

2017 National and State HAI Prc Report

Long-Term Acute Care Hospitals

Introduction:

Welcome to the 2017 National and State HAI Progress Report using the 2015 baseline and risk adjustment calculations. Standardiz are used to describe different HAI types by comparing the number of observed infections to the number of predicted infections. The This report is created by CDC staff within the National Healthcare Safety Network (NHSN).

This workbook includes national and state-specific SIR data for long-term acute care hospitals (LTACHs).

Scope of report:

HAI Type	LTACH	
	National	State
Central line-associated bloodstream infections (CLABSI) by locations	p	p
Catheter-associated urinary tract infections (CAUTI) by locations	p	p
Ventilator-associated events (VAE) by locations	p	p
Hospital-onset methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) bacteremia by facility-wide reporting	p	p
Hospital-onset <i>Clostridioides difficile</i> (CDI) by facility-wide reporting	p	p

Progress

ed infection ratios (SIRs)
2017 SIRs are compared to previous year's SIRs.

2017 Annual National and State HAI Progress Report

Long-term Acute Care Hospitals: Full series of tables for all national and state-specific data

Table 1 National standardized infection ratios (SIRs) for the following HAIs from Long-term Acute Care Hospitals (LTACHs):
1a. Central line-associated bloodstream infections (CLABSI)
1a. Catheter-associated urinary tract infections (CAUTI)
1a. Ventilator-associated events (VAE)
1a. Infection-related ventilator-associated complication and possible ventilator-associated pneumonia (VAVAC)
1b. Hospital-onset methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia
1b. Hospital-onset *Clostridioides difficile* (CDI)

Table 2 State-specific SIRs for CLABSI from LTACHs for all locations combined

Table 3 State-specific SIRs for CAUTI from LTACHs for all locations combined

Table 4 State-specific SIRs for VAE from LTACHs

Table 5 State-specific SIRs for hospital-onset MRSA bacteremia from LTACHs

Table 6 State-specific SIRs for hospital-onset CDI from LTACHs

Table 7 Changes in national SIRs for CLABSI, CAUTI, VAE, hospital-onset MRSA bacteremia, and hospital-onset CDI

Table 8 Changes in state-specific SIRs between 2016 and 2017 from LTACHs

- 8a. CLABSI, all locations combined
- 8b. CAUTI, all locations combined
- 8c. VAE, all locations combined
- 8d. Hospital-onset MRSA bacteremia
- 8e. Hospital-onset CDI

Appendix A Factors used in NHSN risk adjustment of the device-associated HAIs (CLABSI, CAUTI, VAE)

Appendix B Factors used in NHSN risk adjustment of the MRSA Bacteremia and CDI negative binomial

Additional Resources [SIR Guide](#)
[Technical Appendix](#)
[HAI Progress Report Home Page](#)

NOTE: Tables contain data from Long-term Acute Care Hospitals (LTACHs); as such, they exclude

are Hospitals (LTACHs):

neumonia (IVAC-Plus)

hospital-onset CDI between 2016 and 2017 from LTACHs

3) negative binomial regression models from LTACHs

regression models from LTACHs

data from Inpatient Rehabilitation Facilities (IRFs), Critical Access Hospitals (CAHs), and Acute Care Hospitals (A

CHs).

<u>HAI and Patient Population</u>	<u>Reporting Hospitals</u>			<u>Standardize</u>	
	No. of Long Term Acute Care Hospitals Reporting ¹	Total Patient Days	Total Device Days	Observed Events	Predicted Events
CLABSI, all⁴	470	5,467,837	2,526,315	2,382	2,826.560
ICUs⁵	81	279,818	141,415	256	301.640
Wards⁶	463	5,188,019	2,384,900	2,126	2,524.920
CAUTI, all⁷	470	5,430,821	1,910,985	2,862	3,040.180
	81	278,011	120,984	169	263.220
	463	5,152,810	1,790,001	2,693	2,776.960
VAE, all⁷	458	4,875,024	1,144,852	1,732	1,945
	80	268,659	102,331	268	206
	430	4,606,365	1,042,521	1,464	1,739

1. The number of reporting facilities included in the SIR calculation.

2. Percent of facilities with at least one predicted infection (event) that had an SIR significantly greater than or less than the nominal value of the nation.

3. Facility-specific percentiles are only calculated if at least 20 facilities had ≥ 1.0 predicted HAI in 2017. If a facility's predicted number of HAIs was < 1.0, the facility is not included in the percentile calculation.

4. Data from all ICUs, wards (and other non-critical care locations), and NICUs.

5. Data from all ICUs; excludes wards (and other non-critical care locations) and NICUs. For VAE, pediatric locations are excluded from SIR since pediatric patients are not included in the SIR calculation.

6. Data from all wards (for this table, wards also include step-down and specialty care areas [including hematology/oncology, bone marrow transplant, and cardiac surgery]).

7. Data from all ICUs and wards (and other non-critical care locations). This excludes NICUs. For VAE, pediatric locations are excluded from SIR since pediatric patients are not included in the SIR calculation. IVAC-plus includes those events identified as infection-related ventilator-associated condition (IVAC) and possible ventilator-associated pneumonia.

NOTE: Risk factors used in the calculation of the number of predicted device-associated infections are listed in Appendix A.

Table 1a. National standardized infection ratios (SIRs) and facility-specific summary SIRs using HAI data reported to NHSN during 2017 by Central line-associated bloodstream infections (CLABSIs), catheter-associated urinary tract infections (CAUTIs) and ventilator-associated pneumonia (VAPs)

Facility Infection Ratio Data			Facility SIRs Compared to National SIR							
SIR	Lower 95% Confidence Interval	Upper 95% Confidence Interval	No. Facilities with ≥ 1 Predicted Infection (Event)	No. Facilities with SIR Significantly > National SIR		No. Facilities with SIR Significantly < National SIR		5%	10%	
				N	%²	N	%²			
0.843	0.809	0.877	452	51	11%	58	13%	0.000	0.000	
0.849	0.749	0.958	75	10	13%	6	8%	0.000	0.000	
0.842	0.807	0.878	444	48	11%	54	12%	0.000	0.000	
0.941	0.907	0.976	456	69	15%	63	13%	0.000	0.000	
0.642	0.551	0.745	74	3	4%	3	4%	0.000	0.000	
0.970	0.934	1.007	447	64	14%	63	14%	0.000	0.000	
0.891	0.849	0.933	308	54	18%	55	18%	0.000	0.000	
1.300	1.151	1.463	52	11	21%	9	17%	0.000	0.000	
0.842	0.800	0.886	284	48	17%	50	18%	0.000	0.000	

onal SIR for the given HAI type. This is only calculated if at least 10 facilities had ≥ 1.0 predicted HAI in 2017.

<1.0, a facility-specific SIR was neither calculated nor included in the distribution of facility-specific SIRs.

pediatric and neonatal locations are excluded from VAE surveillance.

tj). For VAE, pediatric locations are excluded from SIR since pediatric and neonatal locations are excluded from VAE surveillance.

nce pediatric and neonatal locations are excluded from VAE surveillance. Total VAE includes IVAC-plus events.

a (pVAP). IVAC-plus events are a subset of the total VAE, meaning the IVAC-plus events are included in the total VAE SIR as well.

facility type, HAI, and patient population:
 or-associated events (VAEs)

Percentile Distribution of Facility-specific SIRs³

Median												
15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%
0.000	0.204	0.300	0.375	0.482	0.559	0.644	0.713	0.804	0.890	0.982	1.114	1.267
0.035	0.231	0.270	0.326	0.454	0.497	0.612	0.665	0.739	0.808	1.026	1.150	1.469
0.000	0.189	0.298	0.365	0.475	0.571	0.637	0.712	0.775	0.877	0.973	1.123	1.281
0.161	0.273	0.355	0.446	0.559	0.635	0.723	0.776	0.881	0.976	1.104	1.231	1.377
0.000	0.000	0.000	0.000	0.202	0.383	0.455	0.518	0.612	0.680	0.815	0.864	0.887
0.156	0.265	0.354	0.471	0.576	0.637	0.731	0.789	0.903	0.995	1.130	1.253	1.461
0.000	0.000	0.031	0.173	0.300	0.424	0.506	0.624	0.729	1.011	1.278	1.455	1.625
0.000	0.000	0.187	0.248	0.428	0.435	0.760	0.918	1.070	1.196	1.499	2.030	2.463
0.000	0.000	0.000	0.124	0.235	0.369	0.440	0.536	0.657	0.864	1.129	1.342	1.557

80%	85%	90%	95%
1.411	1.705	2.016	2.647
1.608	1.794	2.115	2.766
1.461	1.708	1.987	2.648
1.607	1.877	2.180	2.796
0.962	1.298	1.543	2.136
1.675	1.929	2.201	2.752
1.909	2.305	2.753	3.842
2.552	3.842	3.893	4.958
1.714	2.099	2.581	3.316

<u>HAI and Patient Population</u>	<u>Reporting Hospitals</u>			Observed Hospital- onset Events ⁴	
	Total Admissions ²	Total Patient Days ³	Community-onset events		
MRSA bacteremia, facility-wide⁴	468	226,589	5,536,825	91	712
Hospital-onset <i>C. difficile</i>, facility-wide⁴	466	227,854	5,577,059	543	4,233

1. The number of reporting facilities included in the SIR calculation.

2. Total inpatient admissions reported from all inpatient locations.

3. Total patient days reported from all inpatient units, excluding counts from CMS-certified rehabilitation and psychiatric locations. Patient days for *C. di*

4. Hospital-onset events are defined as those that were identified in an inpatient location on the 4th day (or later) after admission to the facility.

5. Calculated from a negative binomial regression model. Risk factors used in the calculation of the number of predicted events are listed in Appendix B

6. Percent of facilities with at least one predicted event that had an SIR significantly greater than or less than the nominal value of the national SIR for th

7. Percentile distribution of facility-specific SIRs. This is only calculated if at least 20 facilities had ≥ 1.0 predicted HAI in 2017. If a facility's predicted nur

Table 1b. National standardized infection ratios (SIRs) and facility-specific summary SIRs using HAI data reported to NHSN during 2017 for hospital-onset methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia and hospital-onset *Clostridioides*

Standardized Infection Ratio Data				Facility SIRs Compared to National SIR					
Predicted Hospital-onset Events⁵	SIR	Lower 95% Confidence Interval	Upper 95% Confidence Interval	No. Facilities with ≥1 Predicted Event	No. Facilities with SIR Significantly > National SIR		No. Facilities with SIR Significantly < National SIR		5%
					N	%⁶	N	%	
755.397	0.943	0.875	1.014	319	40	13%	12	4%	0.000
5,503.278	0.769	0.746	0.793	458	59	13%	68	15%	0.000

facile further excludes counts from NICUs and well-baby units.

...
 e given HAI type. This is only calculated if at least 10 facilities had ≥ 1.0 predicted HAI in 2017.
 mber of events was <1.0, a facility-specific SIR was neither calculated nor included in the distribution of facility-specific SIRs.

by facility type, HAI, and patient population:
Clostridium difficile (CDI)

Percentile Distribution of Facility-specific SIRs⁷

													Median	
10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%		
0.000	0.000	0.000	0.000	0.000	0.057	0.449	0.574	0.700	0.782	0.889	1.049	1.349		
0.150	0.251	0.341	0.408	0.501	0.563	0.619	0.689	0.733	0.797	0.846	0.923	0.990		

75%	80%	85%	90%	95%
1.610	1.909	2.040	2.387	2.868
1.064	1.177	1.308	1.553	1.854

**Table 2. State-specific standardized infection rate
NHSN Long-Term Acute Care Ho
Central line-associated bloodstream ir**

State	State NHSN Mandate ²	Any Validation ³	No. of LTACHs Reporting ⁴	No. of Infections			95% CI
				Observed	Predicted	SIR	Lower
Alaska	No	No	1	.	.	.	.
Alabama	No	Yes	9	16	34.534	0.463	0.274
Arkansas			7	16	25.977	0.616	0.365
Arizona	No	No	7	8	29.568	0.271	0.126
California	Yes	Yes	24	314	307.693	1.020	0.912
Colorado	Yes	No	8	21	35.101	0.598	0.380
Connecticut	Yes	No	3	.	.	.	.
D.C.	Yes	Yes	2	.	.	.	.
Delaware			1	.	.	.	.
Florida	No	No	28	138	216.338	0.638	0.538
Georgia	Yes	Yes	16	78	83.854	0.930	0.740
Guam	No	No	1	.	.	.	.
Hawaii	Yes	No	1	.	.	.	.
Iowa	No	No	3	.	.	.	.
Idaho	No	No	3	.	.	.	.
Illinois	Yes	No	9	120	109.245	1.098	0.915
Indiana	Yes	No	13	99	85.668	1.156	0.944
Kansas	No	No	4	.	.	.	.
Kentucky	Yes	No	9	87	52.550	1.656	1.334
Louisiana	No	Yes	34	106	127.250	0.833	0.685
Massachusetts	No	No	14	73	81.625	0.894	0.706
Maryland	No	No	2	.	.	.	.
Maine	No	No	1	.	.	.	.
Michigan	No	No	21	69	75.659	0.912	0.715
Minnesota	No	No	2	.	.	.	.
Missouri			11	40	52.710	0.759	0.549
Mississippi	Yes	No	9	26	46.077	0.564	0.376
Montana	No	No	1	.	.	.	.
North Carolina	No	No	10	54	69.778	0.774	0.587
North Dakota	No	No	2	.	.	.	.
Nebraska	Yes	No	4	.	.	.	.
New Hampshire	No	No	1	.	.	.	.
New Jersey	No	No	12	67	75.711	0.885	0.691
New Mexico	No	No	3	.	.	.	.
Nevada	Yes	Yes	10	42	71.693	0.586	0.428
New York			1	.	.	.	.
Ohio	No	Yes	31	115	171.406	0.671	0.556
Oklahoma			13	49	53.258	0.920	0.688
Oregon	Yes	Yes	1	.	.	.	.
Pennsylvania	Yes	Yes	22	91	86.482	1.052	0.852
Puerto Rico			1	.	.	.	.
Rhode Island	No	No	1	.	.	.	.

South Carolina	Yes	Yes ^a	6	28	35.641	0.786	0.532
South Dakota	No	Yes	1	.	.	.	.
Tennessee	Yes	Yes	9	49	54.666	0.896	0.670
Texas	No	No	80	430	520.512	0.826	0.751
Utah	Yes	No	4	.	.	.	.
Virginia	No	No	6	41	34.176	1.200	0.872
Virgin Islands	No	No	1	.	.	.	.
Vermont	No	No	1	.	.	.	.
Washington	Yes	No	3	.	.	.	.
Wisconsin	No	Yes	6	22	34.098	0.645	0.415
West Virginia	Yes	No	4	.	.	.	.
Wyoming	No	No	1	.	.	.	.
All US			470	2,382	2,826.560	0.843	0.809

1. Includes data reported from all locations (i.e., adult and pediatric critical care units and wards) within LTACHs.
2. Yes indicates the presence of a state mandate to report CLABSI data from any location to NHSN at the beginning of 2017. No indicates that a state mandate did not exist during 2017.
3. Yes indicates that the state health department reported the completion of all of the following validation activities: assessment of missing or implausible values on at least six months of 2017 NHSN data prior to July 1, 2018, an assessment of the accuracy of reported CLABSI data (Yes^A indicates that the state also conducted an audit of facility medical or laboratory records prior to July 1, 2018; No indicates that the state did not conduct an audit; Yes^B indicates that the state health department has performed validation on NHSN data that is voluntary; No indicates that the state health department has not performed validation on NHSN data that is voluntary). Information on validation efforts was requested from all states, regardless of the presence of a reporting of a given HAI to the state health department.
4. The number of LTACHs that reported 2017 CLABSI data and are included in the SIR calculation. SIRs and accuracy are calculated from at least one location in 2017.
5. Percent of facilities with ≥ 1.0 predicted CLABSI that had an SIR significantly greater or less than the nominal value of ≥ 1.0 predicted CLABSI in 2017.
6. Facility-specific key percentiles were only calculated if at least 20 facilities had ≥ 1.0 predicted CLABSI in 2017. Facilities that did not have ≥ 1.0 predicted CLABSI in 2017 were not included in the distribution of facility-specific SIRs.

1.120	6	.	.	.	.	.	.	.
.
1.175	9	.	.	.	.	.	.	.
0.907	76	11%	13%	0.105	0.391	0.805	1.209	.
.
1.612	6	.	.	.	.	.	.	.
.
.
0.961	6	.	.	.	.	.	.	.
.
.
0.877	408	11%	13%	0.000	0.300	0.713	1.267	.

ing of 2017. M indicates midyear implementation of a mandate.

: state health department had access to 2017 NHSN data, state health department performed an
id state health department contacted identified facilities.

B to confirm proper case ascertainment (although intensity of auditing activities
legislative mandate for the particular HAI type. Some states without mandatory
ily shared with them by facilities in their jurisdiction.

ompanying statistics are only calculated for states in which at least 5 LTACHs reported CLABSI data

lue of the 2017 national LTACH CLABSI SIR of 0.843. This is only calculated if at least 10 facilities had

If a facility's predicted number of CLABSI was <1.0, a facility-specific SIR was neither calculated

tiles⁶

90%

2.133

1.297

2.485

2.586

1.527

2.957

1.742

2.016

**Table 3. State-specific standardized infection rate
NHSN Long-Term Acute Care Ho
Catheter-associated urinary tract inf**

State				No. of Infections		95% CI	
				Observed	Predicted	SIR	Lower
Alaska	No	No	1	.	.	.	.
Alabama	No	Yes	9	38	34.732	1.094	0.785
Arkansas			7	38	32.958	1.153	0.828
Arizona	No	No	7	31	34.349	0.903	0.624
California	No	No	24	346	360.093	0.961	0.864
Colorado	No	No	8	86	62.842	1.369	1.101
Connecticut	Yes	No	3	.	.	.	.
D.C.	Yes	Yes	2	.	.	.	.
Delaware			1	.	.	.	.
Florida	No	No	28	180	273.302	0.659	0.568
Georgia	Yes	Yes	16	172	133.781	1.286	1.104
Guam		No	.	.	.	.	.
Hawaii	Yes	No	.	.	.	.	.
Iowa	No	No	3	.	.	.	.
Idaho	No	No	3	.	.	.	.
Illinois	No	No	9	116	124.254	0.934	0.775
Indiana	Yes	No	13	103	78.584	1.311	1.075
Kansas	No	No	4	.	.	.	.
Kentucky	Yes	No	9	62	65.286	0.950	0.734
Louisiana	No	Yes	34	84	132.085	0.636	0.510
Massachusetts	No	No	14	109	79.154	1.377	1.136
Maryland	Yes	No	2	.	.	.	.
Maine	No	No	.	.	.	.	.
Michigan	No	No	21	76	79.377	0.957	0.760
Minnesota	No	No	2	.	.	.	.
Missouri	No		11	60	56.899	1.055	0.812
Mississippi	Yes	No	9	20	52.996	0.377	0.237
Montana	No	No	1	.	.	.	.
North Carolina	No	No	10	40	59.076	0.677	0.490
North Dakota	No	No	2	.	.	.	.
Nebraska	Yes	No	4	.	.	.	.
New Hampshire	No	No	.	.	.	.	.
New Jersey	No	No	12	96	76.158	1.261	1.027
New Mexico	No	No	3	.	.	.	.
Nevada	No	No	10	68	62.444	1.089	0.852
New York			1	.	.	.	.
Ohio	No	Yes	31	167	168.850	0.989	0.847
Oklahoma			13	45	70.557	0.638	0.471
Oregon	Yes	Yes	1	.	.	.	.
Pennsylvania	Yes	Yes	22	96	80.581	1.191	0.970
Puerto Rico			.	.	.	.	.
Rhode Island	No	No	1	.	.	.	.

1.346	6	.	.	.	.	.	.
.
1.189	9	.	.	.	.	.	.
0.782	77	4%	13%	0.000	0.339	0.628	0.861
.
1.039	6
.
.
.
1.687	6
.
.
0.976	456	15%	13%	0.000	0.355	0.776	1.377

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: state health department had access to 2017 NHSN data, state health department performed an
id state health department contacted identified facilities.

legislative mandate for the particular HAI type. Some states without mandatory
ily shared with them by facilities in their jurisdiction.

mpanying statistics are only calculated for states in which at least 5 LTACHs reported CAUTI data

ie of the 2017 national LTACH CAUTI SIR of 0.941. This is only calculated if at least 10 facilities had

: a facility's predicted number of CAUTI was <1.0, a facility-specific SIR was neither calculated

90%

1.847

1.778

1.309

1.837

2.463

2.999

**Table 4. State-specific standardized infection rate
NHSN Long-Term Acute Care Ho
Ventilator-associated event**

State				No. of Events		SIR	95% CI
				Observed	Predicted		Lower
Alaska	No	No	1	.	.	.	.
Alabama	No	No	9	16	23.911	0.669	0.396
Arkansas			7	26	25.009	1.040	0.694
Arizona	No	N	7	12	24.783	0.484	0.262
California	No	No	23	184	267.496	0.688	0.594
Colorado	No	No	8	14	16.090	0.870	0.495
Connecticut	No		2	.	.	.	.
D.C.	No	Yes	2	.	.	.	.
Delaware			1	.	.	.	.
Florida	No	No	28	205	194.498	1.054	0.917
Georgia	No	No	16	66	74.326	0.888	0.692
Guam	No	No	0	.	.	.	.
Hawaii	Yes	No	0	.	.	.	.
Iowa	No	No	3	.	.	.	.
Idaho	No	No	3	.	.	.	.
Illinois	Yes	No	9	116	80.871	1.434	1.191
Indiana	No	No	13	75	50.570	1.483	1.175
Kansas	No	No	4	.	.	.	.
Kentucky	Yes	No	9	58	46.280	1.253	0.960
Louisiana	No	No	29	27	10.046	2.688	1.807
Massachusetts	No	No	13	59	73.381	0.804	0.618
Maryland	No	No	1	.	.	.	.
Maine	No	No	0	.	.	.	.
Michigan	No	No	21	85	66.549	1.277	1.027
Minnesota	No	No	2	.	.	.	.
Missouri			11	31	31.608	0.981	0.678
Mississippi	Yes	No	9	60	23.152	2.592	1.995
Montana	No	No	1	.	.	.	.
North Carolina	No	No	10	37	47.908	0.772	0.552
North Dakota	No	No	2	.	.	.	.
Nebraska	Yes	No	4	.	.	.	.
New Hampshire	No	No	0	.	.	.	.
New Jersey	No	No	11	31	76.095	0.407	0.282
New Mexico	No	No	3	.	.	.	.
Nevada	No	No	10	7	23.640	0.296	0.130
New York			1	.	.	.	.
Ohio	No	No	31	109	117.686	0.926	0.764
Oklahoma			12	21	18.084	1.161	0.738
Oregon	No	No	1	.	.	.	.
Pennsylvania	Yes	Yes	22	69	67.178	1.027	0.805
Puerto Rico			0	.	.	.	.
Rhode Island	No	No	1	.	.	.	.

1.327	6	.	.	.	.	.	.	.
0.715	8	.	.	.	.	.	.	.
1.806	30	27%	3%	0.000	0.226	1.017	2.790	.
0.411	4	.	.	.	.	.	.	.
.
.
1.978	5	.	.	.	.	.	.	.
.
.
0.933	308	18%	18%	0.000	0.031	0.624	1.625	.

of 2017. M indicates midyear implementation of a mandate.

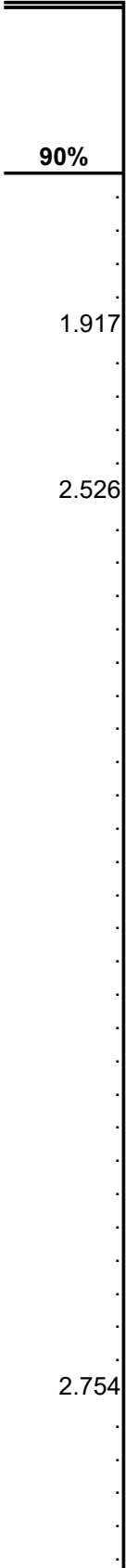
: state health department had access to 2017 NHSN data, state health department performed an
id state health department contacted identified facilities.

legislative mandate for the particular HAI type. Some states without mandatory
ily shared with them by facilities in their jurisdiction.

oaning statistics are only calculated for states in which at least 5 LTACHs reported VAE data

of the 2017 national LTACH VAE SIR of 0.891. This is only calculated if at least 10 facilities had

facility's predicted number of VAE was <1.0, a facility-specific SIR was neither calculated



4.956

3.842

**Table 5. State-specific standardized infection rate
NHSN Long-Term Acute Care Ho**

State				Hospital-onset methicillin-resistant <i>Staphyl</i>			
				No. of Events		95% CI	
				Observed	Predicted	SIR	Lower
Alaska	No	No	1	.	.	.	.
Alabama	No	No	9	12	12.257	0.979	0.530
Arkansas			7	6	7.215	0.832	0.337
Arizona	No	No	7	5	10.616	0.471	0.173
California	Yes	Yes	24	110	69.030	1.594	1.316
Colorado	No	No	8	3	10.820	0.277	0.071
Connecticut	Yes	No	3	.	.	.	.
D.C.	Yes	Yes	2	.	.	.	.
Delaware			1	.	.	.	.
Florida	No	No	28	78	60.188	1.296	1.031
Georgia	Yes	Yes	16	23	30.213	0.761	0.494
Guam	No	No	0	.	.	.	.
Hawaii	Yes	No	1	.	.	.	.
Iowa	No	No	3	.	.	.	.
Idaho	No	No	3	.	.	.	.
Illinois	Yes	No	9	31	26.681	1.162	0.803
Indiana	No	No	13	28	17.208	1.627	1.103
Kansas	No	No	4	.	.	.	.
Kentucky	Yes	No	9	25	13.856	1.804	1.194
Louisiana	No	Yes	33	19	30.22	0.629	0.390
Massachusetts	No	No	13	22	47.315	0.465	0.299
Maryland	No	No	2	.	.	.	.
Maine	No	No	0	.	.	.	.
Michigan	No	No	21	27	25.321	1.066	0.717
Minnesota	No	No	2	.	.	.	.
Missouri			11	13	15.158	0.858	0.477
Mississippi	Yes	No	9	7	11.979	0.584	0.256
Montana	No	No	1	.	.	.	.
North Carolina	No	Yes	10	26	14.315	1.816	1.212
North Dakota	No	No	2	.	.	.	.
Nebraska	Yes	No	4	.	.	.	.
New Hampshire	No	No	0	.	.	.	.
New Jersey			12	25	24.078	1.038	0.687
New Mexico	No	No	3	.	.	.	.
Nevada	Yes	No	10	8	11.637	0.687	0.319
New York			1	.	.	.	.
Ohio	No	Yes	31	26	41.505	0.626	0.418
Oklahoma			13	11	13.355	0.824	0.433
Oregon			1	.	.	.	.
Pennsylvania	Yes	Yes	22	44	27.401	1.606	1.181
Puerto Rico			0	.	.	.	.
Rhode Island	No	No	1	.	.	.	.

1.666	6	.	.	.	.	.	.
.
1.878	8	.	.	.	.	.	.
0.851	48	0%	0%	0.000	0.000	0.431	1.288
.
1.569	3	.	.	.	.	.	.
.
.
0.556	6	.	.	.	.	.	.
.
.
1.014	319	12%	4%	0.000	0.000	0.700	1.610

the beginning of 2017. M indicates midyear implementation of a mandate.

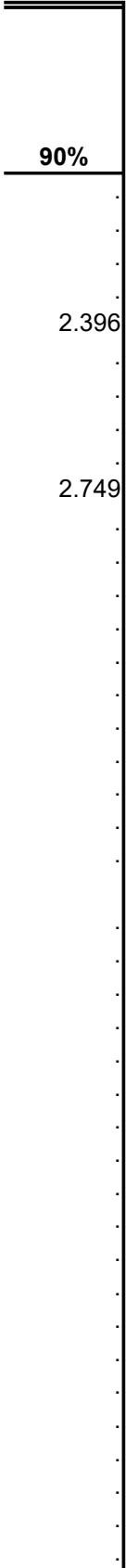
If a state health department had access to 2017 NHSN data, state health department performed an audit and state health department contacted identified facilities.

State health department has a legislative mandate for the particular HAI type. Some states without mandatory reporting requirements have voluntarily shared with them by facilities in their jurisdiction.

Facility-specific SIRs and accompanying statistics are only calculated for states in which at least 5 LTACHs reported data.

Facility-specific SIR is a nominal value of the 2017 national LTACH MRSA SIR of 0.943. This is only calculated if at least 10 facilities have reported data.

Facility-specific SIR is calculated in 2017. If a facility's predicted number of MRSA bacteremia was <1.0, a facility-specific SIR



1.748

2.387

id

**Table 6. State-specific standardized infection rate
NHSN Long-Term Acute Care Ho**

Hospital-onset *Clostridio*

State				No. of Events		95% CI	
				Observed	Predicted	SIR	Lower
Alaska	No	No	1	.	.	.	.
Alabama	No	No	9	27	63.201	0.427	0.287
Arkansas			7	33	50.562	0.653	0.457
Arizona	No	No	7	32	49.922	0.641	0.446
California	Yes	Yes	24	633	547.288	1.157	1.069
Colorado	Yes	No	8	72	77.929	0.924	0.728
Connecticut	Yes	No	3	.	.	.	.
D.C.	No	Yes	2	.	.	.	.
Delaware			1	.	.	.	.
Florida	No	No	28	301	424.060	0.710	0.633
Georgia	Yes	Yes	16	116	195.824	0.592	0.492
Guam	No	No	0	.	.	.	.
Hawaii	Yes	No	0	.	.	.	.
Iowa	No	No	3	.	.	.	.
Idaho	No	No	3	.	.	.	.
Illinois	Yes	No	9	160	206.988	0.773	0.660
Indiana	No	No	13	114	116.950	0.975	0.808
Kansas	No	No	4	.	.	.	.
Kentucky	Yes	No	9	65	91.753	0.708	0.551
Louisiana			33	131	222.542	0.589	0.494
Massachusetts	No	No	13	252	416.171	0.606	0.534
Maryland	No	No	2	.	.	.	.
Maine			0	.	.	.	.
Michigan	No	No	21	136	165.402	0.822	0.693
Minnesota	No	No	2	.	.	.	.
Missouri			11	71	102.425	0.693	0.545
Mississippi	Yes	No	9	35	79.270	0.442	0.312
Montana	No	No	1	.	.	.	.
North Carolina	No	Yes	10	84	102.140	0.822	0.660
North Dakota	No	No	2	.	.	.	.
Nebraska	Yes	No	4	.	.	.	.
New Hampshire	No	No	0	.	.	.	.
New Jersey	No	No	12	113	161.787	0.698	0.578
New Mexico	No	No	3	.	.	.	.
Nevada	No	No	10	102	80.844	1.262	1.034
New York			2	.	.	.	.
Ohio	No	Yes	31	194	294.203	0.659	0.571
Oklahoma			13	62	93.520	0.663	0.513
Oregon	Yes	Yes	1	.	.	.	.
Pennsylvania	Yes	Yes	22	228	192.434	1.185	1.038
Puerto Rico			0	.	.	.	.
Rhode Island	No	No	1	.	.	.	.

0.803	6	.	.	.	.	.	.	.
.
0.781	9	.	.	.	.	.	.	.
0.926	76	0%	12%	0.245	0.441	0.737	1.090	.
.
1.000	6	.	.	.	.	.	.	.
.
.
0.811	6	.	.	.	.	.	.	.
.
.
0.793	458	13%	15%	0.150	0.408	0.733	1.064	.

f 2017. M indicates midyear implementation of a mandate.

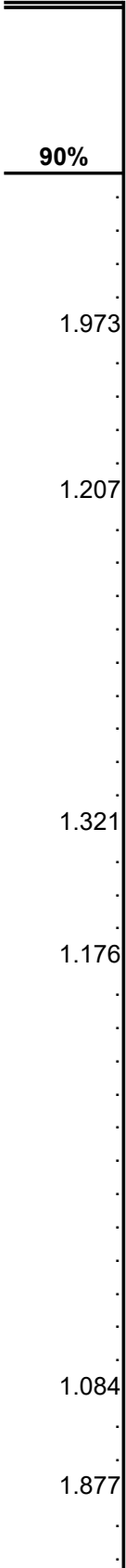
: state health department had access to 2017 NHSN data, state health department performed an
id state health department contacted identified facilities.

legislative mandate for the particular HAI type. Some states without mandatory
ily shared with them by facilities in their jurisdiction.

anying statistics are only calculated for states in which at least 5 LTACHs reported CDI data

of the 2017 national LTACH CDI SIR of 0.769. This is only calculated if at least 10 facilities had

facility's predicted number of CDI was <1.0, a facility-specific SIR was neither calculated



1.641

1.553

Table 7. Changes in national standardized infection ratios (SIRs) using HAI data reported from all NHSN Long-Term Central line-associated bloodstream infections (CLABSIs), catheter-associated urinary tract methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia and *Clostridium*

HAI and Patient Population	2016 SIR	2017 SIR	Percent Change	Direction of Change, Based on Statistical Significance	p-value
CLABSI, all locations¹	0.960	0.843	-12%	Decrease	0.0000
CAUTI, all locations¹	0.977	0.941	4%	No change	0.1481
VAE, all locations	1.054	0.891	-15%	Decrease	0.000
Hospital-onset MRSA bacteremia, facility-wide²	0.944	0.943	0%	No change	0.9706
Hospital-onset <i>C. difficile</i> infections, facility-wide²	0.850	0.769	-10%	Decrease	0.0000

* Statistically significant, p < 0.0500

1. Data from all ICUs, wards (and other non-critical care locations). This excludes IRF locations (or facilities).

2. Hospital-onset is defined as an event detected on the 4th day (or later) after admission to an inpatient location within the facility.

**Acute Care Hospitals (LTACHs) reporting during 2017 by HAI and patient population:
ct infections (CAUTIs), ventilator-associated events (VAEs),
Clostridium difficile infections, 2016 compared to 2017**

Table 8. Changes in state-specific standardized infection ratios (SIRs) between 2016 and 2017 from NHSN Long-Term Acute Care Hospitals
8a. Central line-associated bloodstream infections (CLABSI), all locations¹

State ²	All Long-Term Acute Care Hospitals Reporting to NHSN				
	2016 SIR	2017 SIR	Percent Change	Direction of Change, Based on Statistical Significance	p-value
Alaska	.	.	.	.	.
Alabama	0.712	0.463	35%	No change	0.1613
Arkansas	0.910	0.616	32%	No change	0.2145
Arizona	0.717	0.271	-62%	Decrease	0.0067
California	1.456	1.020	-30%	Decrease	0.0000
Colorado	0.617	0.598	3%	No change	0.9198
Connecticut	.	.	.	.	.
D.C.	.	.	.	.	.
Delaware	.	.	.	.	.
Florida	1.119	0.638	-43%	Decrease	0.0000
Georgia	1.201	0.930	23%	No change	0.0732
Guam	.	.	.	.	.
Hawaii	.	.	.	.	.
Iowa	.	.	.	.	.
Idaho	.	.	.	.	.
Illinois	1.416	1.098	-22%	Decrease	0.0292
Indiana	1.163	1.156	1%	No change	0.9632
Kansas	.	.	.	.	.
Kentucky	0.752	1.656	120%	Increase	0.0000
Louisiana	0.741	0.833	12%	No change	0.3882
Massachusetts	0.975	0.894	8%	No change	0.5707
Maryland	.	.	.	.	.
Maine	.	.	.	.	.
Michigan	1.043	0.912	13%	No change	0.3991
Minnesota	.	.	.	.	.
Missouri	0.923	0.759	18%	No change	0.3236
Mississippi	1.153	0.564	-51%	Decrease	0.0015
Montana	.	.	.	.	.
North Carolina	1.044	0.774	26%	No change	0.0822
North Dakota	.	.	.	.	.
Nebraska	.	.	.	.	.
New Hampshire	.	.	.	.	.
New Jersey	0.838	0.885	6%	No change	0.7433
New Mexico	.	.	.	.	.
Nevada	0.789	0.586	26%	No change	0.1400
New York	.	.	.	.	.
Ohio	0.865	0.671	-22%	Decrease	0.0340
Oklahoma	0.764	0.920	20%	No change	0.3486
Oregon	.	.	.	.	.
Pennsylvania	1.094	1.052	4%	No change	0.7774
Puerto Rico	.	.	.	.	.
Rhode Island	.	.	.	.	.
South Carolina	1.189	0.786	34%	No change	0.0798
South Dakota	.	.	.	.	.
Tennessee	0.673	0.896	33%	No change	0.1688
Texas	0.818	0.826	1%	No change	0.8752
Utah	.	.	.	.	.
Virginia	0.750	1.200	60%	No change	0.0570
Virgin Islands	.	.	.	.	.
Vermont	.	.	.	.	.
Washington	.	.	76%	No change	0.1019
Wisconsin	0.845	0.645	24%	No change	0.3219
West Virginia	.	.	.	.	.
Wyoming	.	.	.	.	.
All US	0.960	0.843	-12%	Decrease	0.0000

* Statistically significant, p < 0.0500

1. Data from all ICUs, wards (and other non-critical care locations).
2. States without SIR either in 2016 and/or 2017 and therefore subsequent data not calculated

Table 8. Changes in state-specific standardized infection ratios (SIRs) between 2016 and 2017 from NHSN Long-Term Acute Care Hospitals
8b. Catheter-associated urinary tract infections (CAUTI), all locations¹

	All Long-Term Acute Care Hospitals Reporting to NHSN				
	2016 SIR	2017 SIR	Percent Change	Direction of Change, Based on Statistical Significance	p-value
Alaska	.	.	.	.	.
Alabama	0.864	1.094	27%	No change	0.2971
Arkansas	0.873	1.153	32%	No change	0.2514
Arizona	0.467	0.903	93%	Increase	0.0166
California	1.057	0.961	9%	No change	0.1944
Colorado	1.414	1.369	3%	No change	0.8307
Connecticut	.	.	.	.	.
D.C.	.	.	.	.	.
Delaware	.	.	.	.	.
Florida	0.879	0.659	-25%	Decrease	0.0027
Georgia	1.367	1.286	6%	No change	0.5573
Guam	.	.	.	.	.
Hawaii	.	.	.	.	.
Iowa	.	.	.	.	.
Idaho	.	.	.	.	.
Illinois	1.044	0.934	11%	No change	0.3681
Indiana	1.208	1.311	9%	No change	0.5576
Kansas	.	.	.	.	.
Kentucky	1.251	0.950	24%	No change	0.0915
Louisiana	0.663	0.636	4%	No change	0.7813
Massachusetts	1.358	1.377	1%	No change	0.9069
Maryland	.	.	.	.	.
Maine	.	.	.	.	.
Michigan	0.947	0.957	1%	No change	0.9452
Minnesota	.	.	.	.	.
Missouri	1.246	1.055	15%	No change	0.3098
Mississippi	0.708	0.377	-47%	Decrease	0.0173
Montana	.	.	.	.	.
North Carolina	0.571	0.677	19%	No change	0.4297
North Dakota	.	.	.	.	.
Nebraska	.	.	.	.	.
New Hampshire	.	.	.	.	.
New Jersey	1.016	1.261	24%	No change	0.1369
New Mexico	.	.	.	.	.
Nevada	0.984	1.089	11%	No change	0.5480
New York	.	.	.	.	.
Ohio	1.296	0.989	-24%	Decrease	0.0071
Oklahoma	0.798	0.638	20%	No change	0.2613
Oregon	.	.	.	.	.
Pennsylvania	1.143	1.191	4%	No change	0.7715
Puerto Rico	.	.	.	.	.
Rhode Island	.	.	.	.	.
South Carolina	1.245	0.983	21%	No change	0.2853
South Dakota	.	.	.	.	.
Tennessee	1.016	0.905	11%	No change	0.5507
Texas	0.735	0.704	4%	No change	0.5568
Utah	.	.	.	.	.
Virginia	0.791	0.759	4%	No change	0.8592
Virgin Islands	.	.	.	.	.
Vermont	.	.	.	.	.
Washington	.	.	.	.	.
Wisconsin	1.096	1.255	15%	No change	0.5477
West Virginia	.	.	.	.	.
Wyoming	.	.	.	.	.
All US	0.977	0.941	4%	No change	0.1481

* Statistically significant, p < 0.0500

1. Data from all ICUs and wards (and other non-critical care locations).
2. States without SIR either in 2016 and/or 2017 and therefore subsequent data not calculated

Table 8. Changes in state-specific standardized infection ratios (SIRs) between 2016 and 2017 from NHSN Long-Term Acute Care Hospitals
8c. Ventilator-associated events (VAE), all locations¹

	All Long-Term Acute Care Hospitals Reporting to NHSN				
	2016 SIR	2017 SIR	Percent Change	Direction of Change, Based on Statistical Significance	p-value
Alaska	.	.	.	.	.
Alabama	0.696	0.669	4%	No change	0.914
Arkansas	0.966	1.040	8%	No change	0.833
Arizona	0.589	0.484	18%	No change	0.617
California	0.747	0.688	8%	No change	0.433
Colorado	1.592	0.870	45%	No change	0.066
Connecticut	.	.	.	.	.
D.C.	.	.	.	.	.
Delaware	.	.	.	.	.
Florida	1.404	1.054	-25%	Decrease	0.002
Georgia	0.999	0.888	11%	No change	0.479
Guam	.	.	.	.	.
Hawaii	.	.	.	.	.
Iowa	.	.	.	.	.
Idaho	.	.	.	.	.
Illinois	1.525	1.434	6%	No change	0.624
Indiana	1.577	1.483	6%	No change	0.698
Kansas	.	.	.	.	.
Kentucky	1.008	1.253	24%	No change	0.244
Louisiana	1.972	2.688	36%	No change	0.254
Massachusetts	0.858	0.804	6%	No change	0.717
Maryland	.	.	.	.	.
Maine	.	.	.	.	.
Michigan	1.055	1.277	21%	No change	0.276
Minnesota	.	.	.	.	.
Missouri	1.140	0.981	14%	No change	0.539
Mississippi	2.695	2.592	4%	No change	0.828
Montana	.	.	.	.	.
North Carolina	1.499	0.772	-48%	Decrease	0.001
North Dakota	.	.	.	.	.
Nebraska	.	.	.	.	.
New Hampshire	.	.	.	.	.
New Jersey	0.438	0.407	7%	No change	0.767
New Mexico	.	.	.	.	.
Nevada	1.097	0.296	-73%	Decrease	0.002
New York	.	.	.	.	.
Ohio	1.617	0.926	-43%	Decrease	0.000
Oklahoma	1.280	1.161	9%	No change	0.759
Oregon	.	.	.	.	.
Pennsylvania	1.315	1.027	22%	No change	0.122
Puerto Rico	.	.	.	.	.
Rhode Island	.	.	.	.	.
South Carolina	1.589	0.919	-42%	Decrease	0.020
South Dakota	.	.	.	.	.
Tennessee	1.341	0.515	-62%	Decrease	0.000
Texas	1.470	1.543	5%	No change	0.665
Utah	.	.	.	.	.
Virginia	0.205	0.247	20%	No change	0.658
Virgin Islands	.	.	.	.	.
Vermont	.	.	.	.	.
Washington	.	.	.	.	.
Wisconsin	2.299	1.418	-38%	Decrease	0.045
West Virginia	.	.	.	.	.
Wyoming	.	.	.	.	.
All US	1.054	0.891	-15%	Decrease	0.000

* Statistically significant, p < 0.0500

1. Data from all ICUs and wards (and other non-critical care locations).
2. States without SIR either in 2016 and/or 2017 and therefore subsequent data not calculated

Table 8. Changes in state-specific standardized infection ratios (SIRs) between 2016 and 2017 from NHSN Long-Term Acute Care Hospitals

8d. Hospital-onset methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia, facility-wide¹

	All Long-Term Acute Care Hospitals Reporting to NHSN				
	2016 SIR	2017 SIR	Percent Change	Direction of Change, Based on Statistical Significance	p-value
Alaska	.	.	.	.	.
Alabama	0.918	0.979	7%	No change	0.8869
Arkansas	0.731	0.832	14%	No change	0.8410
Arizona	1.355	0.471	-65%	Decrease	0.0293
California	1.559	1.594	2%	No change	0.8719
Colorado	0.488	0.277	43%	No change	0.4615
Connecticut	.	.	.	.	.
D.C.	.	.	.	.	.
Delaware	.	.	.	.	.
Florida	1.738	1.296	25%	No change	0.0506
Georgia	0.448	0.761	70%	No change	0.1264
Guam	.	.	.	.	.
Hawaii	.	.	.	.	.
Iowa	.	.	.	.	.
Idaho	.	.	.	.	.
Illinois	1.184	1.162	2%	No change	0.9403
Indiana	1.388	1.627	17%	No change	0.5626
Kansas	.	.	.	.	.
Kentucky	1.342	1.804	34%	No change	0.3270
Louisiana	0.718	0.629	12%	No change	0.6745
Massachusetts	0.345	0.465	35%	No change	0.3622
Maryland	.	.	.	.	.
Maine	.	.	.	.	.
Michigan	1.080	1.066	1%	No change	0.9632
Minnesota	.	.	.	.	.
Missouri	0.937	0.858	8%	No change	0.8172
Mississippi	0.878	0.584	33%	No change	0.4103
Montana	.	.	.	.	.
North Carolina	0.934	1.816	94%	Increase	0.0385
North Dakota	.	.	.	.	.
Nebraska	.	.	.	.	.
New Hampshire	.	.	.	.	.
New Jersey	1.039	1.038	0%	No change	0.9981
New Mexico	.	.	.	.	.
Nevada	0.467	0.687	47%	No change	0.5149
New York	.	.	.	.	.
Ohio	0.780	0.626	20%	No change	0.3869
Oklahoma	0.730	0.824	13%	No change	0.7871
Oregon	.	.	.	.	.
Pennsylvania	1.104	1.606	45%	No change	0.1013
Puerto Rico	.	.	.	.	.
Rhode Island	.	.	.	.	.
South Carolina	1.698	0.877	48%	No change	0.1312
South Dakota	.	.	.	.	.
Tennessee	0.853	1.309	53%	No change	0.1747
Texas	0.869	0.671	23%	No change	0.1133
Utah	.	.	.	.	.
Virginia	0.798	0.903	13%	No change	0.7829
Virgin Islands	.	.	.	.	.
Vermont	.	.	.	.	.
Washington	.	.	.	.	.
Wisconsin	0.549	0.113	79%	No change	0.1328
West Virginia	.	.	.	.	.
Wyoming	.	.	.	.	.
All US	0.944	0.943	0%	No change	0.97061

* Statistically significant, p < 0.0500

1. Hospital-onset is defined as event detected on the 4th day (or later) after admission to an inpatient location within the facility.
2. States without SIR either in 2016 and/or 2017 and therefore subsequent data not calculated

Table 8. Changes in state-specific standardized infection ratios (SIRs) between 2016 and 2017 from NHSN Long Term Acute Care Hospitals
8e. Hospital-onset *Clostridioides difficile* infection (CDI), facility-wide¹

	All Long Term Acute Care Hospitals Reporting to NHSN				
	2016 SIR	2017 SIR	Percent Change	Direction of Change, Based on Statistical Significance	p-value
Alaska	.	.	.	.	.
Alabama	0.559	0.427	24%	No change	0.2931
Arkansas	0.841	0.653	22%	No change	0.2795
Arizona	0.871	0.657	25%	No change	0.1880
California	1.140	1.157	1%	No change	0.7903
Colorado	0.748	0.924	24%	No change	0.2207
Connecticut	.	.	.	.	.
D.C.	.	.	.	.	.
Delaware	.	.	.	.	.
Florida	0.738	0.710	4%	No change	0.6285
Georgia	0.819	0.572	-30%	Decrease	0.0031
Guam	.	.	.	.	.
Hawaii	.	.	.	.	.
Iowa	.	.	.	.	.
Idaho	.	.	.	.	.
Illinois	0.799	0.773	3%	No change	0.7590
Indiana	1.047	0.975	7%	No change	0.5689
Kansas	.	.	.	.	.
Kentucky	0.696	0.708	2%	No change	0.9172
Louisiana	0.681	0.589	14%	No change	0.2167
Massachusetts	0.655	0.629	4%	No change	0.6354
Maryland	.	.	.	.	.
Maine	.	.	.	.	.
Michigan	0.951	0.822	14%	No change	0.2160
Minnesota	.	.	.	.	.
Missouri	0.912	0.693	24%	No change	0.0729
Mississippi	0.657	0.442	33%	No change	0.0618
Montana	.	.	.	.	.
North Carolina	0.890	0.823	8%	No change	0.5957
North Dakota	.	.	.	.	.
Nebraska	.	.	.	.	.
New Hampshire	.	.	.	.	.
New Jersey	0.581	0.698	20%	No change	0.1847
New Mexico	.	.	.	.	.
Nevada	1.284	1.262	2%	No change	0.8977
New York	.	.	.	.	.
Ohio	0.883	0.659	-25%	Decrease	0.0017
Oklahoma	1.057	0.663	-37%	Decrease	0.0032
Oregon	.	.	.	.	.
Pennsylvania	1.265	1.185	6%	No change	0.4659
Puerto Rico	.	.	.	.	.
Rhode Island	.	.	.	.	.
South Carolina	0.942	0.591	-37%	Decrease	0.0252
South Dakota	.	.	.	.	.
Tennessee	0.719	0.622	13%	No change	0.3683
Texas	0.938	0.858	9%	No change	0.0998
Utah	.	.	.	.	.
Virginia	1.025	0.780	24%	No change	0.1160
Virgin Islands	.	.	.	.	.
Vermont	.	.	.	.	.
Washington	.	.	.	.	.
Wisconsin	1.157	0.599	-48%	Decrease	0.0008
West Virginia	.	.	.	.	.
Wyoming	.	.	.	.	.
All US	0.850	0.769	-10%	Decrease	0.0000

* Statistically significant, p < 0.0500

- Hospital-onset is defined as event detected on the 4th day (or later) after admission to an inpatient location within the facility.
- States without SIR either in 2016 and/or 2017 and therefore subsequent data not calculated

Appendix A. Factors used in NHSN risk adjustment of the device-associated HAIs (CLABSI, CAUTI, VAE, IVAC-Plus) negative binomial regression models¹ from Long-Term Acute Care Hospitals

HAI Type	Validated Parameters for Risk Model
CLABSI	Intercept Location Type Facility Bed Size* Average Length of Stay**
CAUTI	Intercept Average Length of Stay** Setting† Location Type
VAE	Intercept Facility bed size* Proportion of admissions on hemodialysis*** Location Type Average Length of Stay**

1. SIR Guide: <https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/nhsn-sir-guide.pdf>

* Facility bed size is taken from the Annual LTACH Survey.

** Average length of stay is taken from the Annual LTACH Survey. It is calculated as: total # of annual patient da

*** Proportion of annual admissions on a ventilator (or hemodialysis) is taken from the Annual LTACH Survey.

It is calculated as: number of admissions on a ventilator (or hemodialysis) / total # of annual admissions.

† LTACH Setting (free-standing vs. within a hospital) is taken from the Annual LTACH Survey.

ys / total # of annual admissions.

Appendix B. Factors used in NHSN risk adjustment of the MRSA Bacteremia and *C. difficile* negative binomial regression models¹ from Long-Term Acute Care Hospitals

HAI Type	Validated Parameters for Risk Model
MRSA bacteremia	Percent of admissions on ventilator*
<i>C. difficile</i> infections	Inpatient CO prevalence rate** Percent of admissions on ventilator* CDI test type^ Percent of single occupancy rooms [‡]

* Percent of annual admissions on a ventilator is taken from the Annual LTACH Survey. It is calculate ventilator / total # annual admissions) x 100

** Inpatient community-onset prevalence is calculated as: (# of inpatient community-onset CDI events / total # inpatient community-onset CDI events) x 100. The prevalence rate for each quarter is used in the risk adjustment.

^ CDI test type is reported on the FacWideIN MDRO denominator form on the 3rd month of each quarter

‡ Percent of beds located in single occupancy rooms is taken from the Annual LTACH Survey. It is calculate (single occupancy rooms / total number of beds) x 100.

ed as: (# admissions on a

/ total # admissions) x 100.

ter.

culated as: # of single occupancy

Additional Resources

SIR Guide: <https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/nhsn-sir-guide.pdf>

Technical Appendix (2017 Report): <http://www.cdc.gov/hai/progress-report/index.html>

Explains the methodology used to produce the HAI Report.

HAI Data Report Home Page: <http://www.cdc.gov/hai/progress-report/index.html>

The complete HAI Report, including the Executive Summary and previous reports, can be found at the above

website.