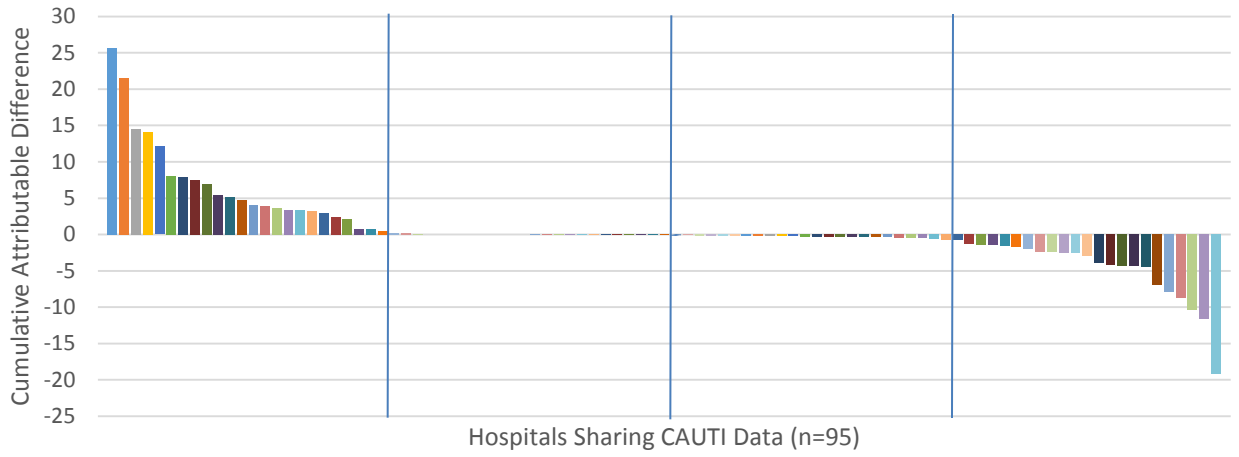


Figure A17. Overall CLABSI CAD Group 1: Facilities with the most infections needed to prevent

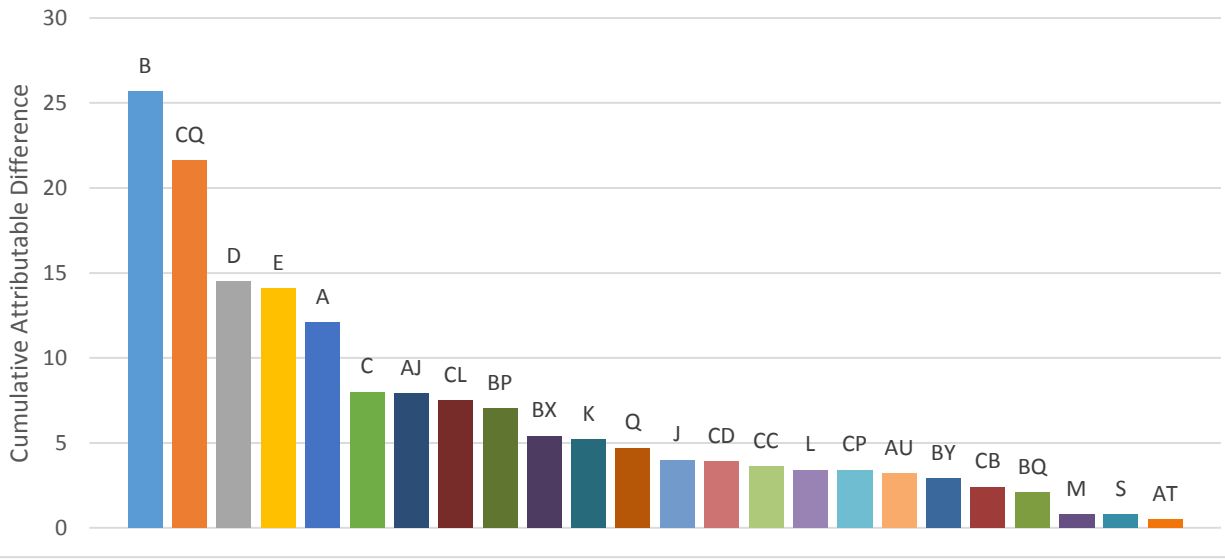


Figure A18. Overall CLABSI CAD Group 2: Facilities with the second most infections needed to prevent or the fewest infections prevented beyond expected

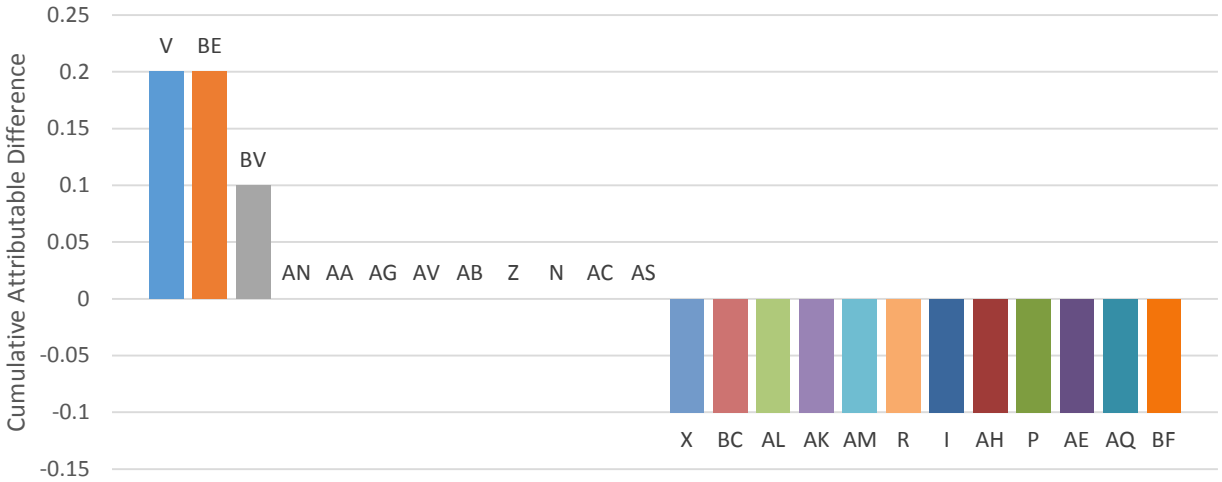


Figure A19. Overall CLABSI CAD Group 3: Facilities with the second most infections prevented beyond expected

Figure A20. Overall CLABSI CAD Group 4: Facilities with the most infections prevented beyond expected

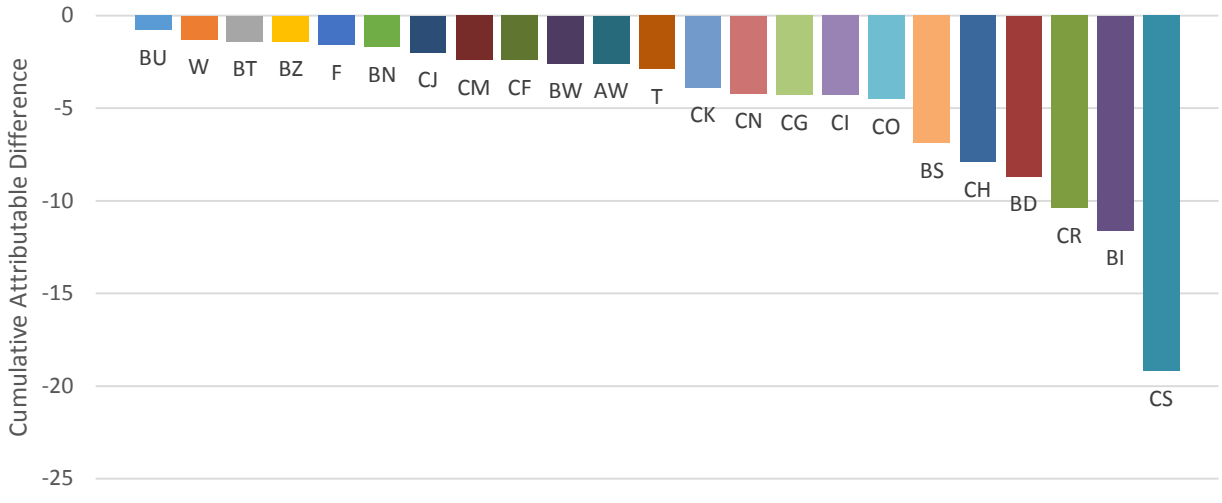


Figure A21. 2015 ICU CLABSI CAD, All Facilities

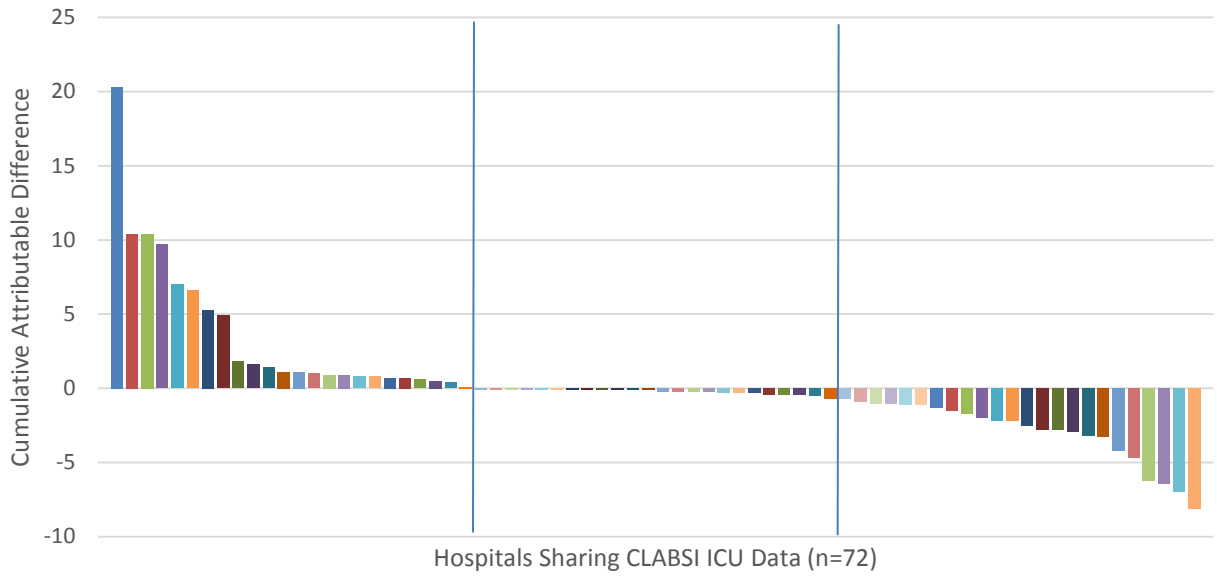


Figure A22. ICU CLABSI CAD Group 1: Facilities with the most infections needed to prevent

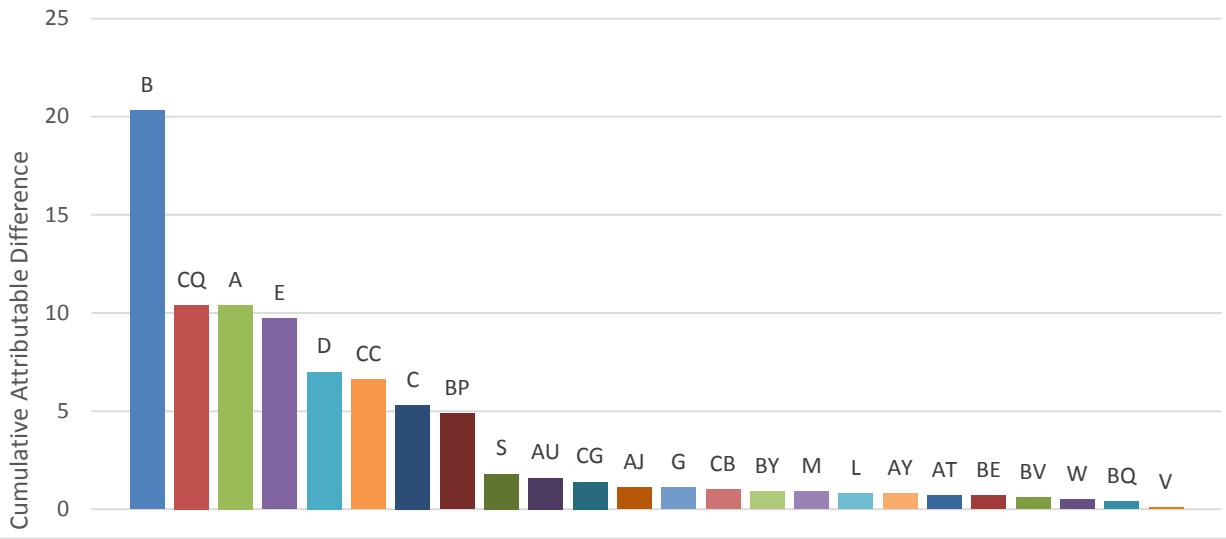


Figure A23. ICU CLABSI CAD Group 2: Facilties with the fewest infections prevented beyond expected

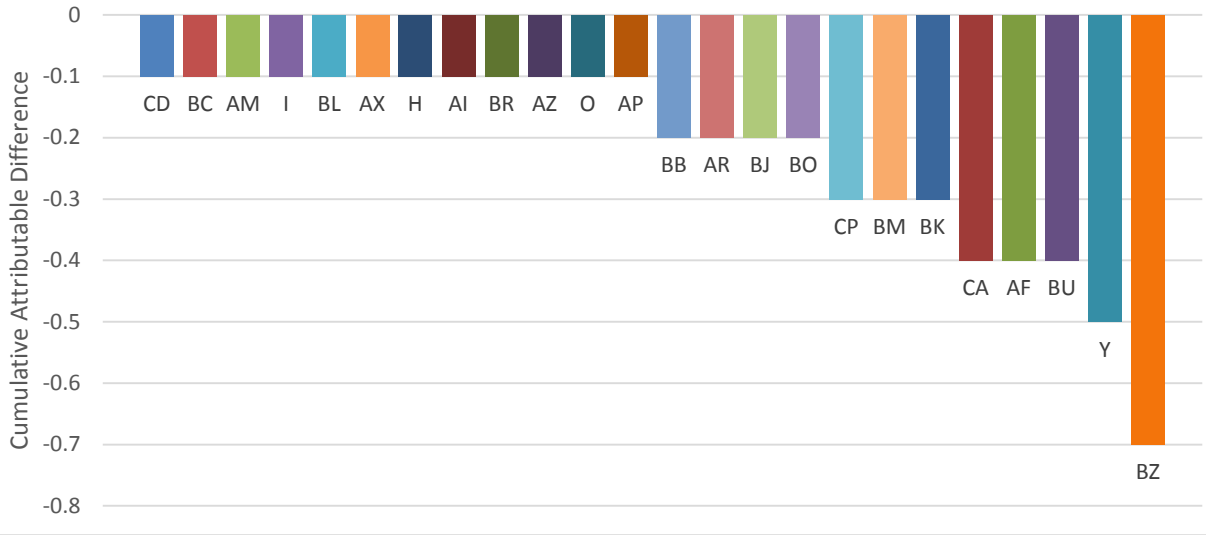


Figure A24. ICU CLABSI CAD Group 3: Facilities with the most infections prevented beyond expected

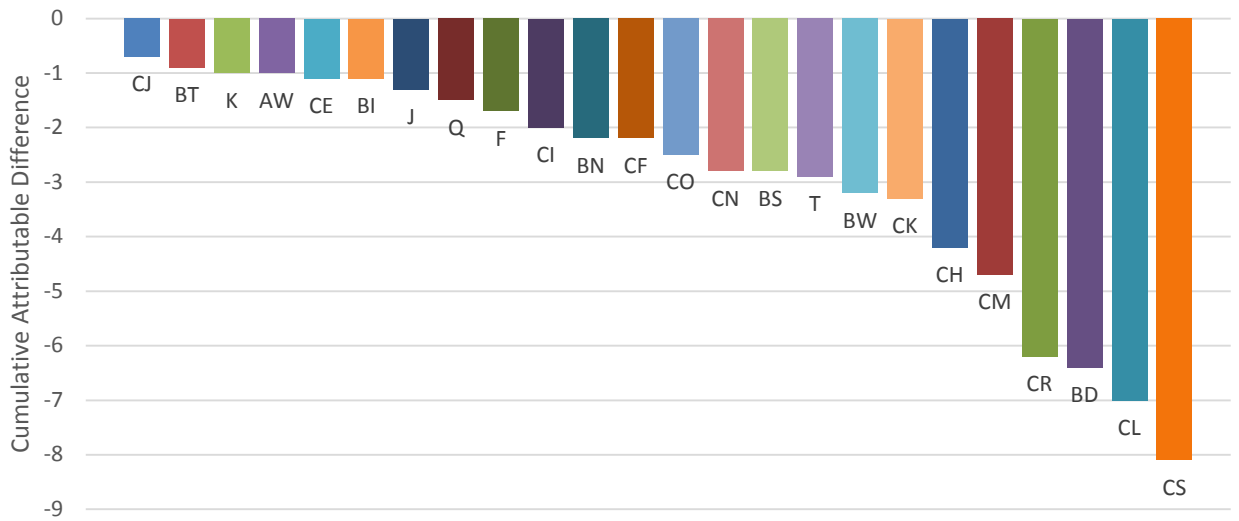


Figure A25. NICU CLABSI CAD, All Hospitals

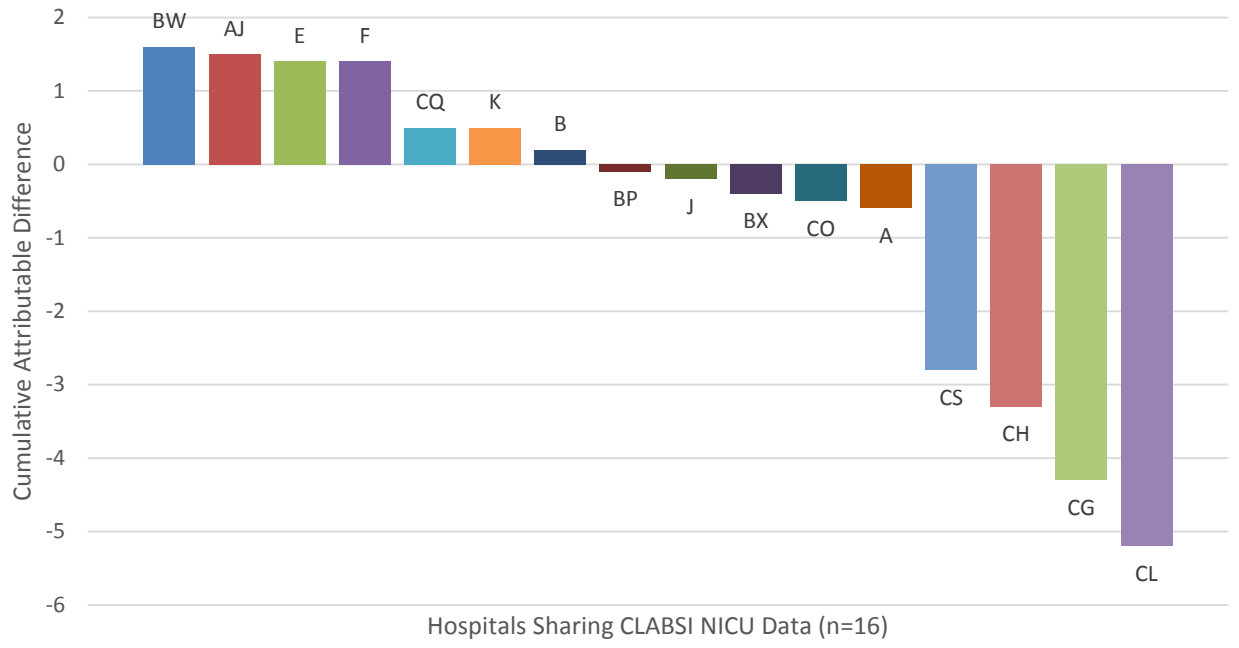


Figure A26. 2015 Ward CLABSI CAD, All Facilities

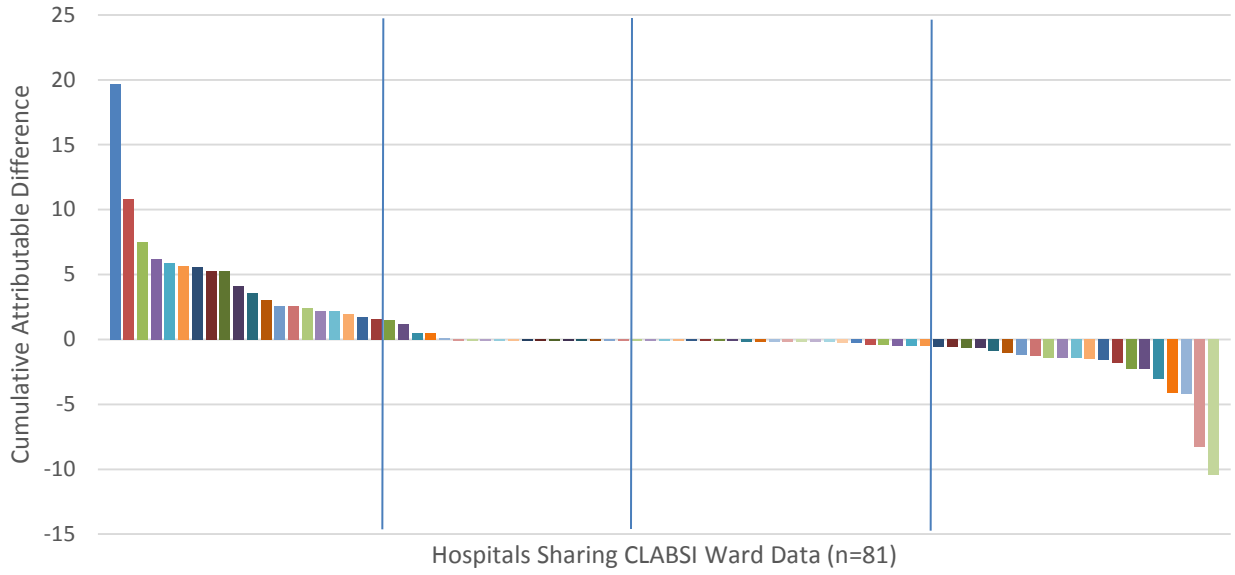


Figure A27. Ward CLABSI CAD Group 1: Facilities with the most infections needed to prevent

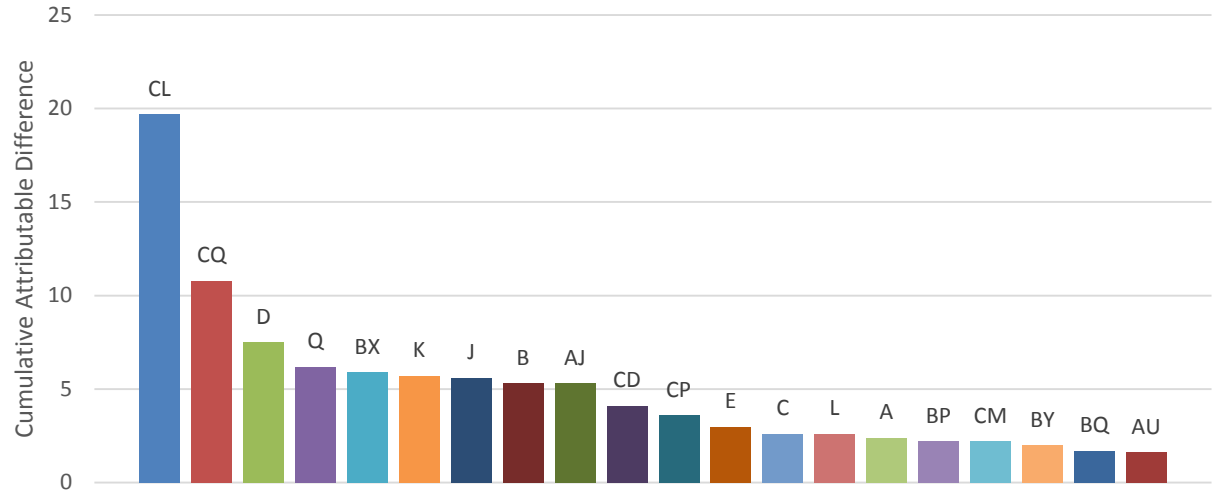


Figure A28. Ward CLABSI CAD Group 2: Facilities with the second most infections needed to prevent or the fewest infections prevented beyond expected

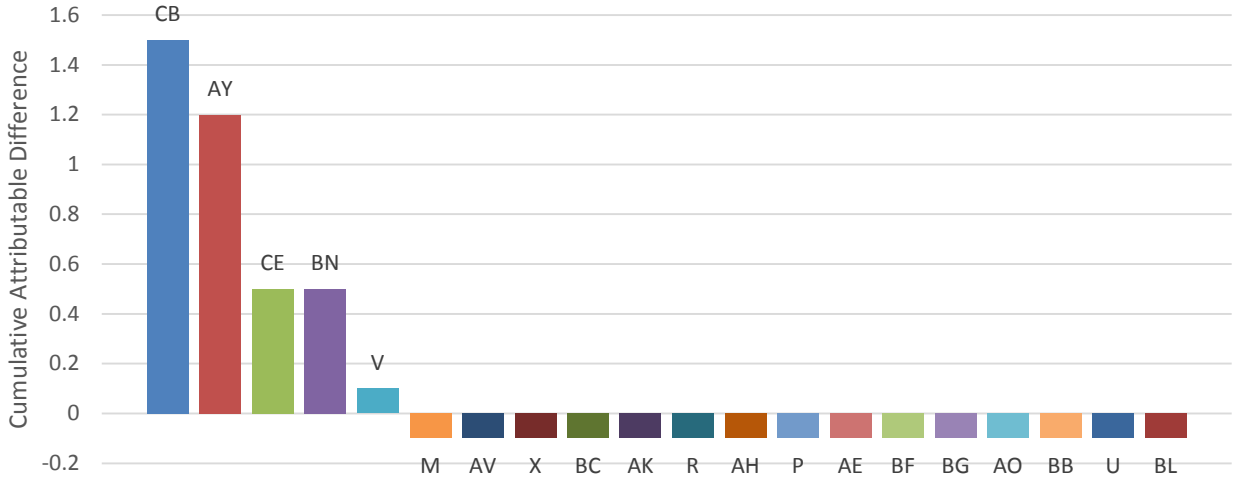


Figure A29. Ward CLABSI CAD Group 3: Facilities with the second most infections prevented beyond expected

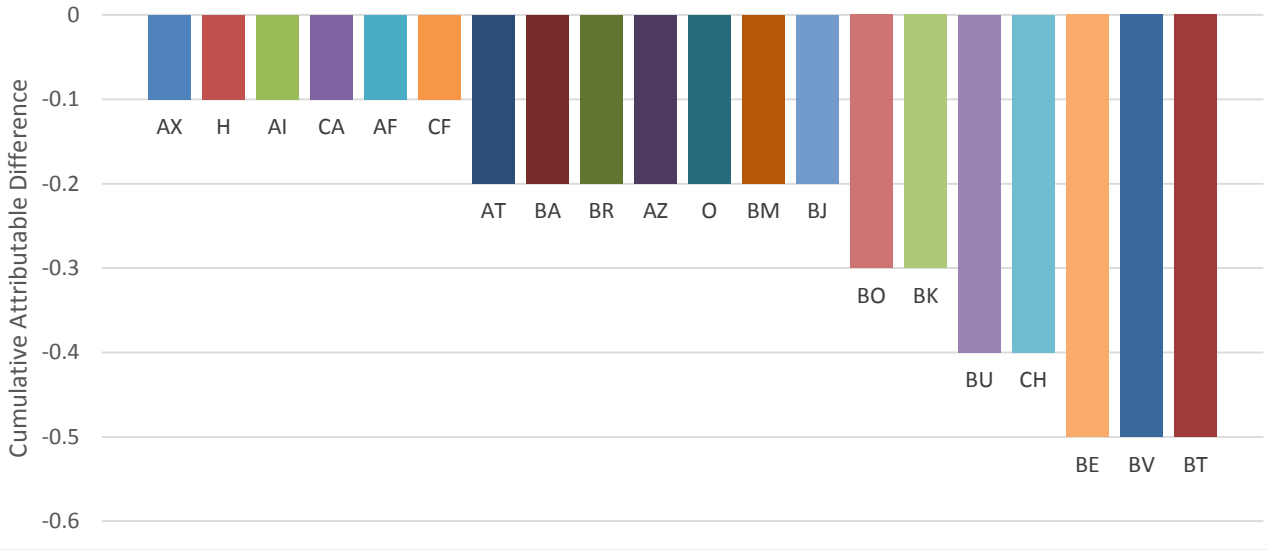


Figure A30. Ward CLABSI CAD Group 4: Facilities with the most infections prevented beyond expected

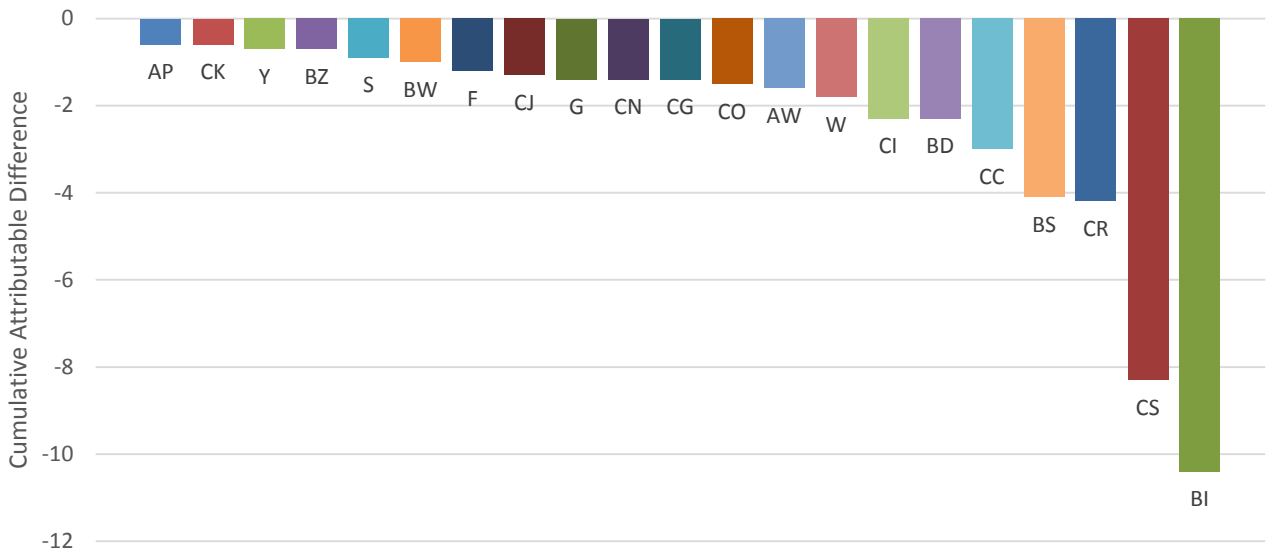


Figure A31. 2015 Facility-wide MRSA CAD, All Facilities

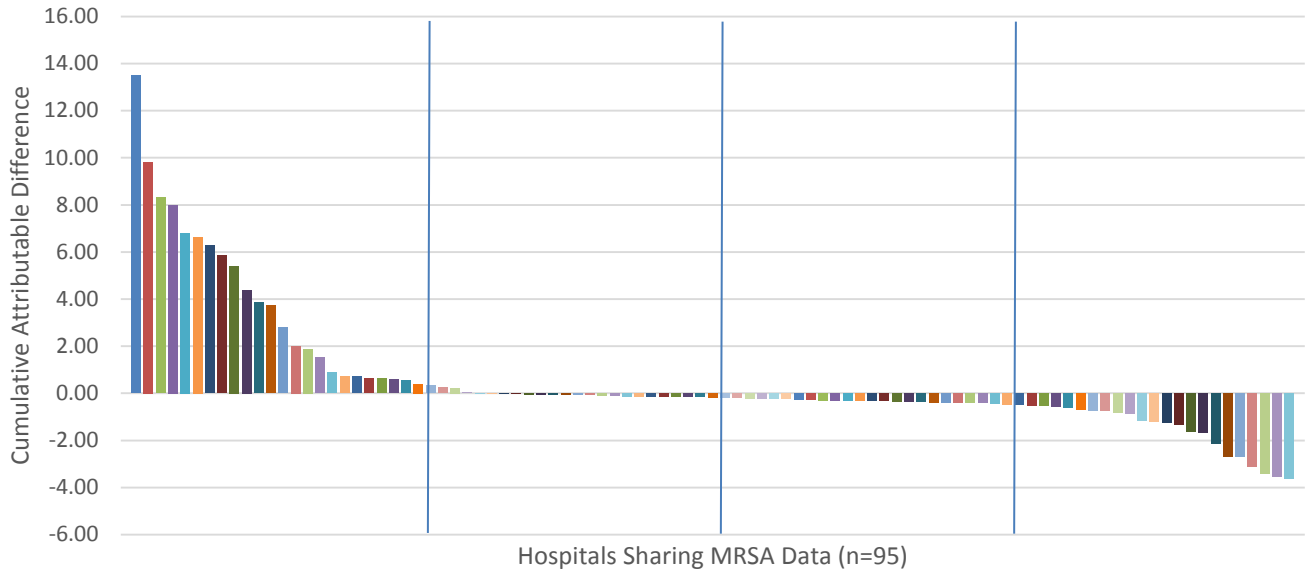


Figure A34. Facility-wide MRSA CAD Group 1: Facilities with the most infenctions needed to prevent

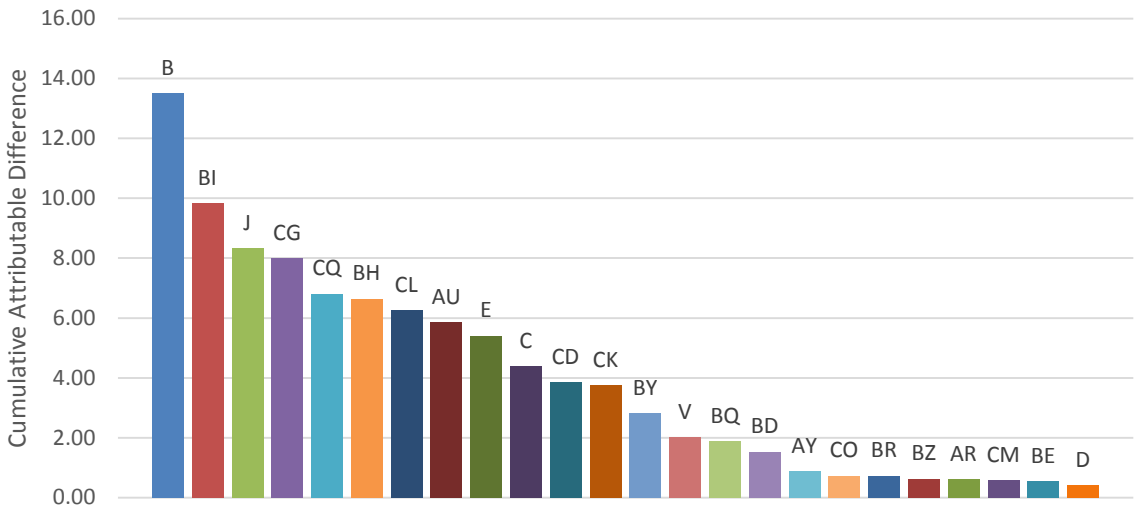


Figure A35. Facility-wide MRSA CAD Group 2: Facilities with the second most infections needed to prevent or the fewest infections prevented beyond expected

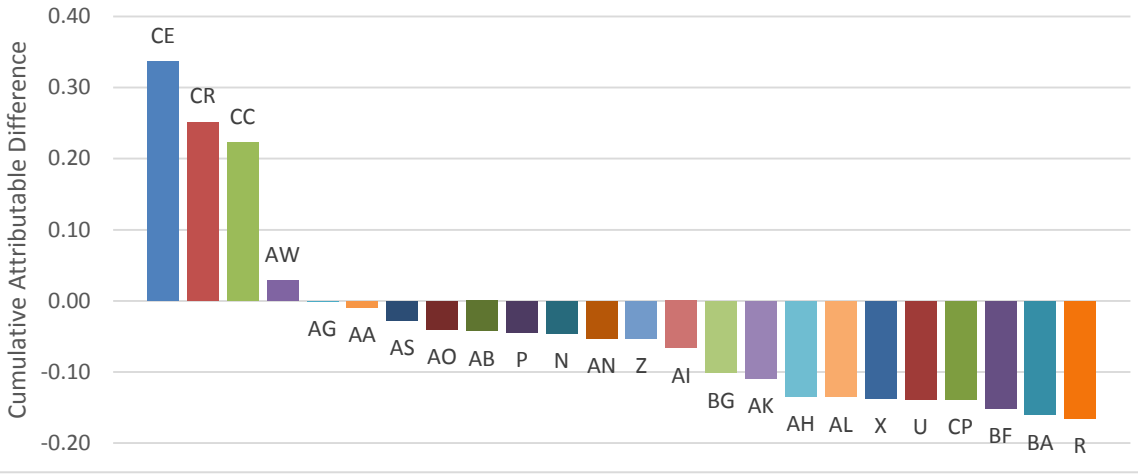


Figure A36. Facility-wide MRSA CAD Group 3: Faciltities with the second most infections prevented beyond expected

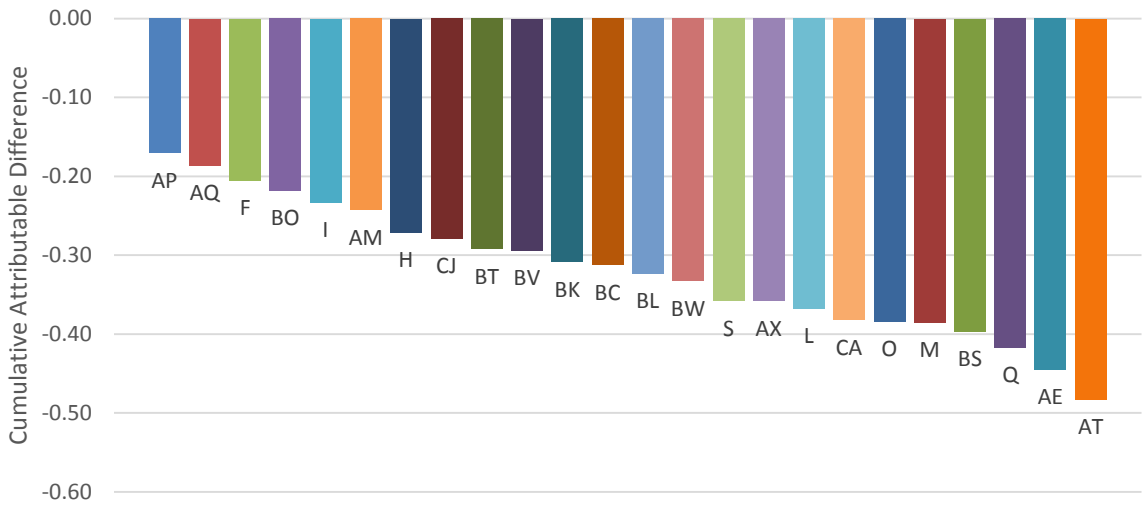


Figure A37. Facility-wide MRSA CAD Group 4: Facilities with the most infections prevented beyond expected

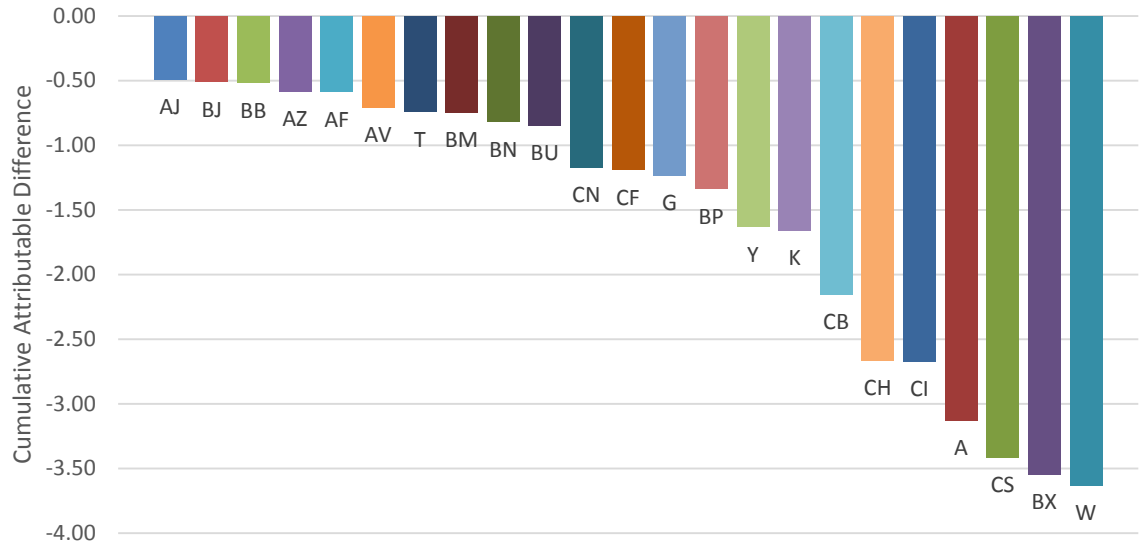


Figure A38. 2015 Facility-Wide CDI CAD, All Facilities

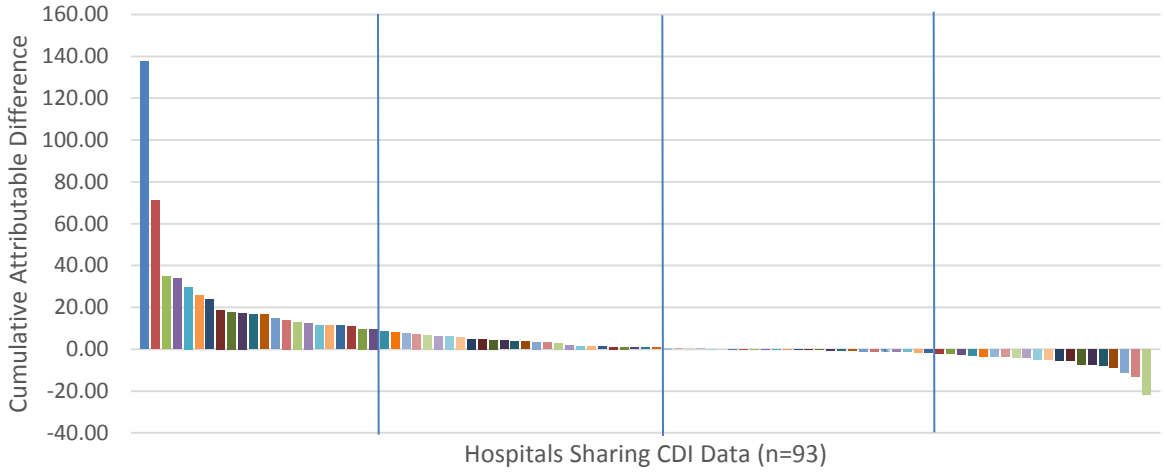


Figure A39. Facility-Wide CDI CAD Group 1: Facilities with the most infections needed to prevent

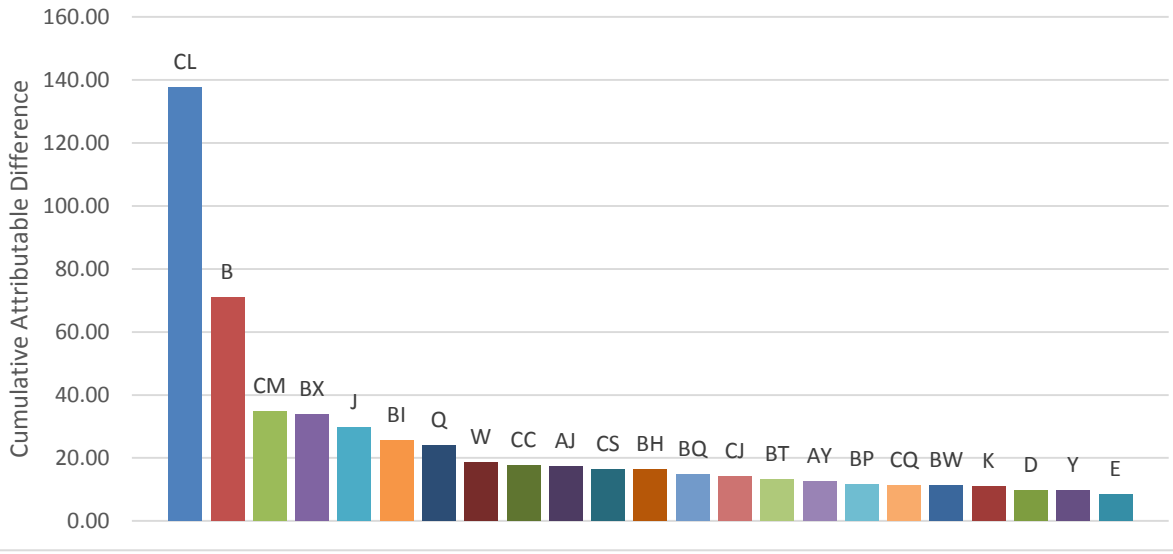


Figure A40. Facility-Wide CDI CAD Group 2: Facilities with the second most infections needed to prevent

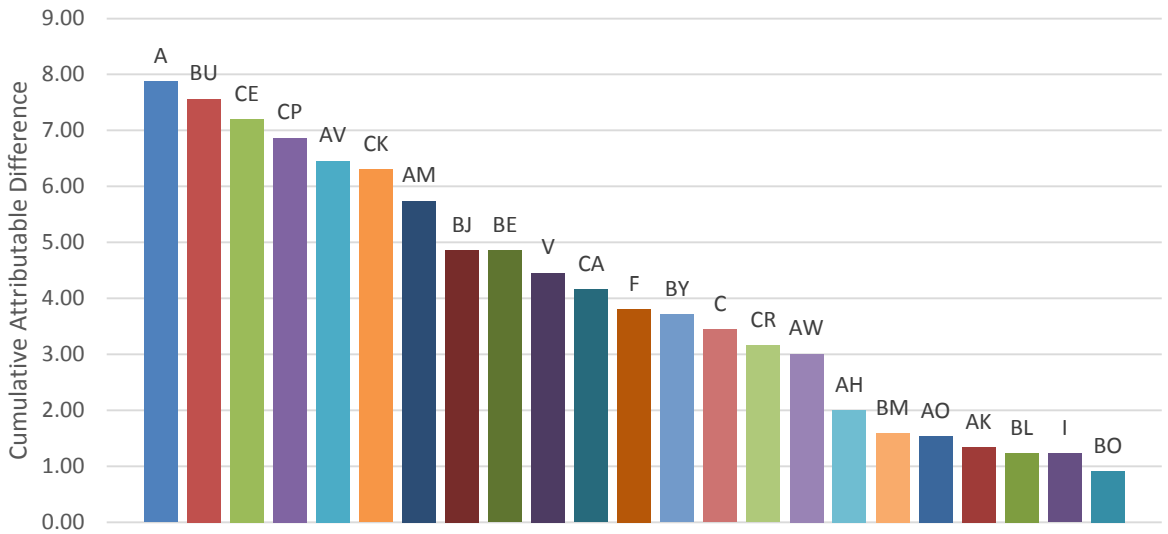


Figure A41. Facility-Wide CDI CAD Group 3: Facilities with the fewest infections needed to prevent or the second most infections prevented beyond expected

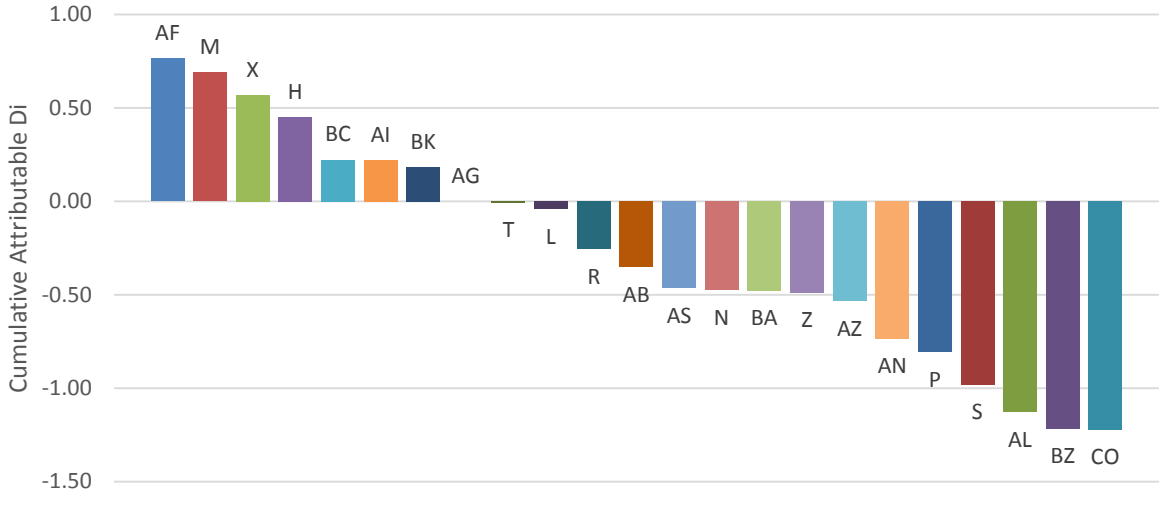


Figure A42. Facility-Wide CDI CAD Group 4: Facilities with the most infections prevented beyond expected

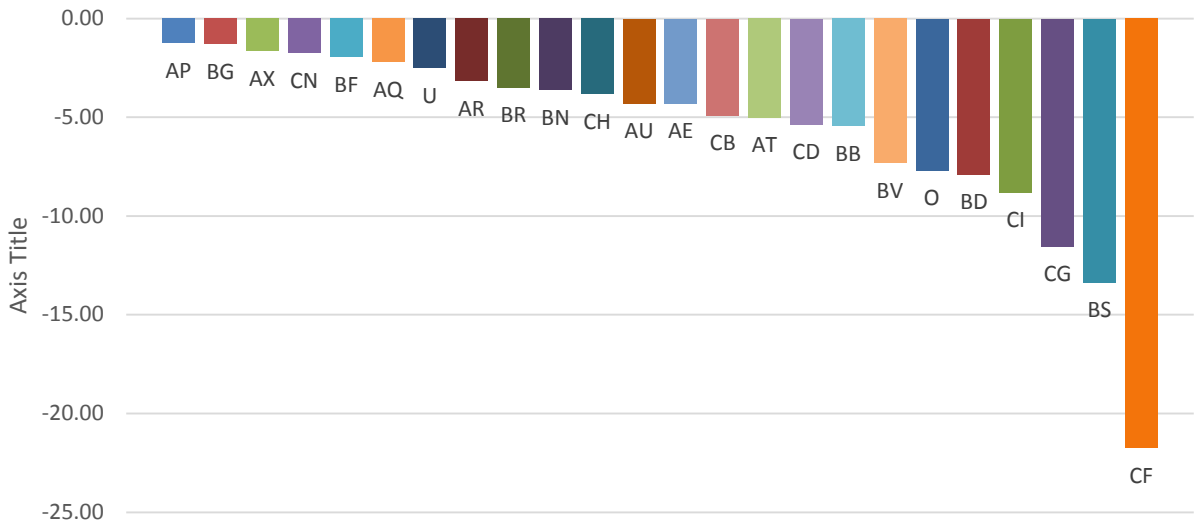


Figure A43. 2015 Facility-wide COLO CAD, All Facilities

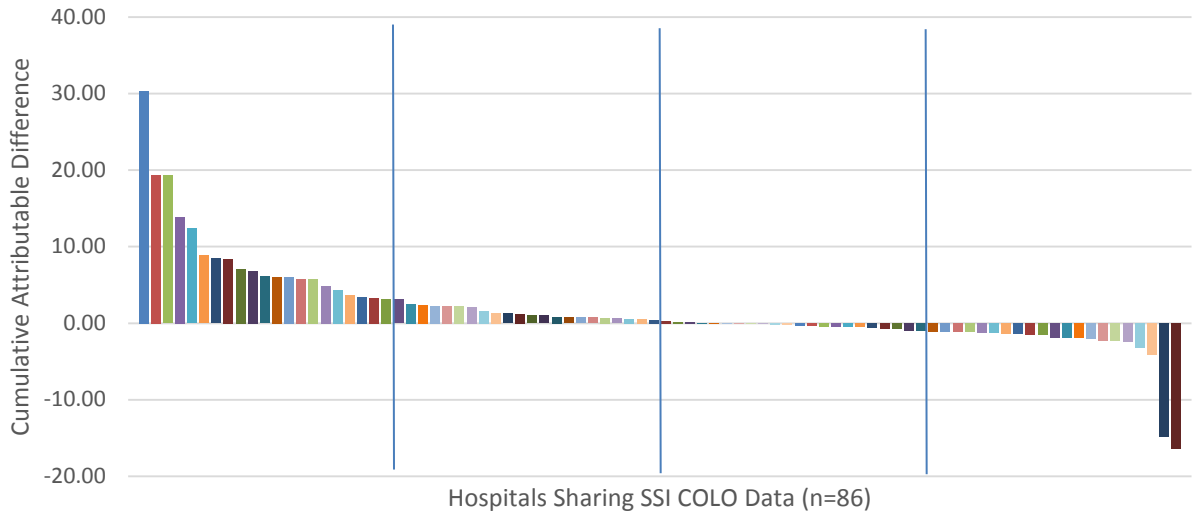


Figure A44. COLO CAD Group 1: Facilities with the most infections needed to prevent

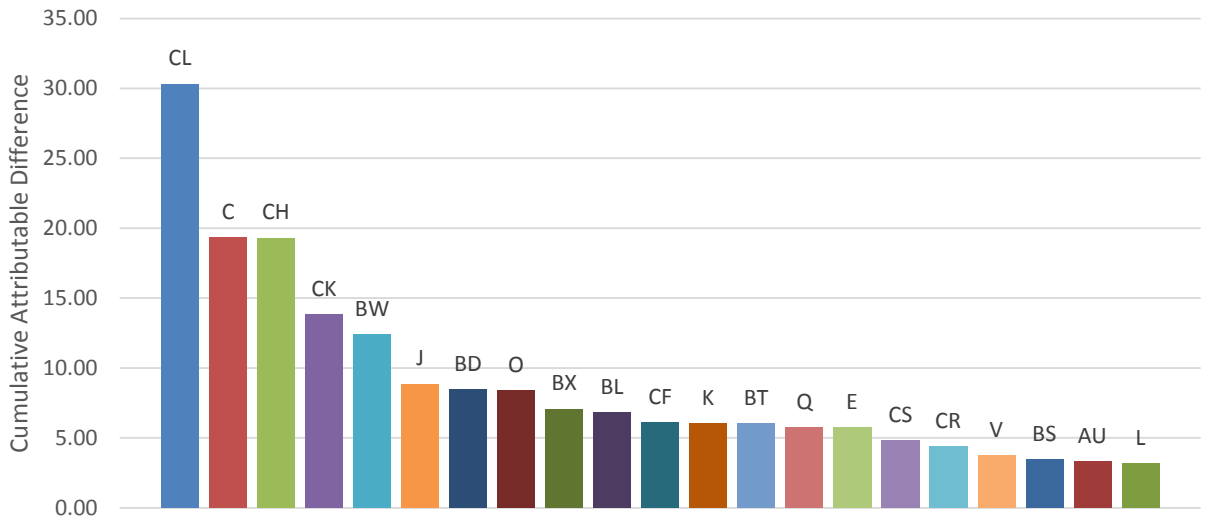


Figure A45. COLO CAD Group 2: Facilities with the second most infections needed to prevent

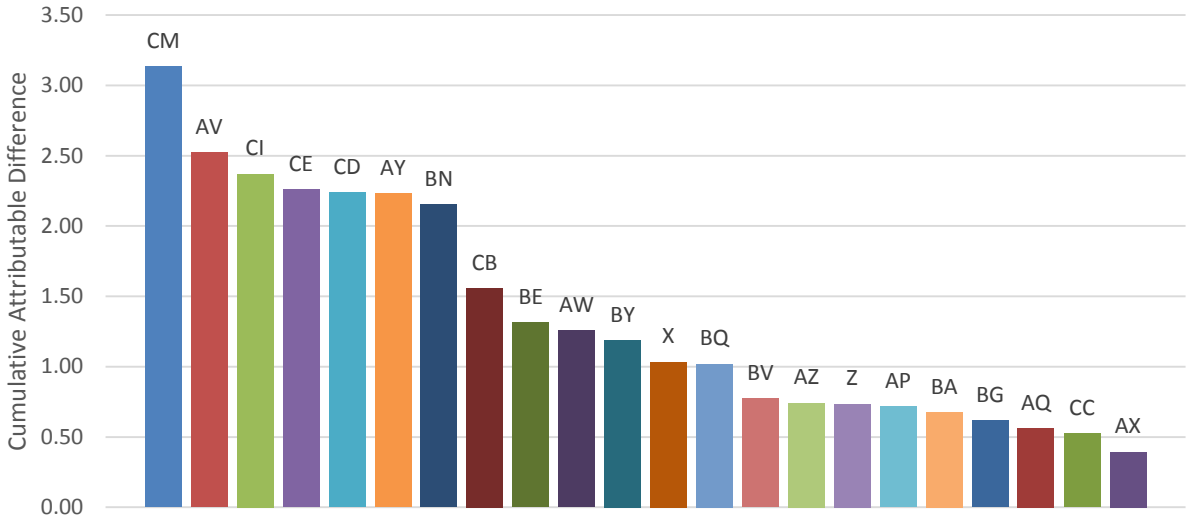


Figure A46. COLO CAD Group 3: Facilities with the fewest infections needed to prevent or the second most infectections prevented beyond expected

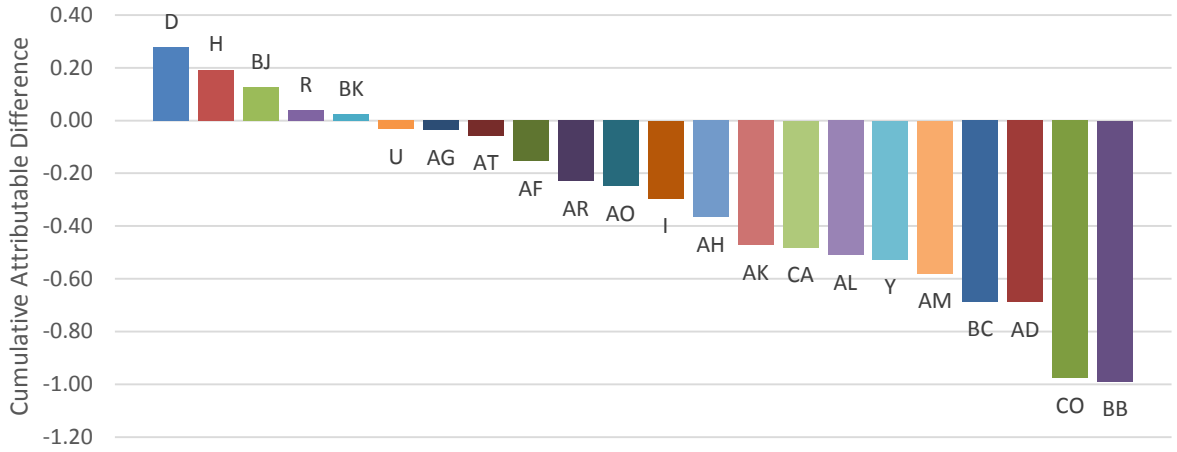


Figure A47. COLO CAD Group 4: Facilities with the most infections prevented beyond expected

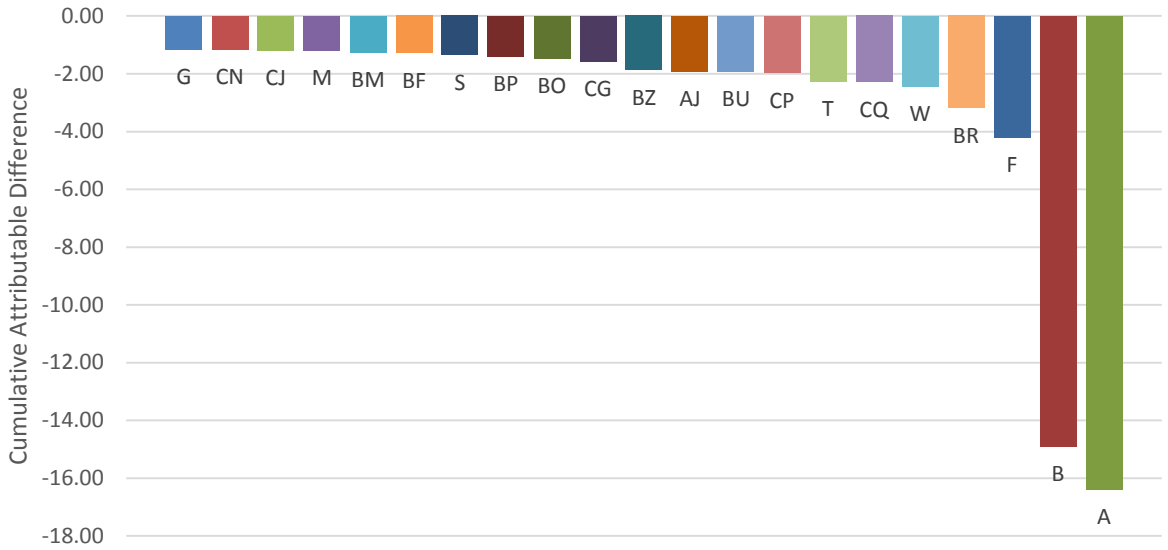


Figure A48. 2015 Facility-wide HYST CAD, All Facilities

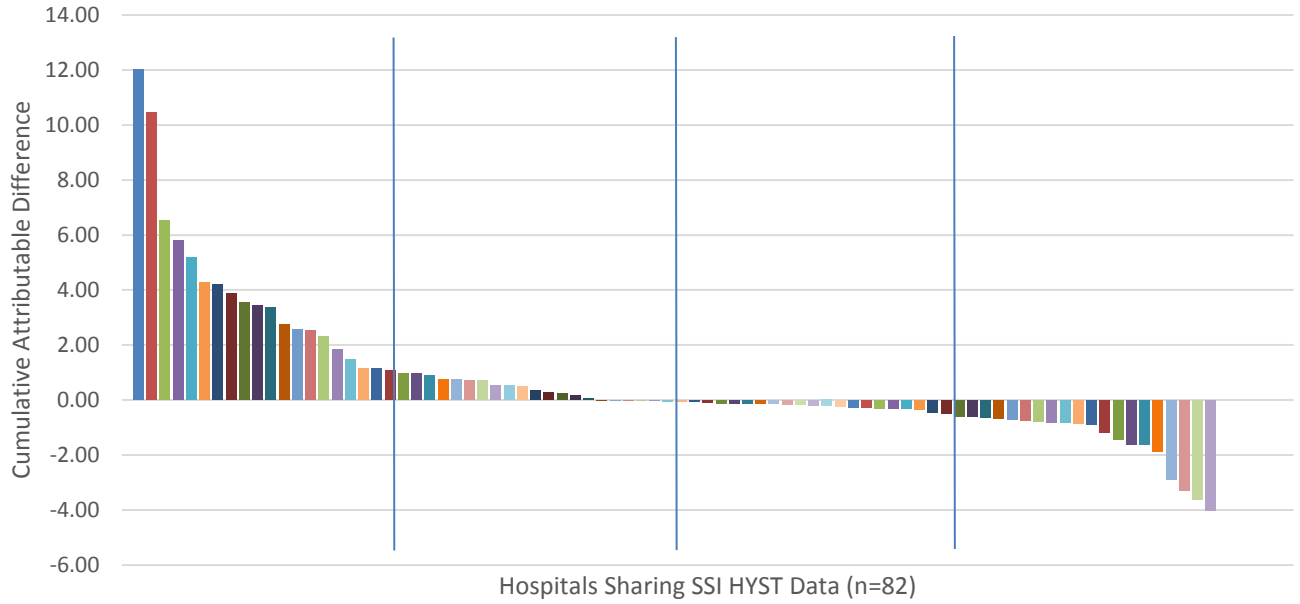


Figure A49. HYST CAD Group 1: Facilities with the most infections needed to prevent

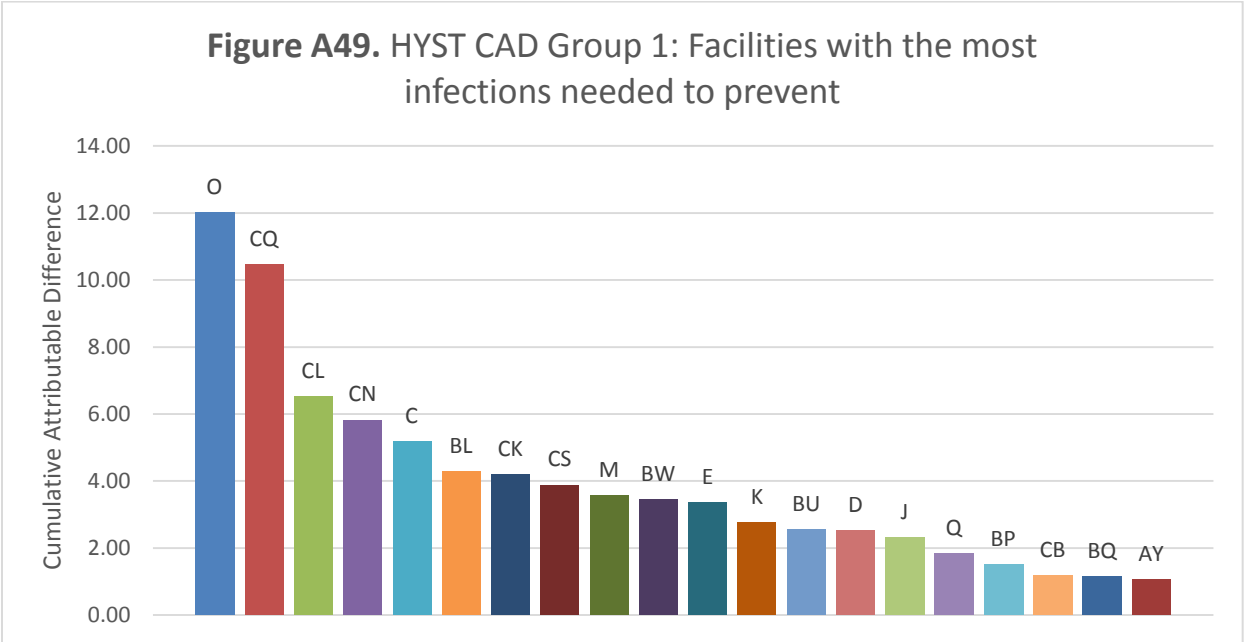


Figure A50. HYST CAD Group 2: Facilities with the second most infections deeded to prevent or the fewest infections prevented beyond expected

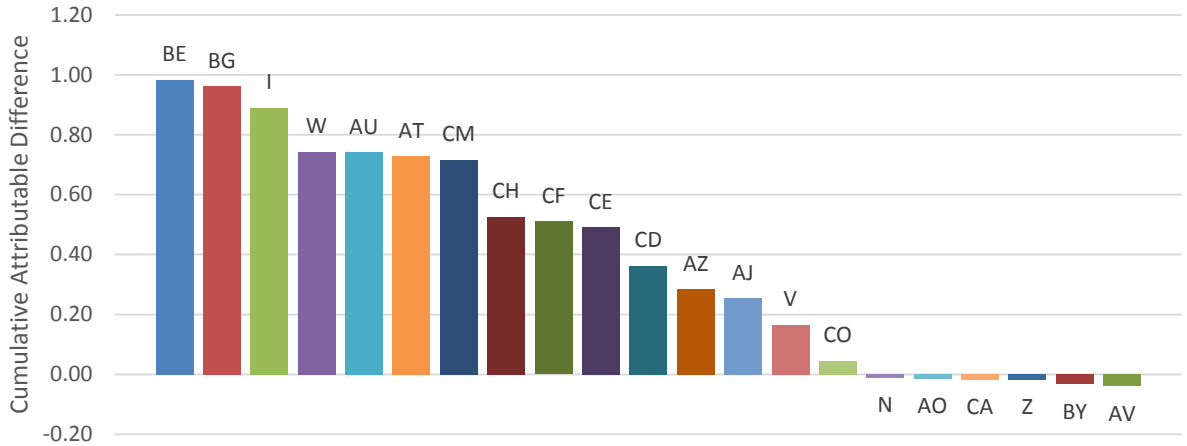
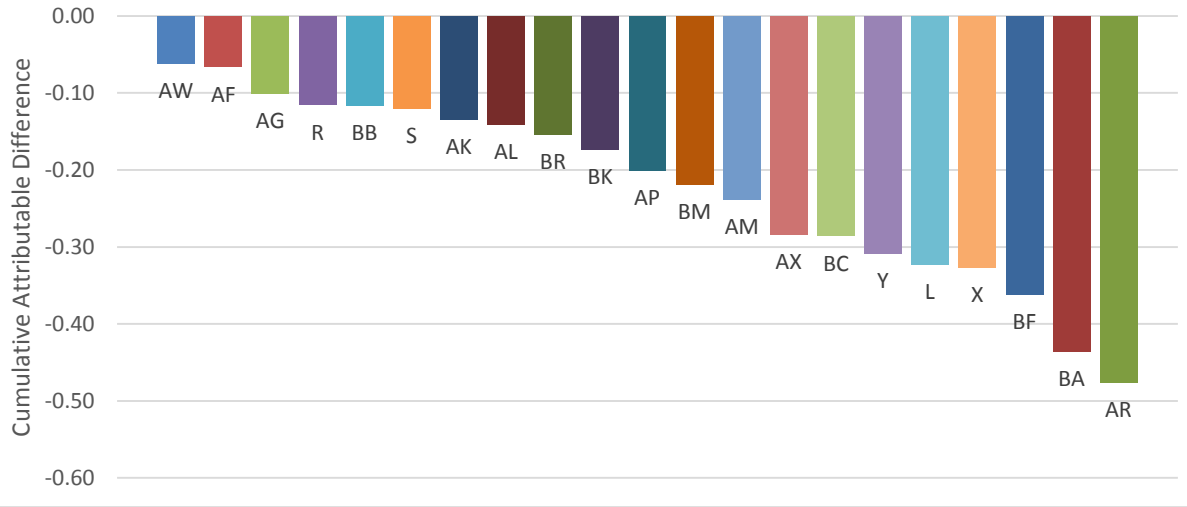


Figure A51. HYST CAD Group 3: Facilities with the second most infections prevented beyond expected



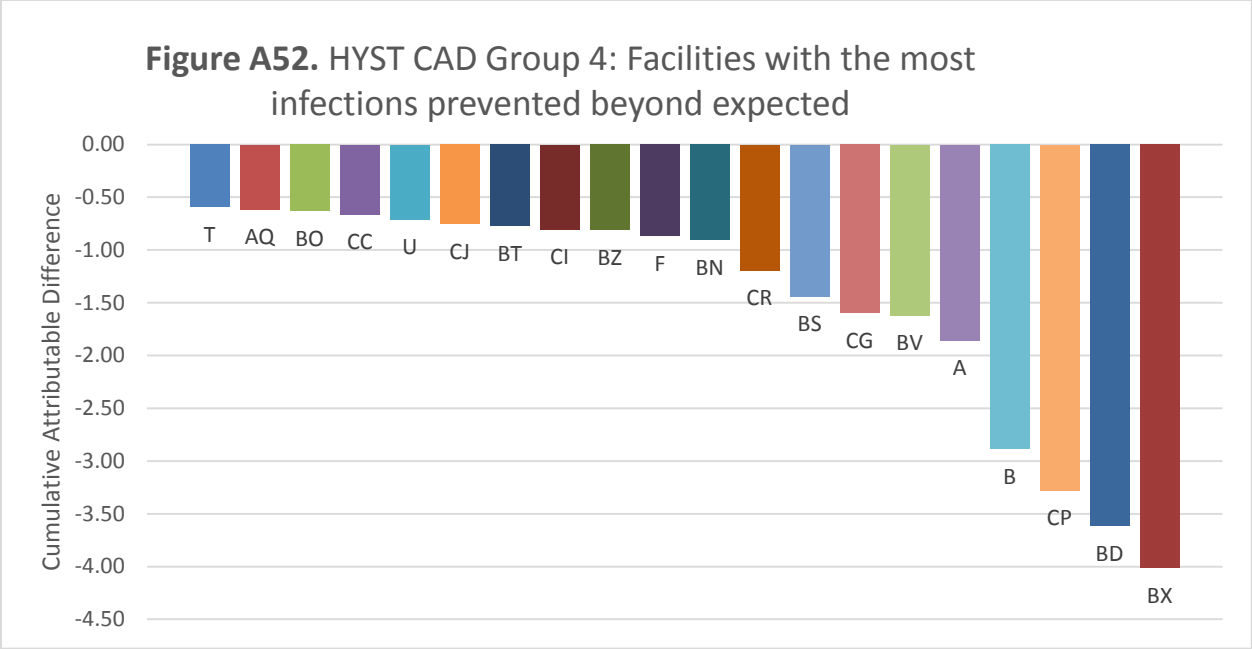


Figure A52. HYST CAD Group 4: Facilities with the most infections prevented beyond expected
Cumulative Attributable Difference
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
T
AQ
BO
CC
U
CJ
BT
CI
BZ
F
BN
CR
BS
CG
BV
A
B
CP
BD
BX