

Healthcare-Associated Infections in Minnesota Acute Care Hospitals

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Healthcare-Associated Infections in Minnesota Acute Care Hospitals 2017

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Contents

Introduction	4
Methods	5
NHSN Data	5
Standardized Infection Ratio (SIR)	5
Risk Adjustment	6
U.S. Department of Health and Human Services (HHS) SIR Goals.....	6
Data Quality	6
Statewide HAI Summary	7
Central Line-Associated Bloodstream Infections (CLABSI)	10
Catheter-Associated Urinary Tract Infection (CAUTI).....	12
Surgical Site Infections (SSI)	14
Methicillin-Resistant <i>Staphylococcus aureus</i> (MRSA) Bacteremia Laboratory-Identified Events (LabID)	16
<i>Clostridioides difficile</i> Infection (CDI) Laboratory-Identified (LabID) Events	18
Antibiotic Stewardship Program Core Elements	20

Introduction

Healthcare-associated infections (HAIs) are infections associated with receiving medical care in a hospital or other health care facility. According to the Centers for Disease Control and Prevention (CDC), there were an estimated 687,000 HAIs in U.S. acute care hospitals in 2015 and approximately 72,000 HAI-associated deaths (CDC, 2018). The widespread use of antibiotics has resulted in an increase in antibiotic-resistant infections, leading to about 2 million illnesses and 23,000 deaths each year in the U.S. (CDC, 2013). In hospitals and other health care settings, antibiotic stewardship programs (ASPs) employ coordinated efforts to improve the effective use of antibiotics. Work done in these programs is an important part of broader health care facility efforts to reduce antibiotic resistance.

Minnesota acute care hospitals participating in the Centers for Medicare and Medicaid Services (CMS) Hospital Inpatient Quality Reporting Program and Inpatient Prospective Payment System (PPS) use the National Healthcare Safety Network (NHSN) to report HAIs and other select measures to fulfill reporting requirements. NHSN is a secure, internet-based surveillance system managed by CDC.

The purpose of this report is to summarize statewide HAI data reported by Minnesota acute care PPS hospitals to NHSN and the progress of all Minnesota acute care hospitals towards implementing CDC's antibiotic stewardship Core Elements as reported through the NHSN annual facility survey.

This report includes five HAIs reported by acute care PPS hospitals:

- Central line-associated bloodstream infections (CLABSI)
- Catheter-associated urinary tract infections (CAUTI)
- Surgical site infections (SSI) following colon surgery and abdominal hysterectomy
- Positive laboratory results for methicillin-resistant *Staphylococcus aureus* (MRSA) in the bloodstream
- Positive laboratory results for *Clostridioides difficile* (*C. difficile*) in stool

This report also includes information reported to NHSN by Minnesota hospitals on their implementation of certain antibiotic stewardship program (ASP) components, or ASP Core Elements.

Methods

NHSN Data

Hospitals self-report data to NHSN according to the NHSN surveillance protocol developed by CDC. Although efforts are made through education and training to improve the standardization and understanding of NHSN surveillance guidelines, definitions, and criteria, there can be variability in interpretation and application, leading to differences in reporting practices among hospitals.

Minnesota Department of Health (MDH) accesses NHSN data through a data use agreement (DUA) with CDC that was initially established in 2013 and updated in November 2017. The DUA establishes a formal data access and data use relationship between MDH and CDC, and stipulates that MDH may only use the data for HAI surveillance and prevention purposes. For more information about MDH NHSN DUA, refer to [The National Healthcare Safety Network \(NHSN\) and Minnesota](http://www.health.state.mn.us/facilities/patientsafety/infectioncontrol/nhsn.html) (<http://www.health.state.mn.us/facilities/patientsafety/infectioncontrol/nhsn.html>).

This report covers data that were collected between January and December 2017 and were downloaded from the NHSN secure internet platform on August 16, 2018; any changes made to the data after this date are not reflected in this report.

There might be variation between results published in this report and results published elsewhere. Hospitals have the ability to modify their NHSN data at any time and as such, results might appear to vary if other sources use different data collection periods or downloaded data from NHSN on a different date.

For more information about NHSN, refer to [National Healthcare Safety Network \(NHSN\)](http://www.cdc.gov/nhsn/) (<http://www.cdc.gov/nhsn/>).

Standardized Infection Ratio (SIR)

The standardized infection ratio (SIR) is a summary measure used to track HAIs at a national, state, or local level over time. The SIR accounts for various facility and/or patient-level factors that contribute to HAI risk. The SIR is calculated by dividing the number of observed infections by the number of predicted infections. The number of predicted infections is calculated based on 2015 national HAI aggregate data, using a multivariable regression model and adjusted using factors found to be significant predictors of HAI incidence.

$$\text{SIR} = \frac{\text{Observed Infections}}{\text{Predicted Infections}}$$

- An SIR greater than 1.0 indicates that more infections were observed than predicted
- An SIR less than 1.0 indicates that fewer infections were observed than predicted

For more information about the SIR, refer to [The NHSN Standard Infection Ratio \(SIR\): A Guide to the SIR](https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/nhsn-sir-guide.pdf) (<https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/nhsn-sir-guide.pdf>).

Risk Adjustment

The SIRs presented in this report are adjusted for risk factors known to be significantly associated with differences in infection incidence, such as type of patient care location, bed size of the hospital, patient age, and other factors. NHSN incorporates information on many important factors that might put a patient at risk for an HAI, but not all clinical details are collected in this system. Therefore, each patient has a different set of risks that might not be fully accounted for in the calculation of the standardized infection ratio.

U.S. Department of Health and Human Services (HHS) SIR Goals

The U.S. Department of Health and Human Services (HHS) sets national HAI reduction targets through the National Action Plan to Prevent Health Care-Associated Infections: Road Map to Elimination. In October 2016, HHS announced new targets for acute care hospitals using national 2015 NHSN data as the baseline. These targets are in effect for a 5-year period during 2015–2020.

The 2020 HHS SIR goals for the HAIs included in this report are as follows:

- CLABSI and MRSA: 0.50
- CAUTI: 0.75
- SSI and CDI: 0.70

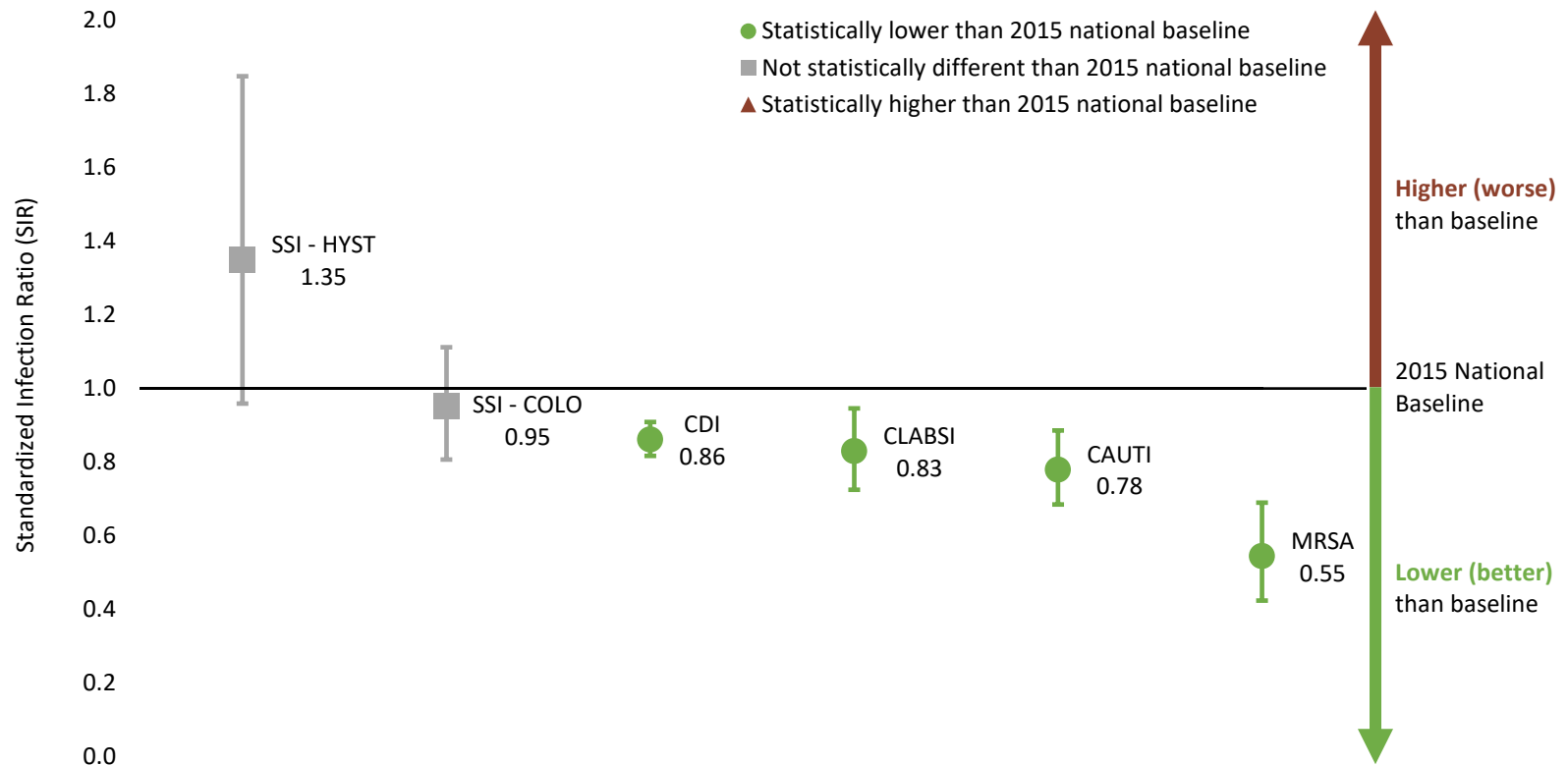
For more information about these targets and the National HAI Action Plan, refer to [National Targets and Metrics – Health Care-Associated Infections \(https://health.gov/hcq/prevent-hai-measures.asp\)](https://health.gov/hcq/prevent-hai-measures.asp).

Data Quality

All data presented in this report are self-reported by hospitals to NHSN. In order to ensure complete and accurate data, MDH conducts quarterly data quality reviews of NHSN data for Minnesota acute care PPS hospitals to identify internal inconsistencies and outlier values that could be erroneous. For more information about MDH NHSN data quality reviews, refer to [The National Healthcare Safety Network \(NHSN\) and Minnesota \(http://www.health.state.mn.us/facilities/patientsafety/infectioncontrol/nhsn.html\)](http://www.health.state.mn.us/facilities/patientsafety/infectioncontrol/nhsn.html).

Statewide HAI Summary

Figure 1. Minnesota PPS Acute Care Hospital Standardized Infection Ratios (SIR) for Selected Healthcare-Associated Infections (HAI), 2017

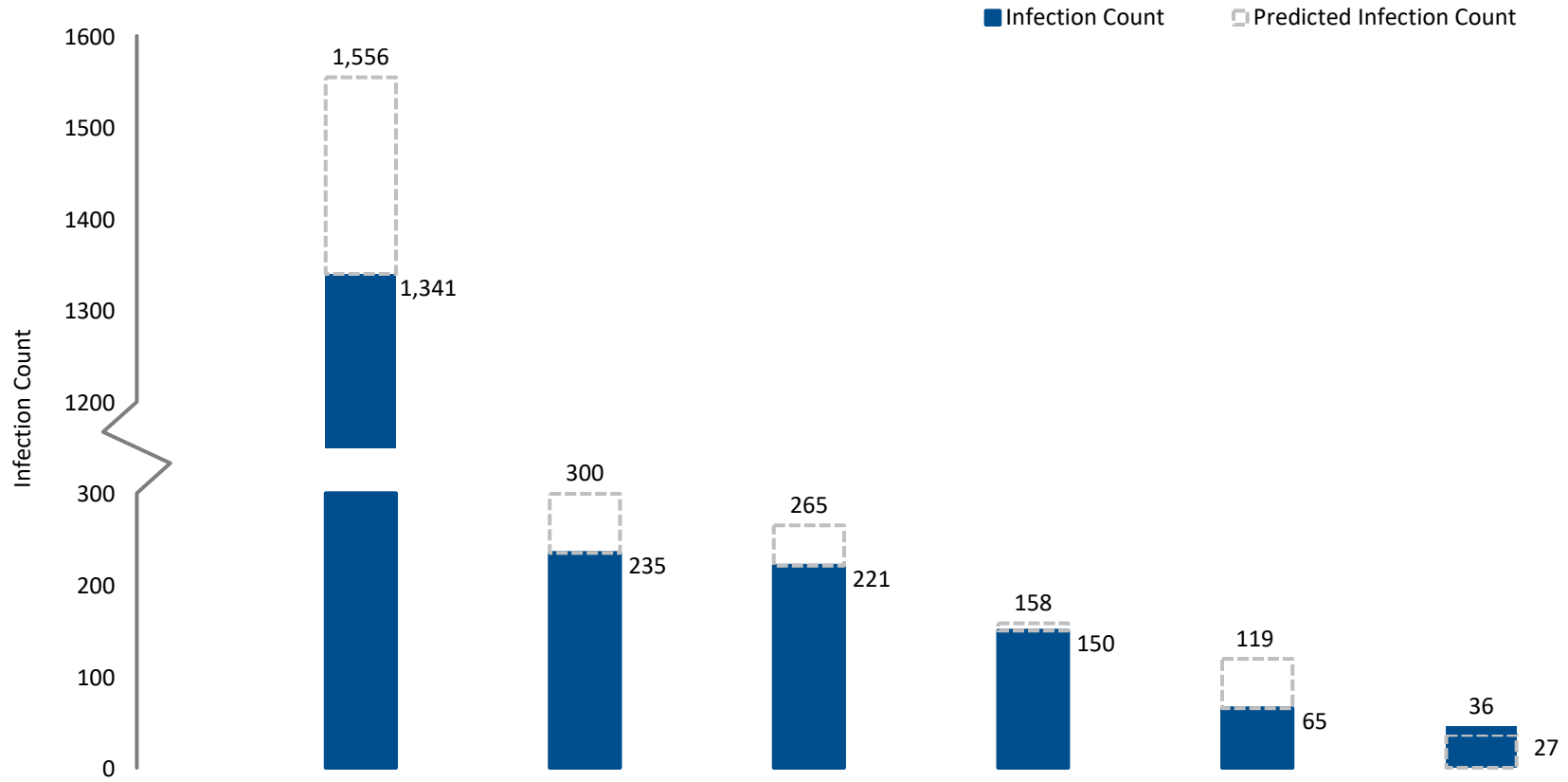


HAI Type	SSI – HYST	SSI – COLO	CDI	CLABSI	CAUTI	MRSA
Infection Count	36	150	1,341	221	235	65
Predicted Infection Count	27	158	1,556	265	300	119
SIR	1.35	0.95	0.86	0.83	0.78	0.55
HHS 2020 SIR Goal	0.70	0.70	0.70	0.50	0.75	0.50

PPS = Prospective Payment Systems; SSI = Surgical Site Infection; HYST = Abdominal hysterectomy; COLO = Colon surgery; CDI = Laboratory-identified *C. difficile*; CAUTI = Catheter-Associated Urinary Tract Infection; CLABSI = Central Line-Associated Bloodstream Infection; MRSA = Laboratory-identified MRSA bacteremia; HHS = U.S. Department of Health and Human Services; Data downloaded from NHSN on August 16, 2018

HEALTHCARE-ASSOCIATED INFECTIONS IN MINNESOTA ACUTE CARE HOSPITALS

Figure 2. Minnesota PPS Acute Care Hospitals Predicted and Actual Infection Counts for Selected Healthcare-Associated Infections (HAI), 2017



HAI Type	CDI	CAUTI	CLABSI	SSI – COLO	MRSA	SSI – HYST
Infection Count	1,341	235	221	150	65	36
Predicted Infection Count	1,556	300	265	158	119	27
SIR	0.86	0.78	0.83	0.95	0.55	1.35
HHS 2020 SIR Goal	0.70	0.75	0.50	0.70	0.50	0.70

PPS = Prospective Payment Systems; SSI = Surgical Site Infection; HYST = Abdominal hysterectomy; COLO = Colon surgery; CDI = Laboratory-identified *C. difficile*; CAUTI = Catheter-Associated Urinary Tract Infection; CLABSI = Central Line-Associated Bloodstream Infection; MRSA = Laboratory-identified MRSA bacteremia; HHS = U.S. Department of Health and Human Services; Data downloaded from NHSN on August 16, 2018

Healthcare-Associated Infection (HAI) data submitted to the National Healthcare Safety Network (NHSN) by Minnesota Acute Care PPS Hospitals (n=50), 2016 and 2017

Table 1. Central Line-Associated Bloodstream Infections (CLABSI)

Unit	2016 MN SIR	2017 MN SIR	% Change (2016 – 2017)	
ICU, NICU, and Ward*	0.76	0.83	↑	9%
ICU	0.93	1.00	↑	7%
NICU	0.48	0.47	↓	-2%
Ward*	0.63	0.73	↑	15%

HHS 2020 SIR Goal: 0.50

*Ward locations include adult and pediatric medical, surgical, and medical/surgical wards

Table 3. Surgical Site Infections (SSI)**

Type	2016 MN SIR	2017 MN SIR	% Change (2016 – 2017)	
Colon Surgery	1.04	0.95	↓	-9%
Abdominal Hysterectomy	1.04	1.35	↑	29%

HHS 2020 SIR Goal: 0.70

** SSI SIR is risk adjusted using the Complex Admission/Readmission model

Standardized Infection Ratio (SIR) = Observed/Predicted HAIs
 Risk adjustment for SIR based on NHSN 2015 national baseline
 Data downloaded from NHSN on August 16, 2018

Table 2. Catheter-Associated Urinary Tract Infections (CAUTI)

Unit	2016 MN SIR	2017 MN SIR	% Change (2016 – 2017)	
ICU and Ward*	1.05	0.78	↓	-25%
ICU	1.18	0.79	↓	-34%
Ward*	0.87	0.78	↓	-10%
Inpatient Rehabilitation	1.56	1.60	↑	3%

HHS 2020 SIR Goal: 0.75

*Ward locations include adult and pediatric medical, surgical, and medical/surgical wards

Table 4. Facility-wide Laboratory-Identified (LabID) Events

Type	2016 MN SIR	2017 MN SIR	% Change (2016 – 2017)	
MRSA Bacteremia	0.52	0.55	↑	5%
C. difficile Infection	0.93	0.86	↓	-7%

MRSA HHS 2020 SIR Goal: 0.50

CDI HHS 2020 SIR Goal: 0.70

Key	
SIR is not statistically different from national baseline	
SIR is statistically lower than national baseline	
SIR is statistically higher than national baseline	
↑↓	Change is not statistically significant
↓	Statistically significant decrease in SIR
↑	Statistically significant increase in SIR

Central Line-Associated Bloodstream Infections (CLABSI)

A **central line** is a tube placed in a large vein to allow access to the bloodstream and administration of intravenous (IV) medications. A **central line-associated bloodstream infection (CLABSI)** can occur when bacteria or other germs travel along a central line and enter the bloodstream. When inserted incorrectly or if the insertion site is not kept clean, a central line can become a pathway for germs to enter the body and a serious bloodstream infection might result.

This report includes CLABSI data reported by Minnesota acute care PPS hospitals from units required for CMS reporting, including adult, pediatric, and neonatal intensive care units (ICU), and adult and pediatric medical, surgical, and medical/surgical wards. It does not include CLABSI data that might have been reported voluntarily from other units, such as specialty wards.

Table 5. CLABSI by Location Type, Acute Care PPS Hospitals, 2017

Location Type	No. Facilities Reporting	Infection Count	Predicted Infection Count	Number Central Line Days	SIR (95% CI)	Facilities with ≥ 1 Predicted Infection	Facilities with ≥ 1 Predicted Infection and SIR Sig. < 1 n (%)	Facilities with ≥ 1 Predicted Infection and SIR Sig. > 1 n (%)
ICU, NICU, and Ward*	50	221	265.0	263,778	0.83 (0.73, 0.95)	22	6 (27%)	1 (5%)
ICU	39	120	120.1	109,723	1.00 (0.83, 1.19)	16	5 (31%)	2 (13%)
NICU	11	8	17.0	11,852	0.47 (0.22, 0.89)	4	0 (0%)	0 (0%)
Ward*	50	93	127.9	142,203	0.73 (0.59, 0.89)	19	3 (16%)	1 (5%)

*Ward locations include adult and pediatric medical, surgical, and medical/surgical wards

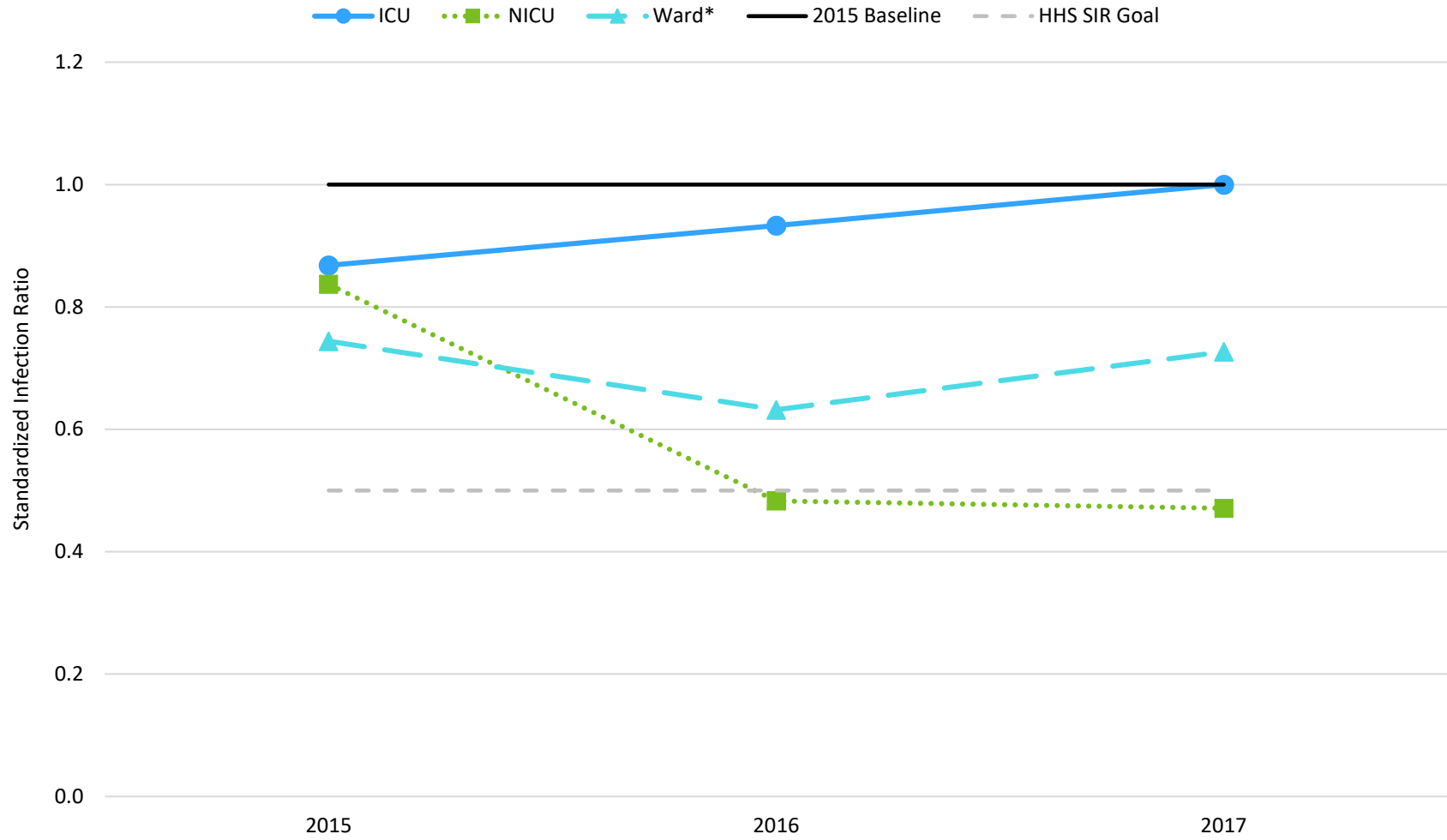
Sig. = statistically significant

Green shading indicates SIR is statistically lower than 2015 national baseline

Red shading indicates SIR is statistically higher than 2015 national baseline

Data downloaded from NHSN on August 16, 2018

Figure 3. CLABSI SIR by Year and Location Type, Acute Care PPS Hospitals, 2015–2017



*Ward locations include adult and pediatric medical, surgical, and medical/surgical wards
 Data downloaded from NHSN on August 16, 2018

Catheter-Associated Urinary Tract Infection (CAUTI)

A **urinary catheter** is a tube placed in the bladder to drain urine. A **catheter-associated urinary tract infection (CAUTI)** can occur when bacteria or other germs travel along a urinary catheter, resulting in a bladder or kidney infection.

This report includes CAUTI data reported by Minnesota acute care PPS hospitals from units required for CMS reporting including adult and pediatric intensive care units (ICU), adult and pediatric medical, surgical, and medical/surgical wards, and CMS-certified inpatient rehabilitation wards. It does not include CAUTI data that may have been reported voluntarily from other units, such as specialty wards.

Table 6. CAUTI by Location Type, Acute Care PPS Hospitals, 2017

Location Type	No. Facilities Reporting	Infection Count	Predicted Infection Count	Number Urinary Catheter Days	SIR (95% CI)	Facilities with ≥ 1 Predicted Infection	Facilities with ≥ 1 Predicted Infection and SIR Sig. < 1 n (%)	Facilities with ≥ 1 Predicted Infection and SIR Sig. > 1 n (%)
ICU and Ward*	50	235	299.6	252,884	0.78 (0.69, 0.89)	29	4 (14%)	2 (7%)
ICU	39	133	169.0	117,447	0.79 (0.66, 0.93)	16	2 (13%)	1 (6%)
Ward*	50	102	130.5	135,437	0.78 (0.64, 0.95)	25	3 (12%)	2 (8%)
Rehabilitation	13	18	11.2	4,266	1.60 (0.98, 2.49)	5	0 (0%)	0 (0%)

*Ward locations include adult and pediatric medical, surgical, and medical/surgical wards

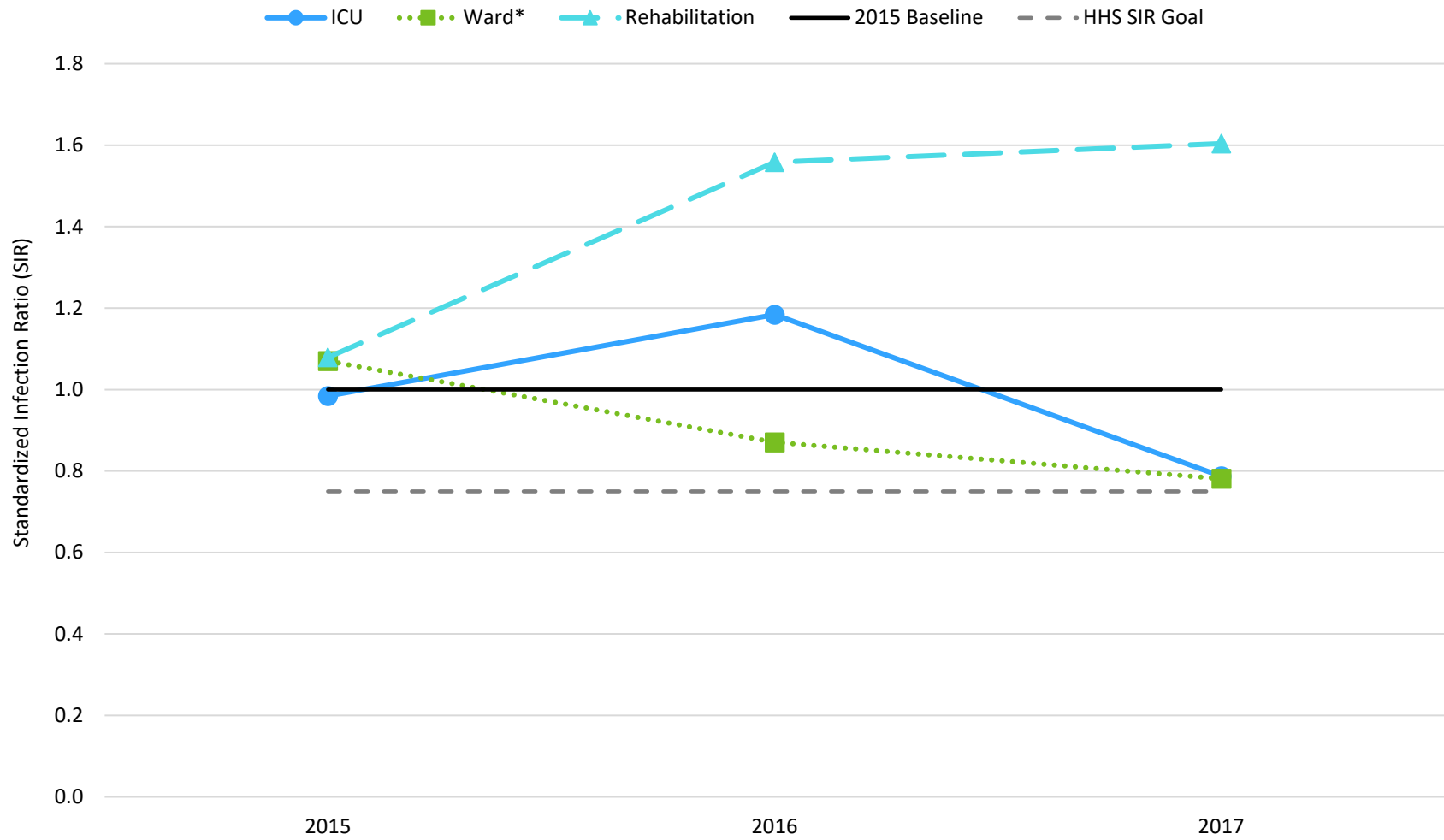
Sig. = statistically significant

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Red shading indicates SIR is statistically higher than 2015 national baseline

Data downloaded from NHSN on August 16, 2018

Figure 4. CAUTI SIR by Year and Location Type, Acute Care PPS Hospitals, 2015–2017



*Ward locations include adult and pediatric medical, surgical, and medical/surgical wards
Data downloaded from NHSN on August 16, 2018

Surgical Site Infections (SSI)

A **surgical site infection** (SSI) occurs after surgery in the part of the body where the surgery took place. These infections might involve only the skin but could also be more serious if tissue under the skin or internal organs are infected. SSIs sometimes take extended time periods after surgery to develop. Symptoms might include fever, redness or pain around the surgical site, or drainage of fluid from the wound.

This report includes SSIs reported by Minnesota acute care PPS hospitals following surgical procedures required for CMS reporting including colon surgeries (COLO) and abdominal hysterectomies (HYST) from hospitals that perform those procedures. It does not include SSI data that may have been reported voluntarily for other types of surgical procedures.

**Table 7. SSIs Following Colon Surgery (COLO) and Abdominal Hysterectomy (HYST),
Acute Care PPS Hospitals, 2017**

Procedure Type	No. Facilities Reporting	Infection Count	Predicted Infection Count	Number of Procedures	SIR (95% CI)	Facilities with ≥ 1 Predicted Infection	Facilities with ≥ 1 Predicted Infection and SIR Sig. < 1 n (%)	Facilities with ≥ 1 Predicted Infection and SIR Sig. > 1 n (%)
COLO	50	150	157.8	5,646	0.95 (0.81, 1.11)	22	1 (5%)	0 (0%)
HYST	48	36	26.7	3,965	1.35 (0.96, 1.85)	9	0 (0%)	1 (11%)

Complex Admission/Readmission SIR model

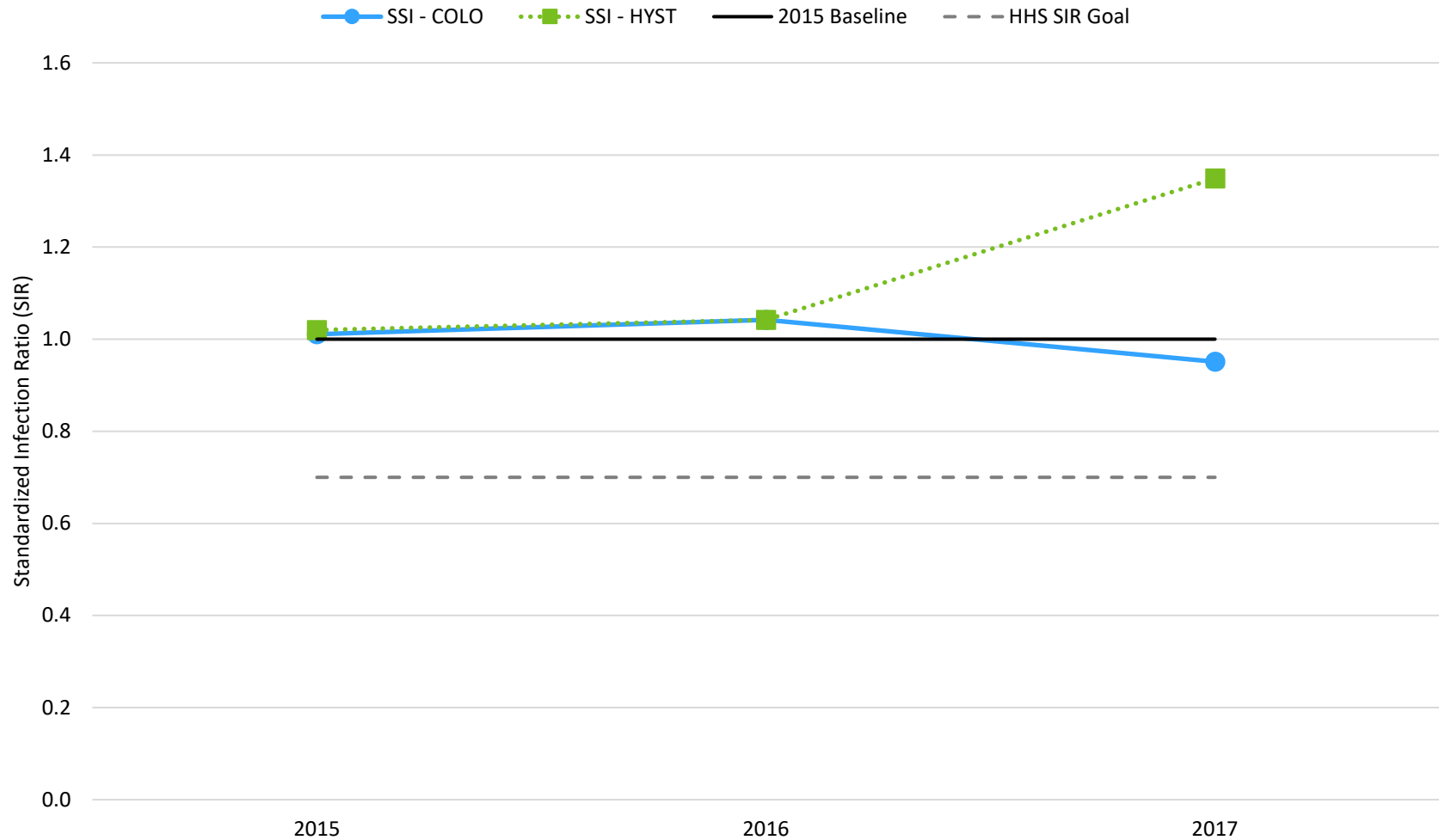
Sig. = statistically significant

Green shading indicates SIR is statistically lower than 2015 national baseline

Red shading indicates SIR is statistically higher than 2015 national baseline

Data downloaded from NHSN on August 16, 2018

Figure 5. SSI Complex Admission/Readmission SIR by Year and Procedure Type, Acute Care PPS Hospitals, 2015–2017



Data downloaded from NHSN on August 16, 2018

Methicillin-Resistant *Staphylococcus aureus* (MRSA) Bacteremia Laboratory-Identified Events (LabID)

Methicillin-resistant *Staphylococcus aureus* (MRSA) infections are caused by bacteria that are resistant to certain types of drugs. MRSA can cause skin or wound infections. Sometimes, MRSA can infect the blood and cause serious illness and even death.

This report includes incident MRSA bloodstream infections identified on or after the fourth day of hospitalization (health care facility-onset) in inpatient locations reported by Minnesota acute care PPS hospitals.

Table 8. Health Care Facility-Onset MRSA Bacteremia LabID Events, Acute Care PPS Hospitals, 2017

No. Facilities Reporting	Infection Count	Predicted Infection Count	Number of Patient Days	SIR (95% CI)	Facilities with ≥1 Predicted Infection	Facilities with ≥1 Predicted Infection and SIR Sig. <1 n (%)	Facilities with ≥1 Predicted Infection and SIR Sig. >1 n (%)
50	65	119.3	2,183,438	0.55 (0.42, 0.69)	22	1 (5%)	0 (0%)

Health care facility-onset events include incident events collected on or after hospital day four

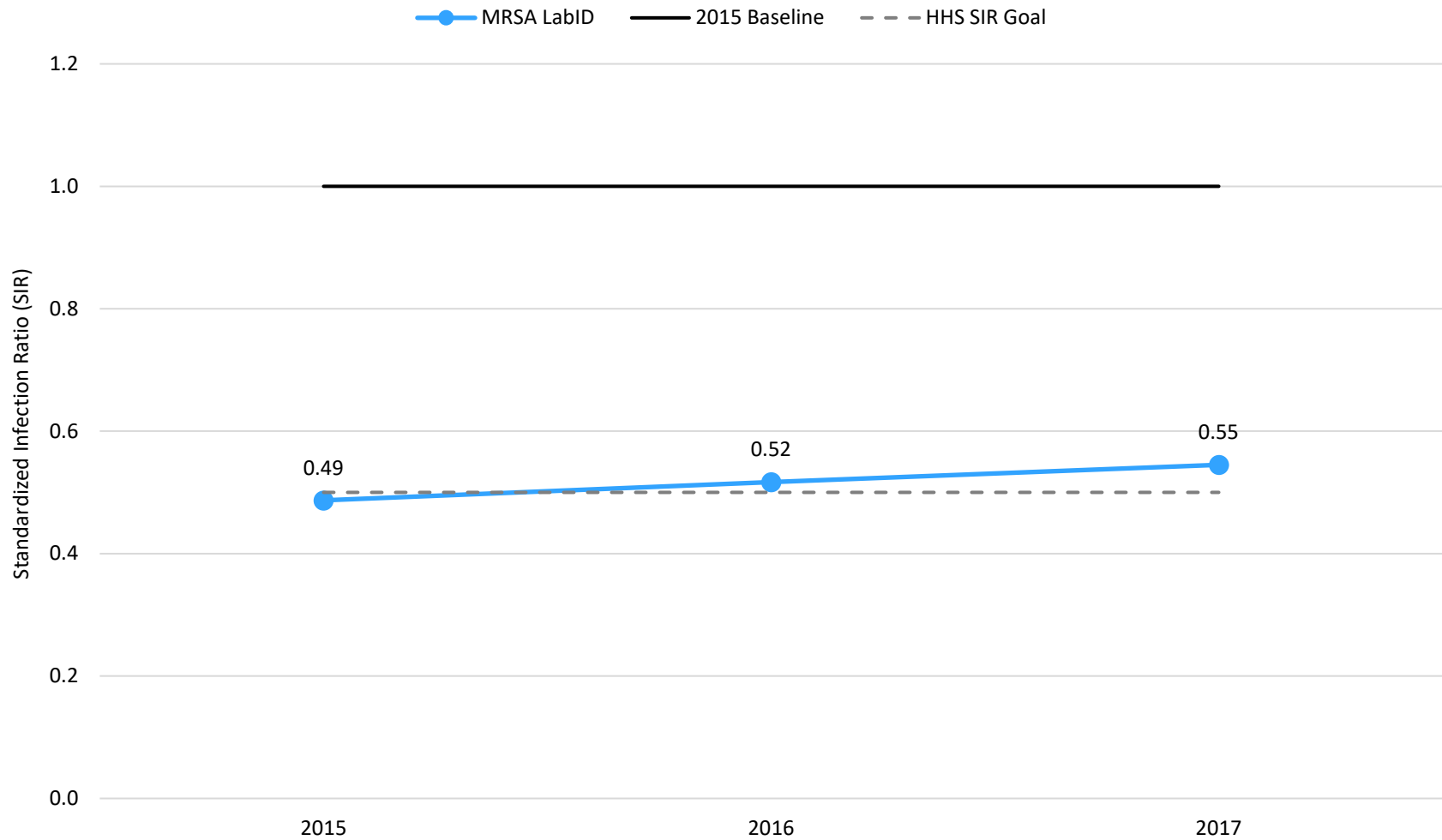
Sig. = statistically significant

Green shading indicates SIR is statistically lower than 2015 national baseline

Red shading indicates SIR is statistically higher than 2015 national baseline

Data downloaded from NHSN on August 16, 2018

Figure 6. Health Care Facility-Onset MRSA LabID Event SIR by Year, Acute Care PPS Hospitals, 2015–2017



Data downloaded from NHSN on August 16, 2018
Health care facility-onset events include incident events collected on or after hospital day four

***Clostridioides difficile* Infection (CDI) Laboratory-Identified (LabID) Events**

Clostridioides difficile (*C. difficile*) is a type of bacteria that causes severe diarrhea and can be deadly. *C. difficile* infections usually occur in people who have recently taken antibiotics and have been under medical care.

This report includes incident *C. difficile* infections identified on or after the fourth day of hospitalization (health care facility-onset) in inpatient locations reported by Minnesota acute care PPS hospitals.

Table 9. Health Care Facility-Onset *C. difficile* Infection LabID Events, Acute Care PPS Hospitals, 2017

No. Facilities Reporting	Infection Count	Predicted Infection Count	Number of Patient Days	SIR (95% CI)	Facilities with ≥ 1 Predicted Infection	Facilities with ≥ 1 Predicted Infection and SIR Sig. <1 n (%)	Facilities with ≥ 1 Predicted Infection and SIR Sig. >1 n (%)
50	1,341	1,555.6	1,999,981	0.86 (0.82, 0.91)	49	10 (20%)	4 (8%)

Health care facility-onset events include incident events collected on or after hospital day four

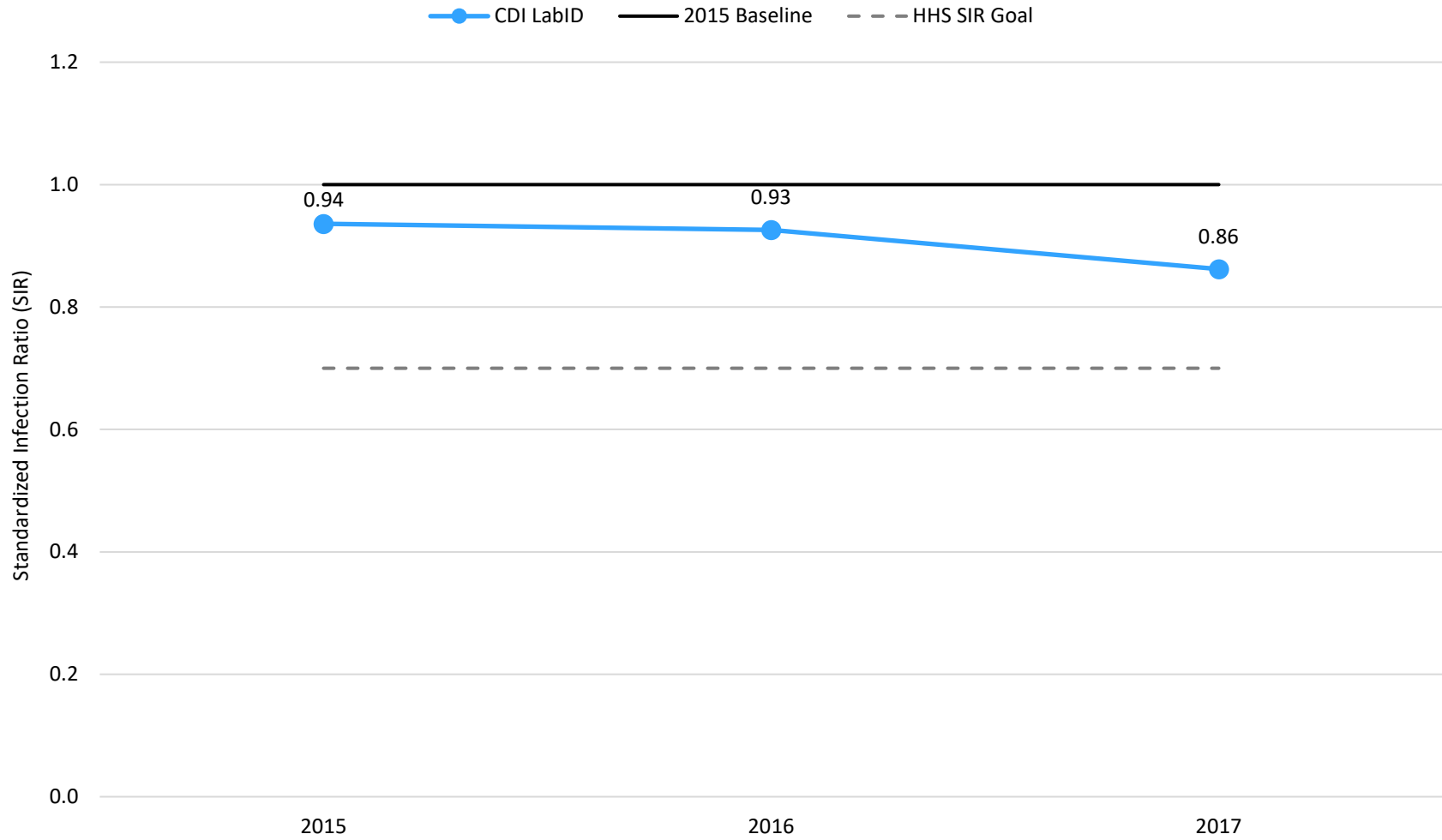
Sig. = statistically significant

Green shading indicates SIR is statistically lower than 2015 national baseline

Red shading indicates SIR is statistically higher than 2015 national baseline

Data downloaded from NHSN on August 16, 2018

Figure 7. Health Care Facility-Onset *C. difficile* Infection LabID SIR by Year, Acute Care PPS Hospitals, 2015–2017



Data downloaded from NHSN on August 16, 2018
Health care facility-onset events include incident events collected on or after hospital day four

Antibiotic Stewardship Program Core Elements

Hospital antibiotic stewardship programs (ASPs) have been shown to improve prescribing and treatment practices and to reduce negative impacts of antibiotic use. In 2014, CDC recommended that all acute care hospitals implement an ASP. That same year, CDC published guidance titled, *The Core Elements of Hospital Antibiotic Stewardship Programs* (CDC, 2014). Recognizing that hospitals differ in terms of organizational structure, care provided, and available resources, the Core Elements are intended to provide flexible guidance to implement the most essential components of an ASP. With this guidance, CDC highlights leadership commitment and a multidisciplinary approach to antibiotic stewardship and regards an ASP that incorporates all seven Core Elements as a comprehensive program.

For several years, the NHSN annual hospital survey has included questions intended to assess a hospital’s adoption of the ASP Core Elements. The survey questions included for each Core Element, and the answers required to judge whether the program includes or “meets” that Core Element, are listed below.

Core Element	NHSN Hospital Survey Questions and Scoring to Assess Adoption of Core Elements
Leadership	One or both: Written leadership statement supports antimicrobial stewardship (AS). Salary support for AS activities.
Accountability	A leader is responsible for AS outcomes.
Drug Expertise	At least one pharmacist is responsible for improving antibiotic use.
Action	One or more of: Policy to document antibiotic clinical indications. Treatment recommendations for common conditions. Formal procedure for ongoing assessment of need for antibiotics (antibiotic time out). Some antibiotics require physician or pharmacist approval. Physician or pharmacist reviews antibiotic prescriptions and communicates with prescribers.
Tracking	One or more of: Adherence to documentation policy is monitored. Adherence to treatment recommendations is monitored. Overall antibiotic use is monitored.
Reporting	One or more of: Physician or pharmacist reviews antibiotic prescriptions and communicates with providers. Prescribers receive facility reports on overall antibiotic use. ASP provides feedback to prescribers.
Education	AS education programs for clinicians and other relevant staff.

The following section details survey results from Minnesota hospitals and, where available, national results. Results from all participating acute care hospitals are included in this section, including critical access hospitals (CAH), and specialty hospitals that voluntarily report these data to NHSN. In reviewing results comparing Minnesota and U.S. hospitals, it should be noted that the proportion of Minnesota NHSN hospitals classified as CAHs is greater than the proportion of CAHs nationwide. In 2016, CAHs accounted for 57% of 123 Minnesota hospitals reporting to NHSN compared with 19.4% of 4,781 nationwide.

Figure 8. Proportion of Minnesota Hospitals Meeting Antibiotic Stewardship Program Core Elements by Year

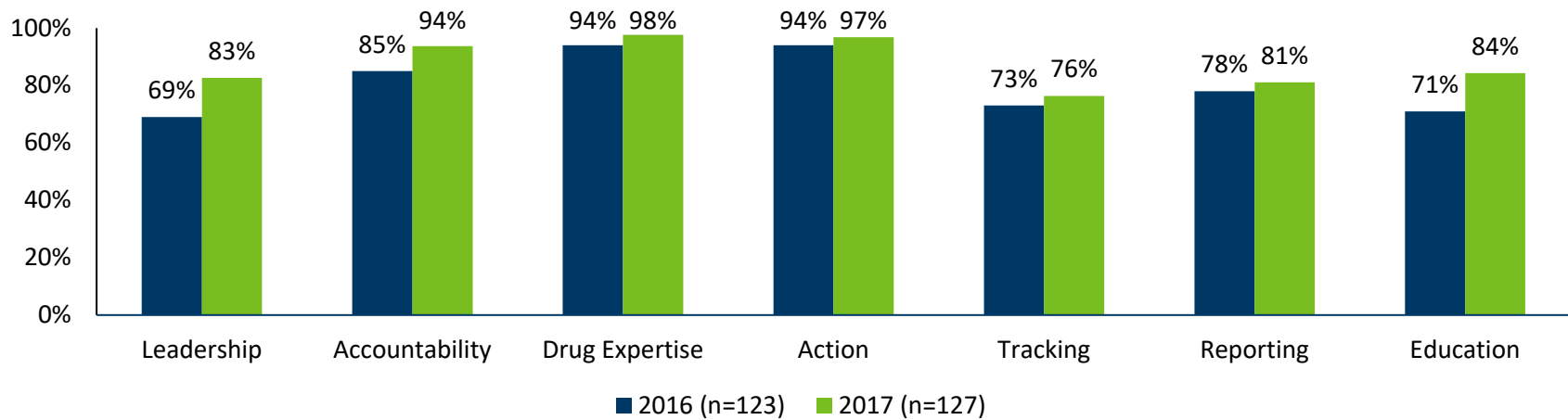


Figure 9. Proportion of Hospitals Meeting All Seven Antibiotic Stewardship Program Core Elements by Year and Location

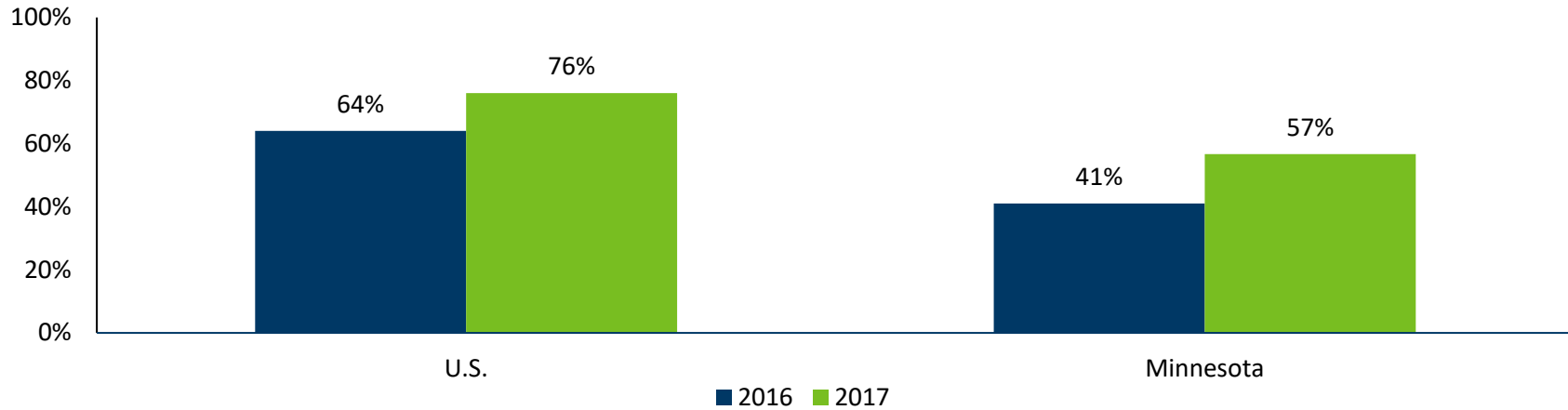


Figure 10. Proportion of Hospitals Meeting All Seven Antibiotic Stewardship Program Core Elements by Hospital Type and Location, 2017

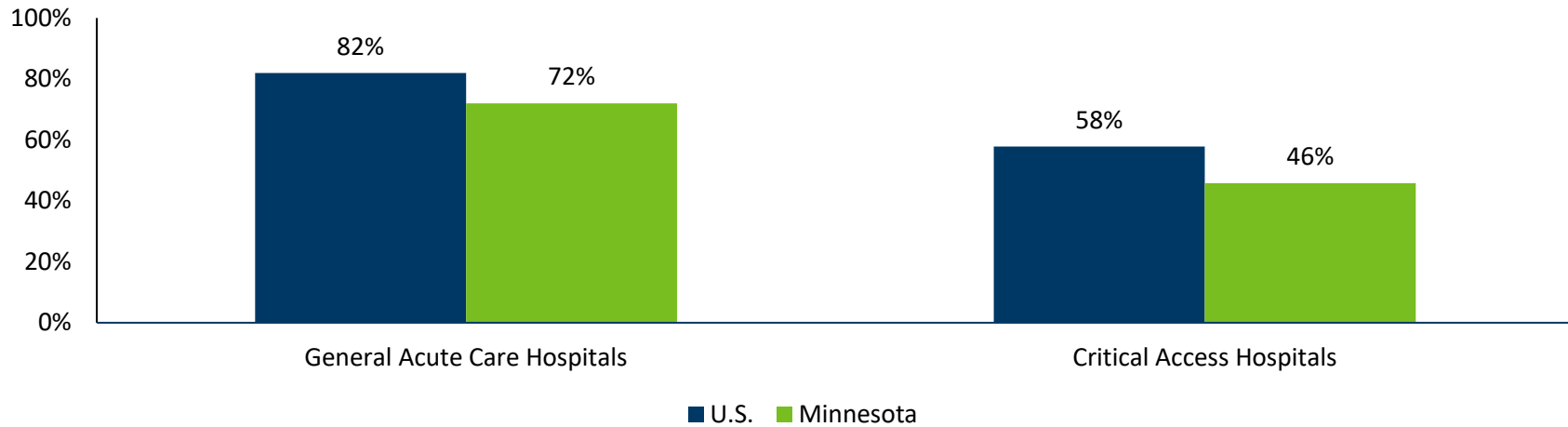


Figure 11. Proportion of Hospitals Meeting All Seven Antibiotic Stewardship Program Core Elements by Teaching Status and Location, 2017

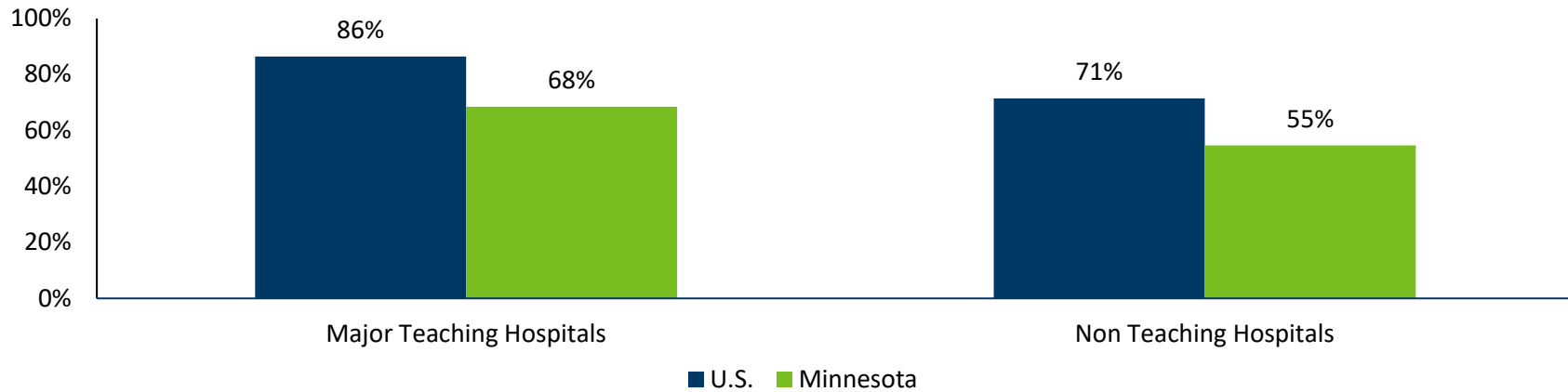
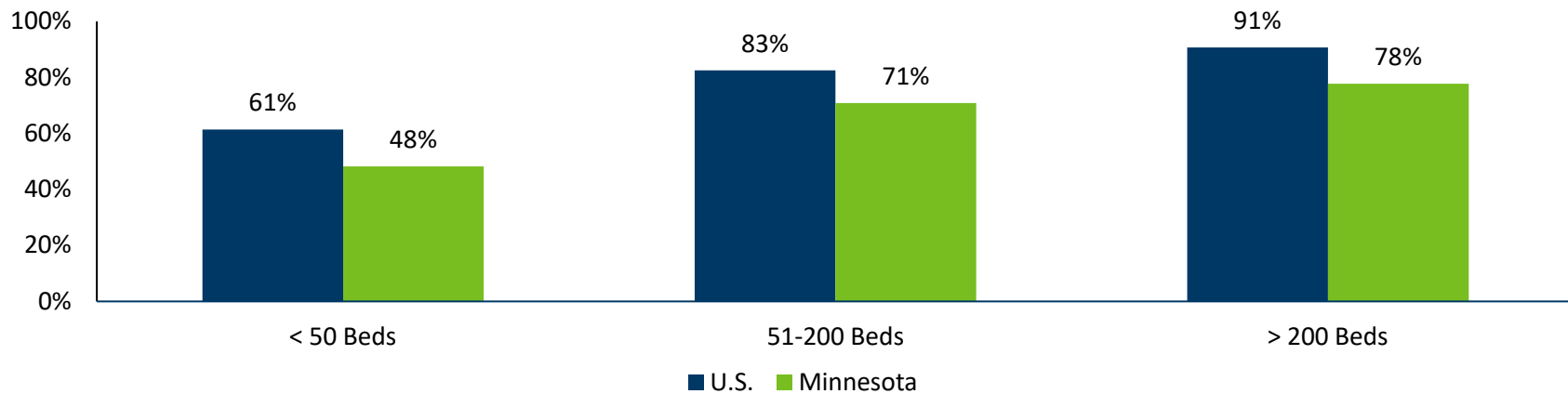


Figure 12. Proportion of Hospitals Meeting All Seven Antibiotic Stewardship Program Core Elements by Hospital Bed Number and Location, 2017



HEALTHCARE-ASSOCIATED INFECTIONS IN MINNESOTA ACUTE CARE HOSPITALS

The NHSN hospital survey asks about several commonly used ASP interventions. To meet the ASP “Action” Core Element, the respondent indicates that one or more of the queried interventions are used in their facility. The table below shows the proportion of Minnesota hospitals reporting use of the indicated intervention.

Table 10. Proportion of Minnesota Hospitals Implementing Specified Antibiotic Stewardship Activities by Hospital Type, 2017

Activity	All Minnesota Hospitals (n=127)	PPS/Other Hospitals (n=55)	Critical Access Hospitals (n=72)
Policy to Document Indications	50%	62%	40%
Treatment Recommendations for Common Conditions	80%	91%	71%
Need for Antibiotics Reassessed (Time Out)	33%	29%	36%
Some Antibiotics Require Approval	57%	69%	49%
Prescribing Reviewed and Feedback Given	76%	87%	67%
Any of these Activities	97%	100%	94%

References

CDC. (2013). *Antibiotic Resistance Threats in the United States*. Atlanta, GA: US Department of Health and Human Services, CDC. Retrieved from CDC Web site: <https://www.cdc.gov/drugresistance/pdf/ar-threats-2013-508.pdf>

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