

Trends in Methicillin-Resistant *Staphylococcus aureus* (MRSA) Infection Reporting in Illinois Acute Care and Critical Access Hospitals, 2012 – 2017

On January 1, 2012, all Illinois acute care and critical access hospitals began mandated reporting of blood cultures positive for MRSA using the Centers for Disease Control and Prevention’s National Healthcare Safety Network (NHSN), Multidrug-Resistant Organism Laboratory-identified (LabID) Event module. The LabID event surveillance method enables facilities to report proxy measures for healthcare-associated infections based on data obtained from the laboratory without clinical evaluation of the patient. This report focuses on trends in NHSN hospital-onset MRSA data across Illinois acute care and critical access hospitals from 2012 – 2017.

Standardized Infection Ratio (SIR)

NHSN uses risk models that determine the predicted number of MRSA events at a facility based on the national baseline data, adjusting for statistically significant risk factors. The MRSA SIR is a measure that compares a facility’s burden of hospital-onset MRSA bacteremia events to that of the national referent population. A facility’s SIR is calculated as the actual, or observed, number of healthcare-associated incident cases reported by the facility divided by the predicted number of infections.

The corresponding 95% confidence interval (CI) is a statistical measure that shows a range of estimated possible values for the SIR. The upper and lower bounds of the interval are used to determine the statistical significance and precision of the SIR. The SIR and 95% CI are interpreted as follows:

- If the 95% CI includes 1 (i.e., lower bound is <1.00 and upper bound is >1.00), the hospital’s number of infections is **similar** to (not significantly different from) the predicted number.
- If the SIR is >1.0 and the 95% CI does not include 1, the hospital had a significantly **higher** number of infections than predicted.
- If the SIR is <1.0 and the 95% CI does not include 1, the hospital had a significantly **lower** number of infections than predicted.

NHSN 2015 Baseline

Before 2015, the MRSA SIR was calculated using a single statistical model for all facility types (acute care and critical access) and national data collected during 2010 – 2011. Starting with 2015 data, the CDC modified the NHSN risk models and updated the national referent population (referred to as the “2015 baseline”). Additionally, NHSN started using four separate statistical models based on facility type: acute care hospital, critical access hospital, inpatient rehabilitation facility, and long-term acute care hospital.

Due to the difference in baseline data and risk adjustment factors, SIRs from 2012 – 2014 are not directly comparable to those from 2015 and beyond. The 2012 – 2014 SIRs under the previous baseline are included and displayed in this report for contextual purpose only and as an indicator of past progress. SIRs under the 2015 baseline will be used in the current and future trend report updates.

Historical trend reports may be found on the Illinois Hospital Report Card website (State Reports of Current Interest):

http://www.healthcarereportcard.illinois.gov/contents/view/State_Reports_of_Current_Interest

MRSA Risk Adjustment Factors

Under the 2015 baseline, the MRSA risk model for acute care hospitals is adjusted for: average length of stay, medical school affiliation, facility bed size, facility type, and prevalence rate of inpatient and outpatient community-onset MRSA. None of the risk factors were significant predictors of MRSA in critical access settings. Therefore, the predicted number of events is calculated using the overall (unadjusted) national MRSA bacteremia experience in critical access hospitals.

Additional information regarding these MRSA risk models and SIR calculations can be found at: <https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/nhsn-sir-guide.pdf>

Summary Tables and Results

Table 1 summarizes hospital-onset MRSA bacteremia events in Illinois acute care and critical access hospitals from 2012 through 2014 under the 2010 – 2011 baseline. In 2017, acute care hospitals reported 187 events compared to 316 predicted, for an SIR of 0.59 (95% CI: 0.512, 0.682) (Table 2). This translates to 41% fewer MRSA bloodstream infections than the 2015 national referent population. Critical access hospitals reported 2 MRSA events compared to 3 predicted, for an SIR of 0.72 (95% CI: 0.121, 2.386), which is statistically similar to the 2015 baseline (Table 3).

Table 1. MRSA SIRs in Illinois acute care and critical access hospitals compared to 2010-2011 national baseline, 2012 – 2014

Reporting Year	# of Facilities Reported	Number of MRSA Bloodstream Infections		Standardized Infection Ratio (SIR)	95% Confidence Interval (SIR)		Statistical Interpretation
		Observed	Predicted		Lower	Upper	
2012	179	358	420	0.85	0.768	0.945	Lower
2013	183	293	409	0.72	0.636	0.800	Lower
2014	183	296	419	0.71	0.629	0.790	Lower

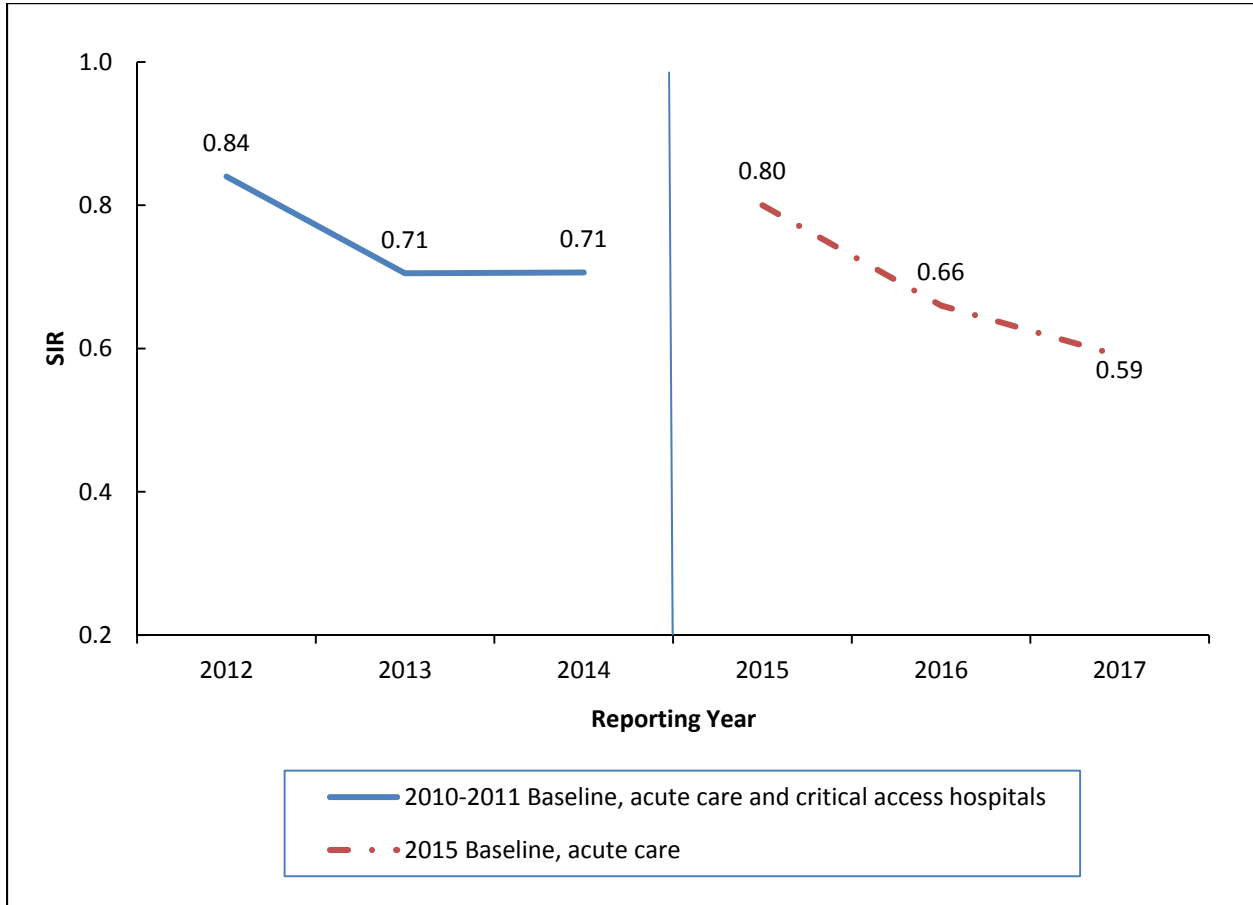
Table 2. MRSA SIRs in Illinois acute care hospitals compared to 2015 national baseline, 2015 – 2017

Reporting Year	# of Facilities Reported	Number of MRSA Bloodstream Infections		Standardized Infection Ratio (SIR)	95% Confidence Interval (SIR)		Statistical Interpretation
		Observed	Predicted		Lower	Upper	
2015	132	244	304	0.80	0.707	0.909	Lower
2016	130	209	316	0.66	0.577	0.757	Lower
2017	132	187	316	0.59	0.512	0.682	Lower

Table 3. MRSA SIRs in Illinois critical access hospitals compared to 2015 national baseline, 2015 – 2017

Reporting Year	# of Facilities Reported	Number of MRSA Bloodstream Infections		Standardized Infection Ratio (SIR)	95% Confidence Interval (SIR)		Statistical Interpretation
		Observed	Predicted		Lower	Upper	
2015	51	5	2	2.03	0.745	4.506	Similar
2016	51	1	3	0.31	0.015	1.503	Similar
2017	51	2	3	0.72	0.121	2.386	Similar

Figure 1. Trend of MRSA SIRs in Illinois acute care and critical access hospitals, 2012 – 2017



The 2012 – 2017 SIRs are graphically displayed in Figure 1. For 2015 – 2017, only acute care SIRs are shown because those for critical access are unstable due to small numbers. Because SIRs calculated under the old baseline are not comparable to those under the new baseline, a blue vertical line in the figure denotes a break between when the old versus new baselines were used.

Summary

Since 2012, the MRSA bacteremia SIRs in Illinois acute care hospitals have been consistently lower compared to the national referent population. This trend continues in 2017, in which the SIR of 0.59 was statistically significantly lower than the 2015 baseline. There was a 10.6% decrease in Illinois MRSA SIRs between 2016 and 2017, but this was not statistically significant (p -value = 0.26). Overall, Illinois acute care hospitals have made significant progress toward decreasing MRSA bacteremia infections in their facilities over the past 5 years.

The MRSA SIRs for critical access hospitals have also decreased since 2015, when the SIR was 2.03. However, the SIRs are unstable from year to year because of the small number of observed and predicted infections in this setting. For example, the SIR jumped from 0.31 in 2016 to 0.72 in 2017, but this was due to an increase of one infection. We continue to explore additional approaches for presenting critical access data in a way that meaningfully guides improvement efforts. Nearly all critical access hospitals in Illinois have successfully achieved zero MRSA bacteremia infections, and they should strive to maintain this level of prevention.