

Healthcare-Associated Infections Among Inpatient Facilities in Pennsylvania: 2022 Annual Report

**Bureau of
Epidemiology**

**Division of Healthcare
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Abbreviations

ACH	Acute Care Hospital
CAH	Critical Access Hospital
CAUTI	Catheter-Associated Urinary Tract Infection
CDC	Centers for Disease Control and Prevention
CDI	<i>Clostridioides difficile</i> Infection
CI	Confidence Interval
CLABSI	Central Line-Associated Bloodstream Infection
COLO	Colon
DOH	Department of Health
HAI	Healthcare Associated Infections
HHS	United States Department of Health and Human Services
HPRO	Hip Arthroplasty
HYST	Abdominal Hysterectomy
IRF	Inpatient Rehabilitation Facility
KPRO	Knee Arthroplasty
LTACH	Long-Term Acute Care Hospital
MCARE	Medical Care Availability and Reduction of Error
MRSA	Methicillin-Resistant <i>Staphylococcus aureus</i> (MRSA)
NHSN	National Healthcare Safety Network
SIR	Standardized Infection Ratio
SSI	Surgical Site Infection
SUR	Standardized Utilization Ratio

Executive Summary

Healthcare associated infections (HAI) are infections that patients acquire while being treated in a medical facility. They contribute to significant financial, physical, and mental strains. The Commonwealth of Pennsylvania mandates that HAIs acquired in hospital facilities are reported to the National Healthcare Safety Network (NHSN) as per the Medical Care Availability and Reduction of Error (MCARE) Act (40 P.S. § 1303.401 – 1303.411 (2007)). This report contains 2022 data from acute care hospitals (ACH, N = 185), critical access hospitals (CAH, N = 16), inpatient rehabilitation facilities (IRF, N = 69), and long-term acute care hospitals (LTACH, N = 17) located in Pennsylvania.

The standardized infection ratio (SIR) compares the number of reported HAIs with the number of predicted HAIs. The number of predicted HAI events is calculated from a statistical model which adjusts for several risk factors and is based on national data from 2015. SIR values were calculated for each HAI by pooling data from facilities of the same type (ACH, CAH, IRF, or LTACH). Monitoring facility and statewide SIR values over time enables facilities and the Department of Health (DOH) to track progress toward the elimination of HAIs.

Table 1 shows results from ACHs in 2022. Key findings include:

- 13% decrease in catheter-associated urinary tract infections (CAUTI) compared to 2021
- 15% decrease in central line-associated bloodstream infections (CLABSI) compared to 2021
- 2% decrease in surgical site infections (SSI) following colon (COLO) surgery among adults compared to 2021
- 22% increase in SSIs following abdominal hysterectomy (HYST) surgery among adults compared to 2021
- No change in *Clostridioides difficile* infections (CDI) compared to 2021
- 11% decrease in positive blood tests for methicillin-resistant *Staphylococcus aureus* (MRSA) compared to 2021

Table 1: ACH SIR Values and Progress Towards Meeting 2030 HAI Goals, 2021 – 2022

HAI	2021 SIR	2022 SIR	Percent Change Between 2021 and 2022 SIR	2030 SIR Goal	2022 SIR At or Below 2030 SIR Goal
CAUTI	0.89	0.77*	13%** ↓	0.50	×
CLABSI	0.93	0.79*	15%** ↓	0.50	×
Adult COLO SSI	0.84	0.82*	2% ↓	0.70	×
Adult HYST SSI	0.81	0.99	22% ↑	0.70	×
CDI	0.58	0.58*	<1% ↑	0.70	✓
MRSA	0.94	0.84*	11% ↓	0.50	×

Source: NHSN, 2021 – 2022

* SIR value is statistically significantly different from 1.0 (mid-P exact binomial test, alpha = 0.05)

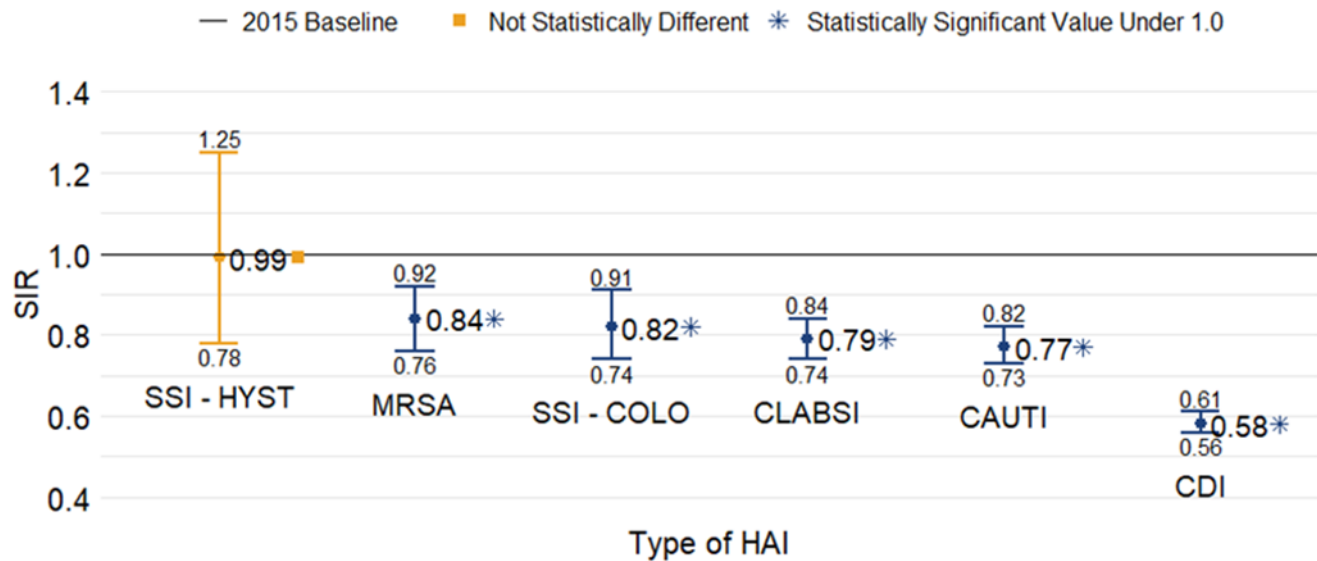
**Difference between 2021 SIR and 2022 SIR is statistically significant (mid-P exact binomial test, alpha = 0.05)

Symbol Key

- ↕↑ Change is not statistically significant between 2021 and 2022
- ↓ Statistically significant decrease in SIR between 2021 and 2022
- ✓ ACH SIR is at or below the SIR goal
- × ACH SIR is not at or below the goal

The Pennsylvania SIR values from ACHs for four HAIs were lower in 2022 compared to 2021; these results were statistically significant for CAUTI and CLABSI. Pennsylvania DOH established 2030 HAI goals for CLABSI, CAUTI, COLO SSI and HYST SSI. The United States Department of Health and Human Services (HHS) set 2030 HAI goals for MRSA and CDI. CDI was the only HAI among ACHs that was at or below the 2030 CDI SIR goal in 2022. As shown in Figure 1, five HAIs in ACHs had 2022 SIR values that were statistically significantly less than 1.0, indicating that fewer HAIs were reported than predicted.

Figure 1: ACH Statewide SIR Values and 95% Confidence Intervals for HAIs, 2022



Source: NHSN, 2022

In this report we included facilities that reported at least one month of data and the ACH category included children’s hospitals and inpatient psychiatric facilities to enable comparison with nationwide trends, so caution should be used when comparing with prior reports. In prior reports, data for those hospitals were presented separately.

Introduction

Hospitalized patients are at risk of acquiring healthcare associated infections (HAI) when receiving medical care. In the United States, HAIs affect about one in 31 inpatients at any given time and lead to thousands of deaths annually.¹ The United States Department of Health and Human Services (HHS) issued the “National Action Plan to Prevent Health Care-Associated Infections: Roadmap to Elimination” to combat this growing problem.² HHS set 2030 standardized infection ratio (SIR) goals for methicillin-resistant *Staphylococcus aureus* (MRSA) and *Clostridioides difficile* infection (CDI). The Pennsylvania Department of Health (DOH) established 2030 SIR goals for central line-associated bloodstream infections (CLABSI), catheter-associated urinary tract infections (CAUTI), and surgical site infections (SSI) following colon (COLO) and abdominal hysterectomy (HYST) surgeries, since HHS does not have established 2030 HAI goals for these HAIs. HHS set 2020 SIR goals.

The risk of HAIs can be reduced if health care providers and staff consistently adhere to infection prevention and control practices and reduce use of invasive devices such as urinary catheters when they are not clinically necessary. Additionally, the Centers for Disease Control and Prevention (CDC) and professional organizations have published guidance to prevent HAIs. The Commonwealth of Pennsylvania mandates that HAIs acquired in hospitals are reported to the National Healthcare Safety Network (NHSN), a platform managed by CDC, as per the Medical Care Availability and Reduction of Error (MCARE) Act (40 P.S. § 1303.401 – 1303.411 (2007)).

This report enables readers to track facility and Commonwealth progress in reducing HAIs in 2022. The SIR value compares the number of HAIs reported each year to the number predicted based on 2015 data. We expect the SIR values to decrease over time as hospitals reinforce use of infection prevention and control procedures, monitor data to track HAIs, and address gaps in prevention practices. Implementing these practices prevents the occurrences of HAIs.³ Decreasing use of medically unnecessary urinary catheters and central lines is one way to decrease CAUTI and CLABSI events. As such, the standardized utilization ratio (SUR) values are expected to decrease over time as education, efforts, and protocols are implemented by facilities to reduce the usage of these devices unless medically necessary.

Methods

Acute care hospitals (ACH, N = 185), critical access hospitals (CAH, N = 16), inpatient rehabilitation facilities (IRF, N = 69), and long-term acute care hospitals (LTACH, N = 17) reported HAIs and related data to the NHSN in 2022. Data were reported according to the NHSN Patient Safety Component Manual, which contains the methods to identify, classify, and report HAIs, facility characteristics, and patients at risk.⁴ The manual also contains HAI definitions, nation burden statistics, and links to prevention methods.

HAI data for 2022 were downloaded from NHSN and included facilities that reported HAI data for at least one month. We included the following HAIs in this report:

- CAUTI,
- CLABSI,
- SSIs in deep tissues or the organ/space from the following four procedures: HYST, COLO, hip arthroplasty (HPRO), and knee arthroplasty (KPRO)

- CDI,
- and MRSA bloodstream infections.

MRSA and CDI data from children's hospitals (N = 3), CAHs (N= 12) and inpatient psychiatric facilities (N = 6) were not required to be submitted; however, data that were voluntarily submitted to the NHSN were included in the report. We examined ACH SSI data from adult and pediatric patients separately. Pennsylvania HAI data were compared to aggregated national data.⁵

NHSN calculated the SIR at the facility level to compare the reported number of HAIs with the predicted number of HAIs.⁶ NHSN used statistical models to calculate the number of predicted infections for each HAI for each facility. The model used national data from 2015 as the baseline to estimate the number of predicted infections. NHSN made separate models for each combination of HAI and facility type (ACH, CAH, IRF, and LTACH). These models adjusted for facility and patient characteristics that were significant HAI predictors as well as the number of patients at risk of acquiring the HAI.⁶ The below formula was used to calculate the SIR at the facility level. The facility level SIR values for each HAI are located in a separate document (Excel file).

$$SIR = \frac{\text{Number of Reported HAIs}}{\text{Number of Predicted HAIs}}$$

We calculated statewide pooled SIR values for each hospital type (ACH, CAH, IRF, and LTACH) by summing the number of reported and predicted infections from all facilities of a certain hospital type and dividing the sum of the reported infections by the sum of the predicted infections. This was repeated for each hospital type and HAI to obtain statewide pooled SIR values. We calculated pooled SIR values only when five or more hospitals contributed data. These pooled SIR values are referred to as "SIR values" throughout this report. The CDC recommends only comparing SIR values from individual facilities that are the same type (ACH, CAH, IRF, or LTACH). CDC also recommends only comparing CDI SIR values to facilities that have the same CDI test type because the statistical models may not adequately adjust for this factor.

$$\text{Statewide Facility Type SIR} = \frac{\text{Sum of Reported HAIs from all Facilities}}{\text{Sum of Predicted HAIs from all Facilities}}$$

The SUR evaluates the reported days of use for indwelling urinary catheters and central lines (devices) compared to predicted days of use based on the 2015 national baseline.⁷ It is calculated using a similar formula and methods as the SIR. We calculated 95% confidence intervals (CI) and p-values to assess the statistical significance of SIR and SUR values using the mid-p exact binomial test.⁸ A two-tailed p-value was used to determine statistical significance. A p-value of less than 0.05 was considered a statistically significant result. Analyses were completed using R version 4.4.2.⁹

The predicted number of infections for a specific HAI type in small hospitals is often less than 1.0. In facilities with less than 1.0 predicted infection, the HAI SIR value was not calculated to avoid overestimating the SIR value. SIR values are calculated when five or more hospitals in a specific group submitted data and the number of predicted infections is 1.0 or more.

Facility level data from this report can be compared to prior reports in which the 2015 baseline data were used. However, caution should be used when comparing SIR and SUR values in this report to those from prior DOH reports. In prior reports, hospitals were excluded if they were not open the full year. Additionally, results from children's hospitals and inpatient psychiatric facilities were presented separately from the other types of ACH hospitals in prior reports. In this report, they are grouped in the ACH facility type to align with CDC methodology for national comparisons.

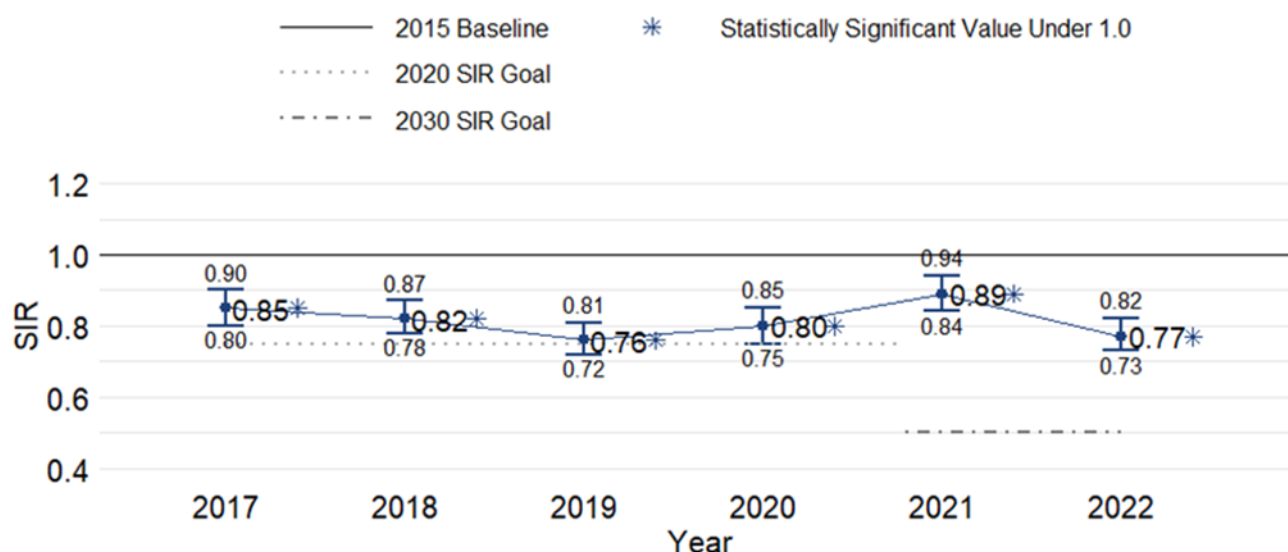
Findings

Catheter-Associated Urinary Tract Infection (CAUTI)

In 2022, 1,164 CAUTIs were reported from 185 ACHs. The statewide SIR was statistically significantly lower than the baseline value of 1.0 (SIR: 0.77; 95% CI: (0.73, 0.82)), indicating fewer reported infections than predicted. The 13% decrease in SIR values between 2021 and 2022 reached statistical significance (p-value < 0.001). The number of reported CAUTIs in 2022 was 347 fewer than predicted among all ACHs.

As shown in Figure 2, the ACH CAUTI SIR values from 2017-2019 decreased slightly and then increased in 2020 and 2021. The 2022 SIR value decreased slightly and was nearly identical to the 2019 SIR value (2019 SIR: 0.76). The SIR value peaked in 2021 at 0.89. For all years, the CAUTI statewide SIR values for ACHs were significantly below the baseline of 1.0, indicating fewer infections than predicted.

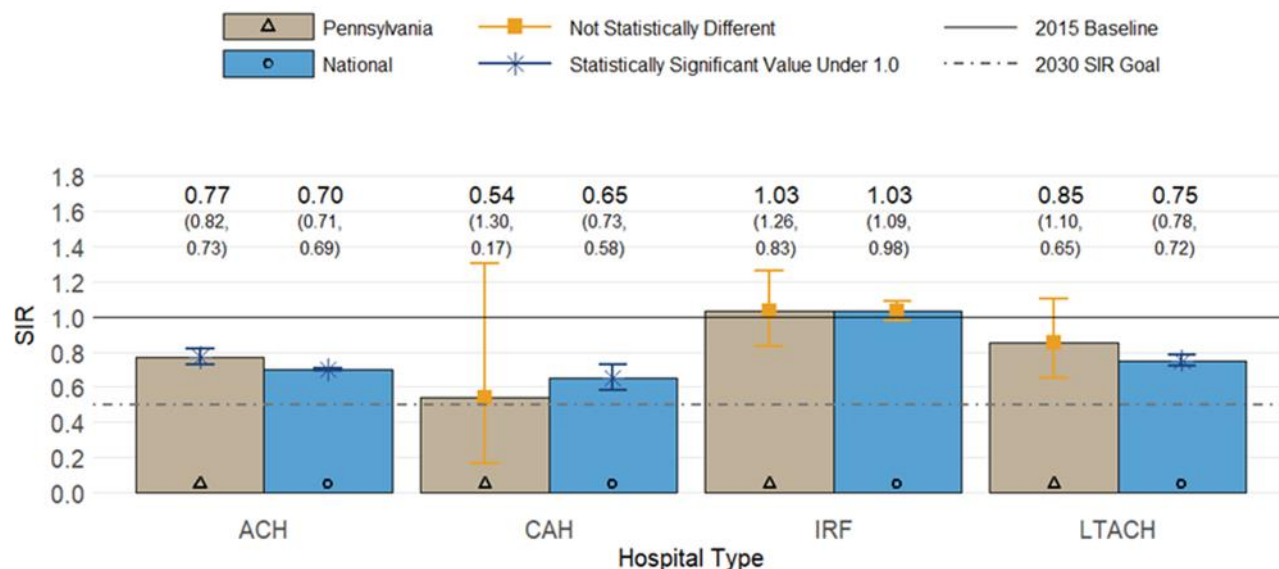
Figure 2: CAUTI SIR Values and 95% CIs in ACHs by Year, Pennsylvania 2017 - 2022



Source: NHSN, 2017 - 2022

As shown in Figure 3, the only facility type in Pennsylvania with a statistically significant CAUTI SIR value below the baseline of 1.0 was ACHs. SIR values for Pennsylvania CAHs and LTACHs were below 1.0, but did not reach statistical significance. Pennsylvania had higher CAUTI SIR values for ACHs and LTACHs compared to national values (ACH p-value < 0.001; LTACH p-value = 0.34). Notably, the ACH CAUTI SIR of 0.77 is higher than the 2030 CAUTI SIR goal of 0.50. To reach the 2030 SIR goal, Pennsylvania ACHs will need to reduce CAUTIs by an additional 35%, or preventing an additional 409 infections.

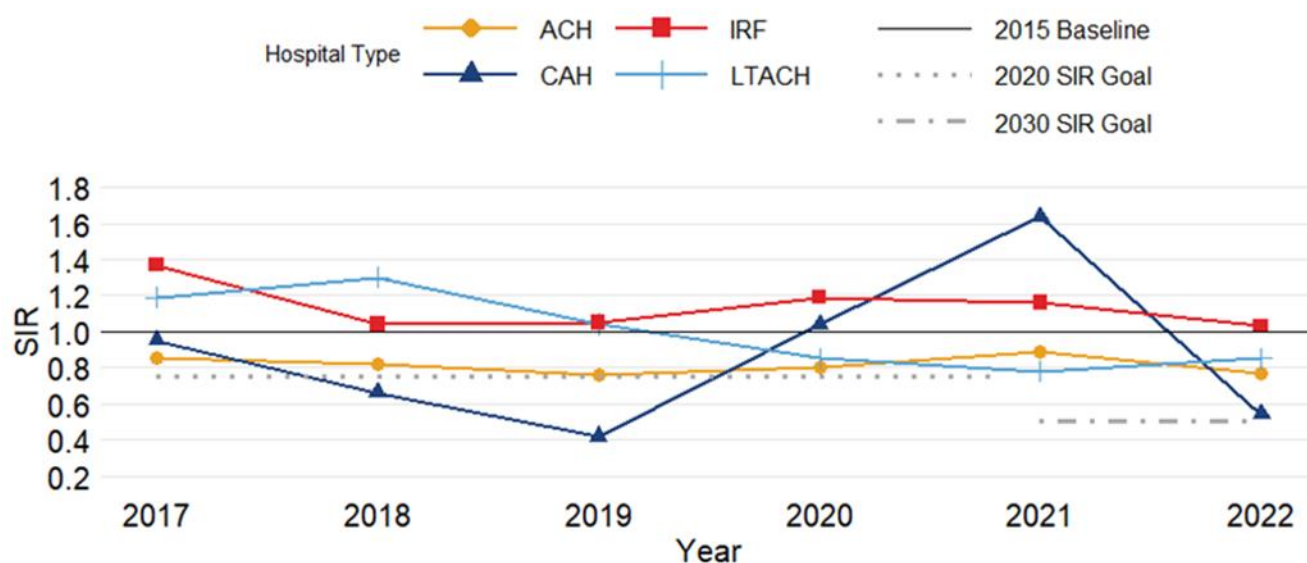
Figure 3: CAUTI SIR Values and 95% CIs by Hospital Type, Pennsylvania and National, 2022



Source: NHSN and CDC, 2022

As shown in Figure 4, the CAUTI statewide SIR values for IRFs were above or at 1.0 for all years shown. The CAUTI SIR values for LTACHs were above 1.0 from 2017 through 2019 and below 1.0 from 2020 through 2022. The SIR values for CAHs fluctuated widely over time due to the low number of predicted infections. To reach the 2030 SIR goal of a 50% reduction in CAUTIs from the number that were predicted to occur, Pennsylvania LTACHs need to prevent an additional 23 infections and Pennsylvania IRFs need to prevent an additional 44 infections. CAHs, although not quite meeting the 2030 CAUTI SIR goal, need to prevent less than one additional infection to reach the goal.

Figure 4: CAUTI Statewide SIR Values by Year and Hospital Type, Pennsylvania 2017 - 2022



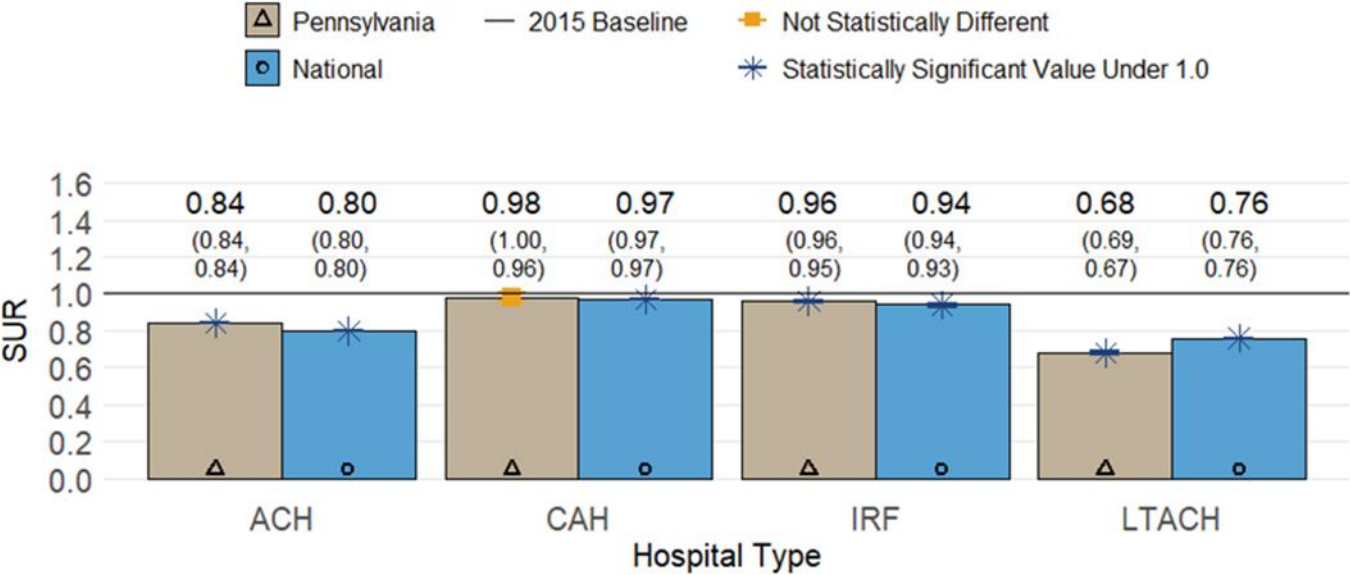
Source: NHSN, 2017 - 2022

The NHSN did not calculate facility level CAUTI SIR values for 125 ACH, CAH, IRF, and LTACHs because the number of predicted CAUTIs was below 1.0. Therefore, data from these facilities should be interpreted cautiously. Of the 125 facilities with less than 1.0 predicted CAUTIs, 89 reported zero infections, 26 reported one infection, seven reported two infections, and three reported three or more infections.

Urinary Catheter Standardized Utilization Ratio (SUR)

As shown in Figure 5, the 2022 urinary catheter statewide SURs for ACHs, IRFs and LTACHs in Pennsylvania were statistically significantly lower than the baseline value of 1.0. This indicated less use of urinary catheters than predicted. Pennsylvania had higher urinary catheter SURs for ACHs, CAHs, and IRFs when compared to national values (ACH p-value < 0.001; CAH p-value = 0.25; IRF p-value < 0.001). Pennsylvania LTACHs had lower urinary catheter SURs when compared to national values (p-value < 0.001).

Figure 5: CAUTI SUR Values and 95% CIs by Hospital Type, Pennsylvania and United States, 2022



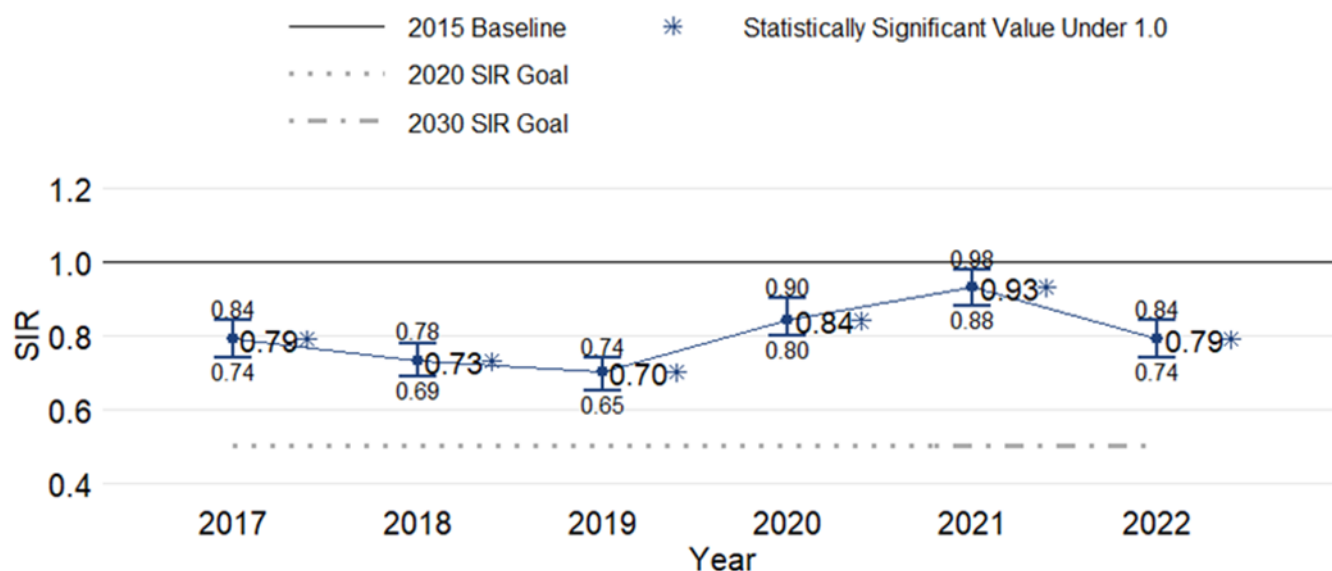
Source: NHSN and CDC, 2022

Central Line-Associated Bloodstream Infection (CLABSI)

In 2022, 1,096 CLABSIs were reported from 183 ACHs. The statewide SIR value was statistically significantly lower than the baseline value of 1.0 (SIR: 0.79; 95% CI: (0.74, 0.84)), indicating fewer infections than predicted. The 15% decrease in SIR values between 2021 and 2022 reached statistical significance (p-value < 0.001). The number of reported CLABSIs in 2022 was 292 fewer than predicted.

As shown in Figure 6, ACH CLABSI SIR values decreased slightly from 2017 until 2019 and peaked in 2021 (SIR: 0.93). For all years, the CLABSI statewide SIR values for ACHs were significantly below the baseline of 1.0, indicating fewer infections than predicted.

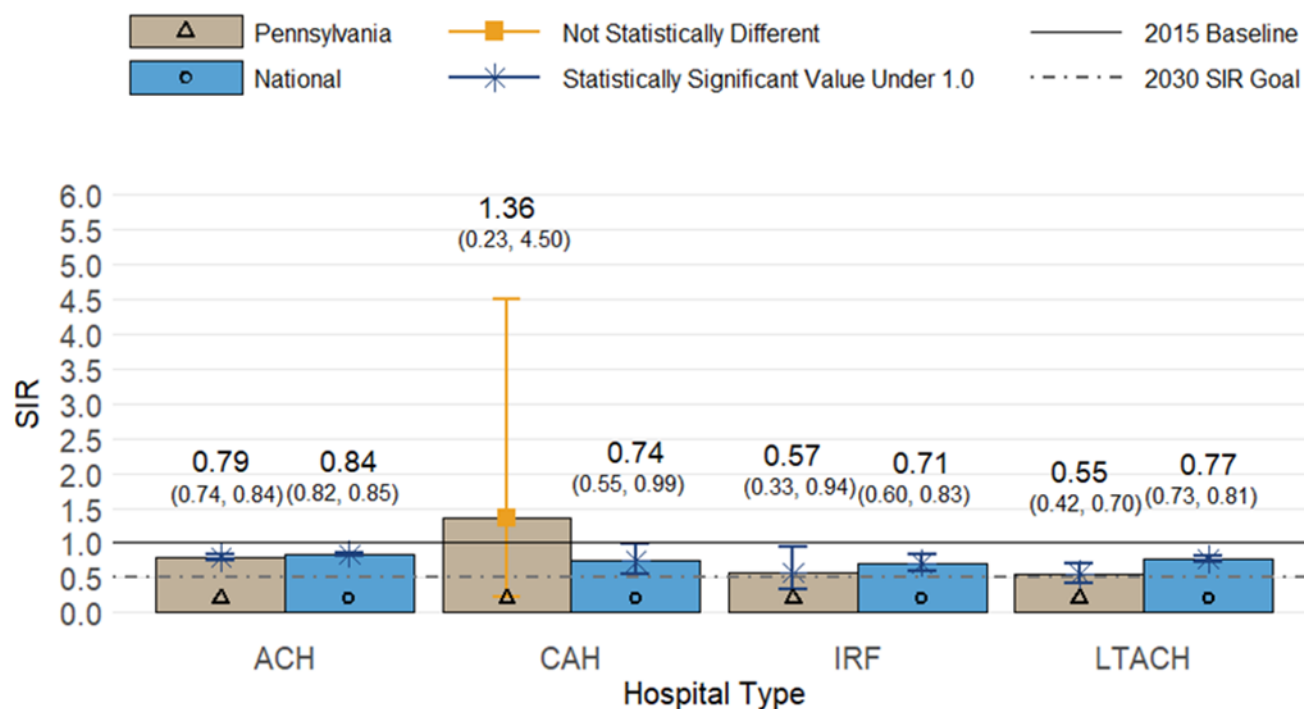
Figure 6: CLABSI Statewide SIR Values and 95% CIs in ACHs by Year, Pennsylvania 2017 – 2022



Source: NHSN, 2017 - 2022

As shown in Figure 7, Pennsylvania ACHs, LTACHs, and IRFs had statistically significant CLABSI SIR values below the baseline of 1.0. The SIR value from CAHs was above the baseline of 1.0, but did not reach statistical significance. Pennsylvania had lower CLABSI SIR values for ACHs, IRFs, and LTACHs when compared to national values (ACH p-value = 0.06; IRF p-value = .46, LTACH p-value = 0.01). Pennsylvania CAHs had a higher CLABSI SIR value when compared to the national value (p-value = 0.41). Additionally, the ACH CLABSI SIR of 0.79 was higher than the 2030 CLABSI SIR goal of 0.50. To reach the 2030 SIR goal, Pennsylvania ACHs need to reduce CAUTIs by an additional 37%, or preventing an additional 402 infections.

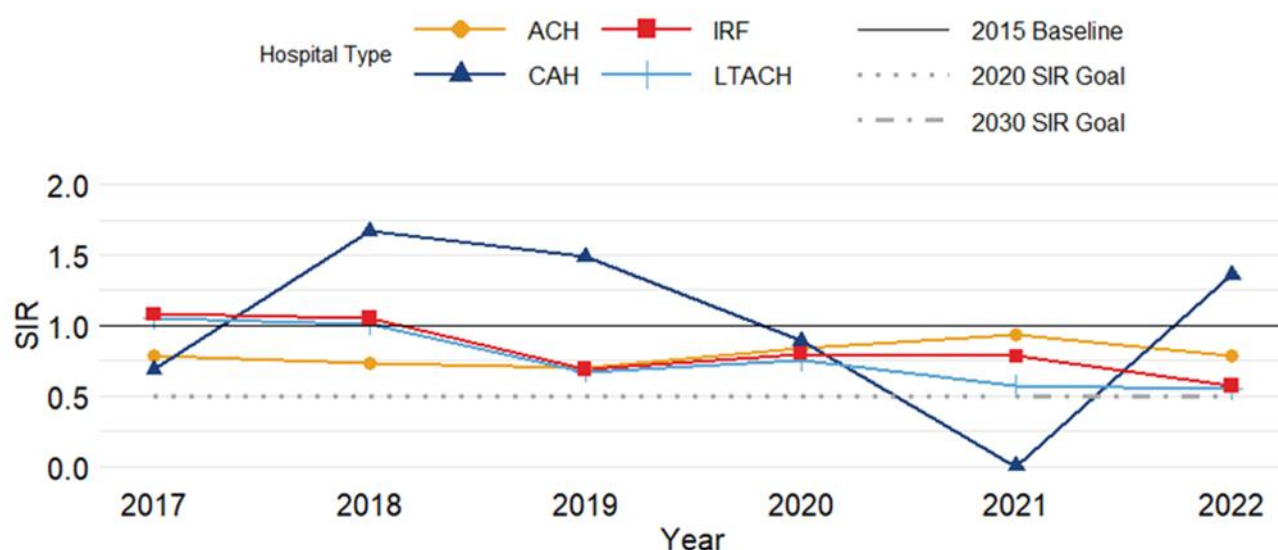
Figure 7: CLABSI SIR Values and 95% CIs by Hospital Type, Pennsylvania and United States, 2022



Source: NHSN and CDC, 2022

As shown in Figure 8, LTACH CLABSI SIR values were above 1.0 in 2017 and 2018 and were below 1.0 from 2019 to 2022. IRF CLABSI SIR values exhibited a similar trend. The CLABSI SIR values in CAHs fluctuated from year to year and ranged from zero reported CLABSIs in 2021 to a SIR of 1.67 in 2018. To reach the 2030 SIR goal of a 50% reduction in CLABSIs from the number that were predicted to occur, Pennsylvania LTACHs need to prevent an additional five infections, Pennsylvania IRFs need to prevent an additional two infections, and Pennsylvania CAHs need to prevent one additional infection.

Figure 8: CLABSI Statewide SIR Values by Year and Hospital Type, Pennsylvania 2017 - 2022



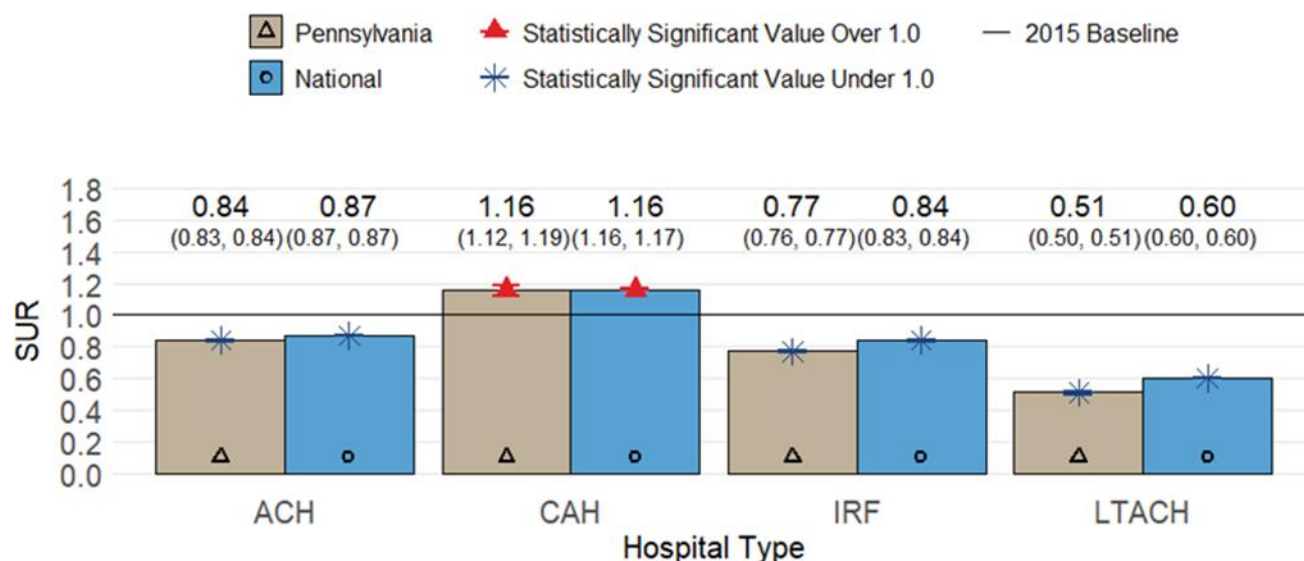
Source: NHSN, 2017 - 2022

The NHSN did not calculate facility level CLABSI SIR values for 154 ACH, CAH, IRF, and LTACHs because the number of predicted CLABSIs was below 1.0. Data from these facilities should, however, be interpreted cautiously, considering the number of reported CLABSIs. Of the 154 facilities with less than 1.0 predicted CLABSI, 132 reported zero infections, 17 reported one infection, five reported two infections and zero reported three or more infections.

Central Line Standardized Utilization Ratio (SUR)

As shown in Figure 9, Pennsylvania ACHs, IRFs, and LTACHs had a statistically significantly lower 2022 central line SUR value than the baseline value of 1.0. This indicates less use of central lines than predicted. The SUR value for Pennsylvania CAHs was statistically significantly higher than the baseline value of 1.0 (SUR = 1.16), indicating higher use of central lines than predicted. Pennsylvania had lower central line SUR values for ACHs, IRFs, and LTACHs when compared to national values (all p-values < 0.001). The national and Pennsylvania central line CAH SUR values were not different from one another (p-value = 0.56).

Figure 9: CLABSI SUR Values and 95% CIs by Hospital Type, Pennsylvania and United States, 2022

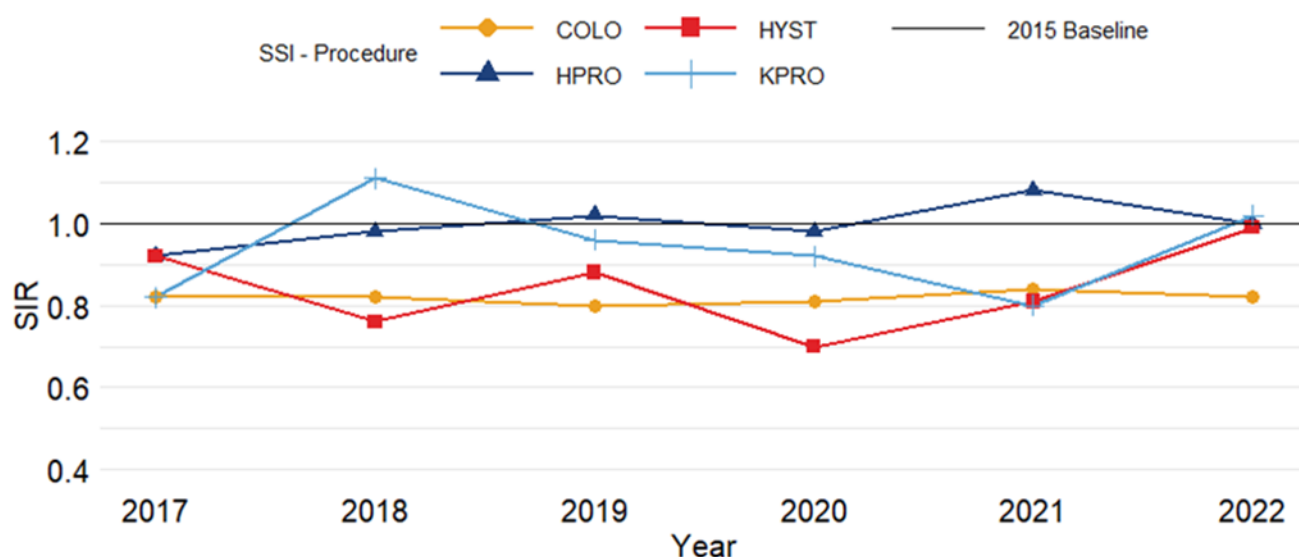


Source: NHSN and CDC, 2022

Surgical Site Infection (SSI)

As shown in Figure 10, the 2022 SSI statewide SIR values for the four monitored surgical procedures among adults in ACHs ranged between 0.82 and 1.02. The 2022 COLO SSI SIR value (0.82) for adults in ACHs was statistically significantly lower than the baseline value of 1.0 (339 reported infections), indicating fewer infections than predicted. This 2022 SIR value was 2% lower than in 2021 (2021 SIR: 0.84; p-value = 0.78). The number of SSIs reported after HPRO (184 reported infections), KPRO (130 reported infections) and HYST (68 reported infections) procedures was not statistically different from the number of predicted SSIs. The 2022 HYST SSI SIR value (0.99) was 22% higher than the 2021 SIR value (2021 SIR: 0.81; p-value = 0.25). The 2022 HPRO SSI SIR value (1.00) was 7% lower than the 2021 SIR value (2021 SIR: 1.08, p-value = 0.49). The 2022 KPRO SSI SIR value (1.02) was 28% higher than the 2021 SIR value (2021 SIR: 0.80, p-value = 0.06).

Figure 10: SSI Statewide SIR Values Among Adults from ACHs by Year, Pennsylvania 2017 – 2022



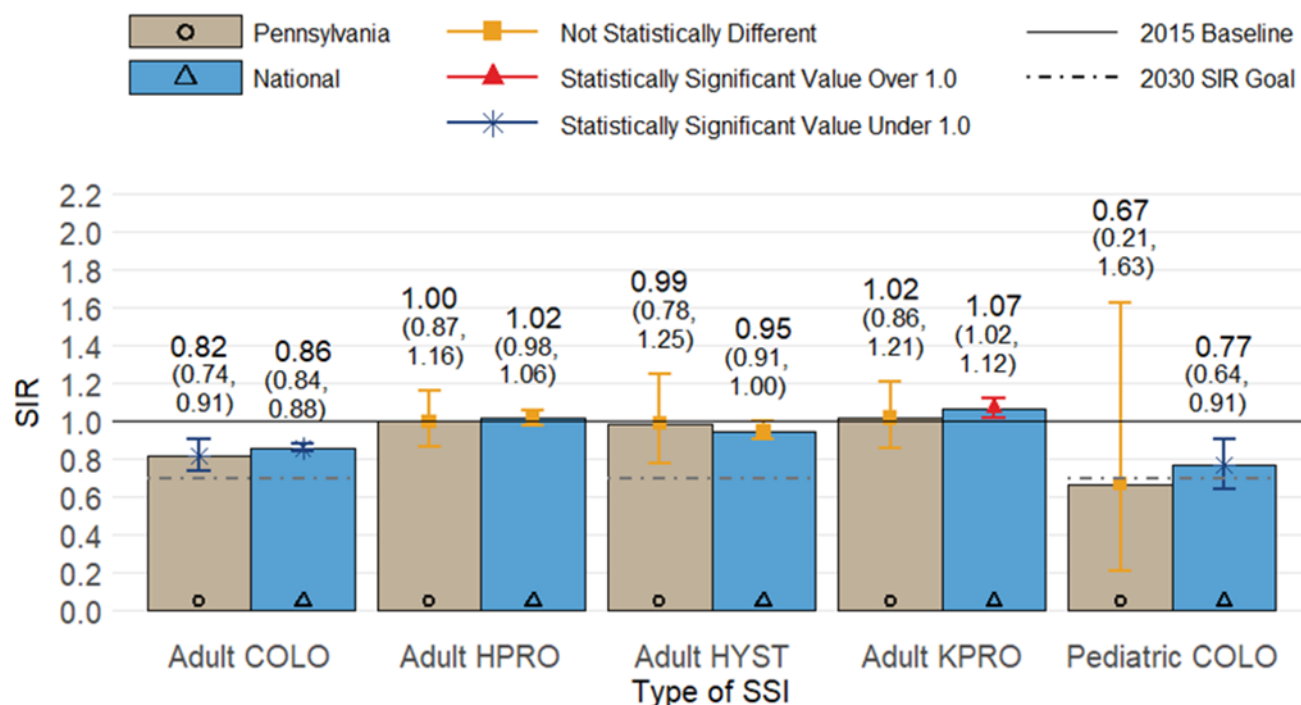
Source: NHSN, 2017 - 2022

The range of SSI SIR values among adults in ACHs for COLO, HYST, HPRO, and KPRO procedures between 2017 and 2022 was between 0.70 and 1.11. COLO and HYST SSI SIR values were below 1.0 in all years. There was little change in COLO SSI SIR values within these years. HYST SSI SIR values varied between 2017 and 2021 and increased in 2022. The KPRO SSI SIR values decreased from 2018 until 2021 and then sharply increased from 0.80 in 2021 to 1.02 in 2022. HPRO SSI SIR values ranged between 0.92 and 1.08 during the six years.

The 2030 SIR goal for HYST and COLO is the same (SIR = 0.70). To reach the 2030 HYST SSI SIR goal of a 30% reduction in HYST SSIs from the number that were predicted to occur, Pennsylvania ACHs need to reduce HYST SSIs by an additional 29%, equating to the prevention of an additional 20 infections. To reach the 2030 COLO SSI SIR goal of a 30% reduction in COLO SSI from the number that were predicted to occur, Pennsylvania ACHs need to reduce COLO SSIs by an additional 15%, or preventing an additional 50 infections.

As shown in Figure 11, Pennsylvania had a higher 2022 adult HYST SSI statewide SIR value when compared to the national value for this metric, although this difference was not statistically significant (p-value = 0.72). Although the COLO SSI SIR value in pediatric patients was lower than for the adult population (four reported pediatric infections), it was not statistically different from the baseline value of 1.0. Pennsylvania had lower SSI SIR values for adult and pediatric COLO, adult HPRO, and adult KPRO procedures when compared to the corresponding national values although none of these differences were statistically significant (adult COLO p-value = 0.44; pediatric COLO p-value = 0.86; adult HPRO p-value = 0.84; adult KPRO p-value = 0.60).

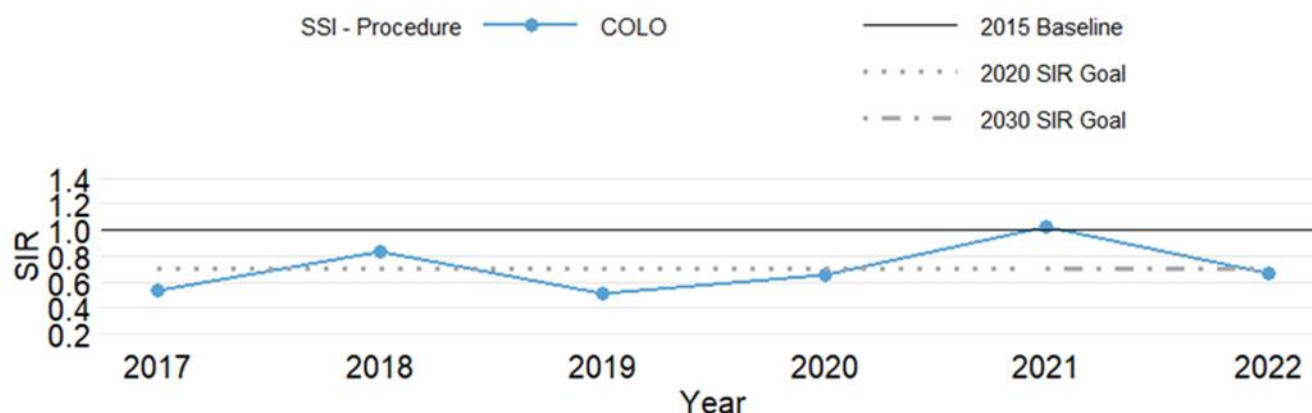
Figure 11: SSI SIR Values and 95%CI's from Surgical Procedures Among Adult and Pediatric Patients in ACHs, Pennsylvania and United States, 2022



Source: NHSN and CDC, 2022

Our ability to analyze SSI data from pediatric patients was limited because fewer than five hospitals contributed data for three pediatric procedures and were therefore excluded from this report; COLO SSIs were the only SSIs reported in pediatric patients. Figure 12 shows COLO SSI statewide SIR values for pediatric patients with surgeries in ACHs between 2017 and 2022. Although the SIR values varied considerably, none were statistically significantly different from 1.0. Between 17 and 31 ACHs contributed data each year and between three and seven COLO SSIs were reported annually.

Figure 12: SSI SIR Values Following Colon Surgery Among Pediatric Patients in ACHs by Year, Pennsylvania 2017 – 2022



Source: NHSN, 2017 - 2022

The NHSN did not calculate 2022 adult facility level SSI SIR values for one of the four procedures included in this report in 377 ACHs and CAHs because the number of predicted SSIs was below 1.0. Data from these hospitals and procedures should, however, be interpreted cautiously, considering the number of reported SSIs. Table 2 shows data from 377 procedures in which a SIR was not calculated.

Table 2: Number (Percent) of Hospitals with Zero, One, Two, or Three or More SSIs Stratified by Surgical Procedure Type Among Those with Less Than One Predicted Infection Among Adults, Pennsylvania, 2022

Surgical procedure	Number of hospitals	Zero infections	One infection	Two infections	Three or more infections
COLO	59	45 (76.3 %)	10 (16.9%)	3 (5.1%)	1 (1.7%)
HPRO	95	67 (70.5 %)	21 (22.1%)	6 (6.3%)	1 (1.1%)
HYST	112	99 (88.4 %)	12 (10.7%)	1 (0.9%)	0 (0.0%)
KPRO	111	78 (70.3 %)	27 (24.3%)	5 (4.5%)	1 (0.9%)
Total	377	289 (76.7%)	70 (18.6%)	15 (4.0%)	3 (0.8%)

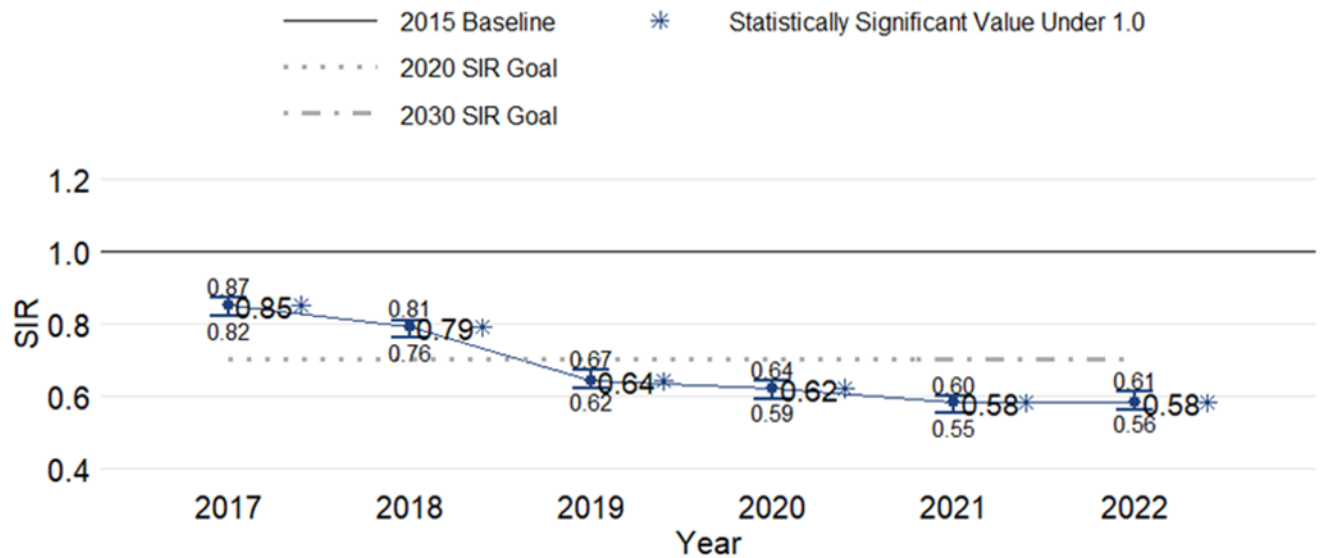
Source: NHSN, 2022

***Clostridioides difficile* Infection (CDI)**

In 2022, 2,186 CDI events were reported from 177 ACHs in Pennsylvania. This is the most common reported HAI assessed. The statewide SIR value was statistically significantly lower than the baseline value of 1.0 (SIR: 0.58), indicating fewer reported infections than predicted. The SIR values in 2021 and 2022 differed by less than 1% (p-value = 0.64). The number of reported CDI events in 2022 was 1,558 less than predicted.

As shown in Figure 13, the ACH CDI SIR remained below the 2030 SIR goal (SIR = 0.70) between 2019 and 2022. For all years, the CDI SIR values for ACHs were significantly below the baseline of 1.0, indicating fewer infections than predicted. ACHs reached the 2030 SIR goal of a 30% reduction in CDIs from the number that were predicted to occur from 2019 – 2022.

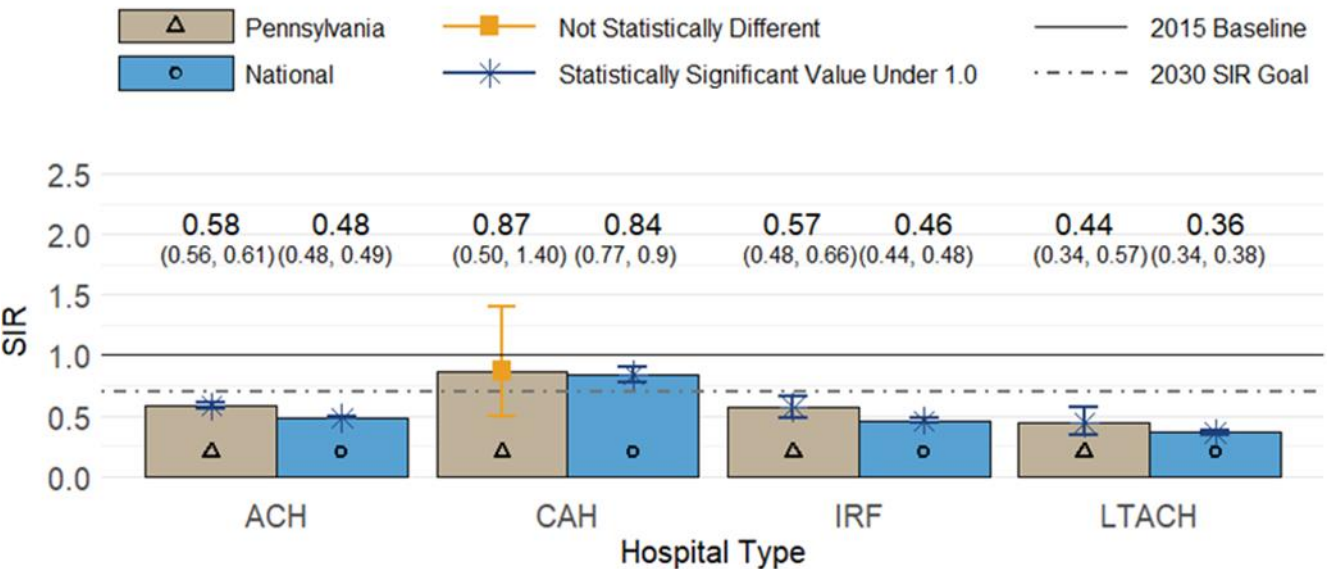
Figure 13: CDI SIR Values and 95% CIs in ACHs by Year, Pennsylvania 2017 – 2022



Source: NHSN, 2017 - 2022

As shown in Figure 14, Pennsylvania ACHs, IRFs and LTACHS had statistically significant CDI SIR values below the baseline of 1.0. The SIR value for Pennsylvania CAHs was below 1.0 but did not reach statistical significance. All Pennsylvania facility types had higher CDI SIR values when compared to national values, for this metric (ACH p-value < 0.001; CAH p-value = 0.85; IRF p-value = 0.015; LTACH p-value = 0.12). All facility types had SIR values below the 2030 SIR goal in 2022 except for CAHs.

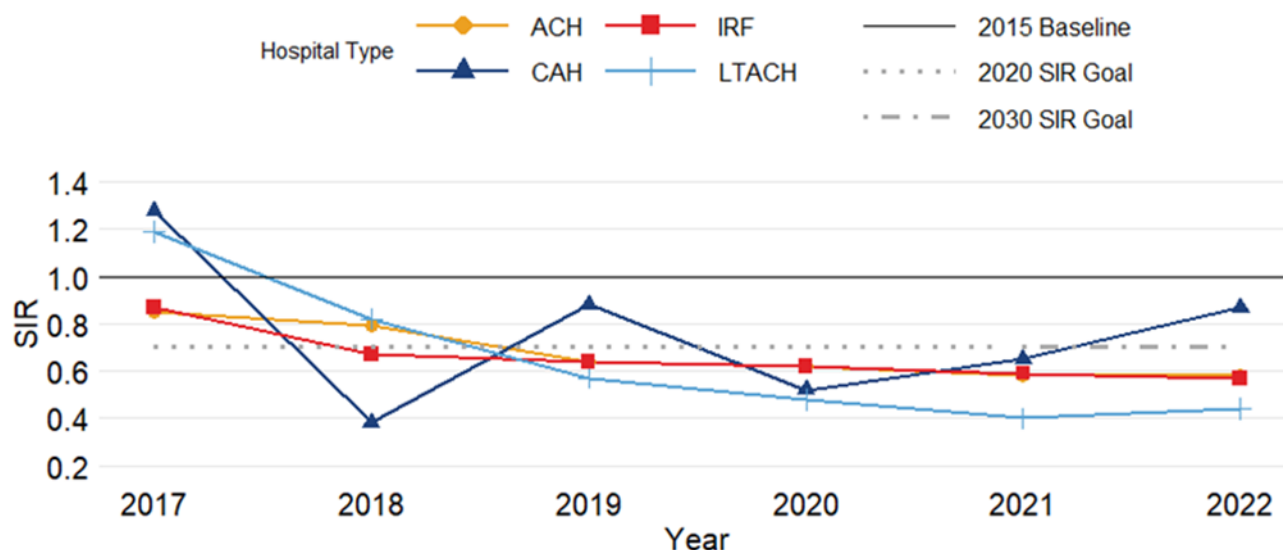
Figure 14: CDI SIR Values and 95% CIs by Hospital Type, National and Pennsylvania, 2022



Source: NHSN and CDC, 2022

As shown in Figure 15, the CDI statewide SIR values from ACHs and IRFs were below 1.0 between 2017 and 2022 and decreased each year until 2021. The 2022 SIR values from ACHs and IRFs were not statistically significantly different from those in 2021 (ACH p-value = 0.64; IRF p-value = 0.70). The CDI SIR value in LTACHs was above 1.0 in 2017 and dropped to 0.44 by 2022. Beginning in 2019, the LTACH SIR values were less than those from ACHs and IRFs. The CDI SIR value from CAHs fluctuated due to low numbers of predicted infections.

Figure 15: CDI SIR Values by Hospital Type and Year, Pennsylvania 2017 – 2022



Source: NHSN, 2017 – 2022

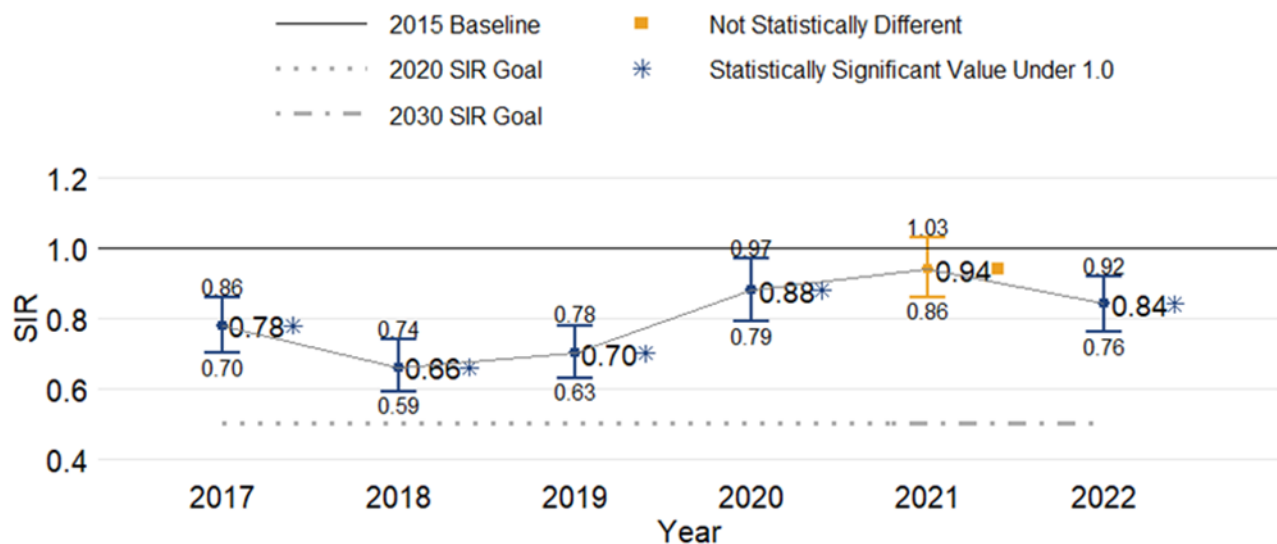
The NHSN did not calculate facility level CDI SIR values for 46 ACHs, IRFs, and CAHs because the number of predicted CDIs was below 1.0. No LTACHs had less than 1.0 predicted CDI. Data from these facilities should, however, be interpreted cautiously, considering the number of reported CDIs. Of the 46 facilities with less than 1.0 predicted CDI, 36 reported zero infections.

Methicillin-Resistant *Staphylococcus aureus* (MRSA) Bloodstream Infections

In 2022, 428 MRSA bloodstream events were reported in 177 ACHs. The MRSA statewide SIR value in ACHs was statistically significantly lower than the baseline value of 1.0 (SIR: 0.84; 95% CI: (0.76, 0.92)) indicating fewer infections than predicted. The number of reported MRSA events in 2022 was 80 fewer than predicted among all ACHs.

As shown in Figure 16, the MRSA ACH SIR values from 2017-2018 decreased. They began increasing in 2019, peaked in 2021 (SIR: 0.94) and decreased slightly in 2022. For all years except 2021, the MRSA statewide SIR values for ACHs were significantly below the baseline of 1.0, indicating fewer infections than predicted.

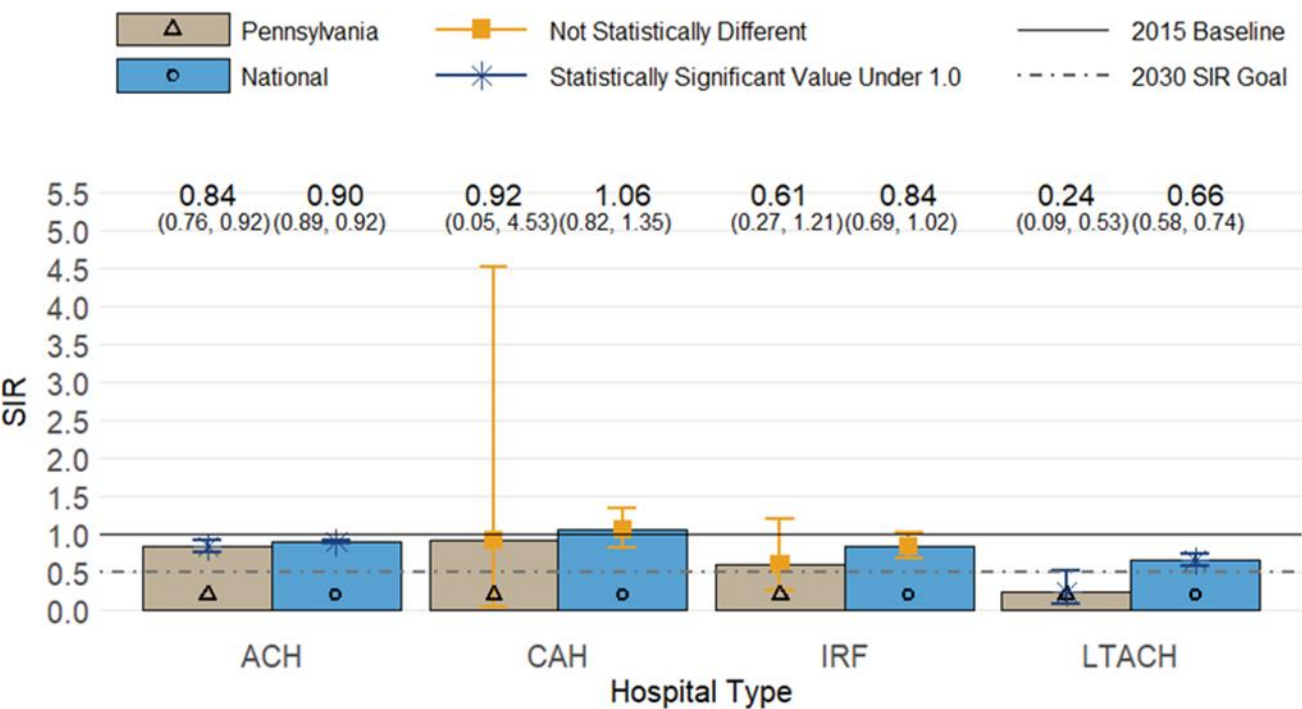
Figure 16: MRSA SIR Values and 95% CIs in ACHs by Year, Pennsylvania 2017 - 2022



Source: NHSN, 2017 - 2022

As shown in Figure 17, Pennsylvania ACHs and LTACHs had statistically significant 2022 MRSA statewide SIR values below the baseline of 1.0. The 2022 SIR values for Pennsylvania CAHs and IRFs were below 1.0 but did not reach statistical significance. All Pennsylvania facility types had lower MRSA SIR values when compared to national values, although the difference was only statistically significant for LTACHs (ACH p-value = 0.15; CAH p-value = 0.99; IRF p-value = 0.43; LTACH p-value = 0.01). Additionally, the ACH MRSA SIR of 0.84 was higher than the 2030 MRSA SIR goal of 0.50. To reach the 2030 SIR goal of 50% reduction in MRSA events from the number that were predicted to occur, Pennsylvania ACHs need to reduce MRSA events by an additional 40%, or preventing an additional 174 infections.

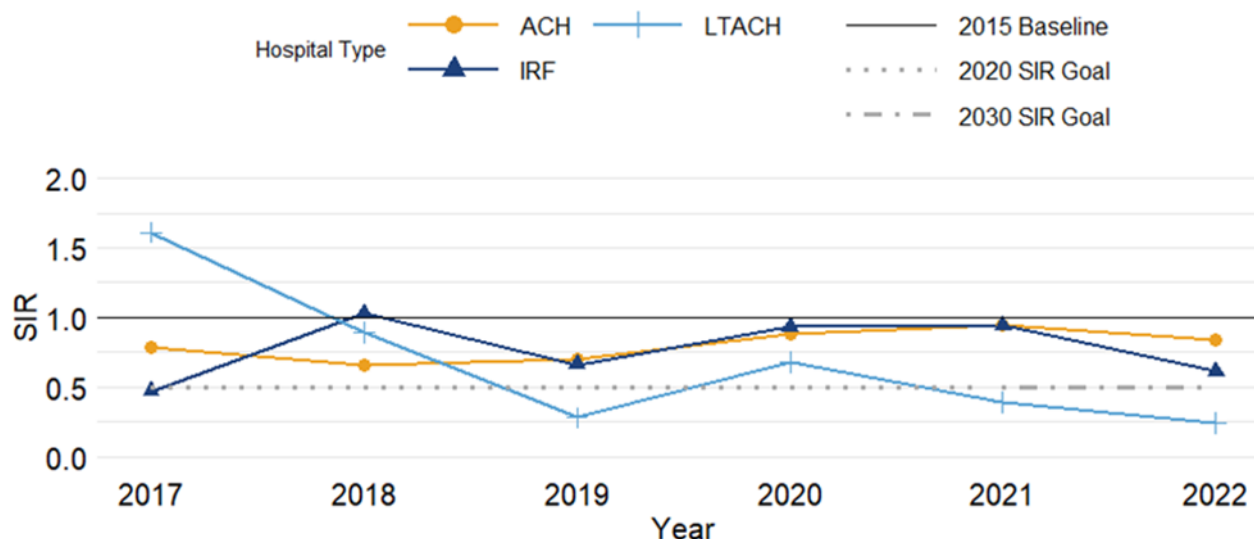
Figure 17: MRSA SIR Values and 95% CIs by Hospital Type, Pennsylvania and United States, 2022



Source: NHSN and CDC, 2022

As shown in Figure 18, IRF SIR values for all years except 2018 were below 1.0. The decrease between 2021 and 2022 did not reach statistical significance (p-value = 0.39). The LTACH SIR values dropped from 1.61 in 2017 to 0.28 in 2019. In 2020, it increased to 0.68 and dropped in the following two years to 0.24. Beginning in 2019 the LTACH SIR values were lower than those from ACHs and IRFs. LTACHs reported 187 fewer MRSA infections than predicted. In 2022, IRFs reported four fewer MRSAs than predicted. To reach the 2030 SIR goal of 50% reduction in MRSA, one HAI needs to be prevented in IRFs. LTACHs reached the 2030 SIR goal. Only in 2022 did CAHs have more than 1 predicted infection so their data are not included in this figure.

Figure 18: MRSA SIR Values by Hospital Type and Year, Pennsylvania 2017 - 2022



Source: NHSN, 2017 - 2022

The NHSN did not calculate facility level MRSA SIR values for 171 ACH, CAH, IRF, and LTACHs because the number of predicted infections was below 1.0. Data from these facilities should, however, be interpreted cautiously, considering the number of reported MRSA events.

Conclusion

This report summarized 2022 hospital data for six HAIs in adults. Among the six adult HAIs in ACHs, four had lower SIRs in 2022 when compared to 2021 (CAUTI, CLABSI, COLO SSI, MRSA), three had statewide SIR values less than national values (CLABSI, COLO SSI, MRSA), one had met the 2030 SIR goal (CDI), and all had fewer HAIs than predicted. Pediatric COLO SSI in ACHs had a lower SIR in 2022 when compared to 2021, had a statewide SIR value less than the national value, and had fewer HAIs than predicted. Measures of device utilization for urinary catheters and central lines were lower than predicted.

Overall, the data demonstrate the success of Pennsylvania ACHs in preventing HAIs; all six HAIs in adults and one in children had fewer infections than predicted. Additionally, there were statistically significant reductions for statewide 2022 CAUTI and CLABSI SIR values compared to 2021 values. These data also illustrate the success hospitals had in reducing HAIs two years after the start of the COVID-19 pandemic. During 2020 and 2021, hospitals struggled to maintain improvements in HAI reduction. However, by 2022, ACHs successfully reduced CAUTIs to near pre-pandemic levels; CLABSI and MRSA SIR values decreased slightly in 2022 but remained elevated compared to pre-pandemic levels.

These data also suggest potential areas of improvement for Pennsylvania hospitals. Specifically, the 2022 ACH statewide HYST SSI SIR value increased considerably from 0.81 in 2021 to 0.99 in 2022, even though they remained lower than predicted. Additionally, 2022

ACH CAUTI and CDI statewide SIR values were statistically significantly higher than those from the nation. Other than CDI, further reductions for all HAIs are needed to meet 2030 SIR goals for HAIs. Facilities with 2022 SIR values above 1.0 should focus their work to reduce the number of HAIs to reach the 2030 SIR goals.

These results should be interpreted while considering certain limitations. CDI and MRSA data from children's hospitals, inpatient psychiatric facilities, and CAH were not required to be reported; these facilities reported these conditions voluntarily. Facilities that voluntarily reported these data may differ from other facilities and may not fully represent the general experience of all such facilities in Pennsylvania. Additionally, it is possible that HAIs were reported inaccurately or that facilities with more robust surveillance programs reported HAIs more often than those with less robust programs. Data quality checks performed by the Pennsylvania DOH sought to minimize these errors. Furthermore, while the SIR calculation was adjusted to account for facility and patient characteristics, it is possible that these adjustments did not fully account for all differences that may have impacted infection risk in facilities.

The Pennsylvania DOH and the CDC envision a future in which patients do not acquire HAIs during their hospital stays. To achieve this goal hospitals must continue to use evidence-based guidelines and multifaceted infection prevention and control interventions. Facilities and public health departments are encouraged to review facility-specific data to compare HAI SIR values to the Pennsylvania and national SIR values. Facilities may benefit from free consultative resources and guidance on HAI reduction strategies from Patient Safety Authority (PSA) and Hospital and Healthsystem Association of Pennsylvania t.^{10, 11}

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