

HEALTHCARE-ASSOCIATED INFECTIONS IN MICHIGAN HOSPITALS

2014 ANNUAL REPORT

Michigan Department of Health and Human Services

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

January 1 – December 31, 2014

Data Accessed: May 27th, 2015 Report Publication: June 26th, 2015

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Introduction

This report includes statewide healthcare-associated infection (HAI) counts, rates, and ratios in Michigan from January through December, 2014. 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 (May 27th, 2015) 104 hospitals had signed a data use and confidentiality agreement (DUA) with MDHHS SHARP. At that time, all 104 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 104 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, 2014, as of the data access date (see Table 1 below), 96 hospitals had the Catheter-Associated Urinary Tract Infection (CAUTI) module in their reporting plan; of these, 87 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.”

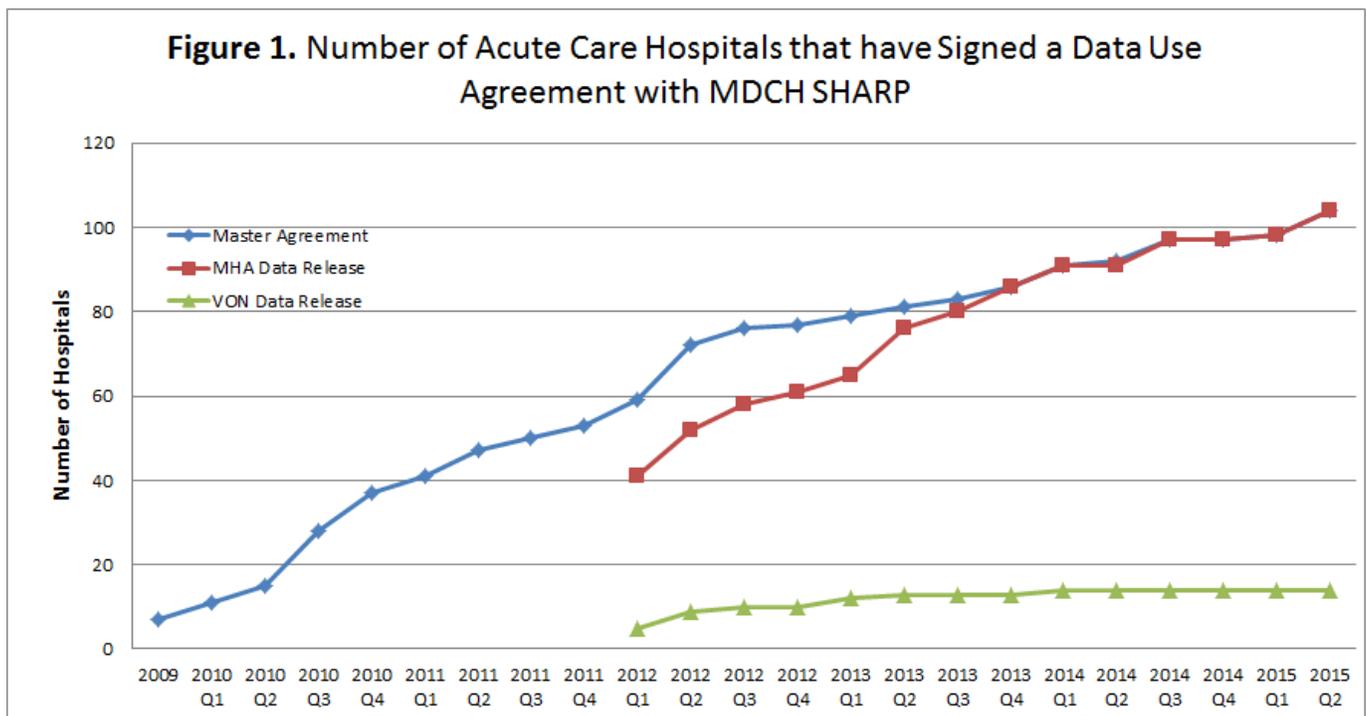
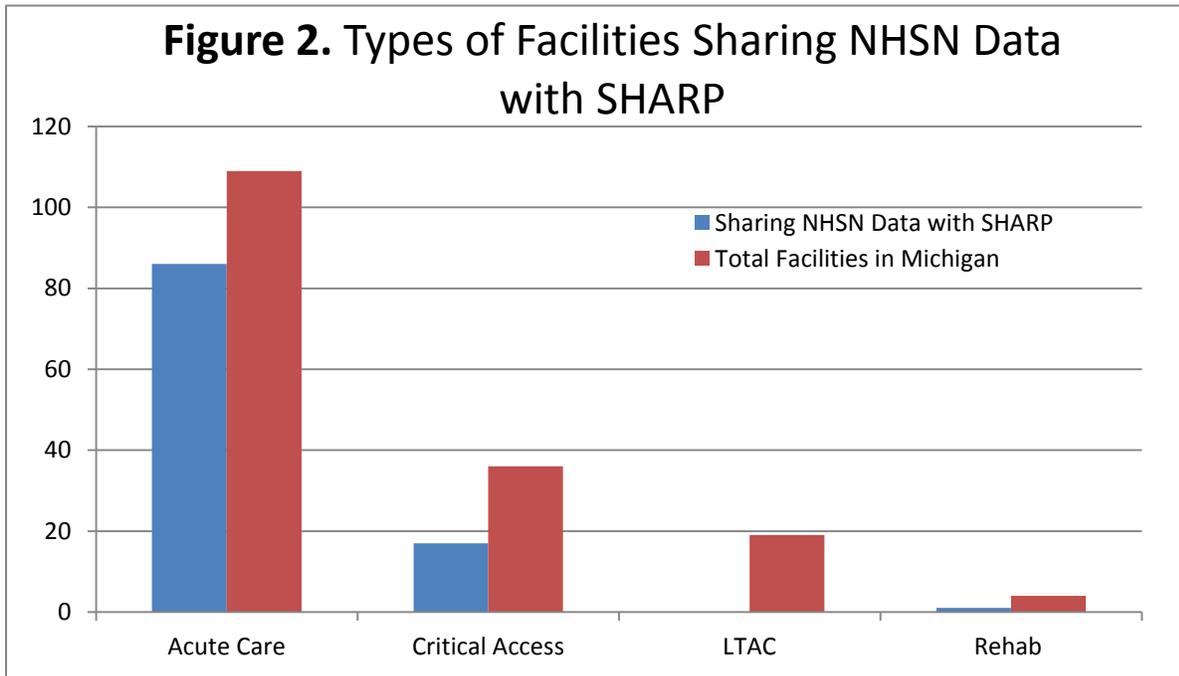


Table 1 and Figure 2 reflect the number of hospitals who have signed a DUA and conferred rights to the SHARP Unit by hospital type compared to the total of each hospital type in Michigan. Sixty-two percent of Michigan hospitals shared data with the SHARP Unit as of the data access date; 83% of participating 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 2014.

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, 83)	17(47, 16)	0(0, 0)	1(25, 0)	104 (62,100)
Michigan Total	109	36	19	4	168

Figure 2. Types of Facilities Sharing NHSN Data with SHARP



The data in Table 2 were obtained from the 2014 NHSN Annual Facility Survey completed by participating hospitals. Among the 93 facilities which completed an annual survey, hospital affiliation is relatively evenly split between teaching and non-teaching.

Table 2. Medical School Affiliation

Hospital Type	Teaching ¹	Non-teaching	Unknown	Total
Number of Facilities	53	38	2	93 ²

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

²Hospitals who have filled out a 2014 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)	11 (65)	15 (58)	16 (57)	15 (56)	13 (68)	18 (72)	7 (64)	9 (60)
Michigan Total	17	26	28	27	19	25	11	15

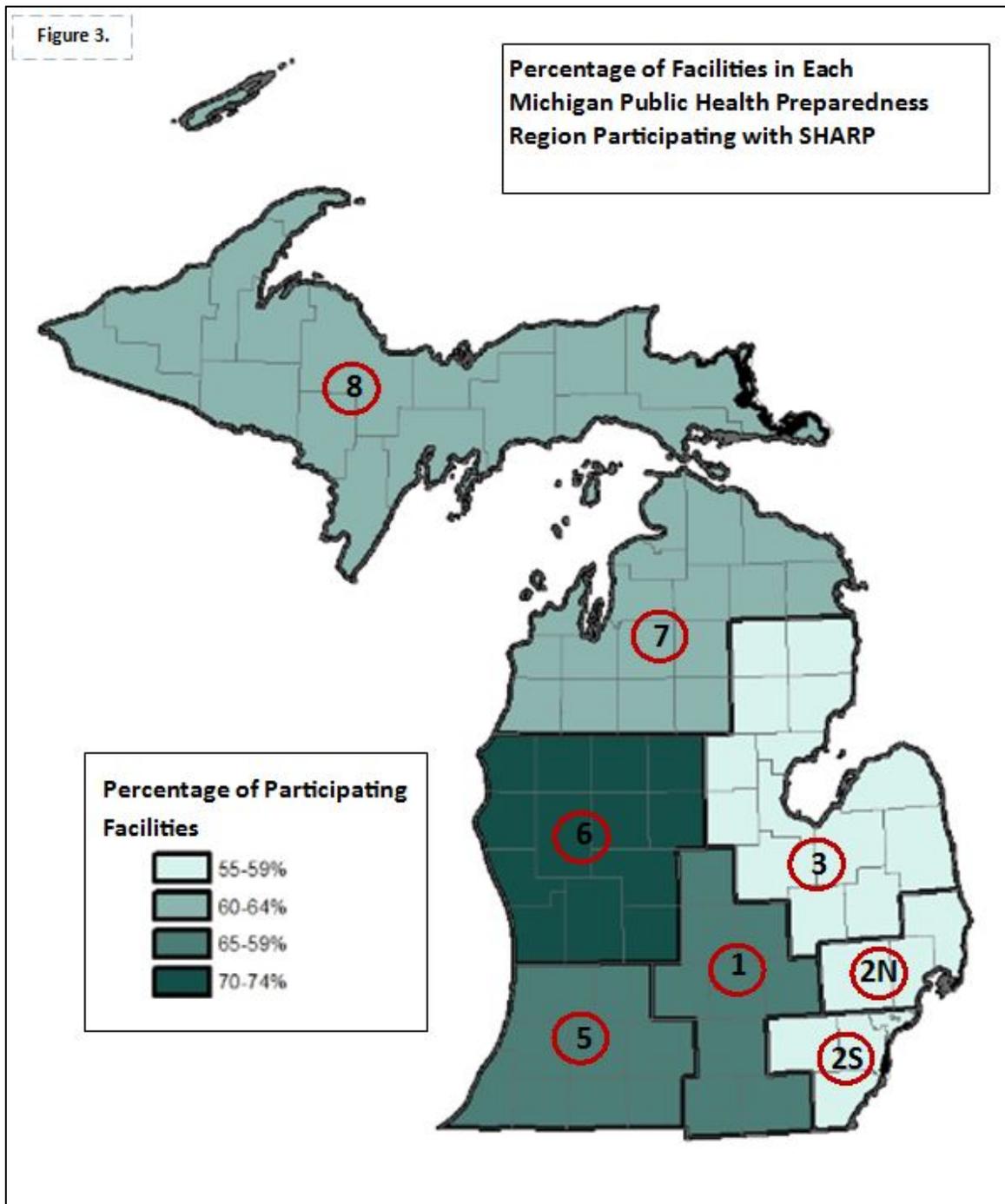


Table 4 (below) shows the number of hospitals participating in SHARP NHSN surveillance by bed size. Forty-three percent of participating hospitals had 100 beds or fewer.

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)	40 (43)	15 (16)	29 (31)	9 (10)	93 ¹

¹Hospitals who have filled out a 2014 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. Sixteen 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	90	90	18	16	71	8	9

¹FacWideIn: All Facility-Wide Inpatient locations

²ICU/CCU: Intensive Care Unit/Critical Care Unit

³NICU: Neonatal Intensive Care Unit

⁴STEP: Step-Down Unit

⁵Wards: Inpatient wards

⁶Other: All other inpatient locations, including inpatient rehab facilities, operating rooms, and locations designated as “other”

⁷Outpatient: All outpatient locations

⁸These 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 Module¹	Number of Facilities Sharing Data²
Catheter-Associated Urinary Tract Infection (CAUTI)	96	87
Clostridium difficile Infection (CDI) Laboratory-identified (LabID) Event	92	90
Methicillin-Resistant Staphylococcus aureus (MRSA) LabID³	92	90
Central Line-Associated Bloodstream Infection (CLABSI)	92	87
Surgical Site Infection (SSI)	90	86
Ventilator-Associated Events (VAE)	56	62 ⁴
Vancomycin-Resistant Enterococci (VRE) LabID	14	16
Acinetobacter LabID	8	N/A
Carbapenem-resistant Enterobacteriaceae (CRE) LabID	7	N/A
Cephalosporin Resistant Klebsiella LabID	5	N/A

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

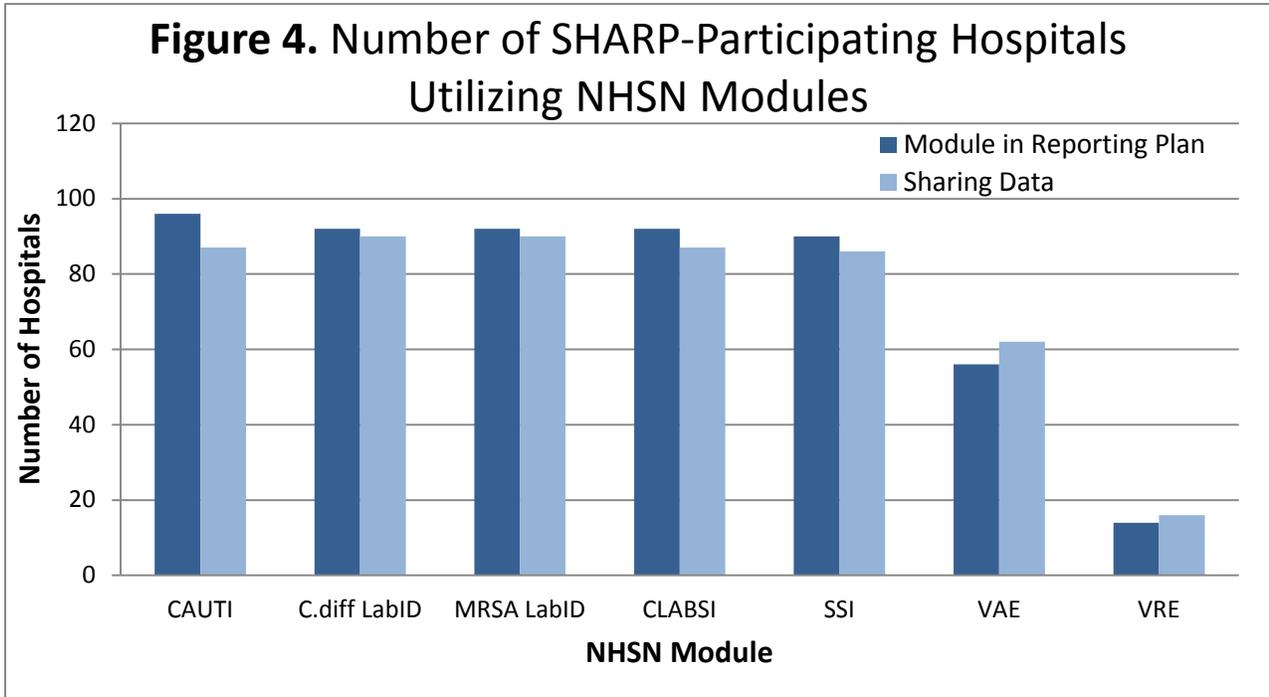
²This is the number of hospitals sharing data for the report period, as of the data access date, taken from those hospitals contributing to the SIR when available.

³MRSA LabID all specimens or blood (bld) only specimens

⁴In 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 2014. 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 2013	Cumulative Data January–December 2014
Frequency, Number		
<i>Facilities with a DUA</i> ¹	93	104
<i>Facilities reporting MRSA LabID</i> ²	87	92
<i>Facilities sharing MRSA LabID</i>	84	85
<i>Aggregated LabID Events</i>	5251	4931
Onset, Number (%)		
<i>Healthcare Facility-Onset (HO)</i>	1072 (20)	1044 (21)
<i>Community-Onset (CO)</i>	4179 (80)	3887 (79)
Specimen Source, Number (% , %HO)³		
<i>Blood</i>	1825 (35, 22)	1804 (37, 22)
<i>Sputum</i>	517 (10, 37)	434 (9, 38)
<i>Wound</i>	1171 (22, 12)	974 (20, 13)
<i>Abcess</i>	304 (6, 9)	415 (8, 8)
<i>Urine</i>	322 (6, 16)	263 (5, 14)
<i>Skin</i>	33 (1, 9)	22 (0, 9)
<i>Other</i>	1079 (21, 24)	1019 (21, 28)
Surveillance Location, Number (% , %HO)⁴		
<i>Intensive/Critical Care Unit</i>	1571 (30, 35)	1419 (29, 33)
<i>Specialty Care Area</i>	21 (0, 0)	15 (0, 20)
<i>Wards</i>	2996 (57, 17)	3038 (62, 19)
<i>Outpatient</i>	660 (13, 0)	449 (9, 0)
<i>Other, LTC, Mixed Adult, etc...</i>	-----	5 (0, 60)

¹DUA: 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.

²MRSA Lab ID: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Laboratory-Identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking laboratory results without conducting additional surveillance for infections.

³The 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.

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

Twenty-one percent of the aggregate events were considered HO, and 79% were determined to be CO. The majority of specimens were from blood sources (37%), followed by other (21%), and then wound (20%). Sputum specimens accounted for only 9% of all specimens, but 38% of these specimens were healthcare facility-onset. Over half of MRSA LabID events came from wards, although only 19% of these were HO. The location with the greatest percentage of HO events was Other (60%), followed by the ICU/CCU (33%).

Table 8 shows aggregate CDI LabID cumulative data for 2014 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 (HO and CO as described previously in the MRSA LabID section Community-onset healthcare facility-associated’ (CO-HCFA) is defined as a ‘CO LabID Event specimen collected from a patient who was discharged from the facility ≤ 4 weeks prior to specimen collection.’ It should also be noted that LabID Event data do not necessarily indicate infection, but denote a positive lab test result from a specimen collected for clinical purposes. LabID data provide a proxy for CDI prevalence.

Table 8. Cumulative Aggregate Clostridium difficile Infection (CDI)¹ LabID Data

	Cumulative Data January–December 2013	Cumulative Data January–December 2014
Frequency, Number		
<i>Facilities with DUA²</i>	93	104
<i>Facilities Reporting CDI LabID³</i>	87	92
<i>Facilities Sharing CDI LabID</i>	85	90
<i>Aggregated LabID Events</i>	9784	10170
Onset, Number (%)		
<i>Healthcare Facility-Onset (HO)</i>	3599 (37)	3720 (37)
<i>Community-Onset Healthcare Facility-Associated (CO-HCFA)</i>	1850 (19)	1769 (17)
<i>Community-Onset (CO)</i>	4335 (44)	4681 (46)
Previous CDI, Number (%)		
<i>Previously Positive</i>	1104 (11)	1437 (14)
<i>CDI assay, recurrent</i>	538 (6)	575 (6)
Surveillance Location, Number (% , %HO)⁴		
<i>Intensive/Critical Care Unit</i>	2323 (24, 45)	2426 (24, 45)
<i>Specialty Care Area</i>	11 (0, 27)	25 (0, 48)
<i>Wards</i>	7003 (72, 36)	7311 (72, 36)
<i>Outpatient</i>	421 (4, 0)	385 (4, 0)
<i>Other, LTC, Mixed Adult, etc...</i>	22 (0, 32)	14 (0, 36)

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

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

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

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

The distributions of CDI LabID events remained stable throughout 2014. Thirty-seven percent of events were HO, 17% CO-HCFA, and 46% 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 (45%) of HO events was the ICU/CCU.

Cumulative Annual Aggregate Rates

Table 9 provides the 2014 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	90	4,313 LabID	4,913,635	1,140,970 Admits	0.878↓	0.378↓
MRSA Bacteremia LabID ⁵	90	1,667 LabID	4,913,635	1,140,970 Admits	0.339	0.146
MRSA Outpatient LabID ⁶	10	265 LabID	-----	308,613 Encounters	-----	0.0859↓

Michigan Data

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

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

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

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

⁴The number of 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.

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

⁶MRSA 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.

The 2014 annual Michigan MRSA inpatient LabID rate was 0.878 events per 1,000 patient-days, which showed a significant decrease from the last annual report LabID rate of 0.9321 ($p=0.005$). 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 0.378 per 100 patient admissions, significantly less than the previous annual inpatient MRSA prevalence rate of 0.3987 per 100 patient days ($p=0.0126$). The annual Michigan Outpatient MRSA prevalence rate significantly decreased from 0.1248 to 0.0859 ($p<0.0001$). MRSA bacteremia LabID event rates did not differ significantly when compared to 2013. 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 2014 annual report. The MRSA bacteremia LabID event rate has only been available since the 2013 annual report.

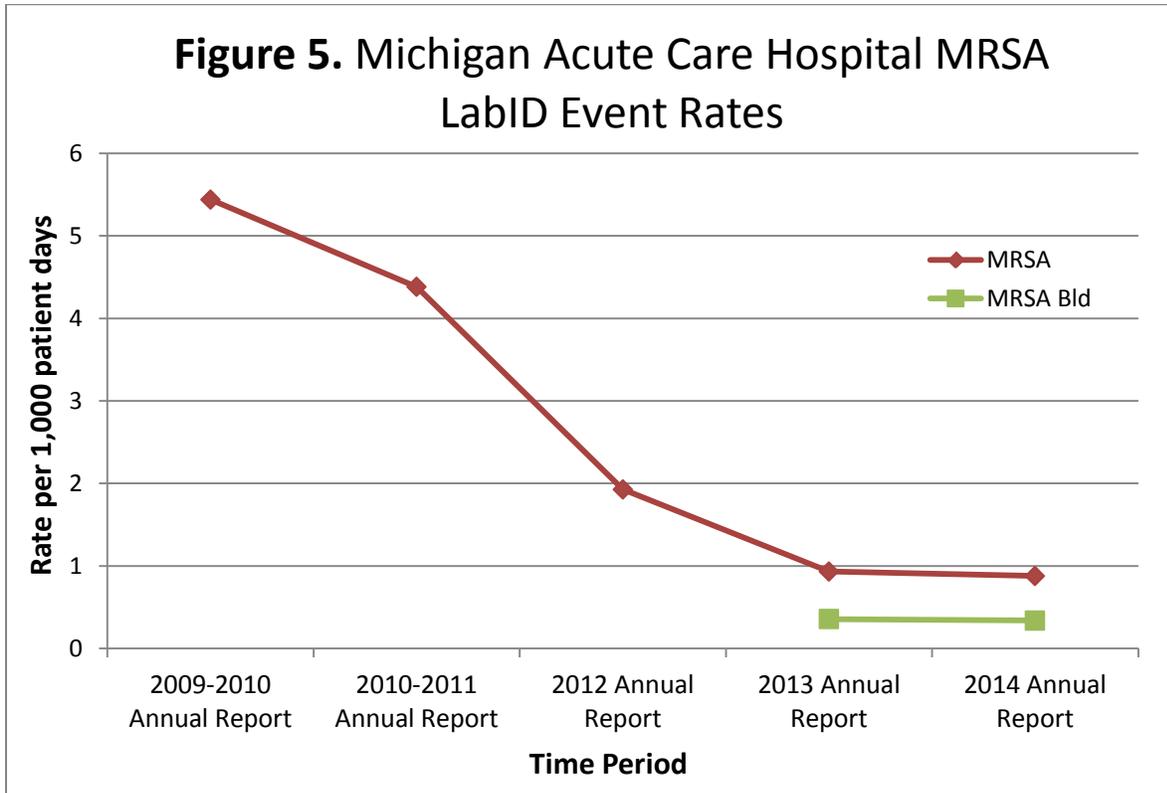


Table 10 stratifies Michigan inpatient MRSA LabID rates by onset for all specimens as well as bacteremia specimens. HO events occur when the LabID specimen was collected on or after day 4 of admission to the facility. Because they are incident events, only a MRSA incidence rate can be calculated. CO 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 LabID¹ 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	820 (20) LabID	4,913,635	-----	0.1669	-----
		337 (20) Bld LabID ⁷	4,913,635	-----	0.0686	-----
90	CO	3,368 (80) LabID	-----	1,140,970	-----	0.2952↓
		1,320 (80) Bld LabID	-----	1,140,970	-----	0.1157

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 0.1669 per 1,000 patient days and the annual HO bacteremia incidence rate was 0.0686 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 0.2952 per 100 admissions, which was significantly lower than the previous annual CO prevalence rate of 0.3103 (p=0.039), and the annual CO bacteremia prevalence rate was 0.1157 per 100 admissions. 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 (80%) of inpatient MRSA LabID events were CO. The graphical display of the annual distributions can be seen in Figure 6 (below). From the 2013 annual report to the 2014 annual report, the ratio of HO to CO events remained similar. However, within HO events, the percentage of bacteremia specimens decreased, while the percentage of all other specimen types increased. The same trend was observed within CO events as well.

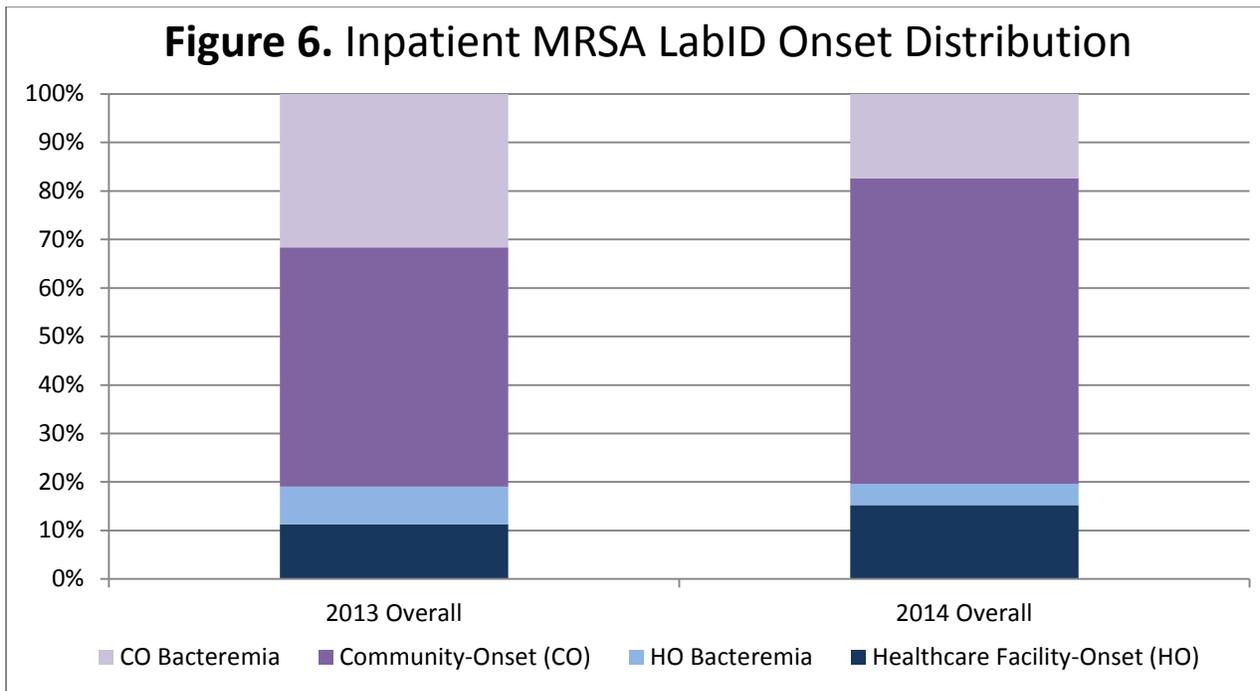


Table 11 provides the annual Michigan inpatient CDI rate and CDI prevalence rate along with the CDI outpatient LabID rate and the CDI surveillance rate. Note that CDI LabID event data do not necessarily indicate infection but denote a positive lab test result from a specimen collected for clinical purposes. LabID Event data provide a proxy measure for *C. difficile* prevalence.

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	90	9,595 LabID	4,590,673	1,052,890 Admits	20.901	0.911
CDI Outpatient LabID ⁵	9	281 LabID	-----	280,740 Encounters	-----	0.100 [↑]

Michigan Data

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

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

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

³CDI 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.

⁴There 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.

⁵CDI 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.

The 2014 annual CDI rate increased from 20.778 to 20.901 per 10,000 patient days, and the prevalence rate increased from 0.8878 to 0.911 per 100 admissions from the previous annual report but neither differed significantly. The CDI outpatient prevalence rate increased significantly from 0.0762 to 0.100 per 100 admissions (p=0.001).

Figure 7 shows the overall CDI LabID event rate trends from the last four 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.

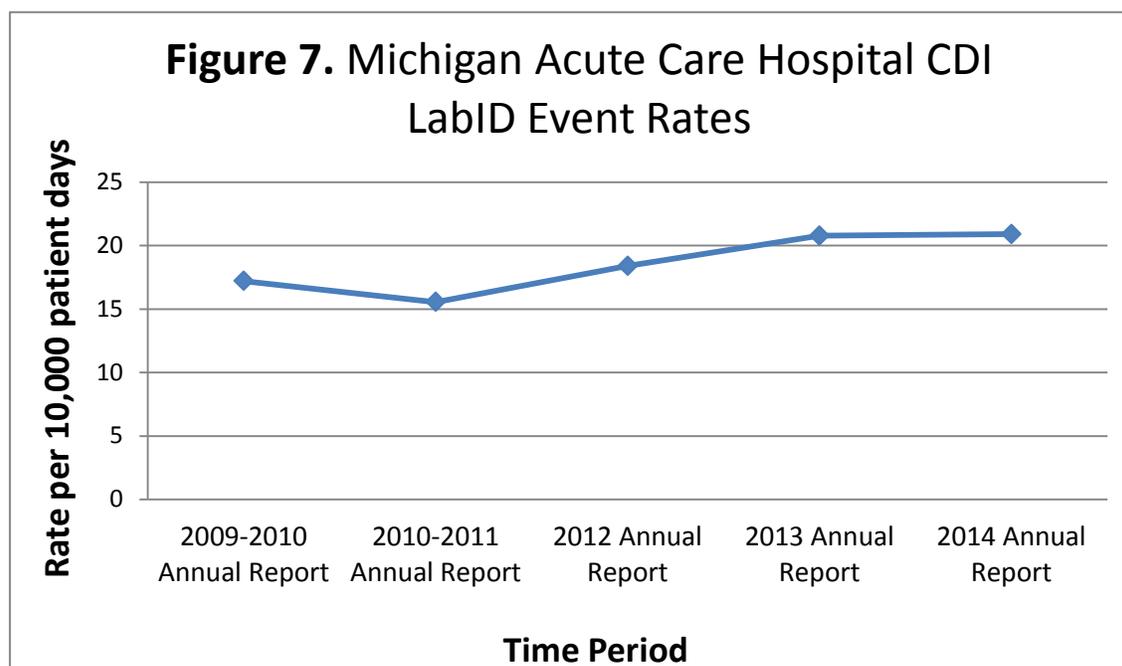


Table 12 provides inpatient CDI LabID rates stratified by onset.

Table 12. Michigan CDI LabID¹ 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	3,538LabID	4,590,673	-----	7.7069	-----	37
90	CO-HCFA	1,666LabID	-----	1,052,890	-----	0.1582	18
90	CO	4,321LabID	-----	1,052,890	-----	0.4104↑	45

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.

²HO: Healthcare facility-onset

³HO 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.

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

⁵CO/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 7.7069 per 10,000 patient days, which was not significantly different 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 increased significantly from 0.3835 to 0.4104 per 100 admissions (p=0.002), and the CDI CO-HCFA Prevalence rate was 0.1582 per 100 admissions, which was not significantly different 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 (45%) of inpatient CDI LabID events were CO, followed by HO (37%). The remaining 18% were CO-HCFA. This is very similar to the 2013 annual report. The graphical display of this can be seen below in Figure 8.

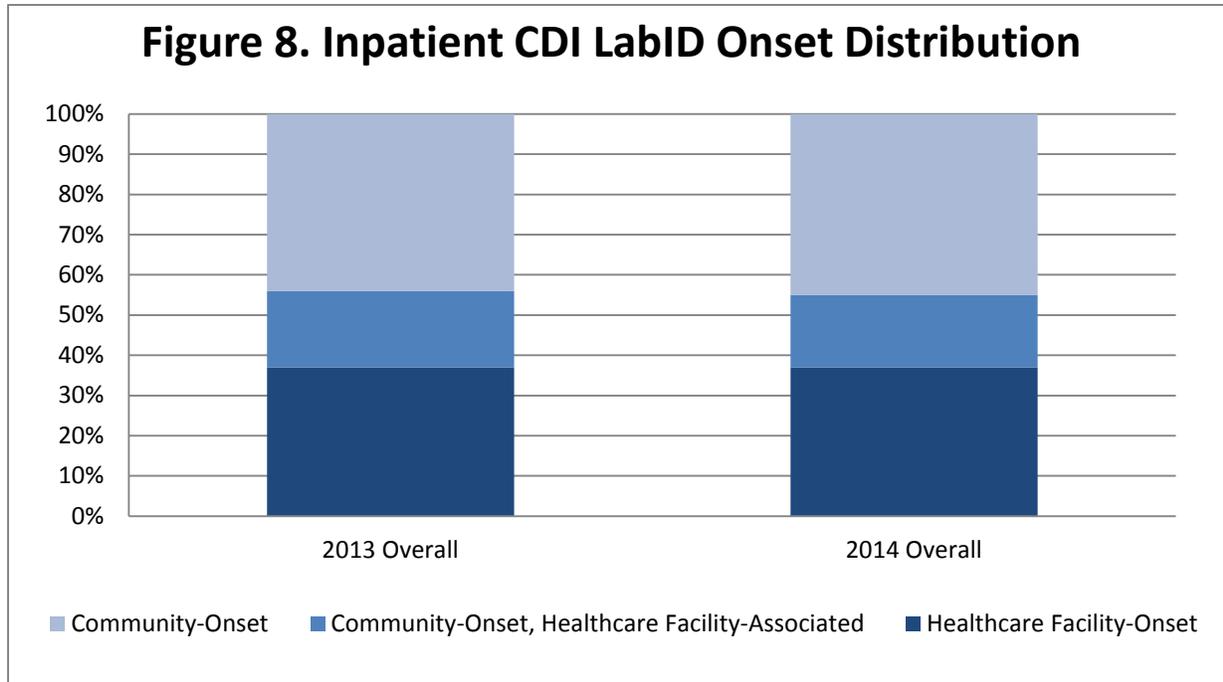


Table 13 shows the inpatient Vancomycin-Resistant Enterococcus (VRE) LabID rates and the outpatient VRE LabID rate. As with MRSA and CDI, there is no comparative national rate for VRE.

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	16	841 LabID	691,547	160,740	1.216↑	0.523↑
VRE Outpatient LabID	3	34 LabID	-----	87,814	-----	0.0387↑

Michigan Rate

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

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

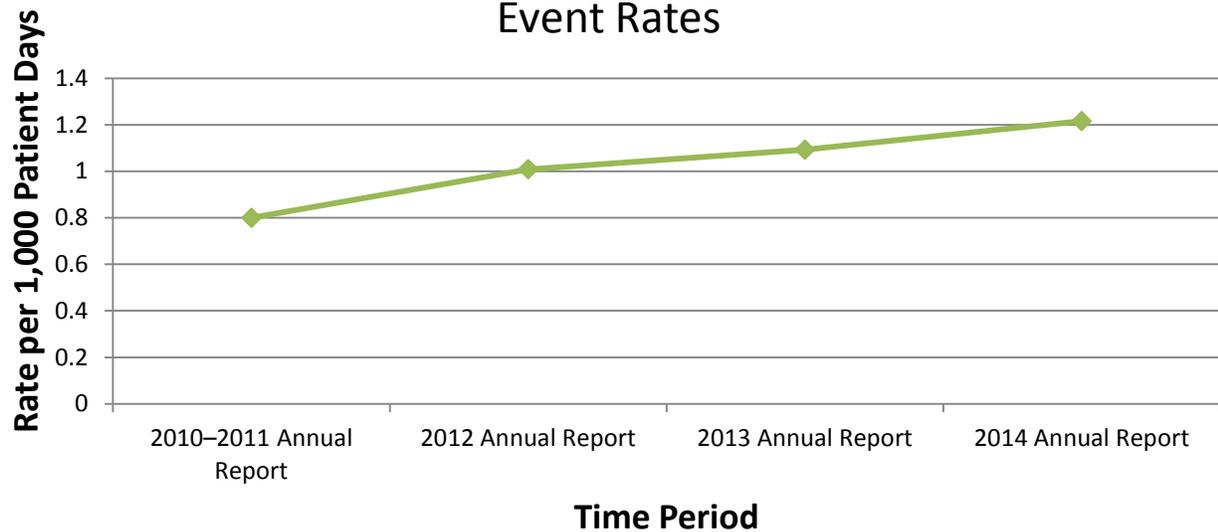
²VRE Prevalence Rate. This is the number of VRE LabID Events per 100 patients admitted.

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

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

The VRE Inpatient Rate significantly increased from 1.0925 to 1.216 per 1,000 patient days ($p=0.0333$), and the prevalence rate significantly increased as well from 0.4602 to 0.523 per 100 admissions ($p=0.0108$). The VRE Outpatient prevalence rate also significantly increased from 0.0138 to 0.0387 per 100 admissions ($p<0.0001$). The trend graph for VRE can be found in Figure 9.

Figure 9. Michigan Acute Care Hospital VRE LabID Event Rates



LabID Standardized Infection Ratios (SIRs)

Table 14 shows the 2014 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. **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	88	4,863,390	337	367.585	0.917	0.1135	0.823, 1.019
<i>C.diff</i> LabID ⁶	88	4,517,784	3,490	3,738.238	0.934	<0.0001	0.903, 0.965

 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)

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

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

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

⁴95% 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.

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

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

The annual MRSA bacteremia LabID SIR was 0.917, which means that there were 8.3% fewer blood specimen MRSA LabID events than expected, based on the national 2010–2011 baseline. The CDI LabID SIR was 0.934, which indicates that there were 6.6% fewer CDI LabID events than expected; this was statistically significant ($p < 0.0001$). There is no trend figure for MDRO/CDI SIRs as it has not been calculated for three or more annual reports. This will be made available in the 2015 annual report.

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.

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	93	1,174	1,841,515	499,482	2.350↓	0.271↓
CLABSI ⁴	89	312	1,566,410	417,368	0.748	0.2664↓
VAC ⁵	62	505	352,680	118,886	4.248↑	0.3371↑
IVAC ⁶	62	162	352,680	118,886	1.363	0.3371↑
Possible VAP ⁷	62	133	352,680	118,886	1.119↑	0.3371↑
Probable VAP ⁸	62	30	352,680	118,886	0.252	0.3371↑
Total VAE ⁹	62	830	352,680	118,886	6.981↑	0.3371↑

Michigan Rate

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

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

²DU: 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.

³CAUTIs 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).

⁴CLABSIs 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).

⁵VAC: Ventilator-Associated Condition

⁶IVAC: Infection-related Ventilator-Associated Condition

⁷Possible VAP: Possible Ventilator-Associated Pneumonia

⁸Probable VAP: Probable Ventilator-Associated Pneumonia

⁹Total 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 2.6033 to 2.350 per 1,000 catheter days ($p=0.0137$). The Michigan DU ratio decreased significantly from 0.3292 to 0.271 ($p<0.0001$).

Hospitals in Michigan have been working diligently to reduce CLABSI rates; this is reflected in the data in Table 15. The Michigan DU ratio significantly decreased from 0.3184 to 0.2664 ($p<0.0001$). The Michigan CLABSI rate decreased from 0.8285 to 0.748, but was not significantly different from the 2013 report.

The Total VAE rate was 6.981 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 and DU increased significantly from 5.77 to 6.981 ($p=0.0004$) and 0.3324 to 0.3371 ($p= 0.0045$), respectively, from 2013. VAC and Possible VAP had significant rate increases from 3.591 to 4.248 ($p=0.0144$) and 0.803 to 1.119 ($p=0.0179$), respectively, whereas IVAC and Probable VAP had no significant change.

Figures 10 and 11 (below) show device-associated infection rates and DU ratios from 2009–2014.

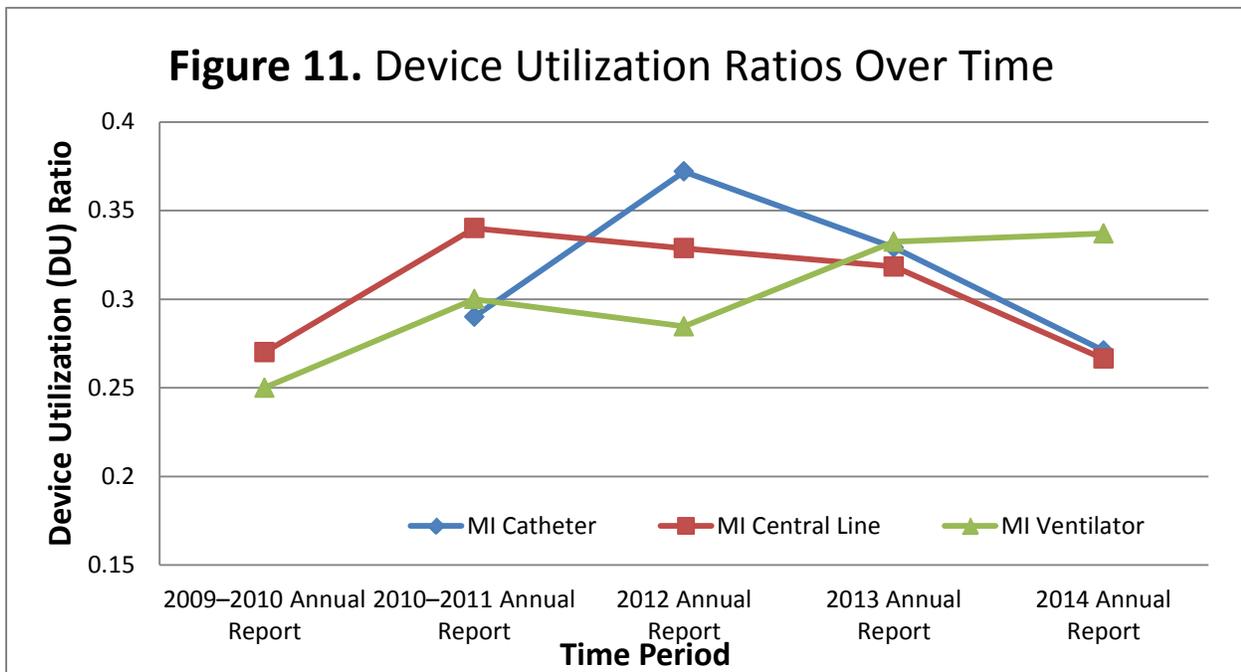
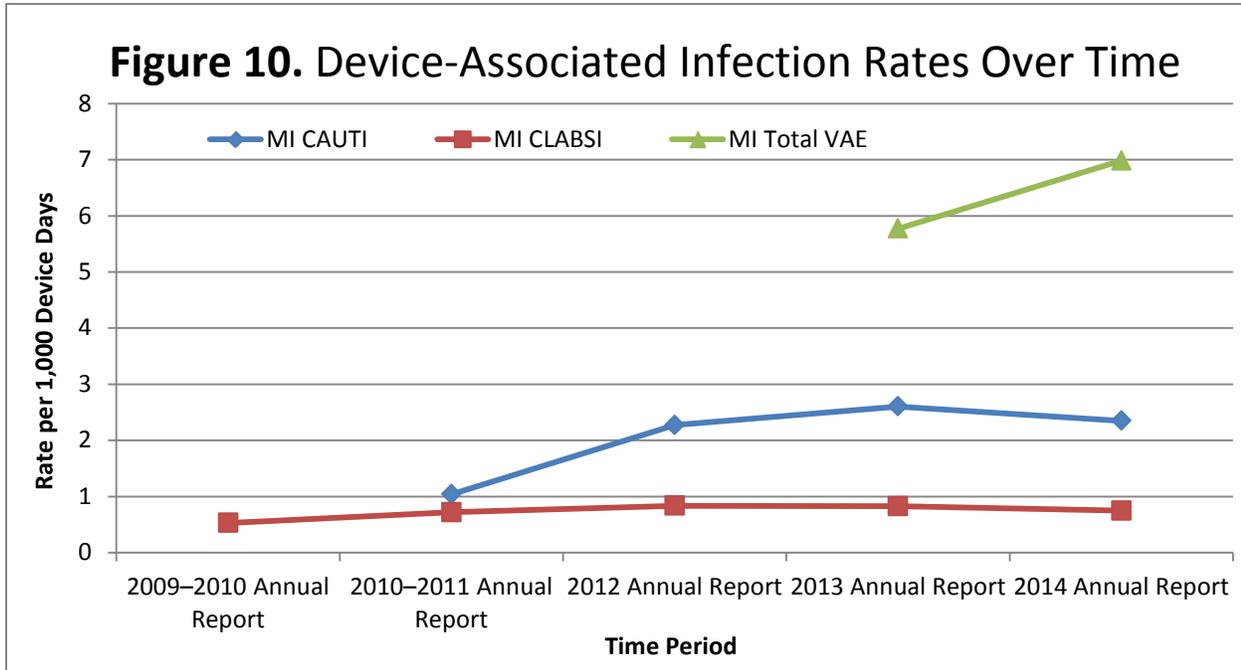


Table 16 provides NICU-specific CLABSI and VAP rates by birth weight. Up to 17 hospitals share and have CLABSI NICU data, and up to 8 hospitals share and have VAP NICU data (depending on birthweight code). If device days were recorded as '0', those data were excluded.

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	18	160,267	30,491	0.590↓	0.190↓
	A ⁴	15	10	20,290	5,618	1.780	0.2769↓
	B ⁵	16	4	21,313	5,905	0.677↓	0.2770
	C ⁶	17	2	34,936	6,778	0.295	0.1940↓
	D ⁷	16	1	48,042	6,042	0.166	0.1258
	E ⁸	17	1	35,686	6,148	0.163	0.1722↑
VAP ⁹	Overall	8	0	55,445	5,633	0↓	0.1016↓
	A	7	0	7,228	2,355	0	0.3258↓
	B	7	0	7,382	1,291	0	0.1749
	C	7	0	14,064	928	0	0.0660↓
	D	8	0	16,150	604	0	0.0374↑
	E	8	0	10,621	455	0	0.0428

Michigan Data

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

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

²DU: 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.

³Central 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).

⁴A: Birthweight ≤750g

⁵B: Birthweight 751–1000g

⁶C: Birthweight 1001–1500g

⁷D: Birthweight 1501–2500g

⁸E: Birthweight >2500g

⁹Ventilator-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 2014 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 2014 US SIR will be added to this report upon CDC's release of these data (expected early 2016). 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	87	329,607	905	731.881	1.237	<0.0001	1.158, 1.319	TBA	TBA
CLABSI ⁹	87	302,282	232	646.112	0.359↓	<0.0001	0.315, 0.408	TBA	TBA
CLABSI ICU	87	271,791	214	575.197	0.372	<0.0001	0.325, 0.424	TBA	TBA
CLABSI NICU	17	30,491	18	70.915	0.254↓	<0.0001	0.155, 0.393	TBA	TBA

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)

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

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

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

⁴P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can 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).

⁵95% CI: 95% confidence interval around the SIR estimate. A 95% CI indicates that 95% of the time, the actual SIR will fall within this interval.

⁶US SIR taken from the National and State Healthcare-Associated Infections Standardized Infection Ratio Report, January–December 2014

⁷US 95% CI taken from the Nation and State Healthcare-Associated Infections Standardized Infection Ratio Report, January–December 2014

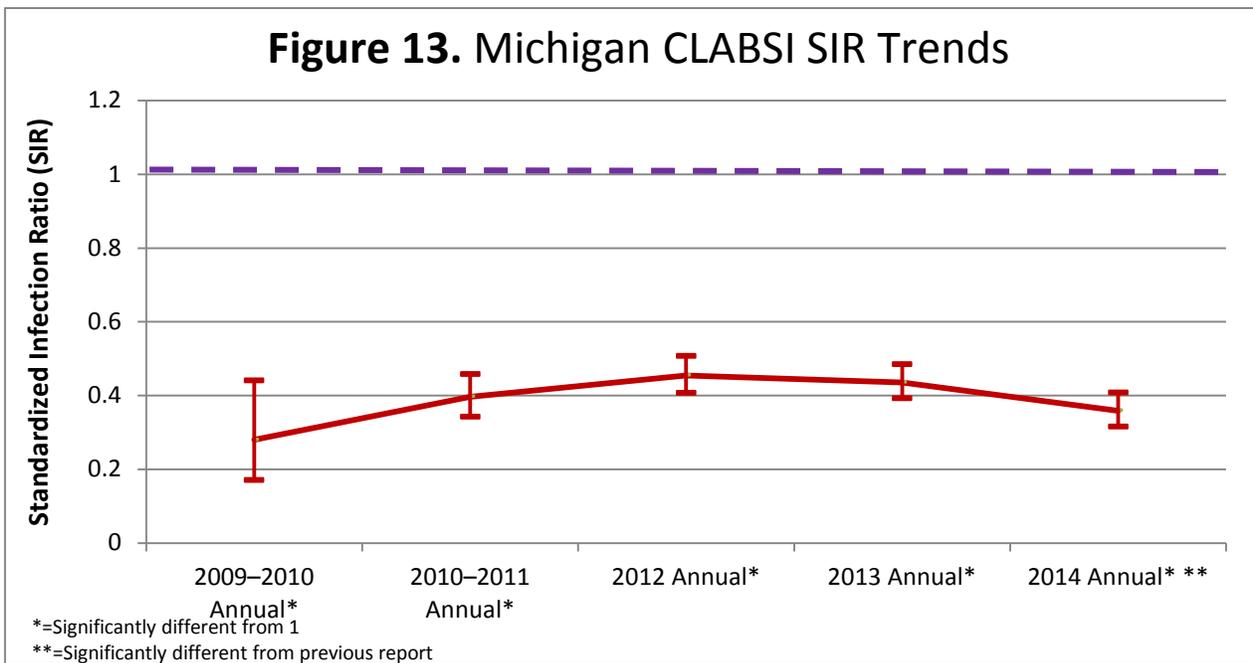
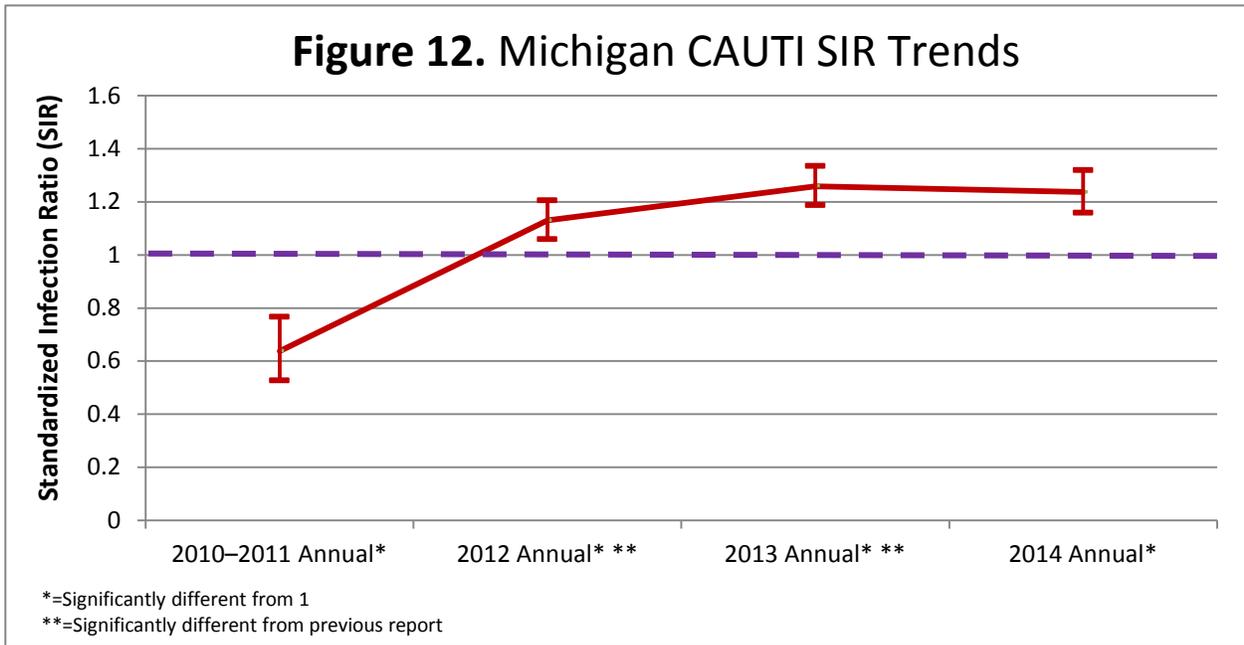
⁸CAUTI: Catheter-Associated Urinary Tract Infection

⁹CLABSI: Central Line-Associated Blood Stream Infection

Michigan's CAUTI SIR was 1.237 for 87 participating hospitals. This SIR can be interpreted as having approximately twenty-four percent more CAUTIs than expected, as determined by national NHSN data. This was not significantly different from the previous 2013 annual report of 1.259..

Michigan’s CLABSI SIR, using data from 87 participating hospitals, was 0.359. This SIR can be interpreted as Michigan having 64.1% fewer CLABSIs than expected, as determined by national NHSN data. This is statistically significantly lower than the expected value and statistically significantly lower than the previous annual report’s SIR of 0.436.

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 2014 annual report.



Procedure-Associated Module Aggregated Data

Table 18 shows the 2014 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.

<i>Table 18. 2014 Annual SSI Rates and SIR by Procedure Type</i>								
Procedure Type	Number of Facilities	Number of Procedures	Number of Observed ¹ SSIs	Number of Expected ² SSIs	MI SSI Rate ³	MI SSI SIR ⁴	MI SIR p-value ⁵	MI SIR 95% Confidence Interval ⁶
Overall	86	54,409	1,176	1,238.376	2.223	0.95	0.077	0.897, 1.005
APPY ⁷	5	409	3	7.280	0.732	0.412	0.0923	0.105, 1.122
BRST ⁸	6	684	6	3.569	0.847	1.681	0.2223	0.681, 3.497
CARD ⁹	5	481	3	5.482	0.624	0.547	0.2932	0.139, 1.489
CBGB ¹⁰	12	1,906	27	42.382	1.677	0.637	0.0126	0.428, 0.914
CBGC ¹¹	10	126	1	2.307	0.794	0.433	0.4287	0.022, 2.137
CHOL ¹²	6	969	8	7.055	0.807	1.134	0.6876	0.527, 2.153
COLO ¹³	86	9,918	659	583.02	6.949	1.130↑	0.0022	1.046, 1.219
CSEC ¹⁴	8	1,402	17	24.736	1.002	0.687	0.1087	0.414, 1.078
FUSN ¹⁵	9	2,579	29	42.133	1.163	0.688	0.0349	0.470, 0.976
FX ¹⁶	6	889	12	15.682	1.459	0.765	0.3586	0.415, 1.301
GAST ¹⁷	8	840	6	14.757	0.713	0.407	0.0122	0.165, 0.846
HER ¹⁸	8	1,407	21	16.683	1.525	1.259	0.2947	0.800, 1.891
HPRO ¹⁹	38	7,467	102	103.311	1.391	0.987↑	0.9494	0.809, 1.193
HYST ²⁰	80	9,601	154	182.796	1.591	0.842↓	0.0325	0.717, 0.984
KPRO ²¹	40	10,740	73	105.516	0.689	0.692	0.0009	0.546, 0.865
LAM ²²	8	1,938	15	19.134	0.825	0.784	0.3492	0.456, 1.264
OVRV ²³	5	321	1	1.258	0.309	0.795	0.9262	0.040, 3.921
PVBY ²⁴	5	228	11	15.536	4.825	0.708	0.2464	0.372, 1.231
RFUSN ²⁵	7	110	1	2.781	0.909	0.36	0.2962	0.018, 1.773
VHYS ²⁶	9	417	3	5.130	0.685	0.585	0.3614	0.149, 1.592
XLAP ²⁷	5	198	0	2.285	0.000	0.000	0.1017	0, 1.311

■ 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)

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

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

³MI SSI Rate: 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.

⁴SIR: Standardized Infection Ratio: Ratio of observed events compared to the number of predicted events, accounting for unit type or procedure. An SIR of 1 can be interpreted as having the same number of events that were predicted. An SIR that is between 0 and 1 represents **fewer** events than predicted, while an SIR of greater than 1 represents **more** events than expected.

⁵P-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).

⁶95% CI: 95% confidence interval around the SIR estimate. A 95% CI indicates that 95% of the time, the actual SIR will fall within this interval.

⁷APPY: Appendix surgery

⁸BRST: Breast surgery

⁹CARD: Cardiac surgery

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

¹¹CBGC: Coronary artery bypass graft with chest incision only

¹²CHOL: Gallbladder surgery

¹³COLO: Colon surgery

¹⁴CSEC: Cesarean Section

¹⁵FUSN: Spinal fusion

¹⁶FX: Open reduction of fracture

¹⁷GAST: Gastric surgery

¹⁸HER: Herniorrhaphy

¹⁹HPRO: Hip prosthesis

²⁰HYST: Abdominal hysterectomy

²¹KPRO: Knee prosthesis

²²LAM: Laminectomy

²³OVRY: Ovarian Surgery

²⁴PVBY: Peripheral vascular bypass surgery

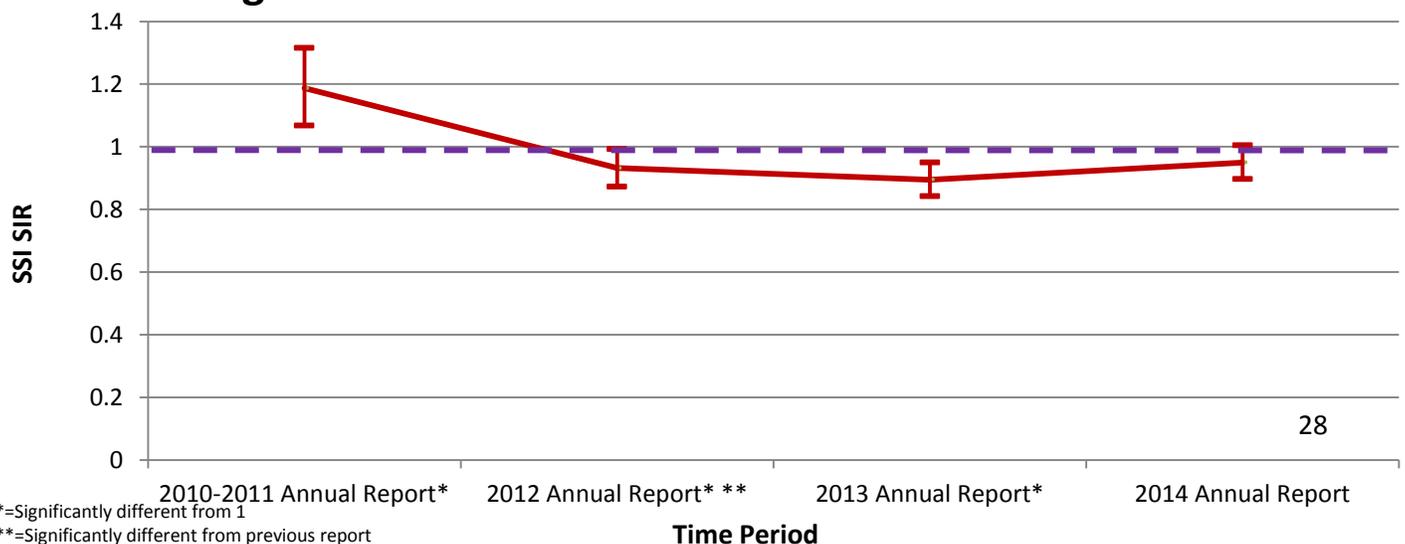
²⁵RFUSN: Small Bowel Surgery

²⁶VHYS: Vaginal hysterectomy

²⁷XLAP: Exploratory Laparotomy

The Overall SSI SIR was 0.95 (95% CI: 0.897, 1.005), which demonstrated fewer infections than expected. Individual procedure type SIRs which indicated significantly fewer infections than expected include: coronary artery bypass grafts (SIR: 0.637, 95% CI: 0.428,0.914), spinal fusions (SIR: 0.688, 95% CI: 0.470, 0.976), gastric surgeries (SIR: 0.407, 95% CI: 0.165, 0.846), abdominal hysterectomies (SIR: 0.842, 95% CI: 0.717, 0.984), and knee prosthesis surgeries (SIR: 0.692, 95% CI: 0.546, 0.865). Only the colon surgery SIR indicated significantly more infections than expected (SIR: 1.130, 95% CI: 1.046, 1.219).

Figure 14. Overall SSI Standardized Infection Ratios



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. 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 when available in the 2013 annual report. Trend graphs are made available for rates and will be made available for SIRs in the 2015 annual report when three data points are available.

Table 19. MDRO Rates¹ 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 (52)	0.8273	0.2817 (78)	0.876	0.0216	0.781, 0.980
	CDI LabID ⁷ (52)	20.8400	0.4019↑ (44)	0.944	0.001	0.912, 0.977
Non-Teaching	MRSA LabID (33)	1.4424	0.4331 (82)	0.997	1.00	0.633, 1.498
	CDI LabID (36)	21.4732	0.4683 (55)	0.862	0.0256	0.755, 0.981

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)

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

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

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

⁴P-value: An SIR p-value of < 0.05 is considered significantly different than expected. It can 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).

⁵95% CI: 95% confidence interval around the SIR estimate. A 95% CI indicates that 95% of the time, the actual SIR will fall within this interval.

⁶MRSA 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.

⁷CDI 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 2014 annual data, teaching hospitals had significantly fewer MRSA bld LabID events and CDI LabID events than expected, with SIRs of 0.876 (95% CI: 0.781, 0.980) and 0.944 (95% CI: 0.912, 0.977), respectively. Non-teaching hospitals had significantly fewer CDI LabID events than expected with an SIR of 0.862 (95% CI: 0.755, 0.981). Rate trends can be seen in Figures 15-16, below.

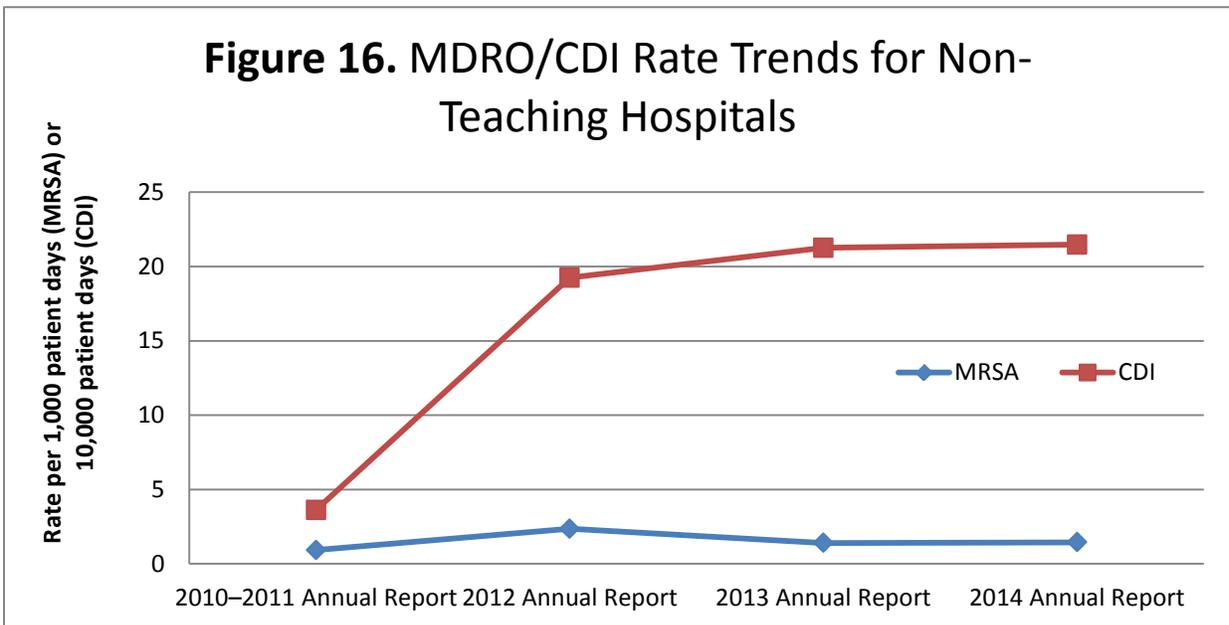
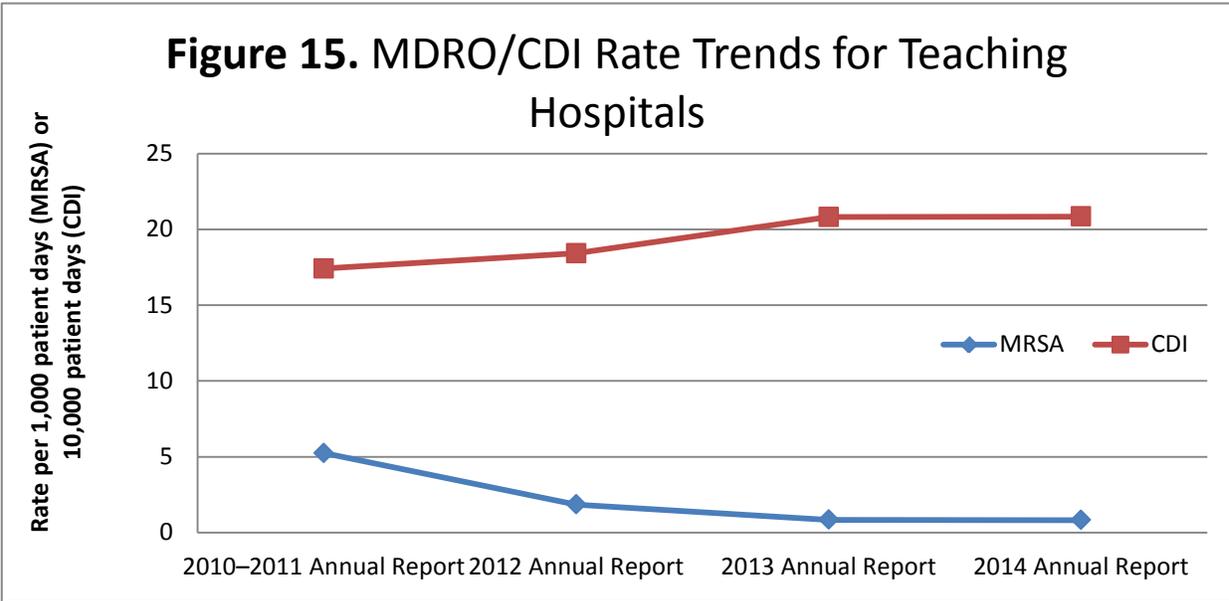


Table 20. Device-Associated Infection Rates¹ and SIR by Facility Type

Facility Type	Device-Associated Infection (Number of Hospitals)	Rate	SIR ²	SIR p-value ³	SIR 95% Confidence Interval ⁴
Teaching	CAUTI ⁵ (51)	2.4911↓	1.145↓	<0.0001	1.077, 1.216
	CLABSI ⁶ (51)	0.7471	0.369↓	<0.0001	0.329, 0.413
	Total VAE ⁷ (37)	7.2399↑	----	----	----
Non-Teaching	CAUTI (40)	1.2717	0.732	0.0273	0.542, 0.968
	CLABSI (36)	0.7643	0.535	0.0061	0.317, 0.850
	Total VAE (13)	3.5630	----	----	----

 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)

¹Rates 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.

²SIR: 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.

³P-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).

⁴95% 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.

⁵CAUTI: Catheter-Associated Urinary Tract Infection

⁶CLABSI: Central Line-Associated Blood Stream Infection

⁷VAE: Ventilator-Associated Event

In the 2014 annual data, Michigan teaching hospitals had 14.5% more CAUTIs than expected, while non-teaching hospitals had 26.8% fewer infections than expected, both of these findings are statistically significant. Both Michigan teaching and non-teaching hospitals had significantly fewer CLABSIs than expected. Rate trends can be seen in Figures 17–18, below.

Figure 17. Device Rate Trends for Teaching Hospitals

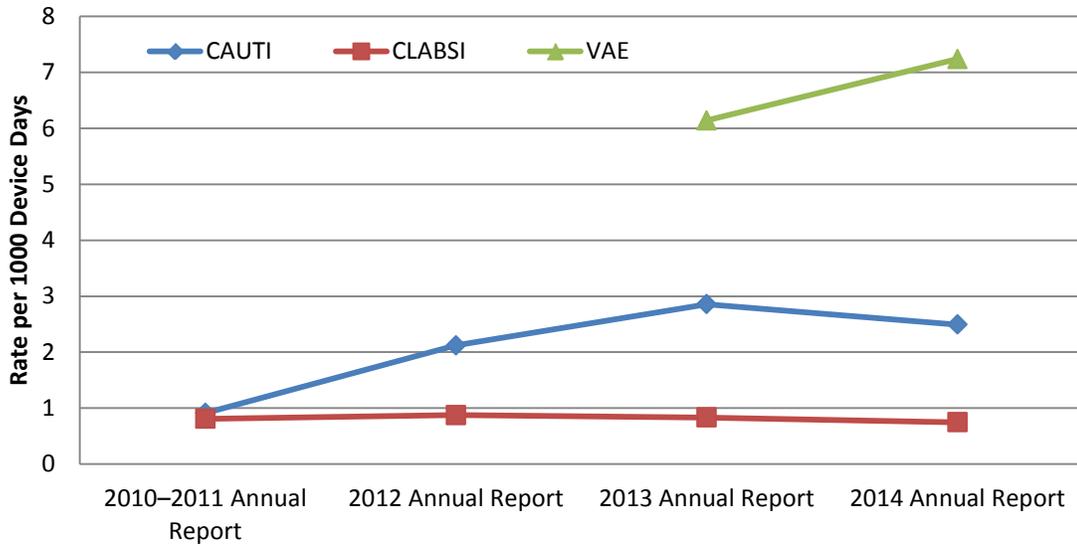


Figure 18. Device Rate Trends for Non-Teaching Hospitals

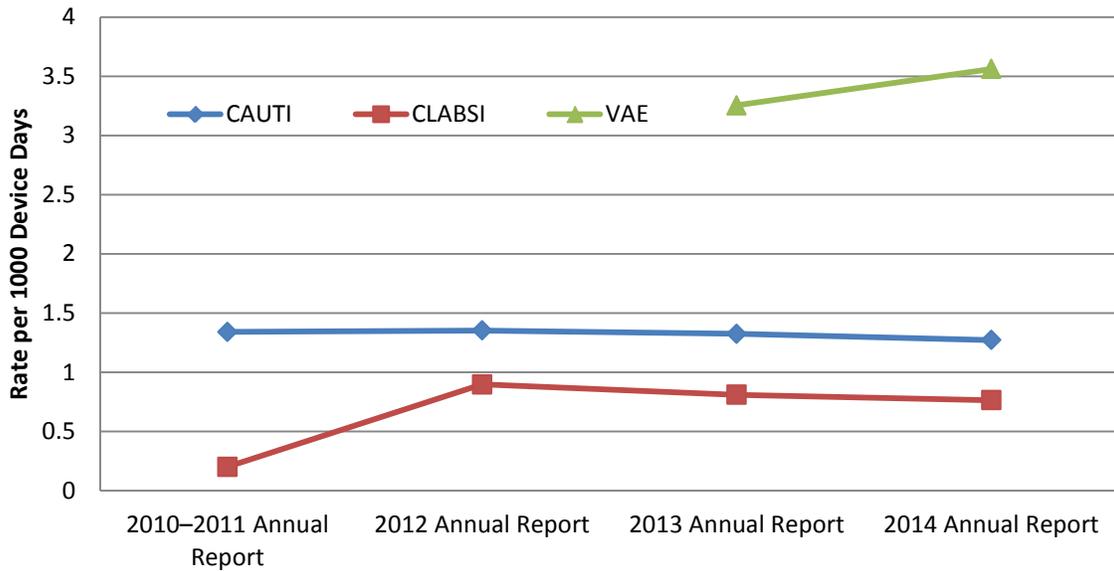


Table 21. MDRO Rates¹ and SIR by Michigan Region

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 (10)	0.9550	0.3450 (82)	0.508	0.0071	0.283, 0.848
	CDI LabID ⁷ (10)	18.1986	0.4335 (53)	0.667	<0.0001	0.576, 0.769
2N	MRSA LabID (14)	0.7724	0.2970 (80)	0.976	0.823	0.795, 1.186
	CDI LabID (14)	21.1094	0.4415 (44)	0.974	0.4224	0.915, 1.037
2S	MRSA LabID (16)	0.5241	0.2070 (70)	1.200	0.034	1.017, 1.406
	CDI LabID (16)	23.6458	0.3819 (39)	1.132	<0.0001	1.074, 1.193
3	MRSA LabID (12)	1.3803	0.5117 (75)	0.775	0.085	0.568, 1.034
	CDI LabID (12)	20.2226	0.4925 (49)	0.801	<0.0001	0.724, 0.884
5	MRSA LabID (11)	0.3536	0.1101 (87)	0.758	0.265	0.449, 1.205
	CDI LabID (11)	17.1749	0.3287 (54)	0.714	<0.0001	0.614, 0.826
6	MRSA LabID (17)	0.5533	0.1933 (86)	0.481	0.0007	0.289, 0.754
	CDI LabID (17)	18.3226	0.3792 (52)	0.754	<0.0001	0.666, 0.850
7 and 8	MRSA LabID (10)	2.3446	0.8993 (89)	0.539	0.1464	0.198, 1.195
	CDI LabID (10)	18.6558	0.4331 (54)	0.749	0.0009	0.625, 0.891

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.

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

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

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

⁴P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can 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).

⁵95% CI: 95% confidence interval around the SIR estimate. A 95% CI indicates that 95% of the time, the actual SIR will fall within this interval.

⁶MRSA 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.

⁷CDI 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 2014 annual data, regions 1 and 6 had significantly fewer MRSA LabID events than expected. Regions 1, 3, 5, 6, and 7/8 had significantly fewer CDI LabID events than expected while region 2S had significantly higher MRSA and CDI LabID events than expected. The combined regions 7 and 8 had a CDI LabID SIR of 0.749 (95% CI: 0.625, 0.891), which indicates 25.1% fewer events than expected. This is the first annual report to obtain rates and SIRs for individual regions and thus rate and SIR trend figures are not available. The subsequent, 2015, annual report will include these graphs.

Table 22. Device-Associated Infection Rates¹ 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	2.1997 (11)	0.925	0.7140	0.617, 1.337
	CLABSI ⁶	0.9499 (10)	0.405	<0.0001	0.247, 0.627
	Total VAE ⁷	16.0858 (8)	----	----	----
2N	CAUTI	2.1154 (14)	0.982	0.8330	0.855, 1.123
	CLABSI	0.8065 (14)	0.419	<0.0001	0.318, 0.543
	Total VAE	5.5738 (9)	----	----	----
2S	CAUTI	3.1897 (15)	1.44	<0.0001	1.317, 1.571
	CLABSI	0.8074 (15)	0.376	<0.0001	0.317, 0.442
	Total VAE	6.5932 (10)	----	----	----
3	CAUTI	1.6841 (14)	0.793	0.0024	0.679, 0.922
	CLABSI	0.6104 (14)	0.334	<0.0001	0.252, 0.434
	Total VAE	6.8579 (10)	----	----	----
5	CAUTI	2.0024 (12)	1.008	0.9340	0.759, 1.315
	CLABSI	0.2912 (11)	0.211	<0.0001	0.098, 0.401
	Total VAE	7.0050 (6)	----	----	----
6	CAUTI	2.2813 (17)	1.125	0.2480	0.918, 1.364
	CLABSI	0.8280 (16)	0.305	<0.0001	0.202, 0.444
	Total VAE	5.1946 (11)	----	----	----
7 and 8	CAUTI	1.6333 (10)	0.889	0.5302	0.611, 1.253
	CLABSI	0.8505 (10)	0.230	0.0002	0.073, 0.556
	Total VAE	8.5129 (8)	----	----	----

 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.

¹Rates 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.

²SIR: 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.

³P-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).

⁴95% 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.

⁵CAUTI: Catheter-Associated Urinary Tract Infection

⁶CLABSI: Central Line-Associated Blood Stream Infection

⁷VAE: Ventilator-Associated Event

From the 2014 annual data, region 2S had significantly more CAUTIs than expected, with a SIR of 1.44 (95% CI: 1.317, 1.571). Region 3 had significantly less CAUTIs than expected with a SIR of 0.793 (95% CI: 0.679, 0.922). All other regions had significantly fewer CLABSIs than expected based on their SIRs.

Table 23. MDRO Rates¹ 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 (53)	0.9210↓	0.3161↓ (83)	1.199	0.354	0.800, 1.731
	CDI LabID ⁷ (53)	21.3365↑	0.4964↑ (54)	0.886	0.011	0.805, 0.972
>200 Beds	MRSA LabID (37)	0.8683	0.2904 (77)	0.869	0.018	0.771, 0.975
	CDI LabID (37)	20.8035	0.3911↑ (43)	0.963	0.141	0.915, 1.012

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).

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

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

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

⁴P-value: An SIR p-value of <0.05 is considered significantly different than expected. It can 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).

⁵95% CI: 95% confidence interval around the SIR estimate. A 95% CI indicates that 95% of the time, the actual SIR will fall within this interval.

⁶MRSA 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.

⁷CDI 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 2014 data, smaller (≤200 beds) hospitals had significantly fewer CDI LabID events than expected with an SIR of 0.886 (95% CI: 0.805, 0.972). Larger hospitals (>200 beds) had significantly fewer MRSA LabID events than expected with SIRs of 0.869 (95% CI: 0.771, 0.975). MRSA LabID events in smaller hospitals increased from 0.958 to 1.199 from the previous annual report. However, this increase was not statistically significant. Rate trends can be seen in Figures 19-20, below.

Figure 19. MDRO/CDI Rate Trends for ≤ 200 Beds

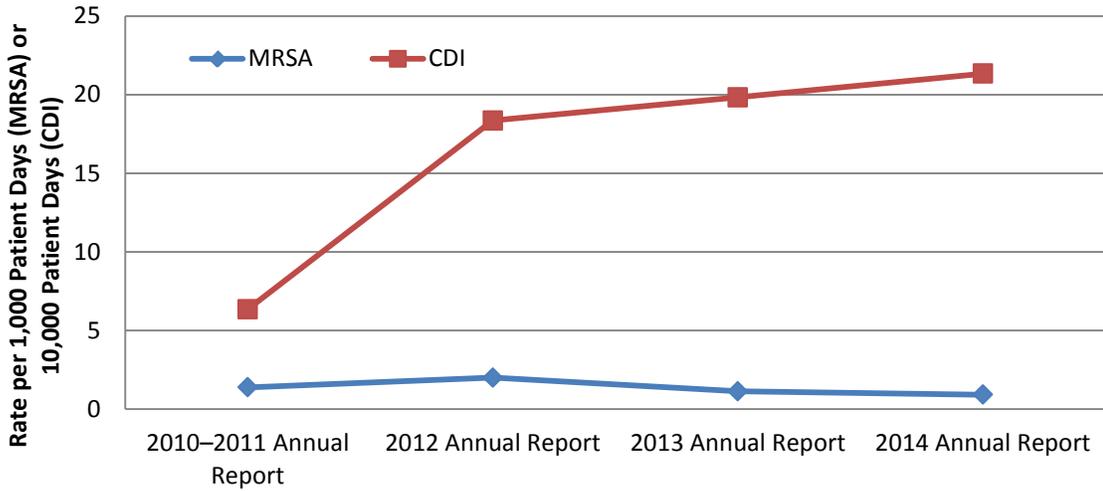


Figure 20. MDRO/CDI Rate Trends for >200 Beds

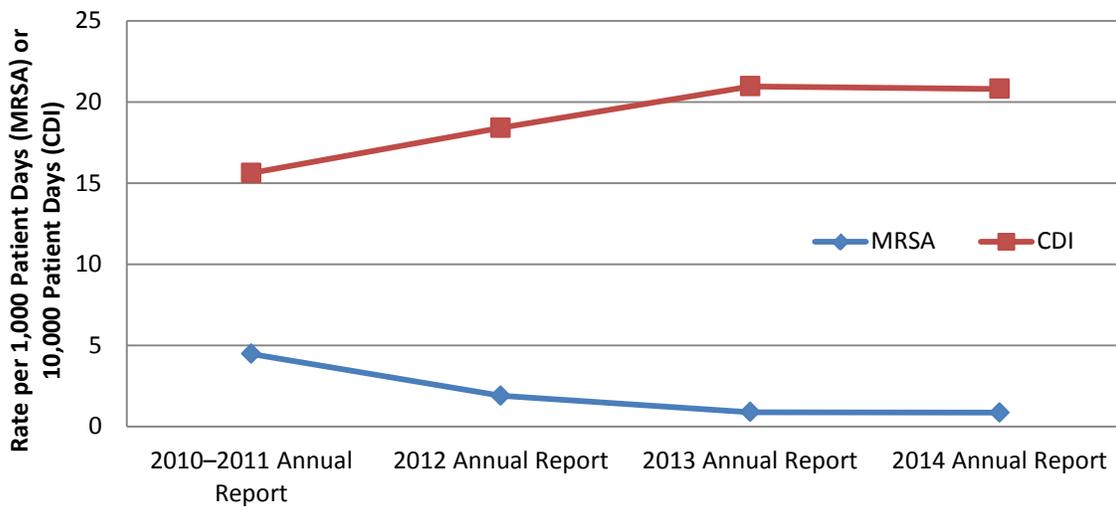


Table 24. Device-Associated Infection Rates¹ and SIR by Facility Bed Size

Bed Size	Device-Associated Infection	Rate (Number of Facilities)	SIR ²	SIR p-value ³	SIR 95% Confidence Interval ⁴
≤200 Beds	CAUTI ⁵	1.4655 (56)	0.849	0.191	0.658, 1.080
	CLABSI ⁶	0.5921 (48)	0.319	<0.0001	0.223, 0.443
	Total VAE ⁷	2.9730 (37)	----	----	----
>200 Beds	CAUTI	2.5560↓ (37)	1.256	<0.0001	1.152, 1.367
	CLABSI	0.6306 (37)	0.393	<0.0001	0.332, 0.461
	Total VAE	7.4786↑ (25)	----	----	----

 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)

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

²SIR: 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.

³P-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).

⁴95% 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.

⁵CAUTI: Catheter-Associated Urinary Tract Infection

⁶CLABSI: Central Line-Associated Blood Stream Infection

⁷VAE: Ventilator-Associated Event

According to 2014 annual data, larger hospitals (>200 beds) had significantly more CAUTIs than expected with a SIR of 1.256 (95% CI: 1.152, 1.367) and smaller hospitals (≤200 beds) had a CAUTI SIR not significantly different than expected. Both small and large hospitals had significantly fewer CLABSIs than expected with SIRs of 0.319 (95% CI: 0.223, 0.443) and 0.393 (95% CI: 0.332, 0.461), respectively. Rate trends can be seen in Figures 21-22, below.

Figure 21. Device Rate Trends for ≤ 200 Beds

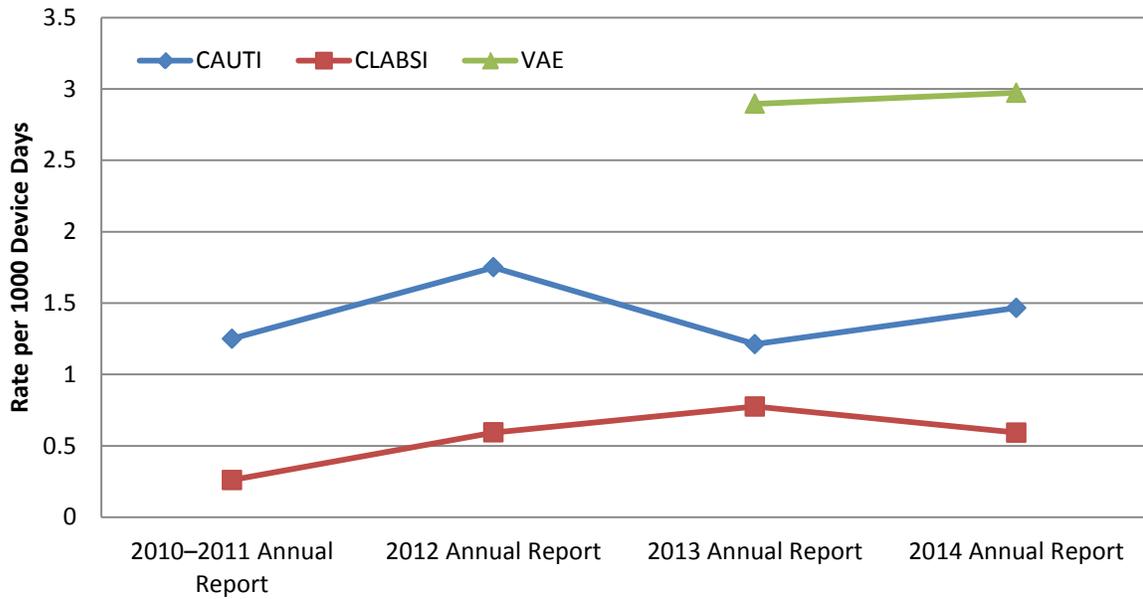
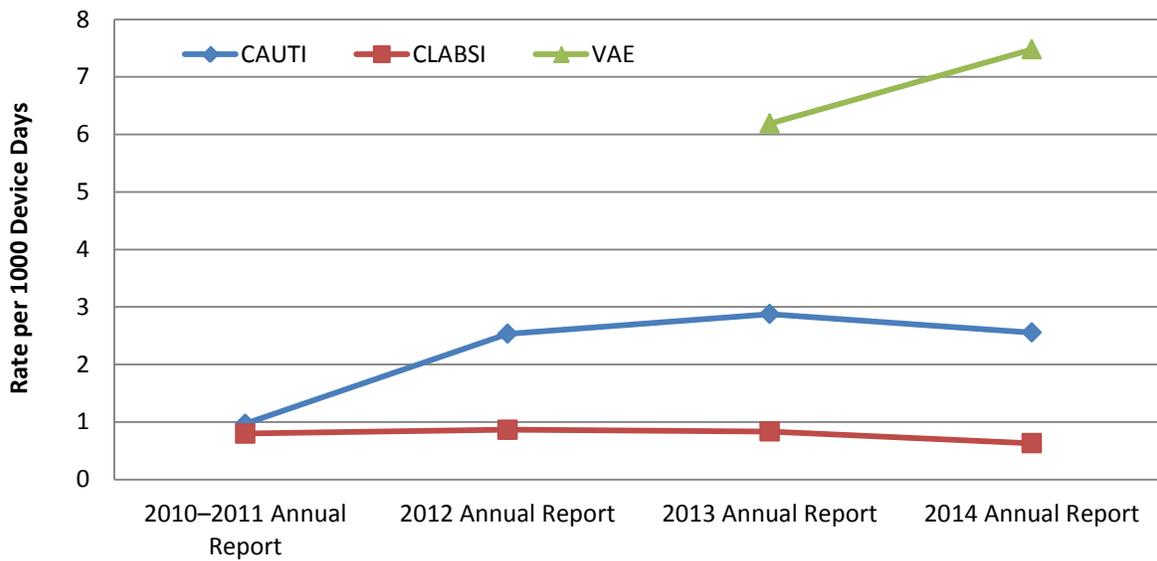


Figure 22. Device Rate Trends for >200 Beds



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 2014 reporting period. This report followed the same structure as the previous 2013 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	<i>Clostridium difficile</i> 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 <i>Staphylococcus aureus</i>
NHSN	National Healthcare Safety Network
SCA	Specialty Care Area
SHARP	Surveillance of Healthcare-Associated & Resistant Pathogens
SIR	Standardized Infection Ratio
SSI	Surgical Site Infection
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. 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, Ward, NICU), 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

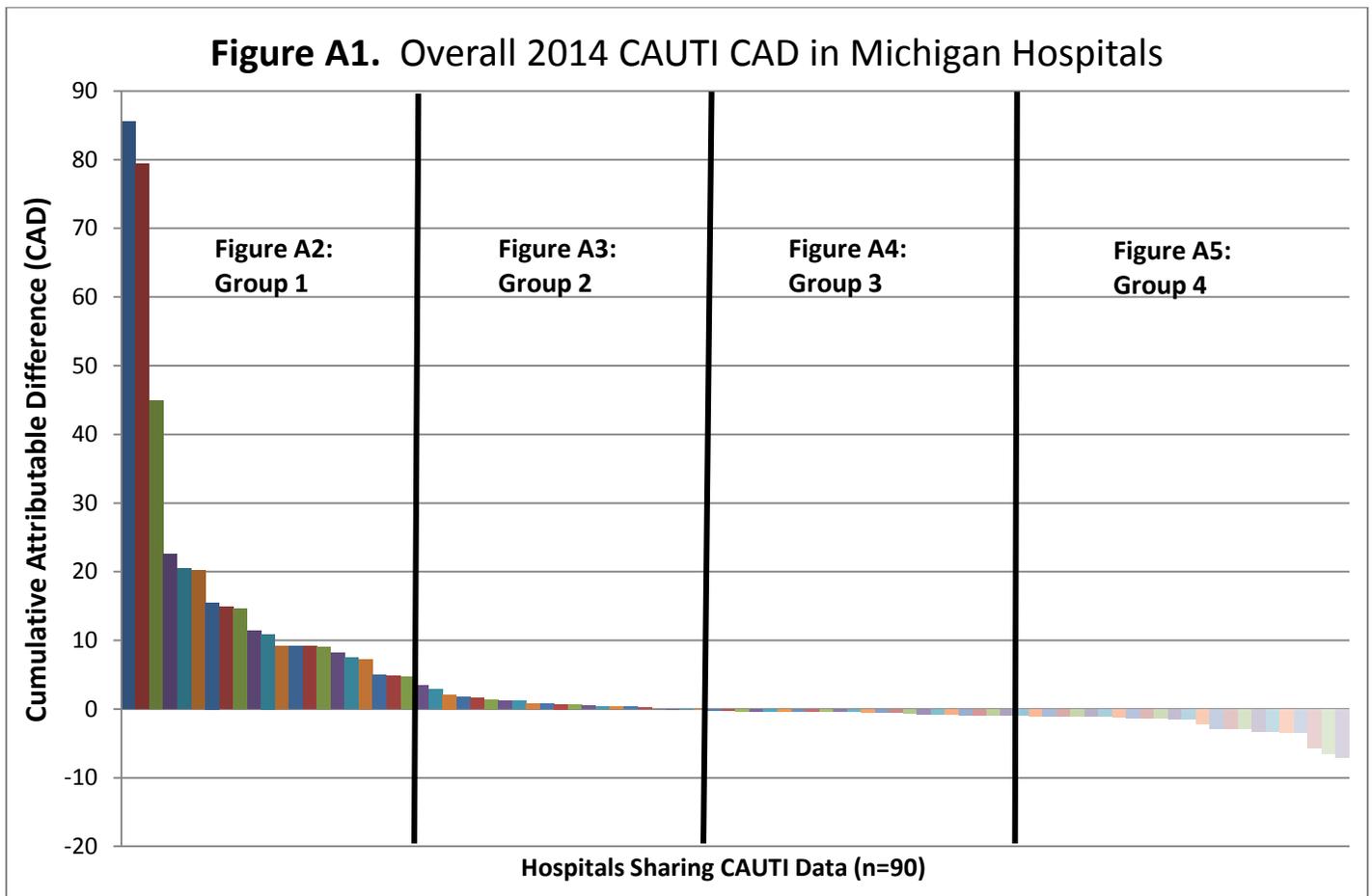


Figure A2. CAUTI CAD Group 1: Facilities with the most infections needed to prevent

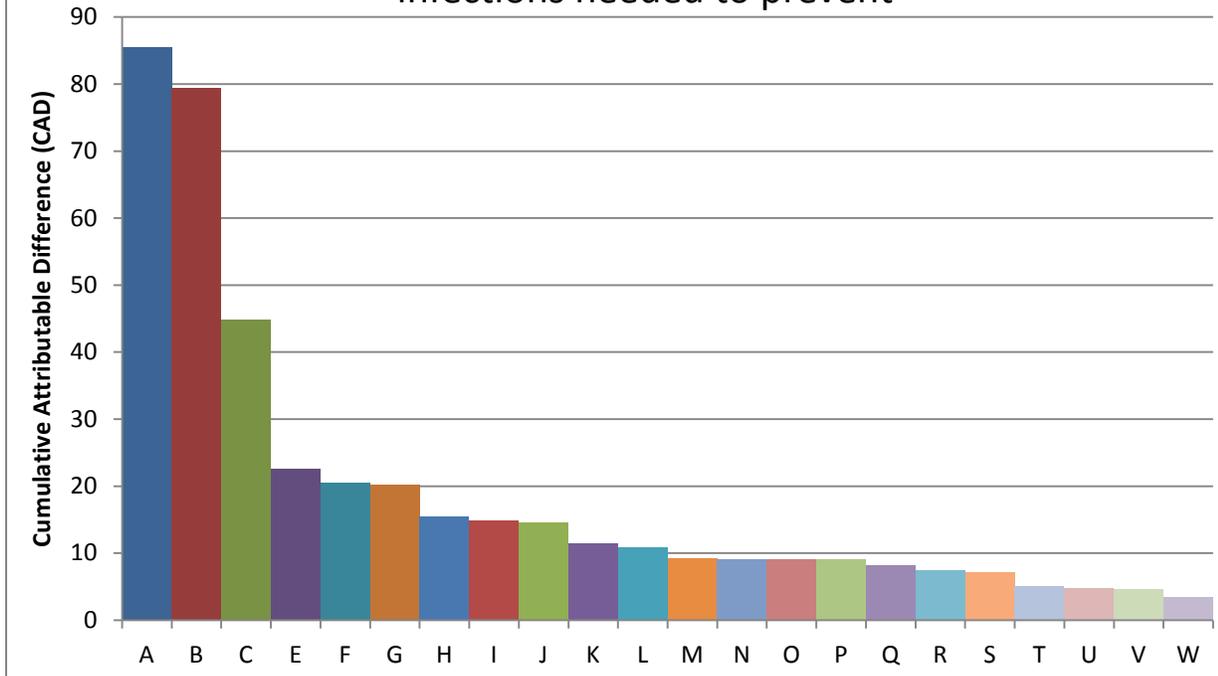


Figure A3. CAUTI CAD Group 2: Facilities with the second most infections needed to prevent or the fewest infections prevented beyond expected

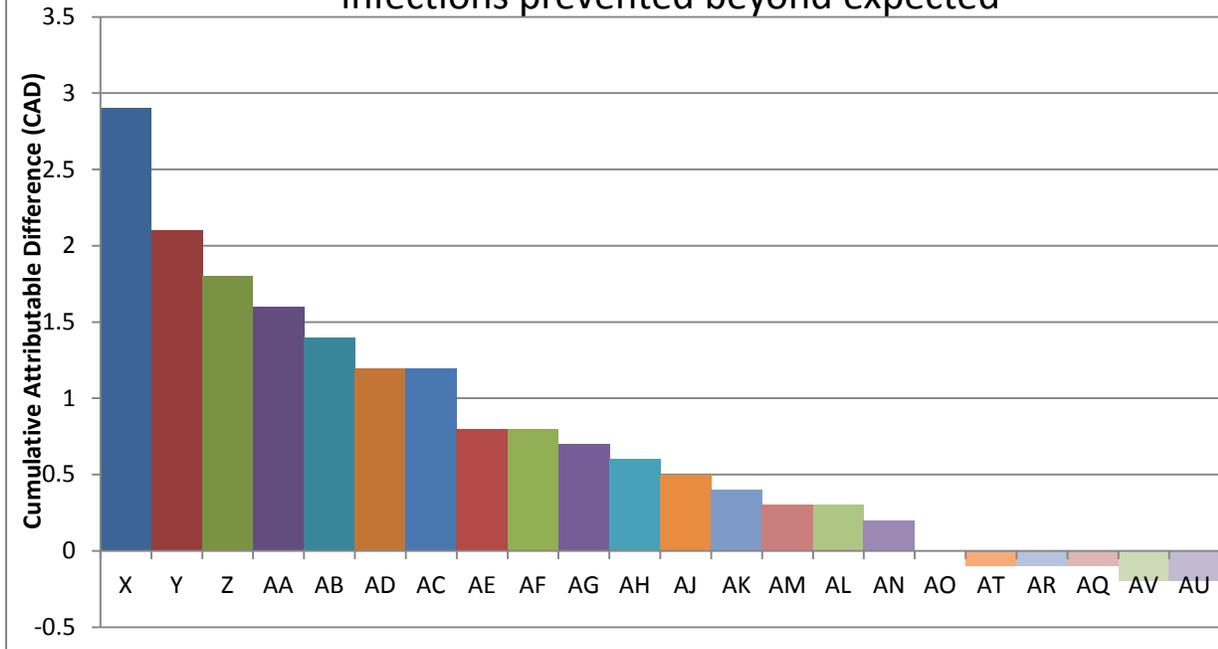


Figure A4. CAUTI CAD Group 3: Facilities with the second most infections prevented beyond expected

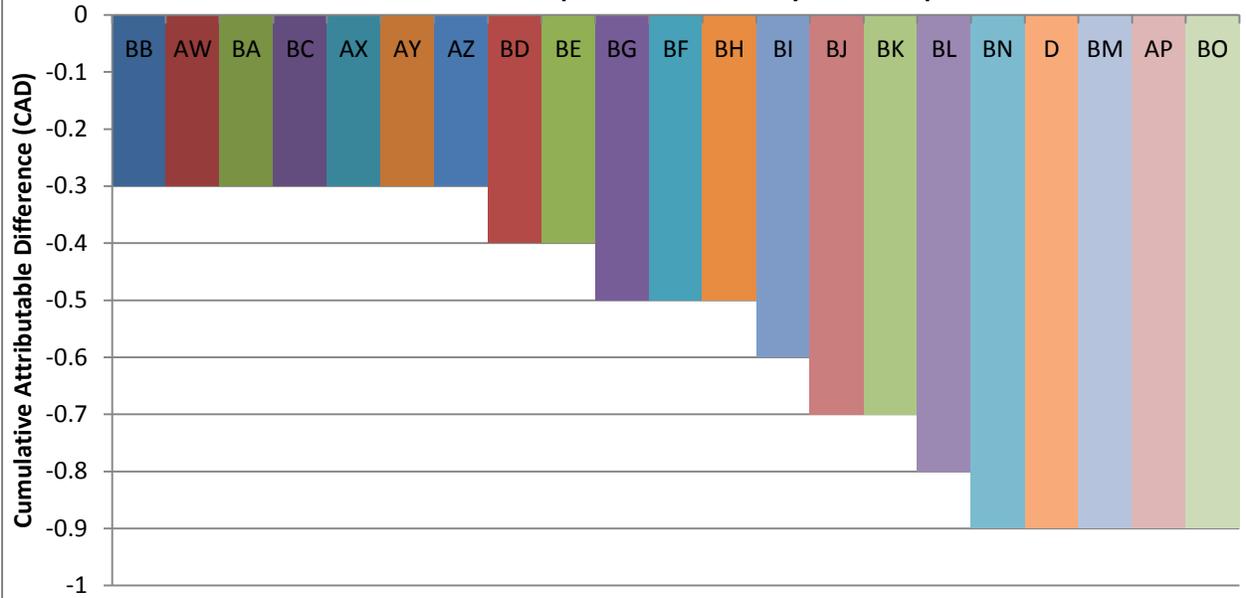


Figure A5. CAUTI CAD Group 4: Facilities with the most infections prevented beyond expected

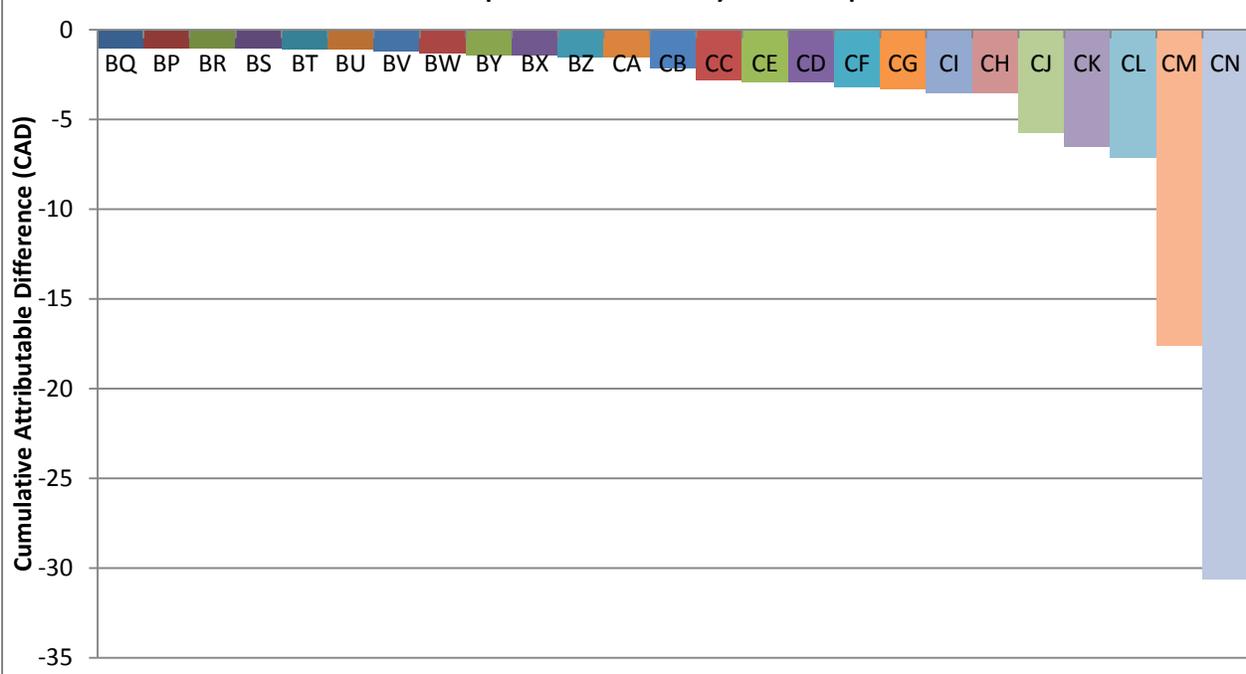


Figure A7. ICU CAUTI CAD Group 1: Facilities with the most infections needed to prevent

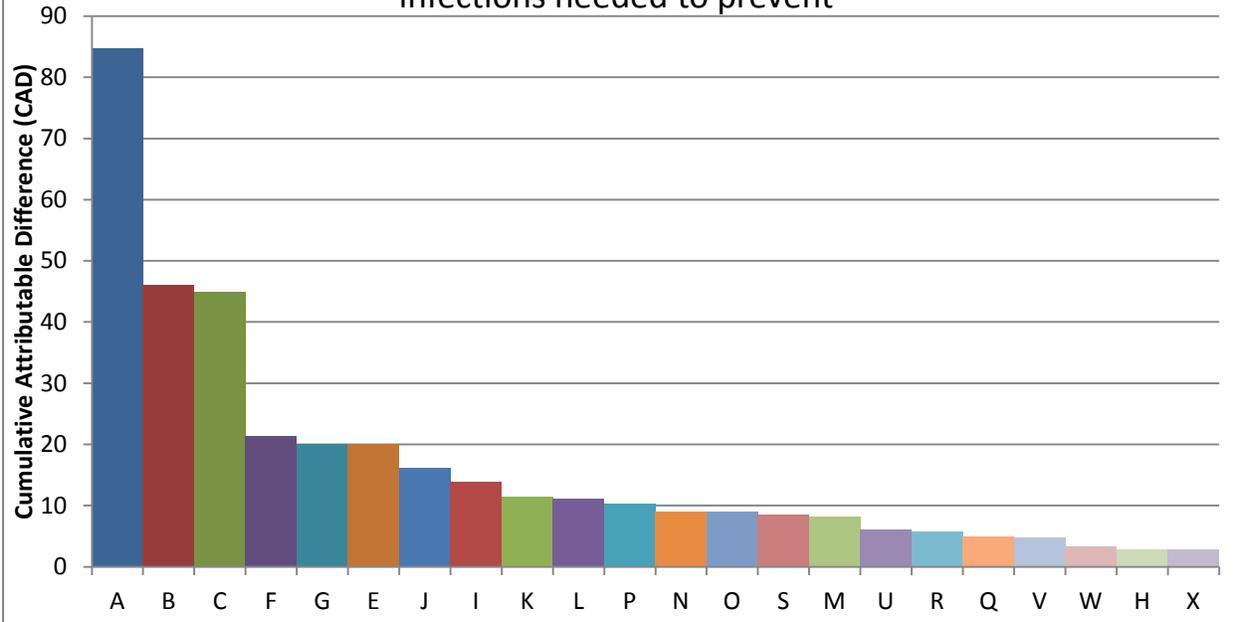


Figure A8. ICU CAUTI CAD Group 2: Facilities with the second most infections needed to prevent or the fewest infections prevented beyond expected

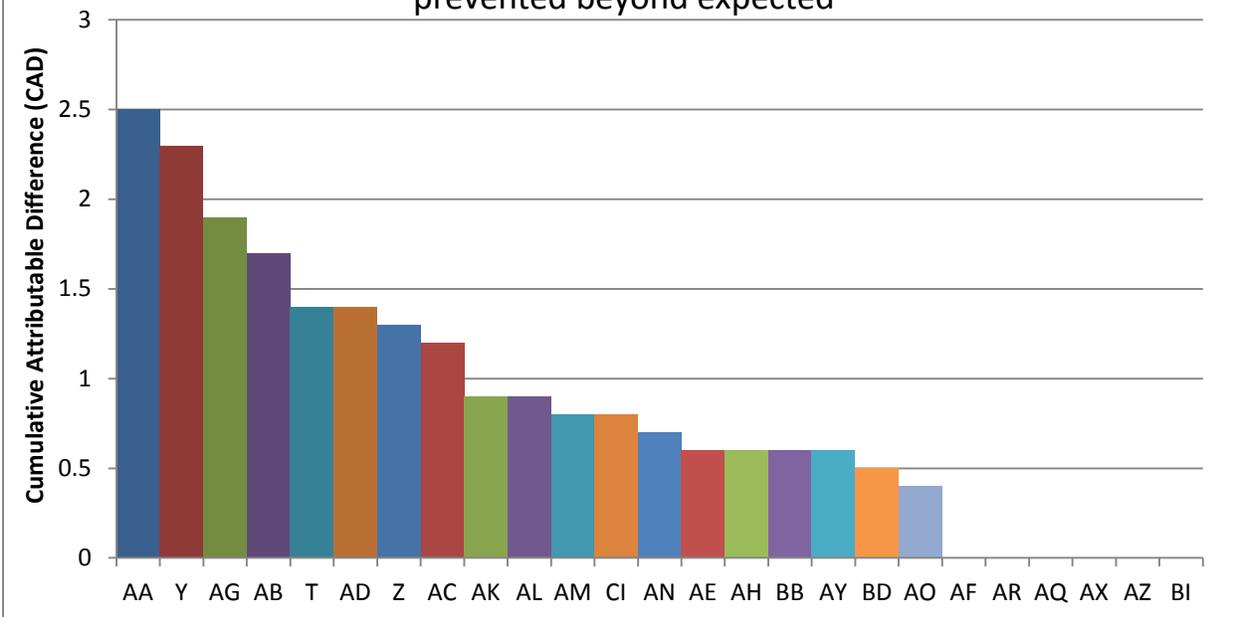


Figure A9. ICU CAUTI CAD Group 3: Facilities with the second most infections prevented beyond expected

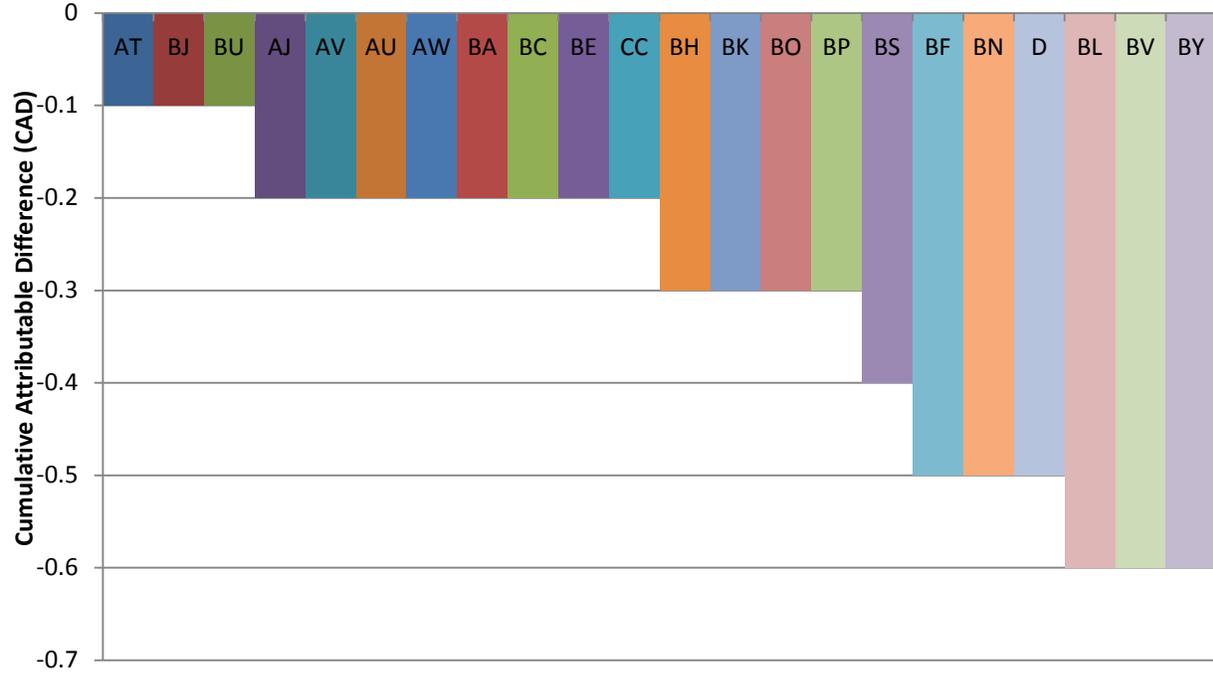


Figure A10. ICU CAUTI CAD Group 4: Facilities with the most infections prevented beyond expected

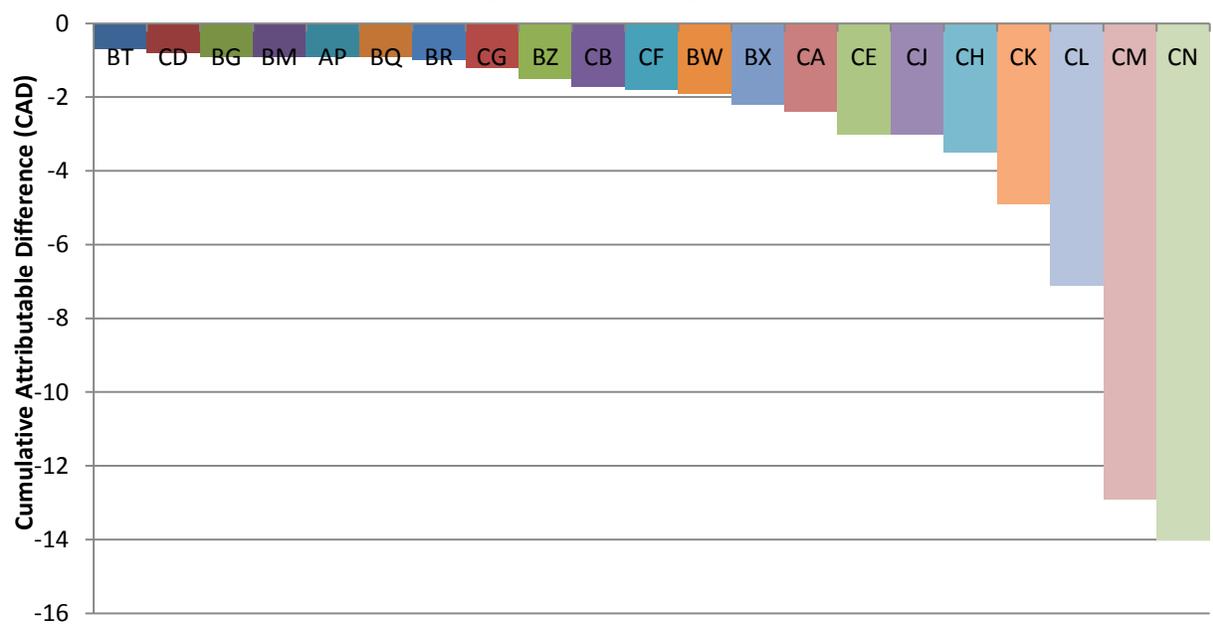


Figure A11. 2014 CAUTI Ward CAD in Michigan Hospitals

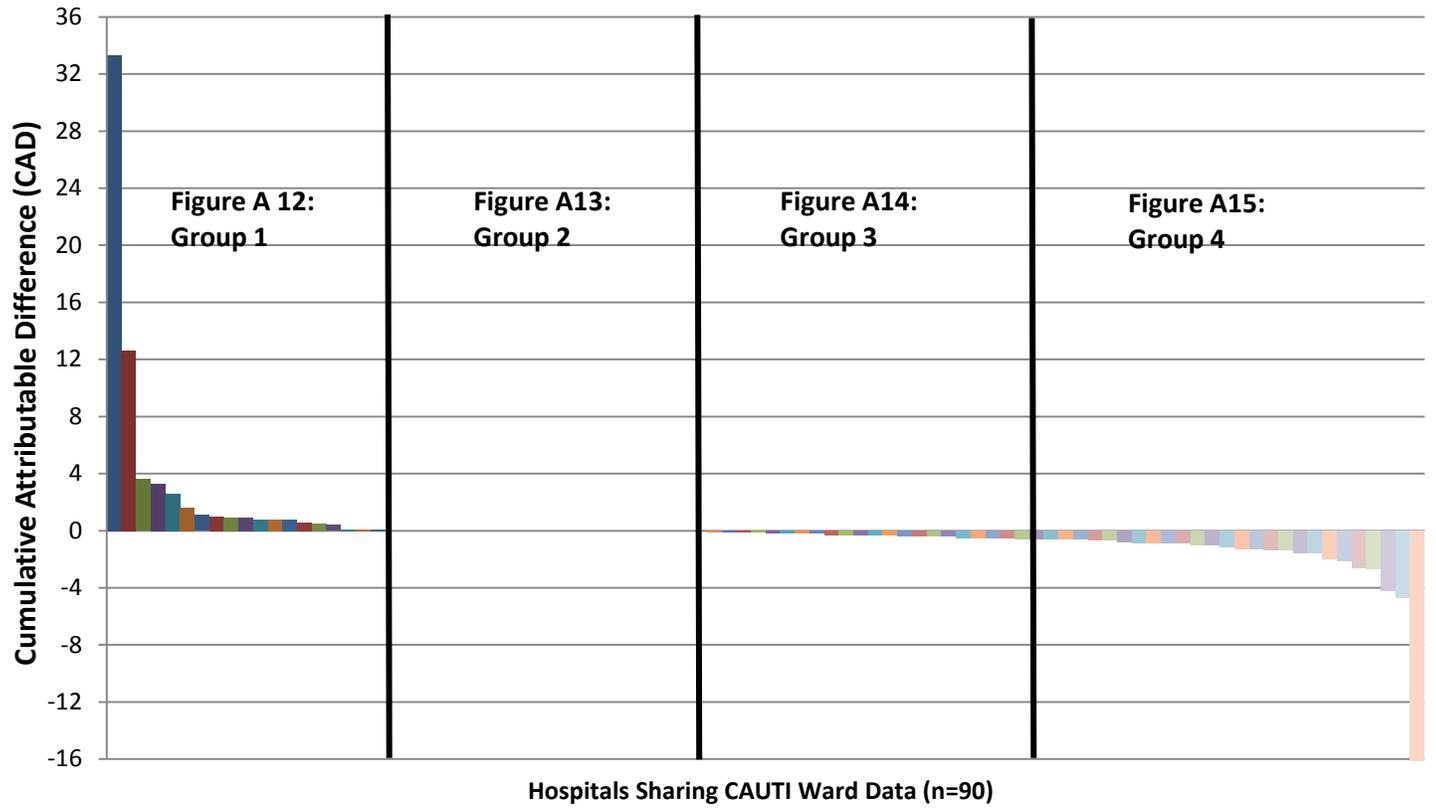


Figure A12. Ward CAUTI CAD Group 1: Facilities with the most infections needed to prevent or the fewest infections prevented beyond expected

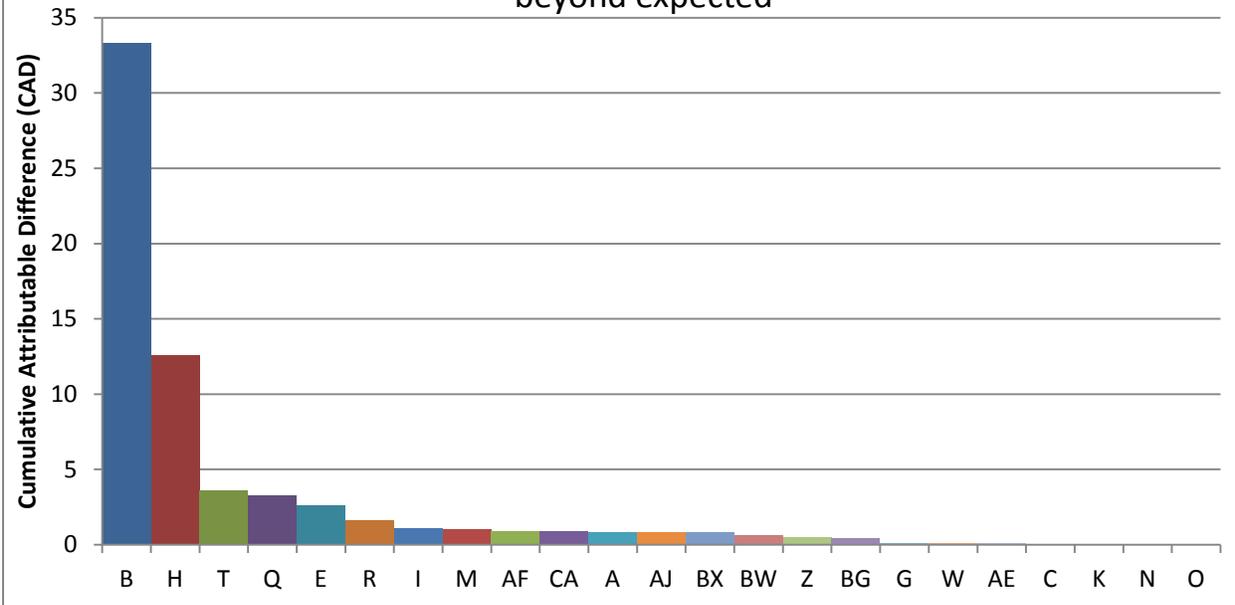
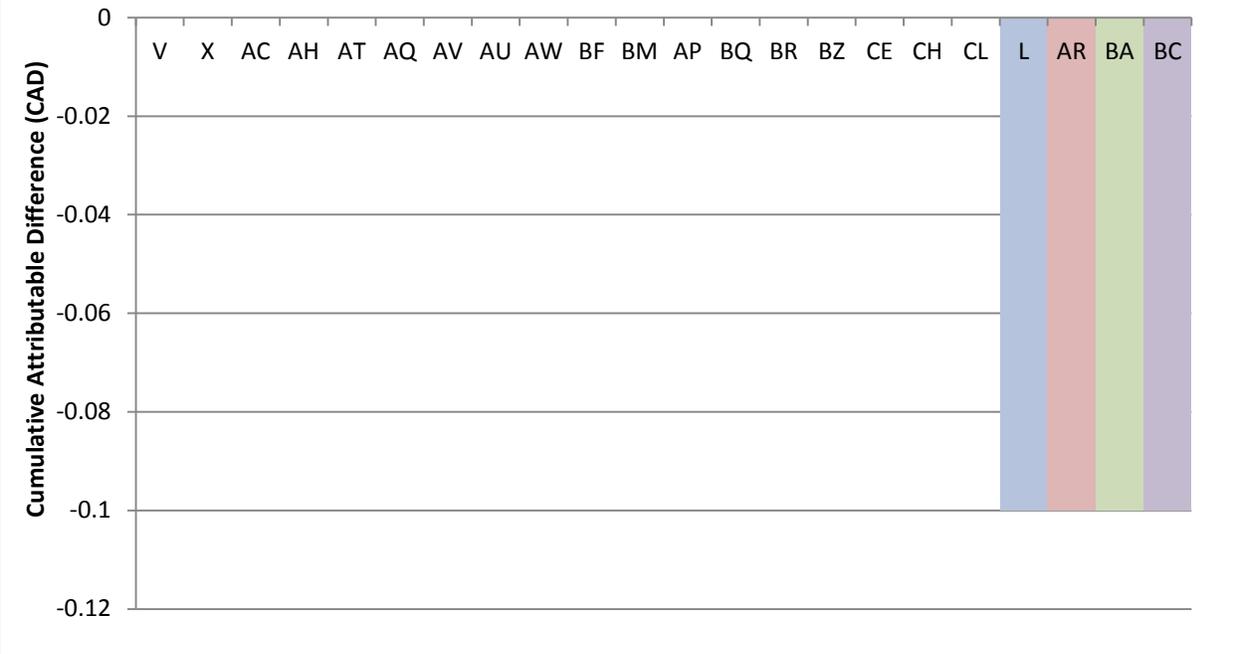


Figure A13. Ward CAUTI CAD Group 2: Facilities with the second most infections needed to prevent or the fewest infections prevented beyond expected



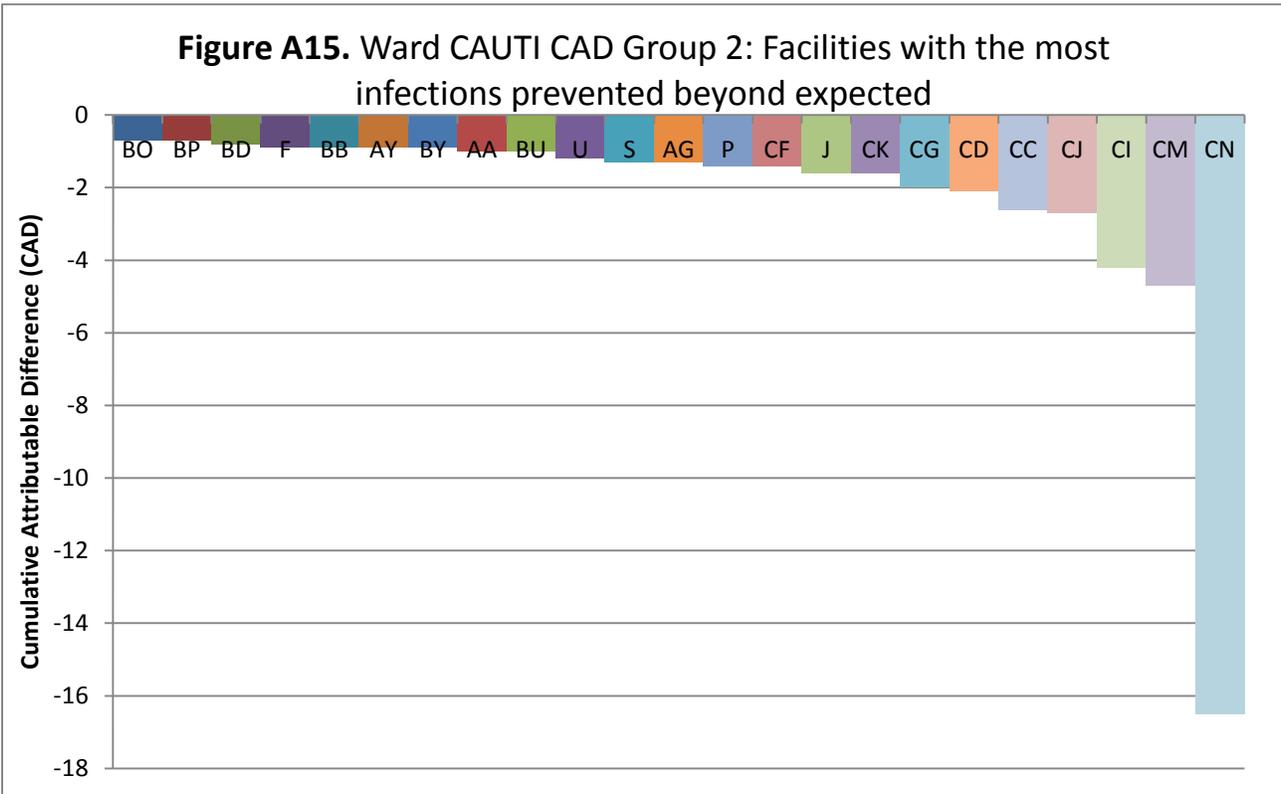
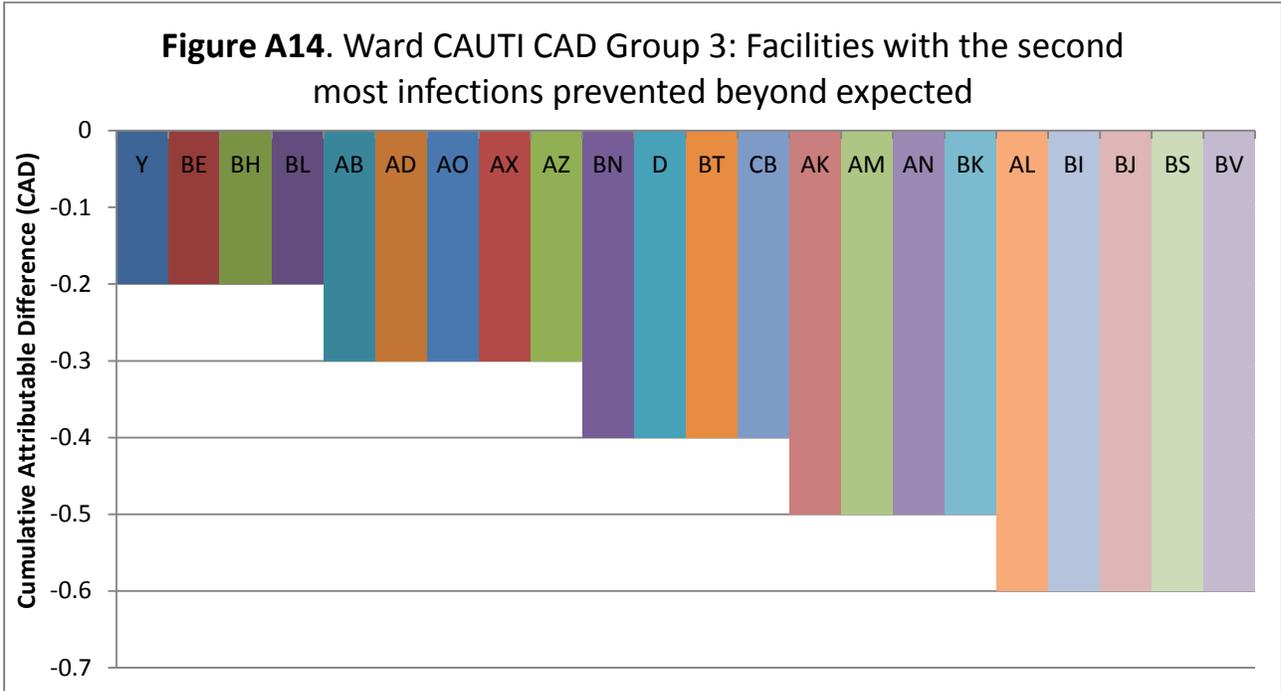


Figure A17. Overall CLABSI CAD Croup 1: Facilities with the most infections needed to prevent

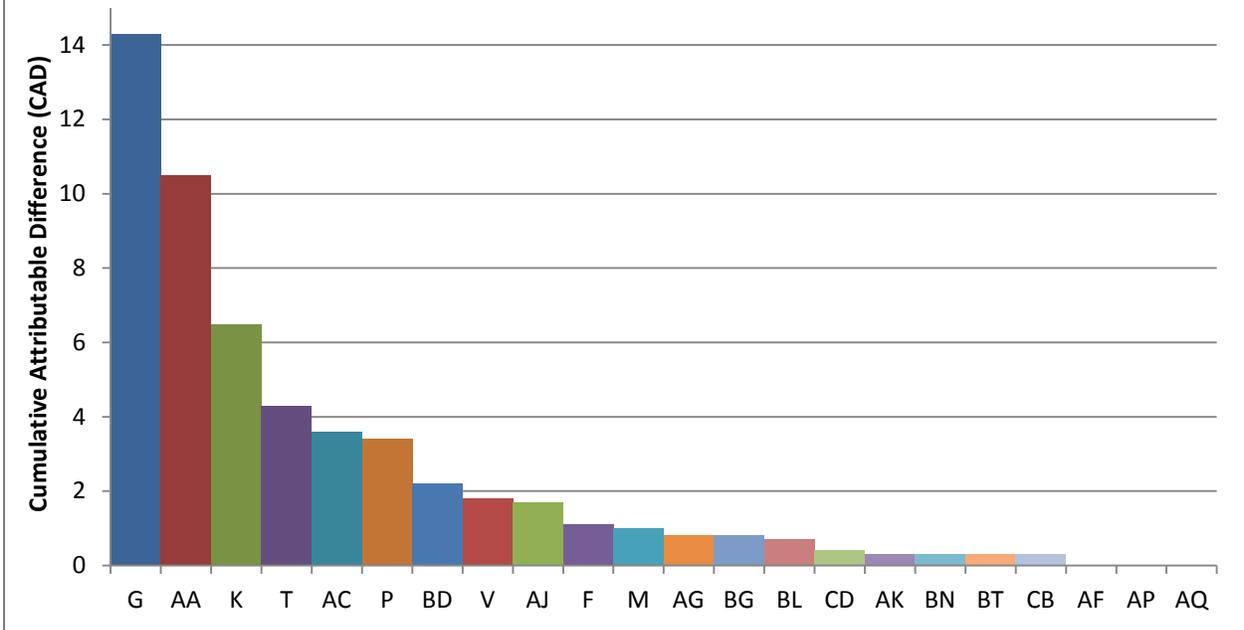


Figure A18. Overall CLABSI CAD Group 2: Facilities with the fewest infections prevented beyond expected

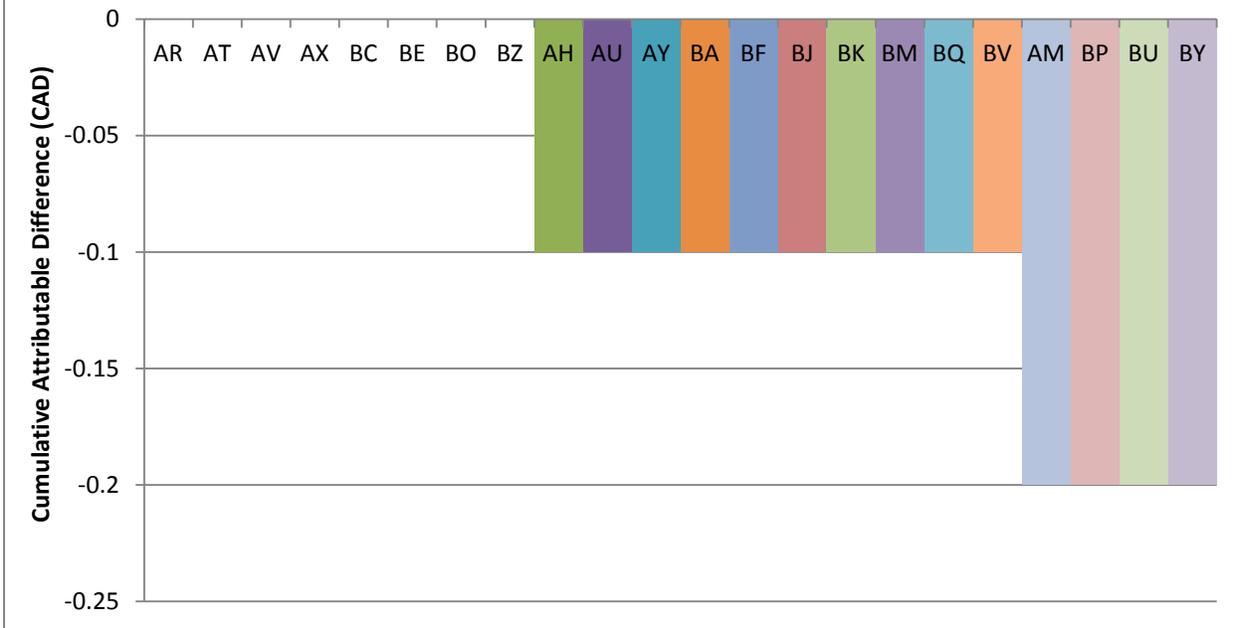


Figure A19. Overall CLABSI CAD Group 3: Facilities with the second most infections prevented beyond expected

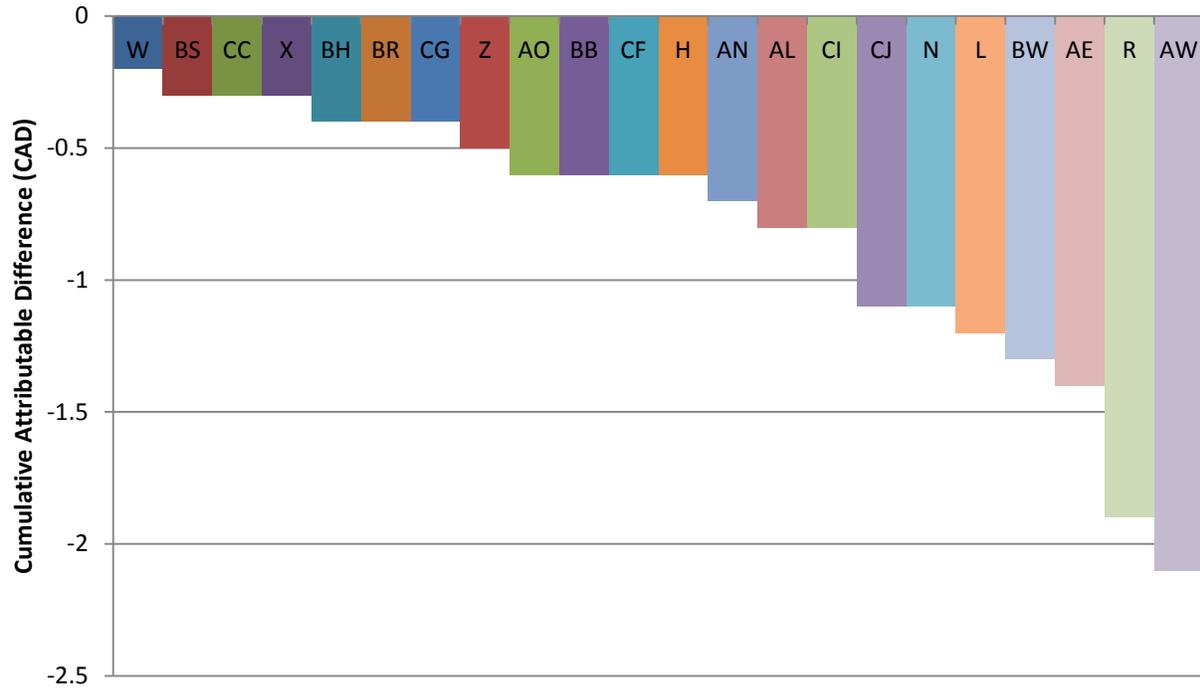


Figure A20. Overall CLABSI CAD Group 4: Facilities with the most infections prevented beyond expected

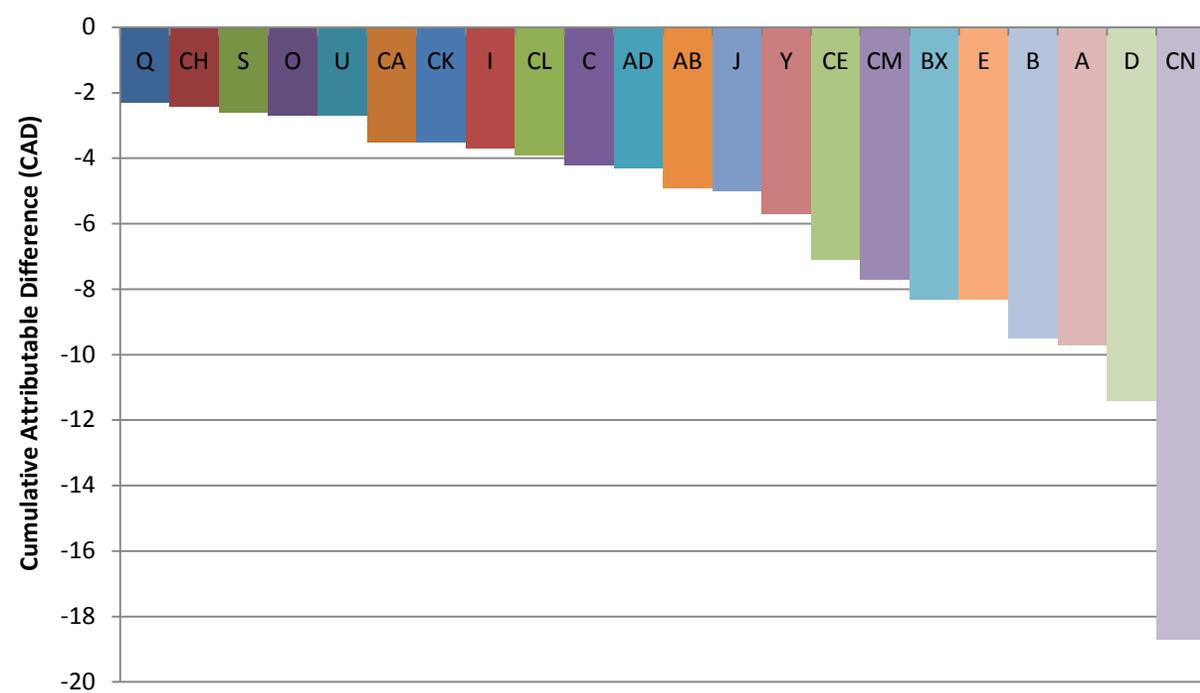


Figure A21. 2014 ICU CLABSI CAD, All Facilities

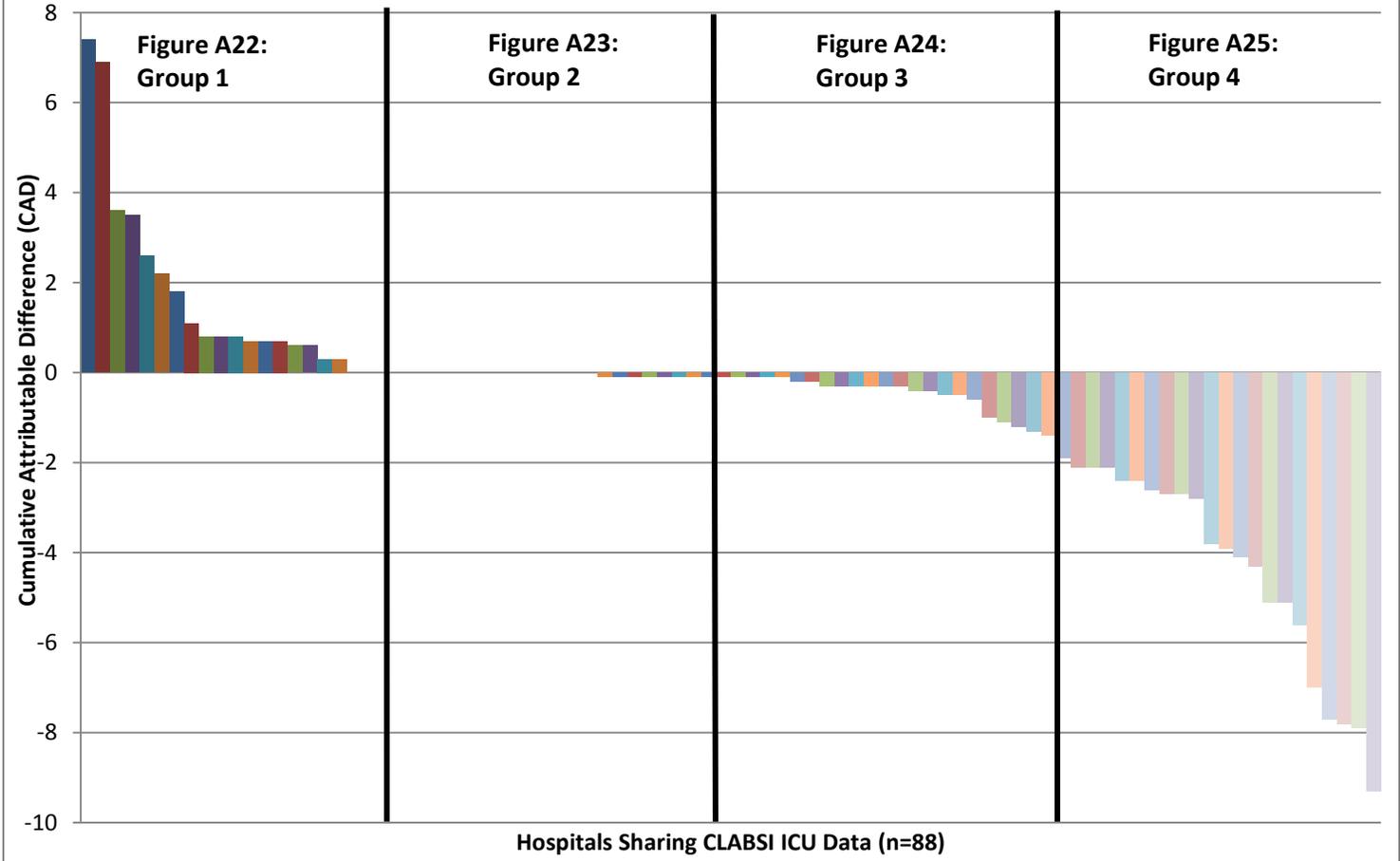


Figure A22. ICU CLABSI CAD Group 1: Facilities with the most infections needed to prevent

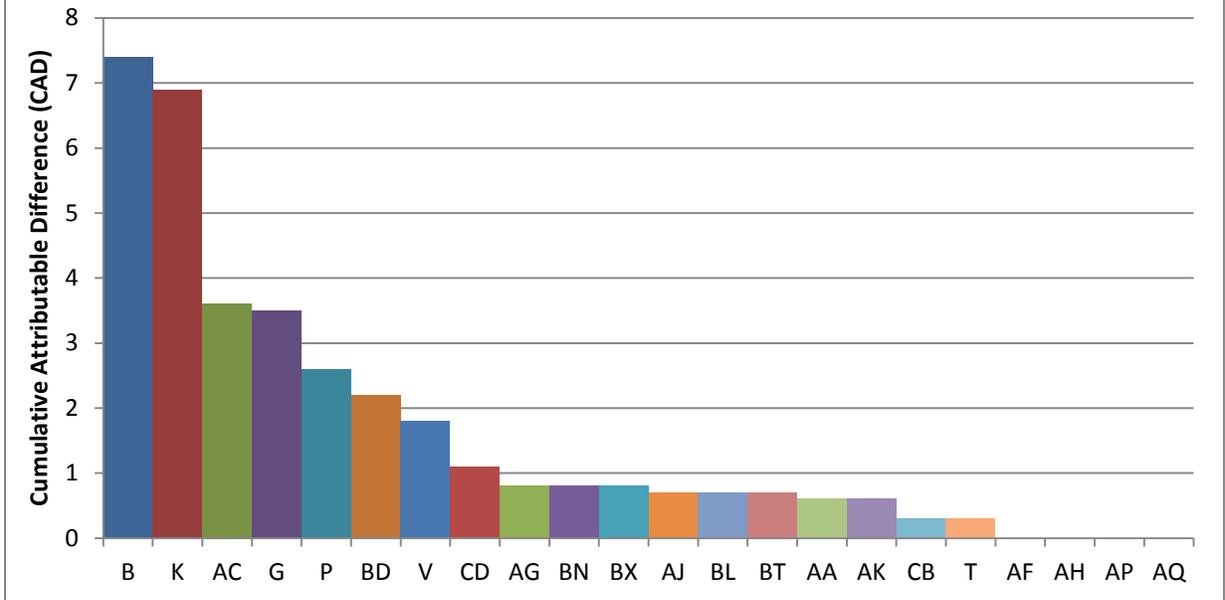


Figure A23. ICU CLABSI CAD Group 2: Facilities with the fewest infections prevented beyond expected



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

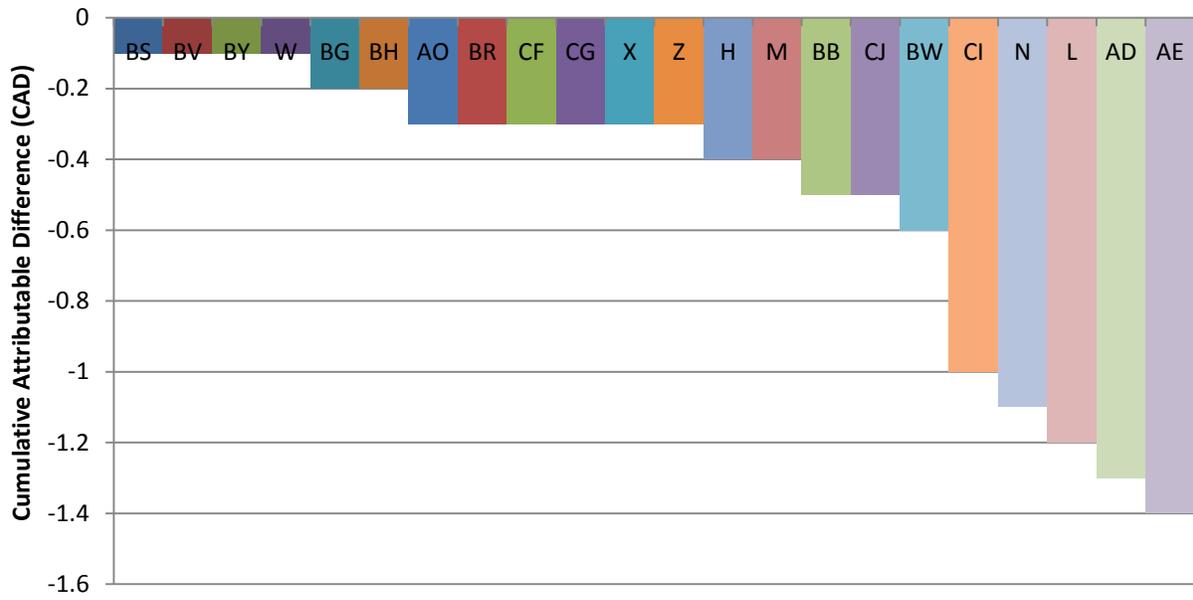


Figure A25. ICU CLABSI CAD Group 4: Facilities with the most infections prevented beyond expected

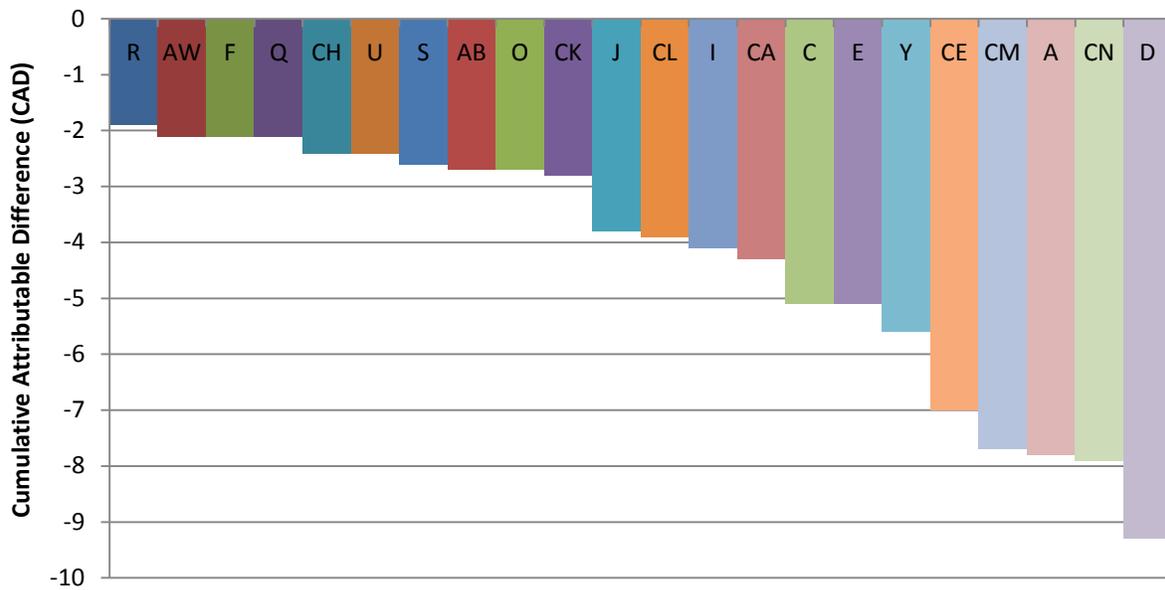


Figure A26. Ward CLABSI CAD, All Facilities

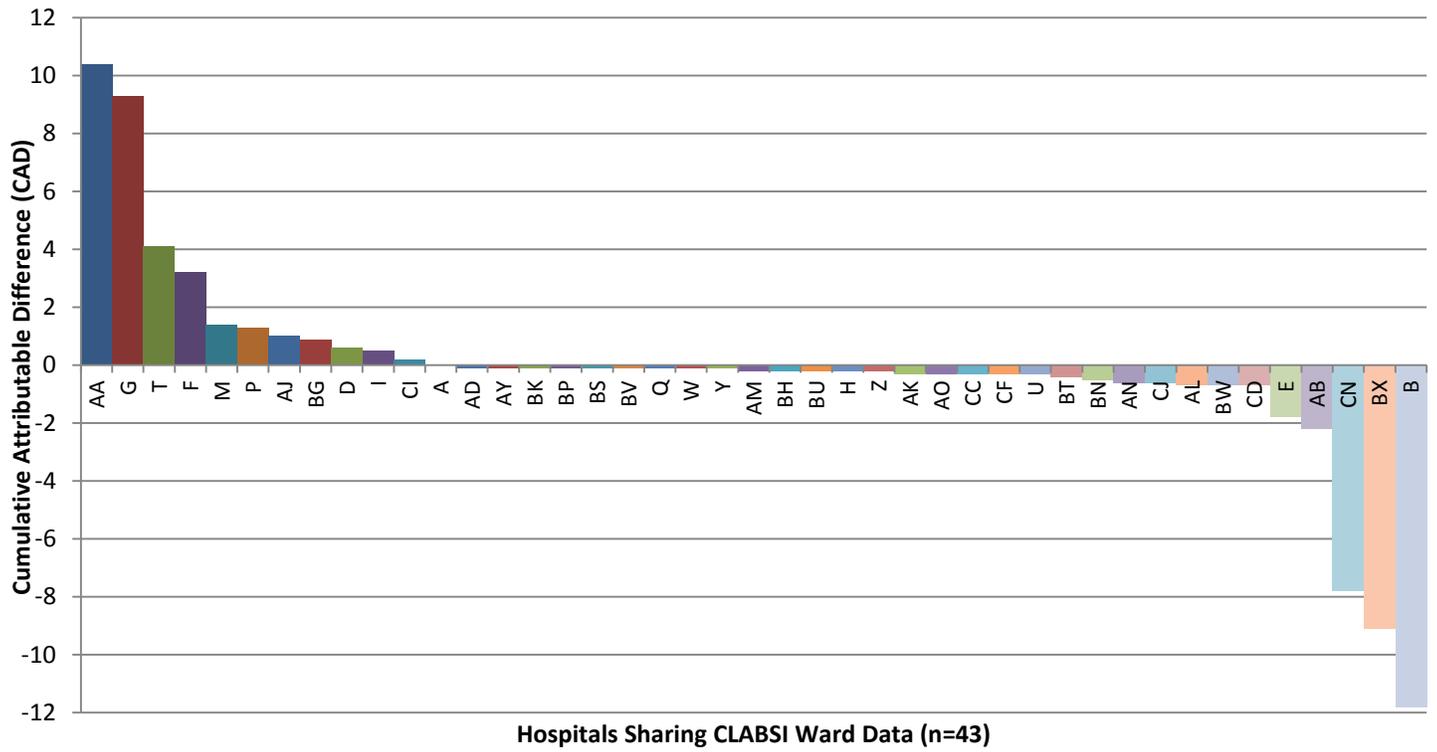


Figure A27. NICU CLABSI CAD, All Hospitals

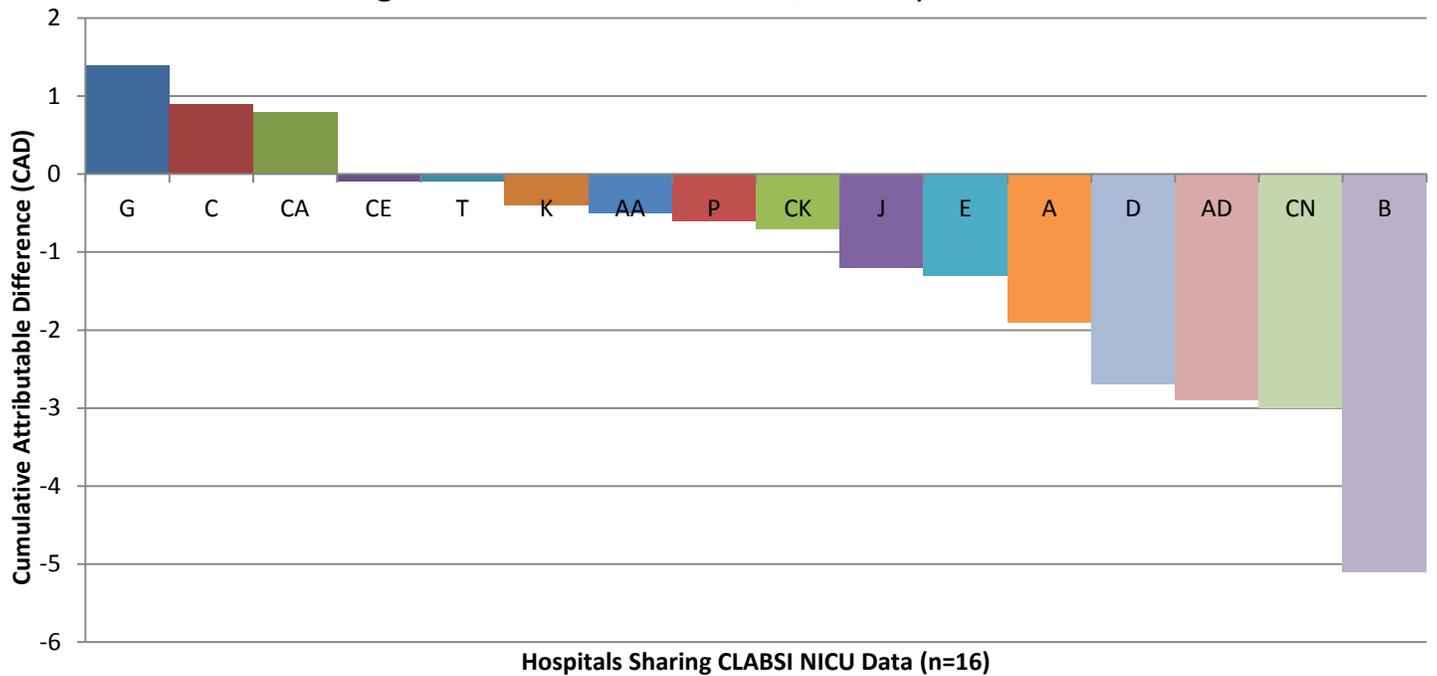


Figure A28. 2014 Facility-Wide CDI CAD, All Facilities

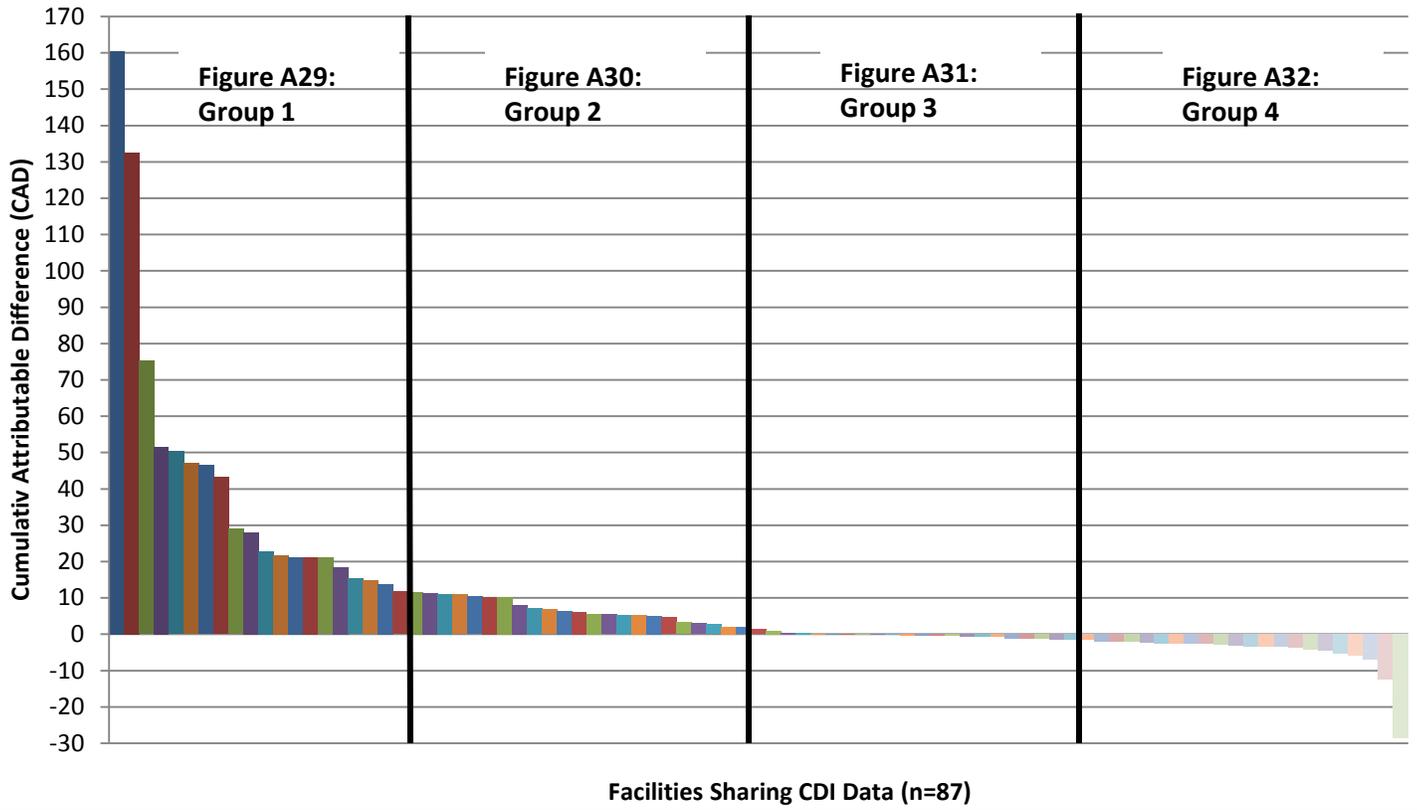


Figure A29. Facility-Wide CDI CAD Group 1: Facilities with the most infections needed to prevent

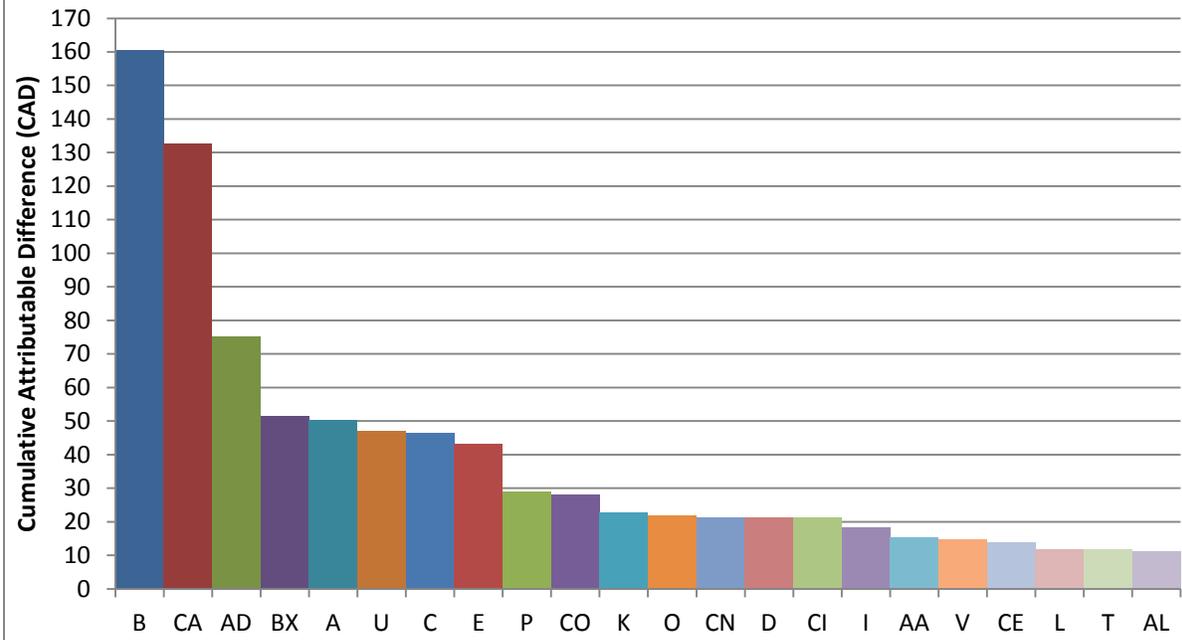


Figure A30. Facility-Wide CDI CAD Group 2: Facilities with the second most infections needed to prevent

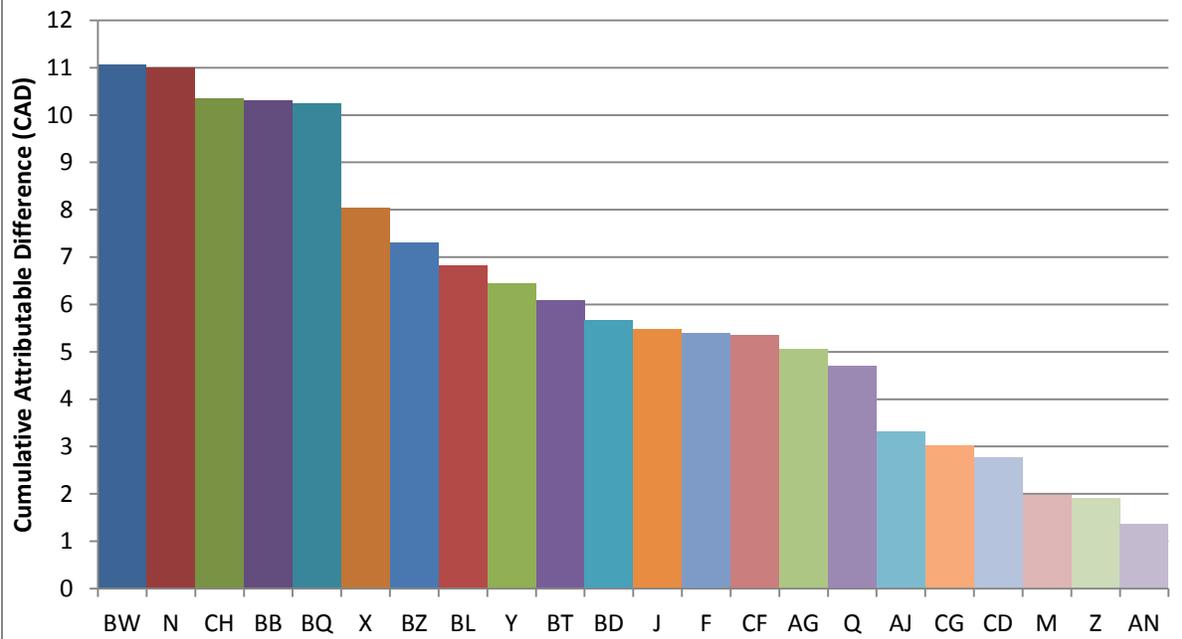


Figure A31. Facility-Wide CDI CAD Group 3: Facilities with the fewest infections needed to prevent or the second most infections prevented beyond expected

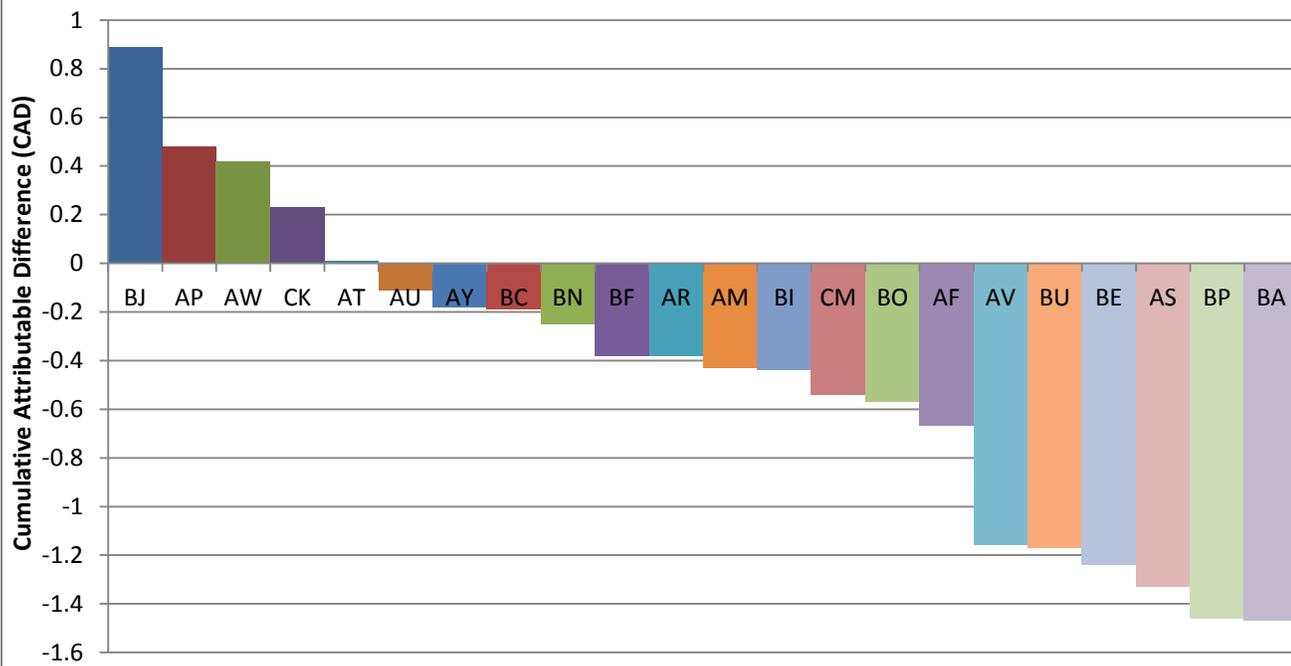


Figure A32. Facility-Wide CDI CAD Group 4: Facilities with the most infections prevented beyond expected



Figure A33. Facility-wide MRSA CAD, All Facilities

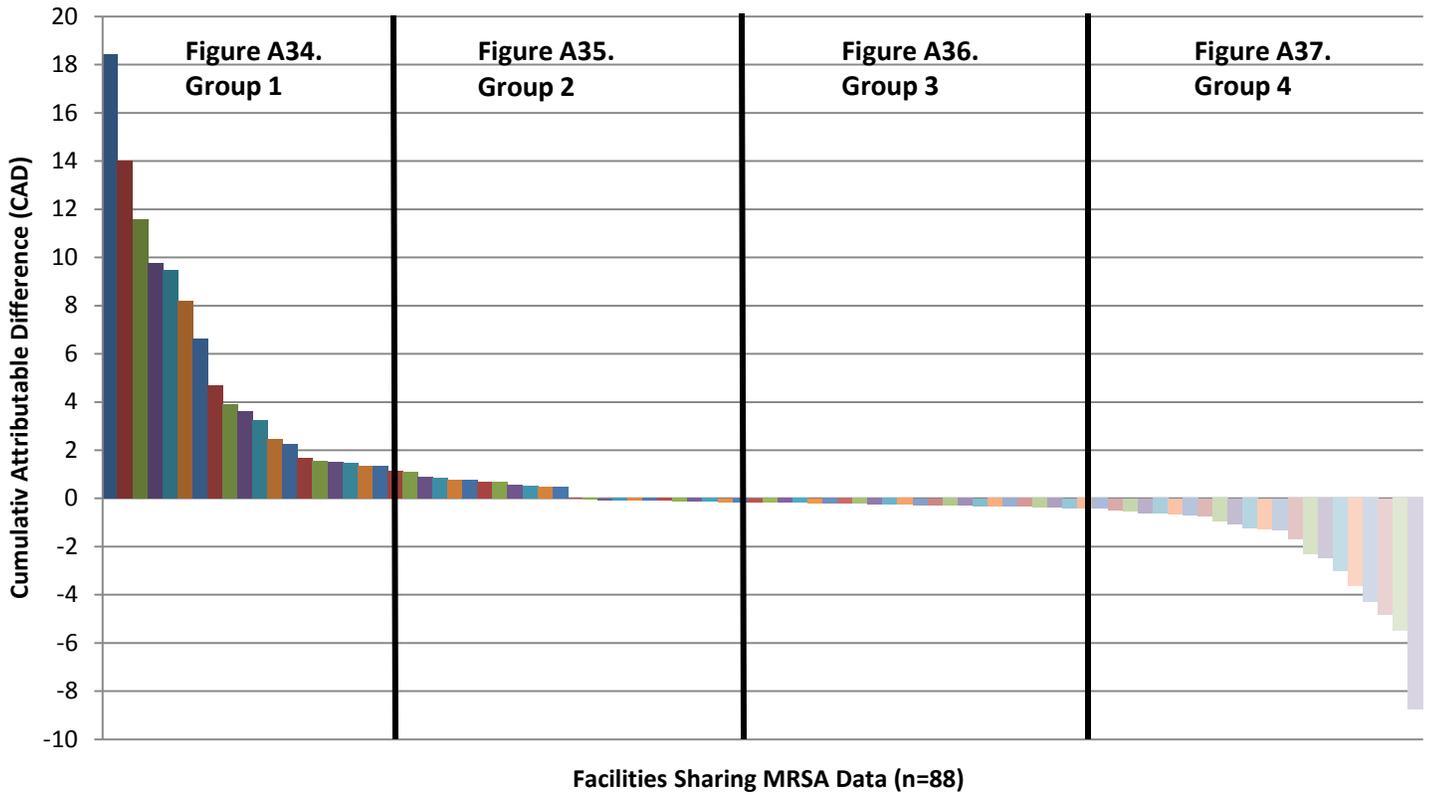


Figure A34. Facility-wide MRSA CAD Group 1: Facilities with the most infections needed to prevent

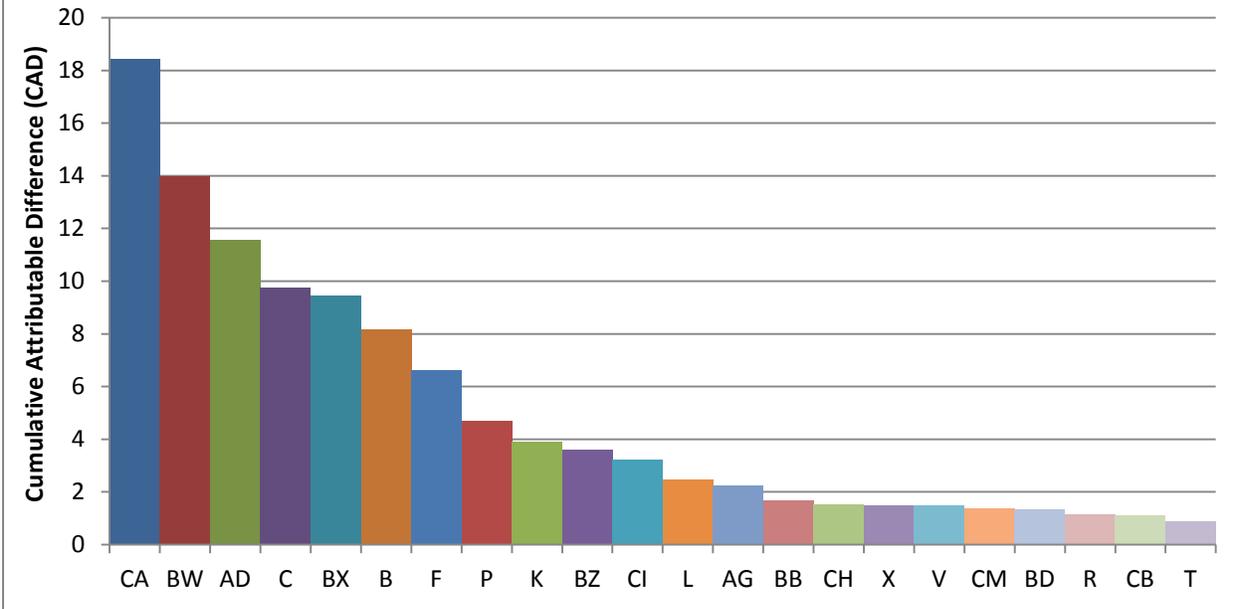


Figure A35. Facility-wide MRSA CAD Group 2: Facilities with the second most infections needed to prevent or the fewest infections prevented beyond expected

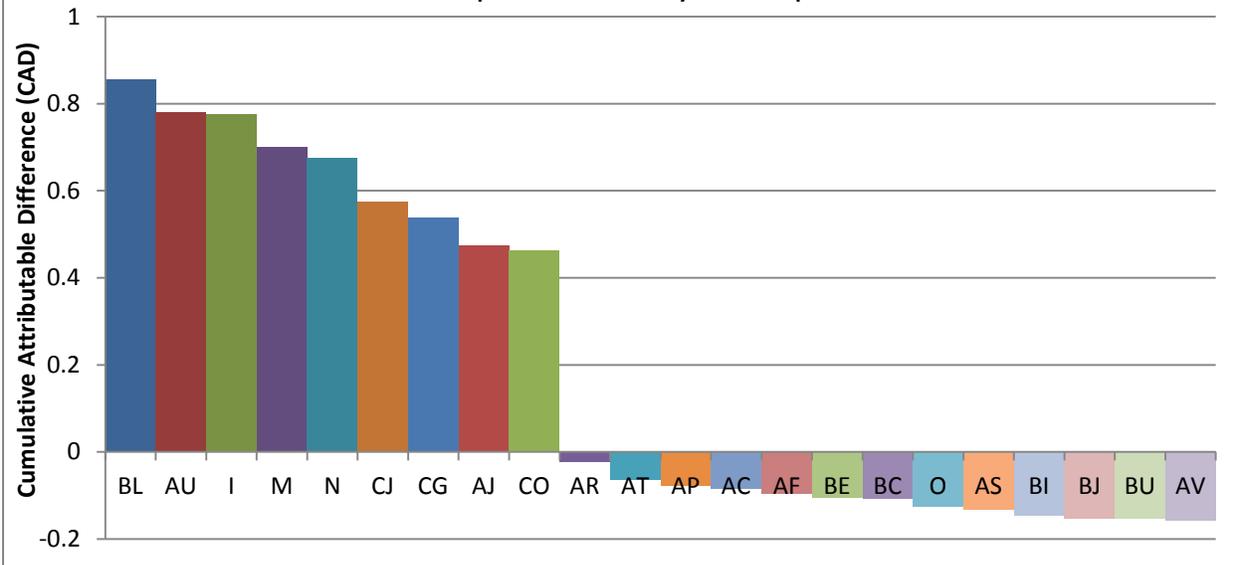


Figure A36. Facility-wide MRSA CAD Group 3: Facilities with the second most infections prevented beyond expected

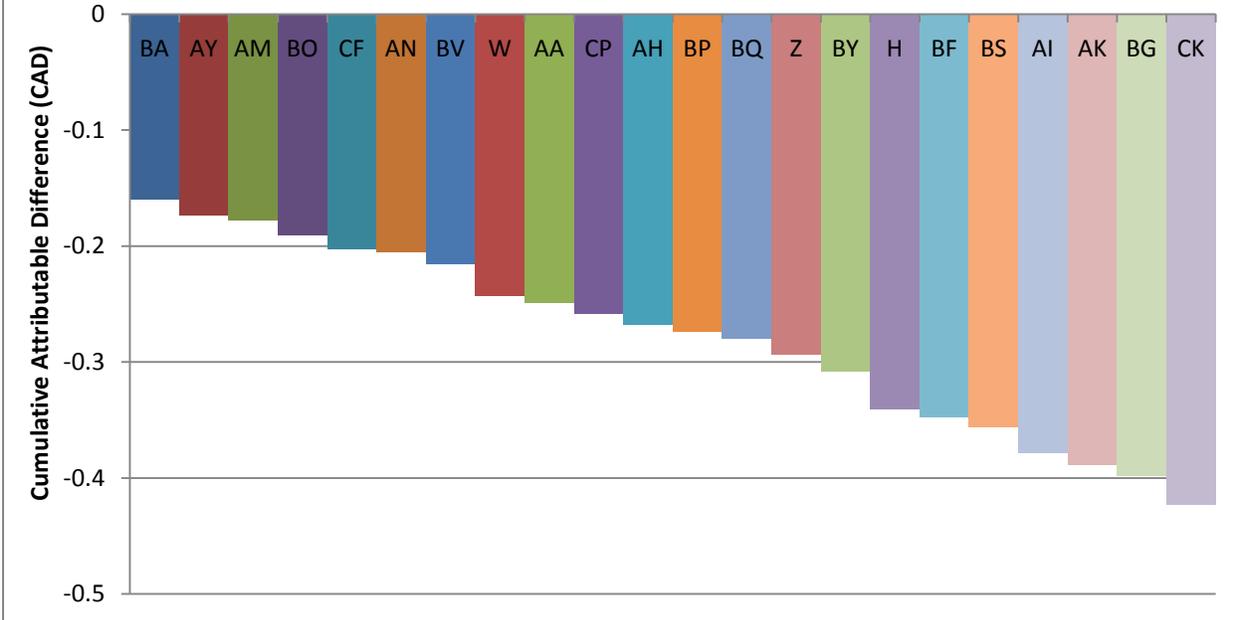


Figure A37. Facility-wide MRSA CAD Group 4: Facilities with the most infections prevented beyond expected

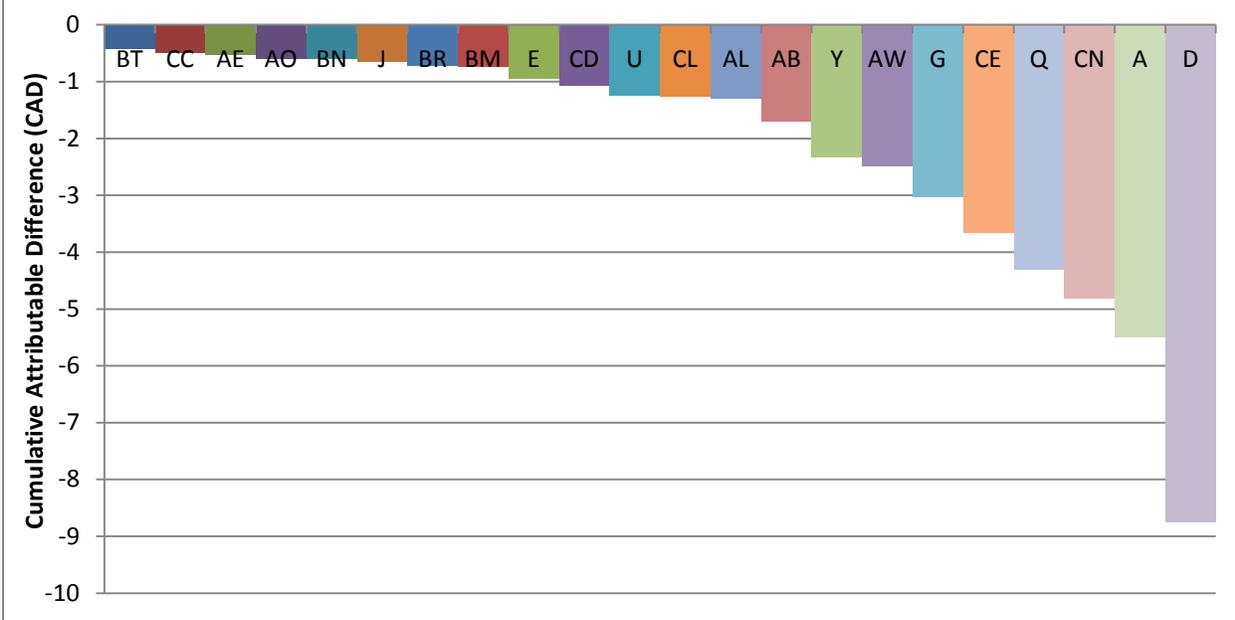


Figure A38. 2014 Facility-wide COLO CAD, All Facilities

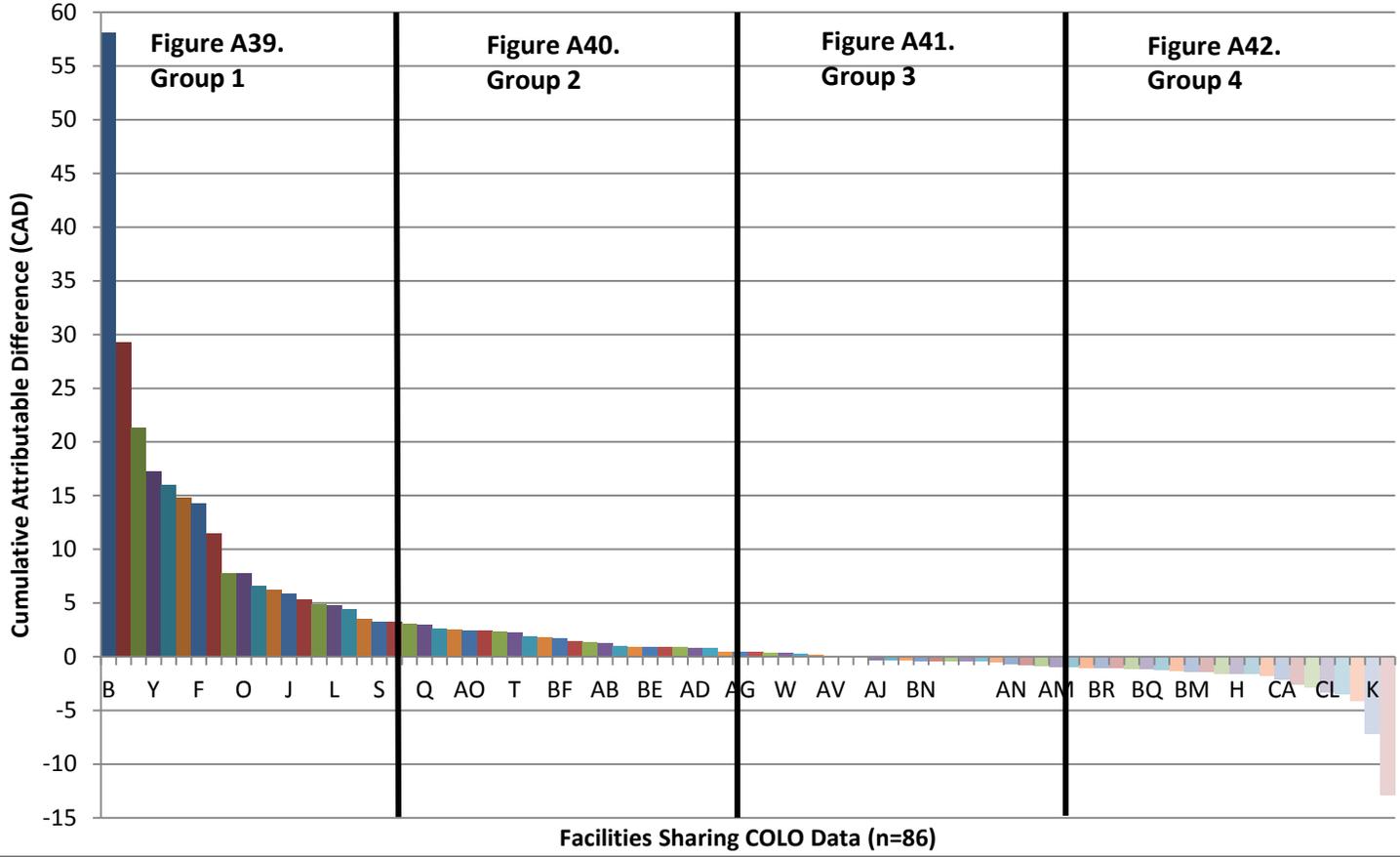


Figure A39. COLO CAD Group 1: Facilities with the most infections needed to prevent

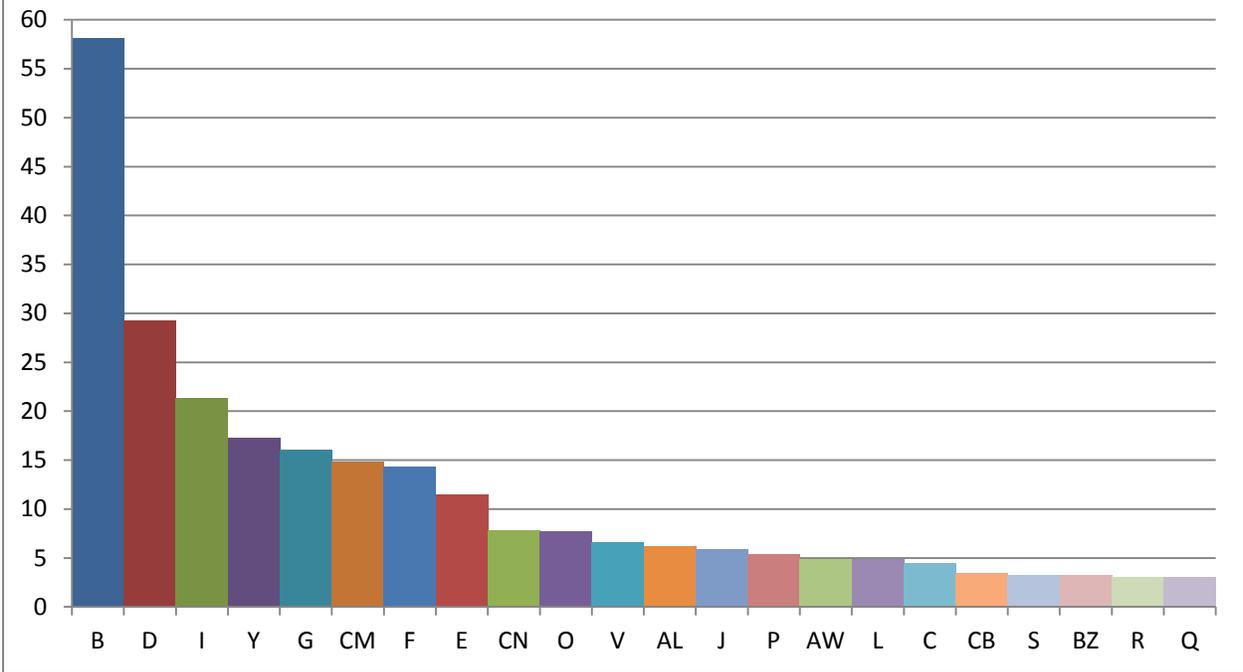


Figure A40. COLO CAD Group 2: Facilities with the second most infections needed to prevent

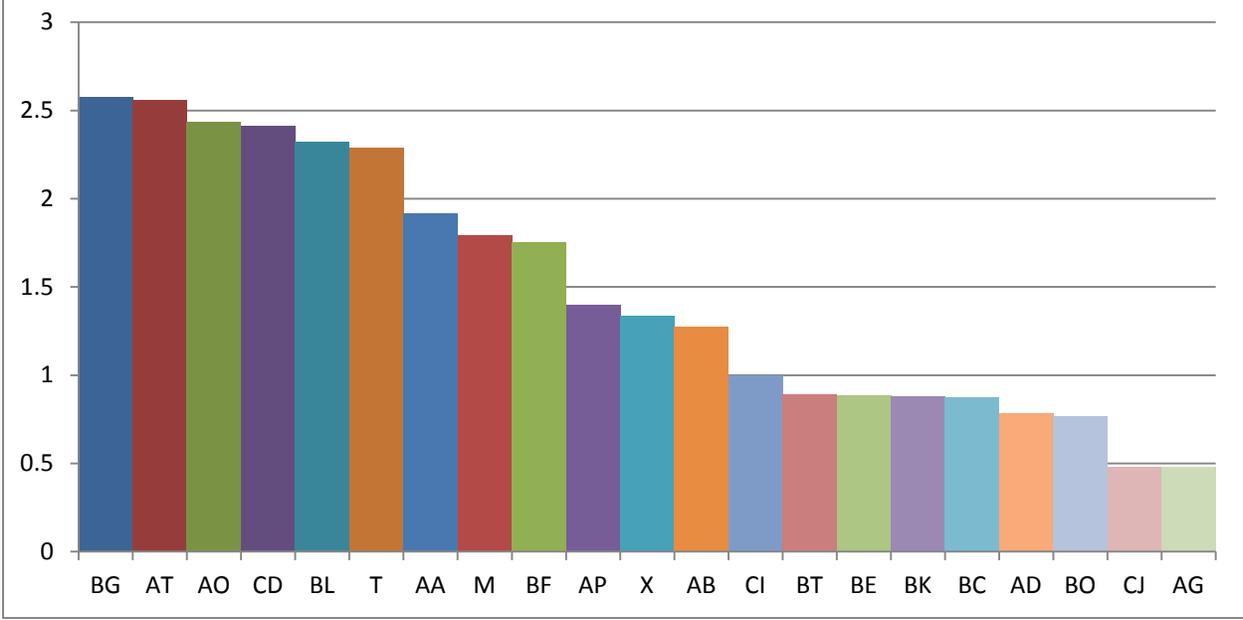


Figure A41. COLO CAD Group 3: Facilities with the fewest infections needed to prevent or the second most infections prevented beyond expected

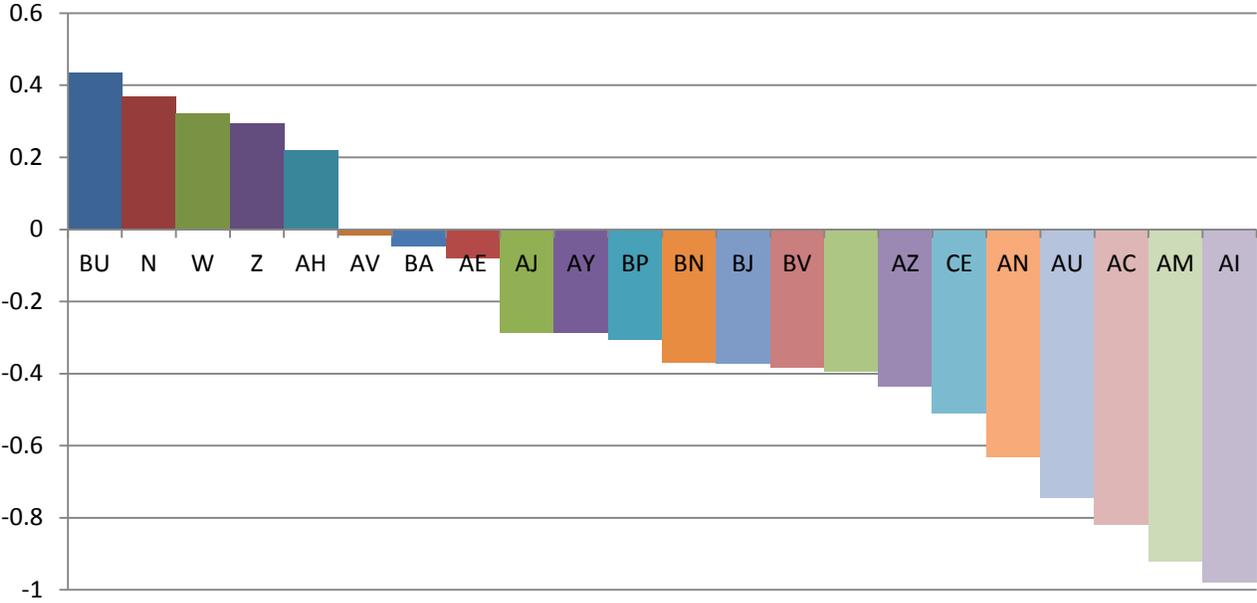


Figure A42. COLO CAD Group 4: Facilities with the most infections prevented beyond expected

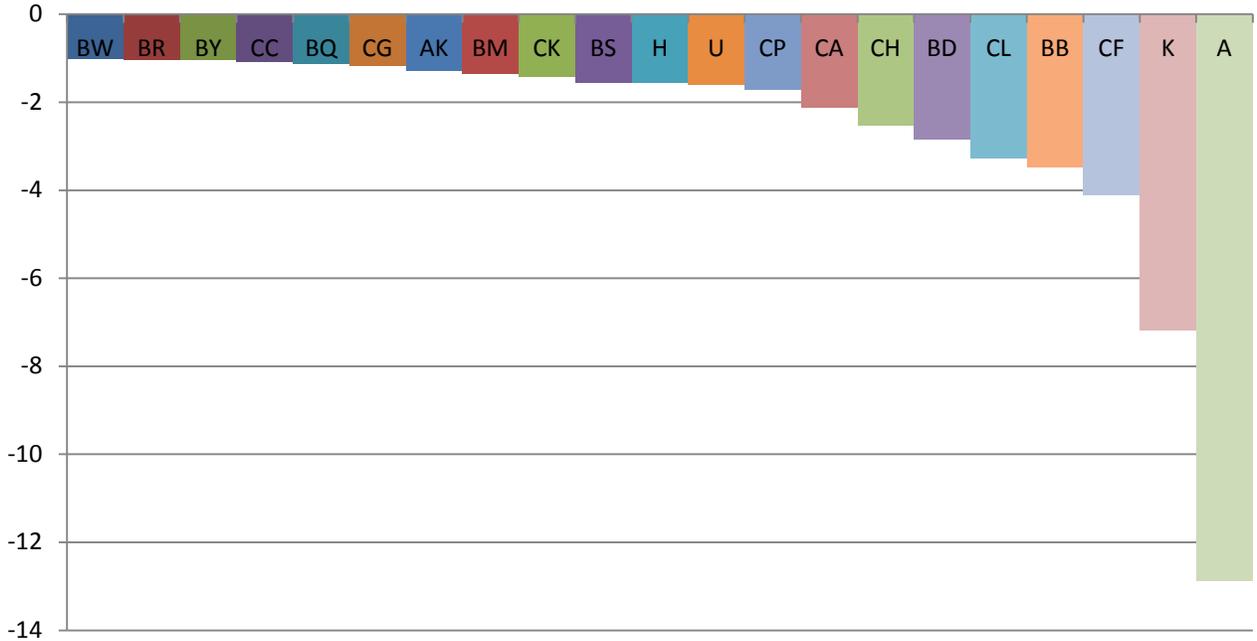


Figure A43. Facility-wide HYST CAD, All Facilities

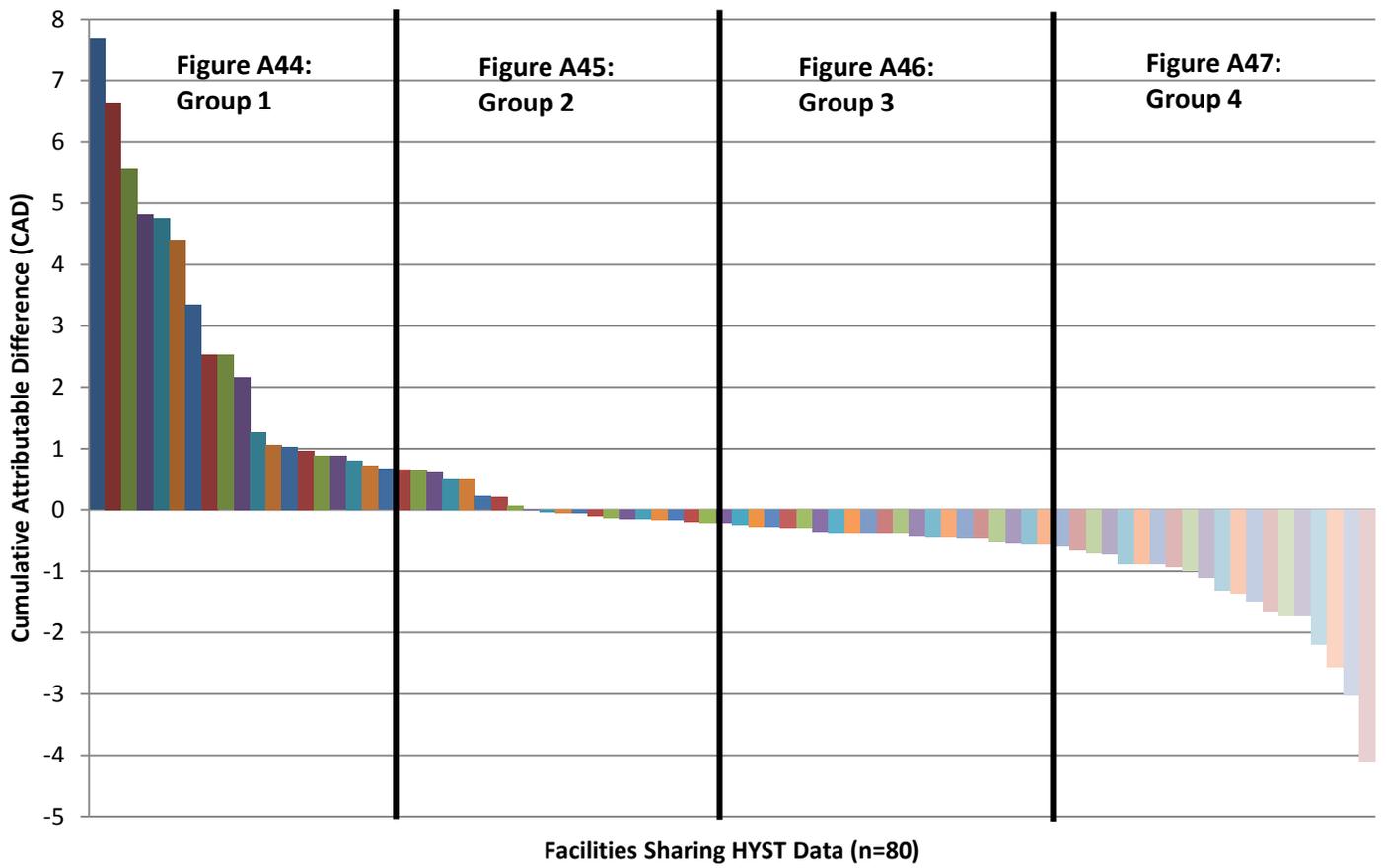


Figure A44. HYST CAD Group 1: Facilities with the most infections needed to prevent

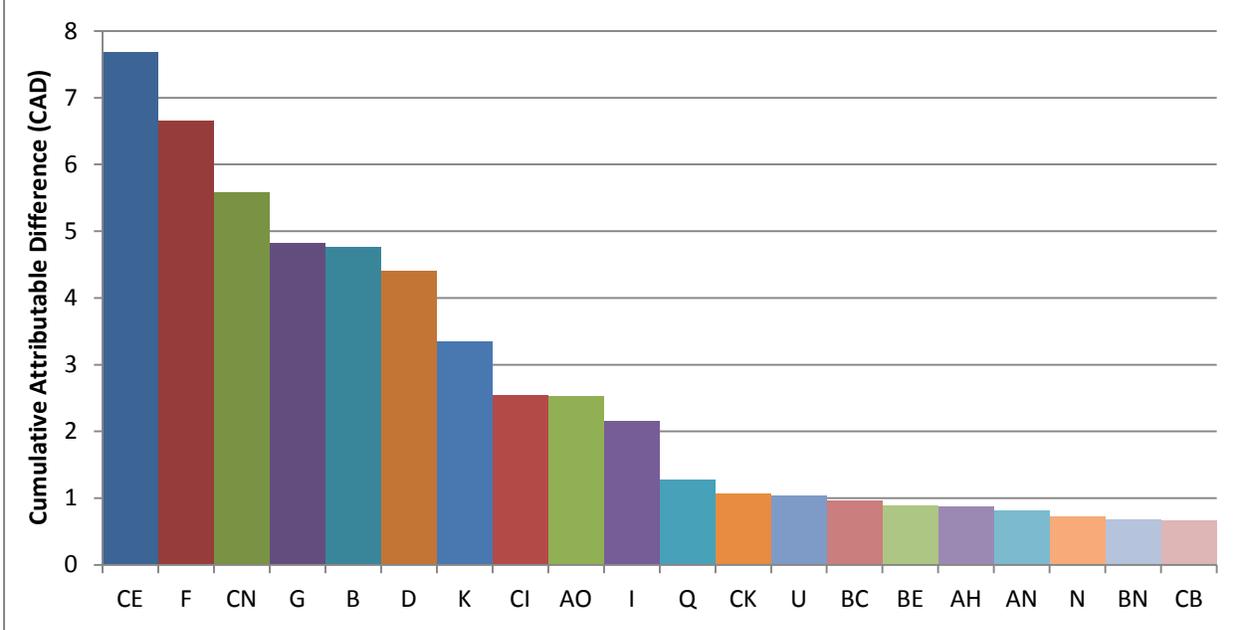


Figure A45. HYST CAD Group 2: Facilities with the second most infections needed to prevent or the fewest infections prevented beyond expected

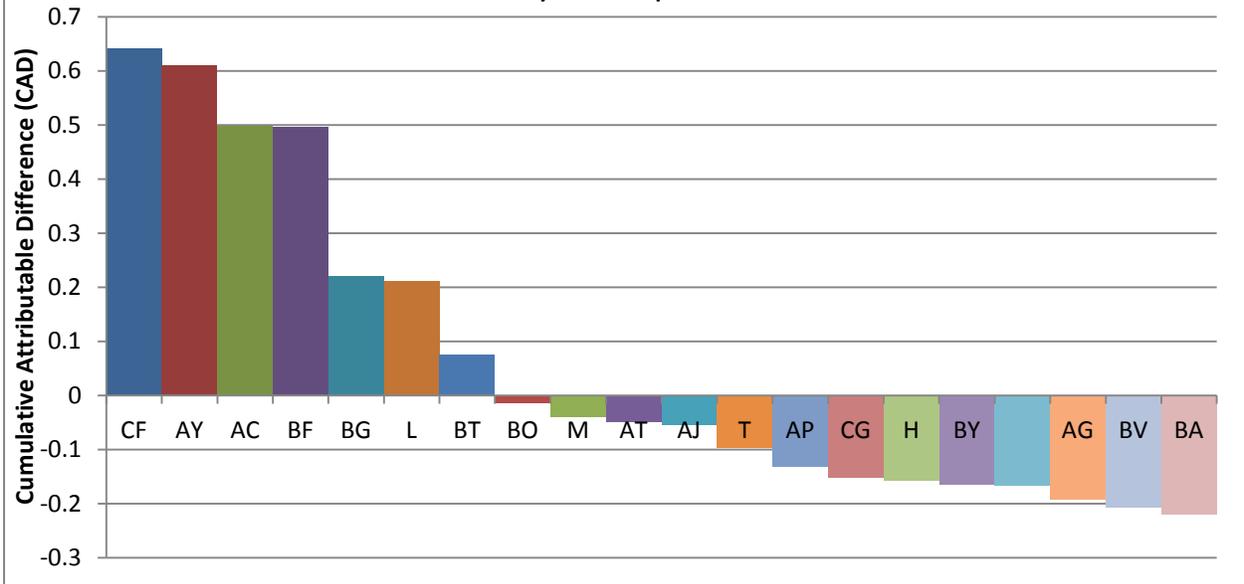


Figure A46. HYST CAD Group 3: Facilities with the second most infections prevented beyond expected

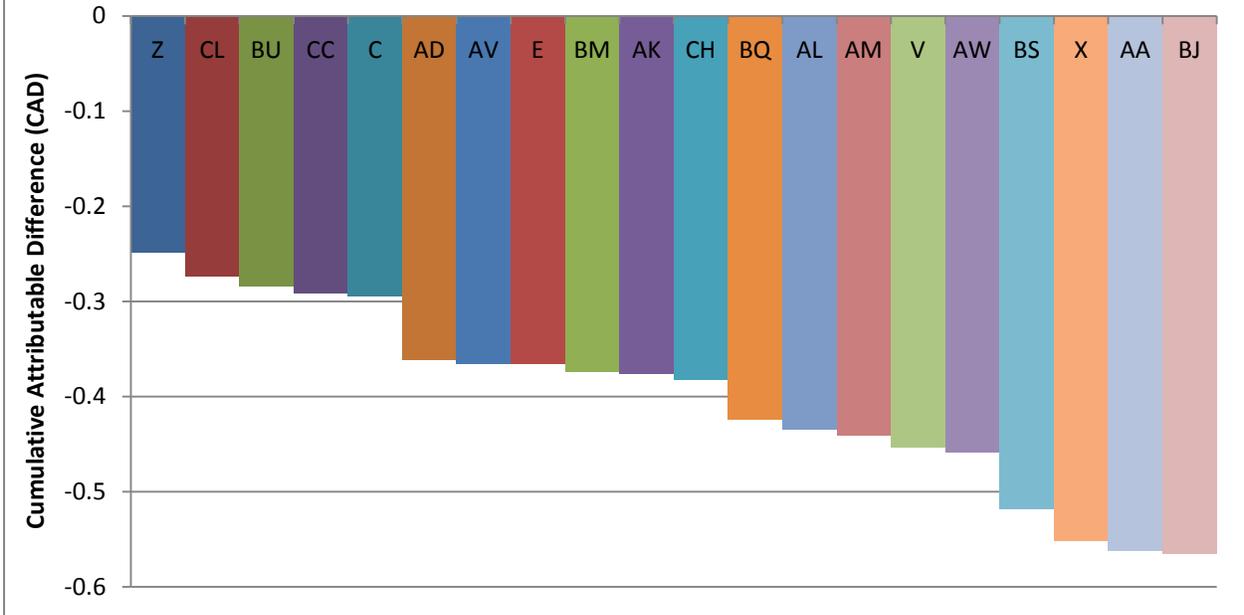
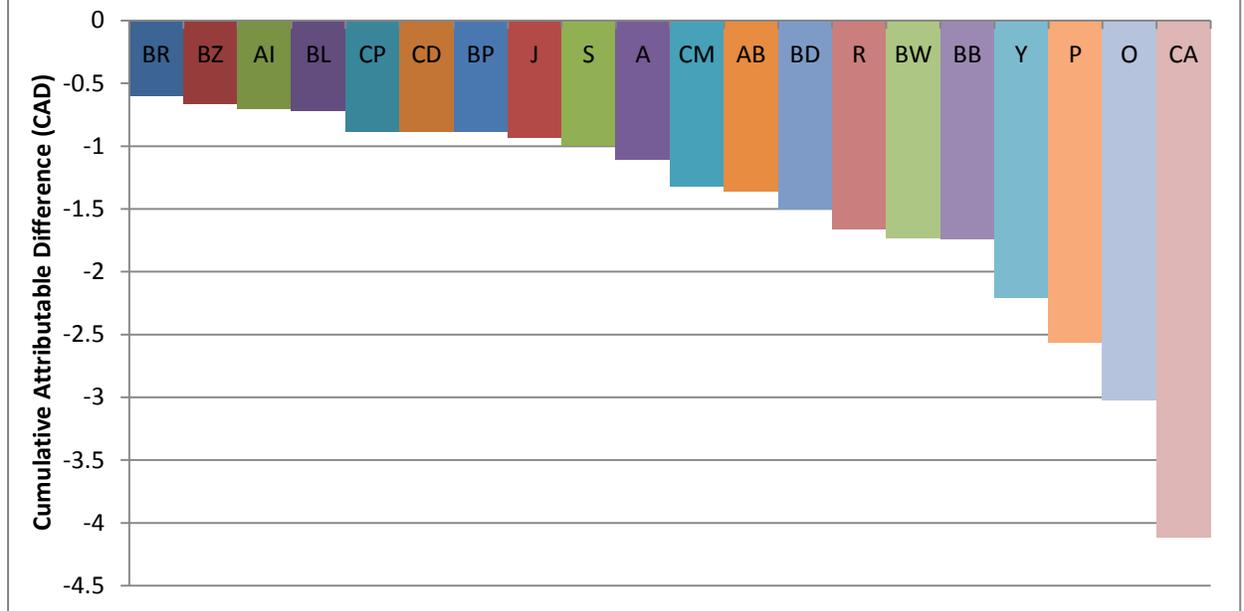


Figure A47. HYST CAD Group 4: Facilities with the most infections prevented beyond expected



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

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