



# **Hospital-Acquired Infections in New York State, 2022**

## **Part 2: Technical Report**

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# Introduction

In accordance with public health law 2819, New York State (NYS) has been tracking hospital-acquired infections (HAIs) since 2007. This law was created to provide the public with fair, accurate, and reliable HAI data to compare hospital infection rates and to support quality improvement and infection prevention activities in hospitals.

The NYS Department of Health (NYSDOH) determines which HAI indicators must be reported annually with the help of a Technical Advisory Workgroup (TAW), a panel of experts in the prevention and reporting of HAIs. In addition to reporting the HAI data mandated by NYS, hospitals enter data into the National Healthcare Safety Network (NHSN) for federal programs (e.g., Centers for Medicare and Medicaid Services [CMS]), regional collaboratives, and local surveillance. NYSDOH can access data not mandated by NYS through a data use agreement (DUA) with the Centers for Disease Control and Prevention (CDC). The DUA specifies that NYSDOH may only use these other data for surveillance or prevention purposes, not for public reporting of facility-specific data or for regulatory action. NYSDOH does not audit these data. These data are only reported in aggregate. More information about the DUA is available on the CDC website at [https://www.cdc.gov/hai/pdfs/stateplans/New-York\\_DUA.pdf](https://www.cdc.gov/hai/pdfs/stateplans/New-York_DUA.pdf).

Table 1 summarizes the progression of NYS reporting requirements through 2022 and includes additional data available through the DUA.

**Table 1. HAIs reported by NYS hospitals, by year**

Type of Infection	2007	2008	2009	2010-2011	2012	2013	2014	2015-2018	2019	Since 2020*
Central line-associated bloodstream infections in ICUs	P <sup>1</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓
Colon surgical site infections	P <sup>1</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓
Coronary artery bypass graft surgical site infections	P <sup>1</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hip replacement surgical site infections		✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Clostridioides difficile</i> infections			P <sup>2</sup>	✓	✓	✓	✓	✓	✓	✓
Abdominal hysterectomy surgical site infections					✓	✓	✓	✓	✓	✓
Carbapenem-resistant Enterobacterales infections						P <sup>2</sup>	✓	✓	✓	✓
Central line-associated bloodstream infections in medical/surgical/medical-surgical/step-down wards						DUA	DUA	✓	✓	✓
Spinal fusion surgical site infections									✓	✓
Central line-associated bloodstream infections in oncology and mixed-acuity units									✓	✓
Central line-associated bloodstream infections in telemetry units										✓
Catheter-associated urinary tract infections						DUA	DUA	DUA	DUA	DUA
Methicillin-resistant <i>Staphylococcus aureus</i> bacteremia						DUA	DUA	DUA	DUA	DUA

✓ = full reporting (hospital-specific rates published) P<sup>1</sup> = pilot reporting full year (hospital-specific rates not published)

P<sup>2</sup> = pilot reporting half year from July (hospital-specific rates not published)

DUA = Not required by NYS but reported for CMS programs and available through a DUA between CDC and NYS beginning May 2013. \* Reporting was suspended from January through June 2020 due to the COVID-19 pandemic.

This report focuses on HAI rates in 163 NYS hospitals in 2022. NYS does not require reporting by hospitals that do not have enough data to produce statistically meaningful rates. These hospitals are:

- critical access hospitals or hospitals with less than 26 acute care beds,
- hospitals that perform fewer than 20 reportable surgeries and have fewer than 50 central line days per year and an average length of stay of less than 3 days, and
- hospitals that are exclusively research, psychiatric, addiction recovery (alcohol or drugs), or freestanding rehabilitation.

The detailed information in this report is primarily intended for use by hospital infection preventionists (IPs), but it may also be used by others who want more detailed information than is available in “Part 1: Summary for Consumers” of this two-part report.

Because of substantive changes to HAI surveillance definitions that occurred between 2007 and 2015, state and federal agencies designated 2015 as the “baseline” for assessment of trends. This baseline will be used until surveillance definitions change such that the comparisons are no longer valid, or until policy changes require a new baseline. This report will assess trends between 2015 and 2022. For information on HAI rates before 2015, please visit our website:

[\(https://www.health.ny.gov/statistics/facilities/hospital/hospital\\_acquired\\_infections/\)](https://www.health.ny.gov/statistics/facilities/hospital/hospital_acquired_infections/)

## **Surgical Site Infections (SSIs)**

For each type of SSI, the following pages present detailed information on the severity (depth) of infections, the circumstance of detection (initial hospitalization, readmission, etc.), the microorganisms involved, and time trends. In addition, detailed plots show each individual hospital’s risk-adjusted infection rates compared to the state average.

SSIs are categorized into three groups depending on the severity of the infection:

- Superficial Incisional SSI – This infection occurs around the skin where the surgical incision was made. The patient may have pus draining from the incision or laboratory-identified pathogens from cultures of the incision.
- Deep Incisional SSI – This infection occurs beneath the incision in muscle tissue. Pus may drain from the incision, and patients may experience fever and pain. The incision may reopen on its own, or a surgeon may reopen the wound.
- Organ or Space SSI – This type of infection occurs in body organs or the space between organs. Pus may collect in an abscess below the muscles, resulting in inflammation and pain.

Hospital IPs use a wide variety of surveillance methods to identify SSIs. Some routinely review all procedures for SSIs, while others review a subset of procedures that are flagged based on data mining systems, wound culture reports, readmission, return to surgery, and discharge coding. IPs review the selected procedures using many data sources, including laboratory reports, operative reports, physician

dictated operative notes, progress notes, discharge notes, history and physical examination documentation, return to surgery, radiology reports, infectious disease consultations, intraoperative reports, outpatient/emergency room visits, vital sign documentation, antibiotic prescriptions, and coding summary sheets.

SSIs may be detected on the original hospital admission, readmission to the same hospital, readmission to a different hospital, or only in outpatient settings (post-discharge surveillance [PDS] and not readmitted). The ability to identify SSIs among patients seen by physicians in outpatient settings varies among hospitals. PDS infections are excluded from hospital-specific comparisons in this report so as not to penalize facilities with the best surveillance systems.

If there is evidence of clinical infection or abscess at the time of a surgical procedure, any resulting SSI will be designated as “present at time of surgery” (PATOS). The number of PATOS SSIs are summarized for each type of procedure. Because PATOS SSIs are more difficult to prevent, these SSIs and procedures are excluded from the final hospital risk-adjusted rates.

## **Colon Surgical Site Infections**

In 2022, 153 hospitals reported a total of 1,133 colon SSIs out of 19,123 procedures, a crude rate of 5.92 infections per 100 procedures. NYSDOH excludes some of these SSIs and procedures from SSI rates before evaluating time trends and comparing hospital performance, as described below.

Of the 1,133 infections, 353 (31%) were classified as PATOS. The PATOS SSIs were predominantly organ/space (90%). At completion of the surgery 86% were closed by primary intention. PATOS SSIs/procedures were excluded from the final SSI rate because these infections are more difficult to prevent. However, to encourage hospitals to continue to implement prevention efforts for these types of procedures, the number of excluded PATOS are listed in the hospital-specific colon SSI rate plots at the end of the section.

Of the remaining 780 infections, 43% were superficial, 8% were deep, and 49% were organ/space (Table 2). Half of the SSIs (52%) were detected during the initial hospitalization; 32% were identified upon readmission to the same hospital; 3% involved readmission to another hospital; and 13% were detected using post-discharge surveillance and not readmitted. The majority of the PDS infections were superficial. Detection of SSIs in outpatient locations is labor intensive and is not standardized across hospitals; therefore, the NYSDOH did not include these 98 PDS infections in the final SSI rate so as not to penalize facilities with the best surveillance systems. The final colon SSI rate in 2022 was 3.63 per 100 procedures.

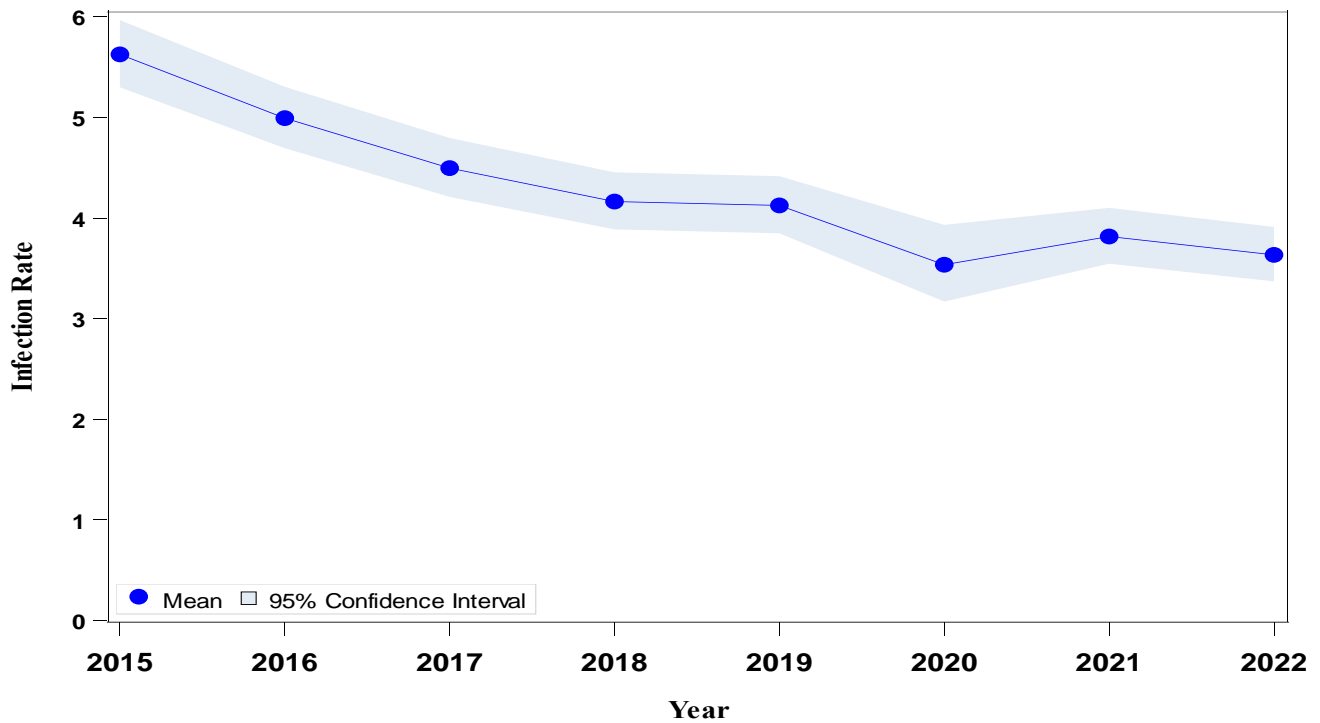
**Table 2. Method of detection of colon SSI by depth of infection, New York State 2022**

Extent (Row%) (Column%)	When Detected				Total
	Initial Hospitalization	Readmitted to the Same Hospital	Readmitted to Another Hospital	Post-Discharge Surveillance Not Readmitted	
<b>Superficial Incisional</b>	153 (45.4) (37.4)	83 (24.6) (33.1)	10 (3.0) (45.4)	91 (27.0) (92.9)	337 (43.1%)
<b>Deep Incisional</b>	34 (53.1) (8.3)	27 (42.2) (10.8)	0 (0) (0)	3 (4.7) (3.1)	64 (8.2%)
<b>Organ/Space</b>	222 (58.6) (54.3)	141 (37.2) (56.2)	12 (3.2) (54.6)	4 (1.2) (4.1)	379 (48.6%)
<b>Total</b>	409 (52.4%)	251 (32.2%)	22 (2.8%)	98 (12.6%)	780

NYS data reported as of June 15, 2023. Excludes infections present at time of surgery (PATOS).

Trends in colon SSI rates after deleting PATOS and PDS infections are shown in Figure 1. Between 2015 and 2022, the colon SSI rate declined 35.5%, from 5.63 infections per 100 procedures in 2015, to 3.63 infections per 100 procedures in 2022.

**Figure 1. Trend in colon SSI rates, New York State 2015-2022**



Year	# Hospitals	# Infections	# Procedures	Infection Rate (95% Confidence Interval)
2015	160	1,047	18,611	5.63 (5.30, 5.97)
2016	161	994	19,910	4.99 (4.69, 5.30)
2017	162	881	19,594	4.50 (4.21, 4.80)
2018	160	810	19,472	4.16 (3.88, 4.45)
2019	158	776	19,207	4.04 (3.77, 4.33)
2020	154	328	9,277	3.53 (3.17-3.92)
2021	152	713	18,684	3.82 (3.55-4.10)
2022	153	682	18,770	3.63 (3.37, 3.91)

New York State data reported as of June 15, 2023. Infection rate is the number of infections divided by the number of procedures, multiplied by 100.

The most common microorganisms associated with colon SSIs were Enterococci and *Escherichia coli* (Table 3).

**Table 3. Microorganisms identified in colon SSIs, New York State 2022**

<b>Microorganism</b>	<b>Number of Isolates</b>	<b>Percent of Infections</b>
Enterococci	299	26.4
- VRE	(65)	(5.7)
<i>Escherichia coli (E. coli)</i>	275	24.3
- CRE- <i>E. coli</i>	(1)	(0.1)
Yeast	112	9.9
Klebsiella spp.	97	8.6
- CRE-Klebsiella	(6)	(0.5)
Bacteroides spp.	83	7.3
Pseudomonas spp.	80	7.1
Streptococci	55	4.9
<i>Staphylococcus aureus</i>	52	4.6
- <i>Staphylococcus aureus</i> -MRSA	(20)	(1.8)
Enterobacter spp.	40	3.5
- CRE-Enterobacter	(1)	(0.1)
Coagulase negative staphylococci	39	3.4
Proteus spp.	25	2.2
Clostridioides spp.	24	2.1
Citrobacter spp.	19	1.7
Prevotella spp.	14	1.2
Eggerthella spp.	12	1.1
<i>Morganella morganii</i>	12	1.1
Stenotrophomonas spp.	11	1.0
Other	50	4.4

New York State data reported as of June 15, 2023. Out of 1133 infections (includes post-discharge surveillance). No microorganisms identified for 374 infections VRE: vancomycin-resistant enterococci; CRE: carbapenem-resistant Enterobacterales; MRSA: methicillin-resistant *Staphylococcus aureus*; MDR: multidrug resistant; spp: multiple species

## **Risk Adjustment for Colon SSIs**

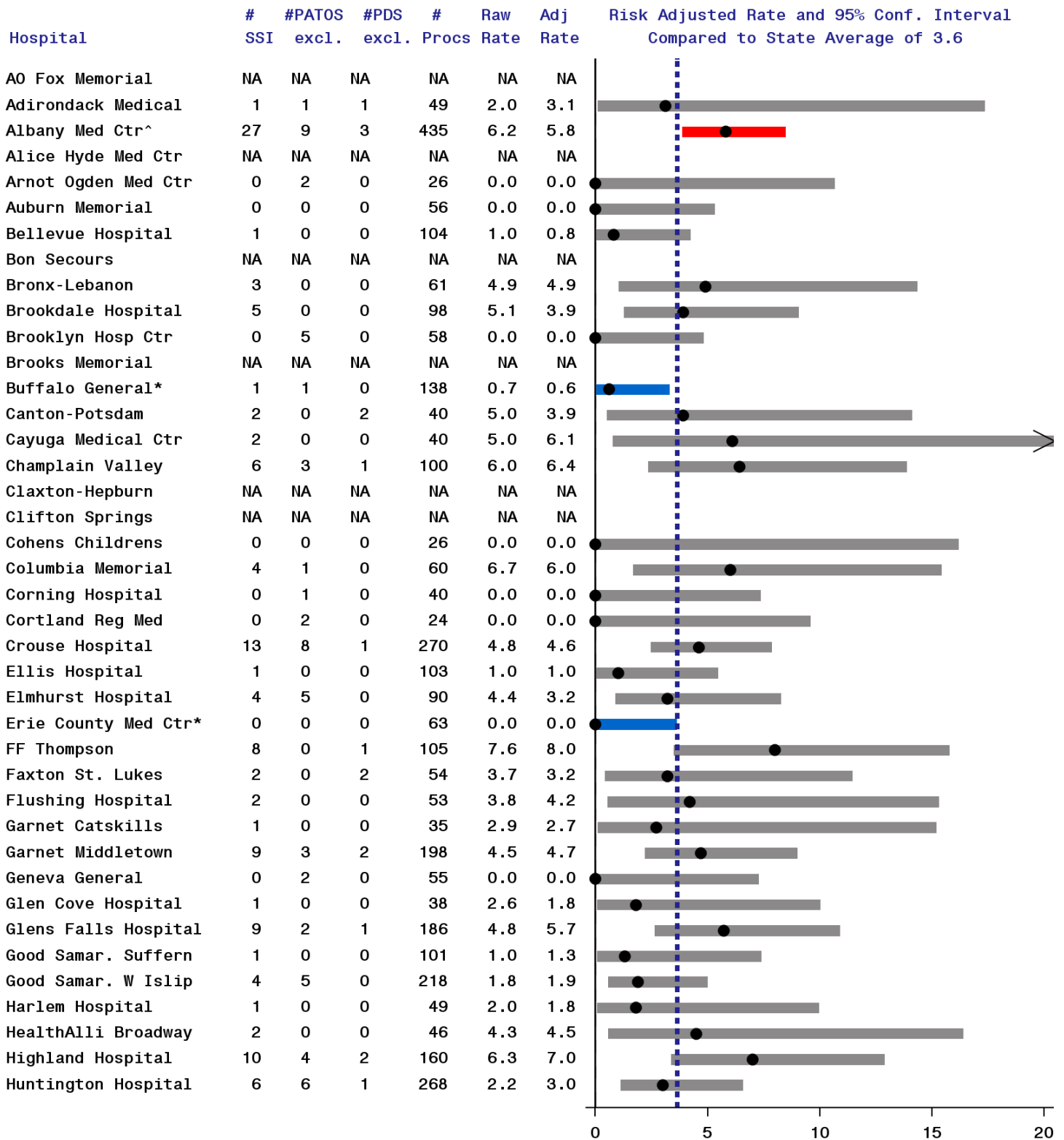
The following risk factors were associated with these SSIs and included in the risk adjustment model:

- For each increase in American Society of Anesthesiologists (ASA) score (1, 2, 3/4/5), a measure of systemic disease, patients were 1.5 times more likely to develop an SSI.
- Procedures that used traditional surgical incisions were 2.8 times more likely to result in SSI than procedures performed entirely laparoscopically.
- Patients with obesity (body mass index [BMI] greater than 30) were 1.4 times more likely to develop an SSI than patients with BMI less than or equal to 30.
- For each additional hour of procedure duration, patients were 1.1 times more likely to develop an SSI.

## **Hospital-Specific Colon SSI Rates**

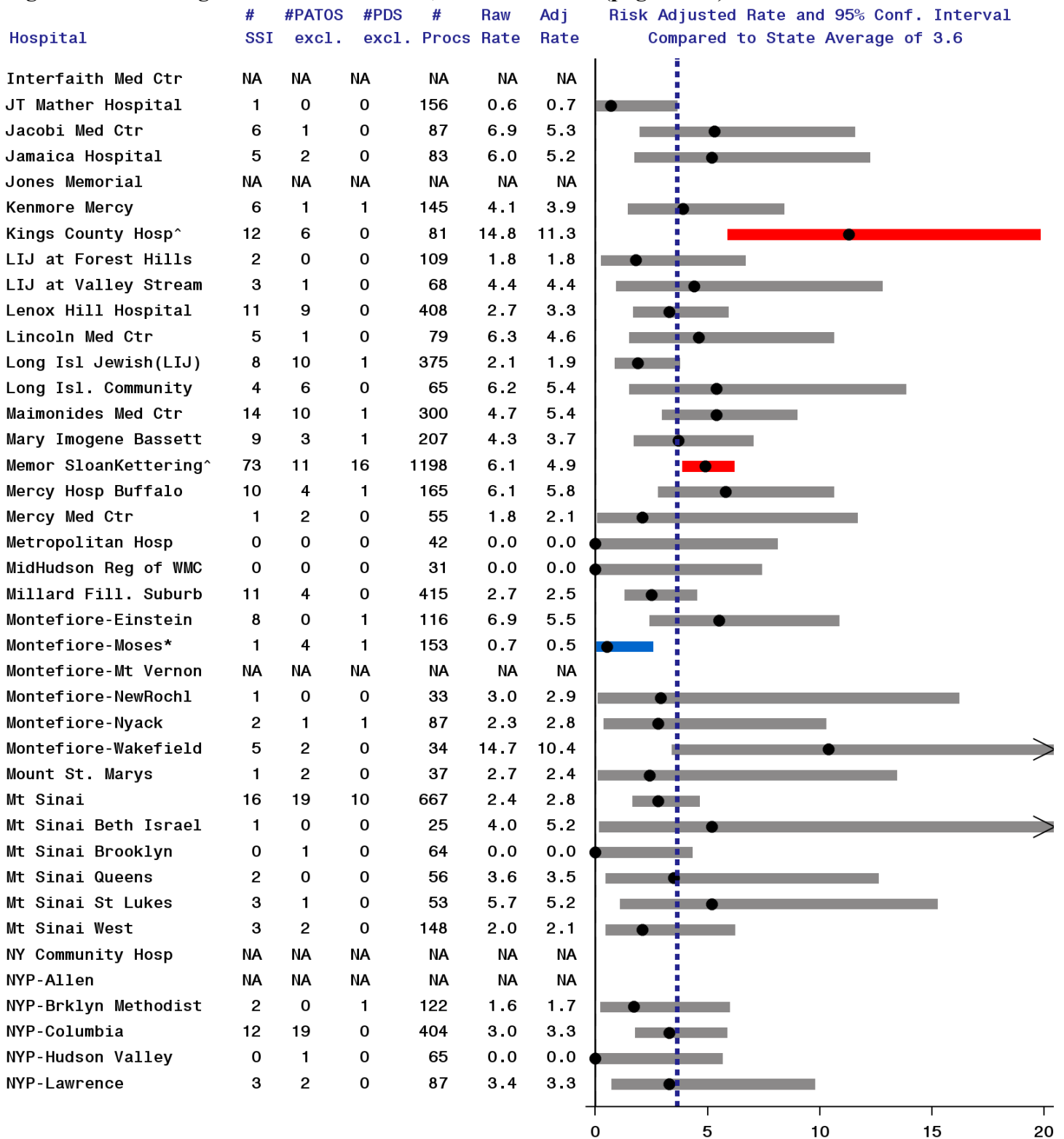
Hospital-specific colon SSI rates are provided in Figure 2. Of the 126 hospitals that reported more than 20 procedures, 7 hospitals (6%) had colon SSI rates that were statistically higher than the state average. All 7 hospitals are required to submit improvement plans following the NYSDOH HAI Reporting Program's Policy for Facilities with Consecutive Years of High HAI Rates ([http://www.health.ny.gov/statistics/facilities/hospital/hospital\\_acquired\\_infections/](http://www.health.ny.gov/statistics/facilities/hospital/hospital_acquired_infections/)). Six hospitals (5%) had rates that were statistically lower than the state average.

Figure 2. Colon surgical site infection rates, New York 2022 (page 1 of 4)



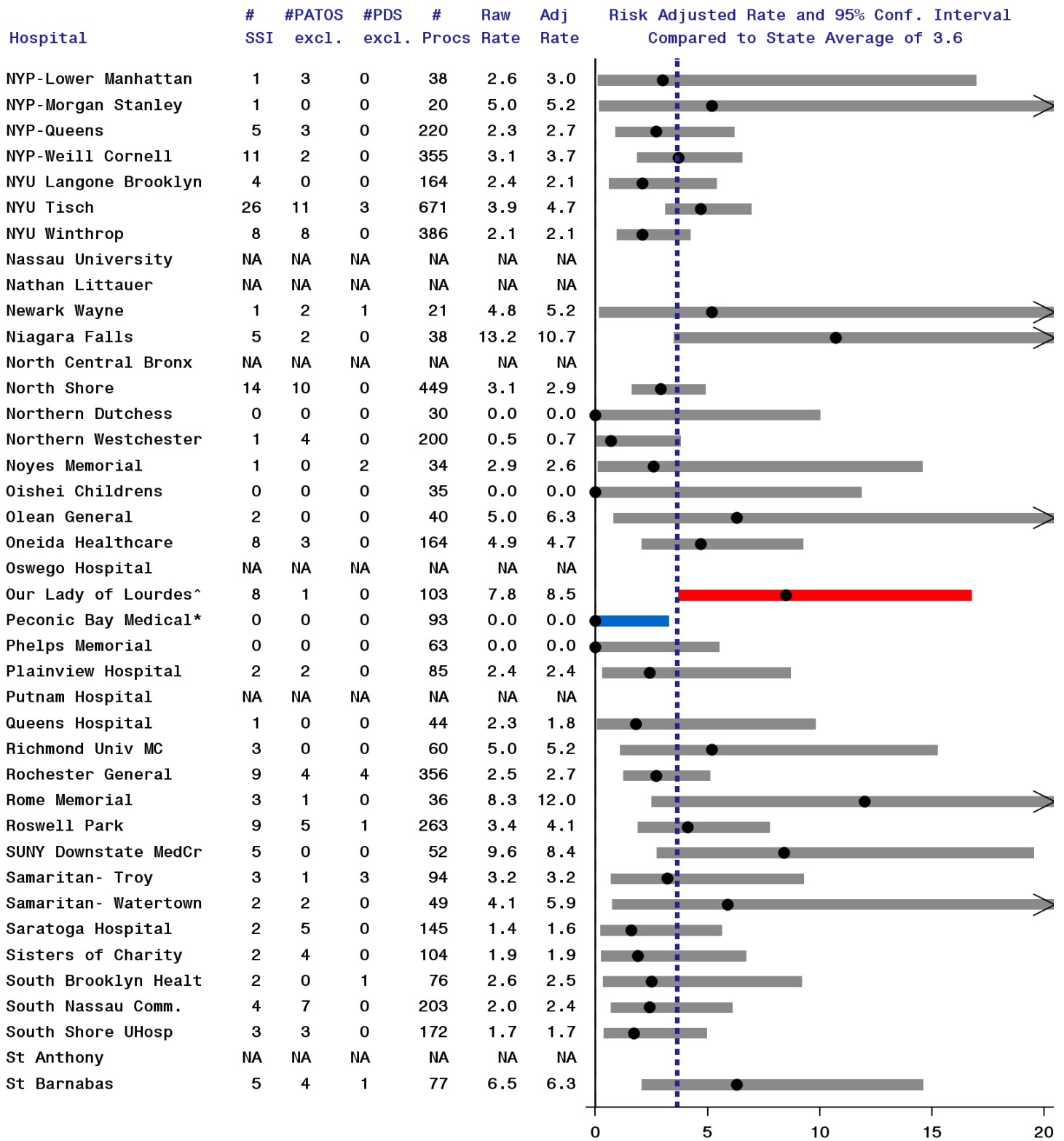
Data reported as June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^^ Significantly higher than state average. —\*\* Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using ASA score, obesity, duration, and endoscope. Excludes SSIs present at time of surgery and non-readmitted cases identified using post discharge surveillance.

**Figure 2. Colon surgical site infection rates, New York 2022 (page 2 of 4)**



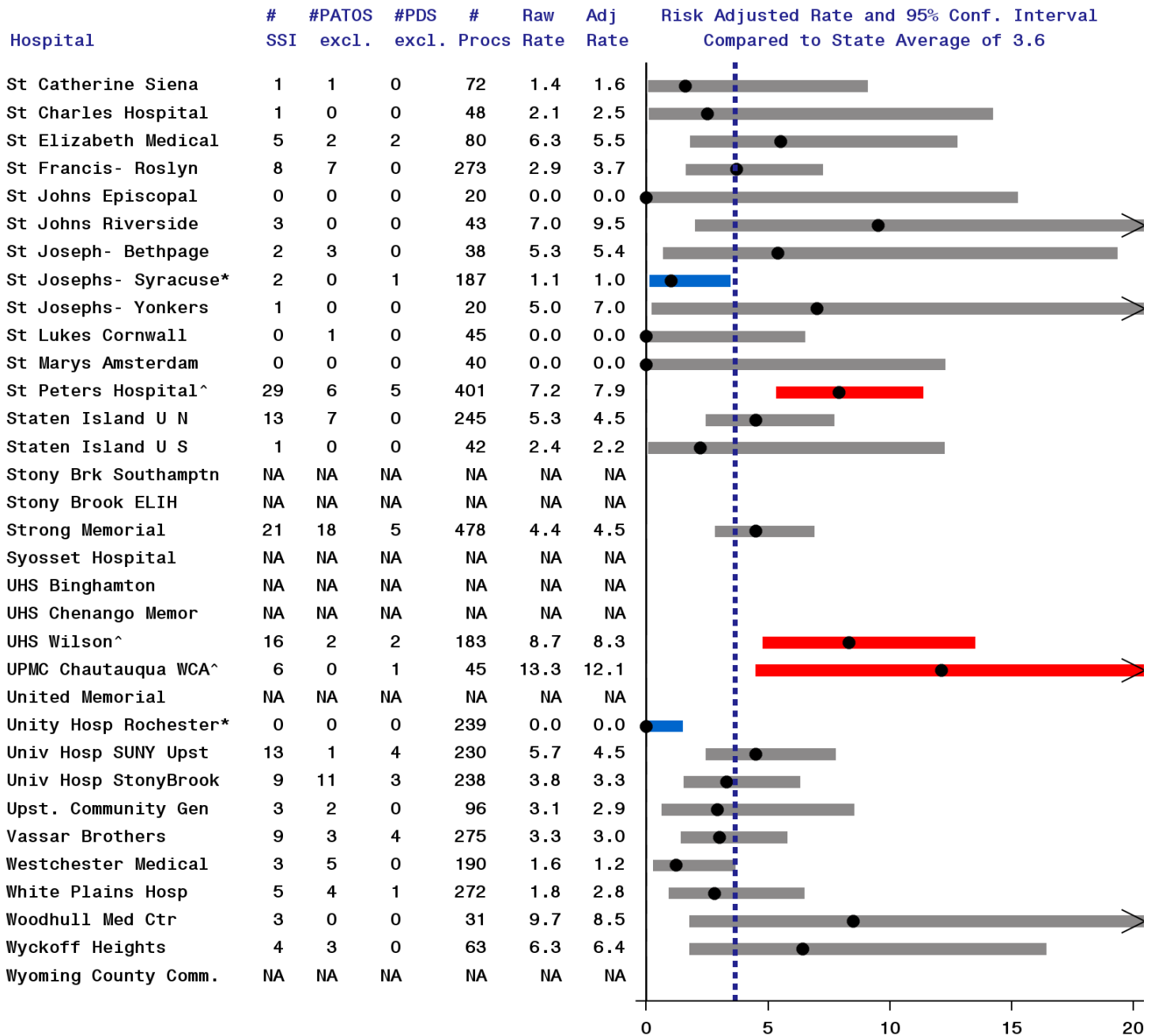
Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^^ Significantly higher than state average. —\*\* Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using ASA score, obesity, duration, and endoscope. Excludes SSIs present at time of surgery and non-readmitted cases identified using post discharge surveillance.

Figure 2. Colon surgical site infection rates, New York 2022 (page 3 of 4)



Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^^ Significantly higher than state average. —\*\* Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using ASA score, obesity, duration, and endoscope. Excludes SSIs present at time of surgery and non-readmitted cases identified using post discharge surveillance.

Figure 2. Colon surgical site infection rates, New York 2022 (page 4 of 4)



Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^^Significantly higher than state average. —\*\*Significantly lower than state average. —Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using ASA score, obesity, duration, and endoscopy. Excludes SSIs present at time of surgery and non-readmitted cases identified using post discharge surveillance.

# **Coronary Artery Bypass Graft (CABG) Surgical Site Infections**

CABG surgery usually involves two surgical sites: a chest incision and a separate site to harvest “donor” vessels. Because infections can occur at either incision site the SSI rates are presented separately.

## **CABG Chest Site Infections**

In 2022, 35 hospitals reported a total of 122 CABG chest site SSIs out of 9,393 procedures, a rate of 1.3 infections per 100 procedures. NYSDOH excludes some of these SSIs and procedures from SSI rates before evaluating time trends and comparing hospital performance, as described below.

Of the 122 infections, one was classified as PATOS. PATOS SSIs/procedures were excluded from the final SSI rate because these infections are more difficult to prevent. However, to encourage hospitals to continue to implement prevention efforts for these types of procedures, the number of excluded PATOS are listed in the hospital-specific colon SSI rate plots at the end of the section.

Of the remaining 121 infections, 44% were superficial, 30% were deep, and 26% were organ/space (Table 4). Most of the SSIs (50%) were detected upon readmission to the same hospital; 24% were identified during the initial hospitalization; 7% involved readmission to another hospital; and 19% were detected using PDS and not readmitted. The majority (70%) of these SSIs were superficial, 26% were deep and 1 (4%) was organ space infection. Detection of SSIs in outpatient locations is labor intensive and is not standardized across hospitals; therefore, the NYSDOH did not include these 23 PDS infections in the final SSI rate so as not to penalize facilities with the best surveillance systems.

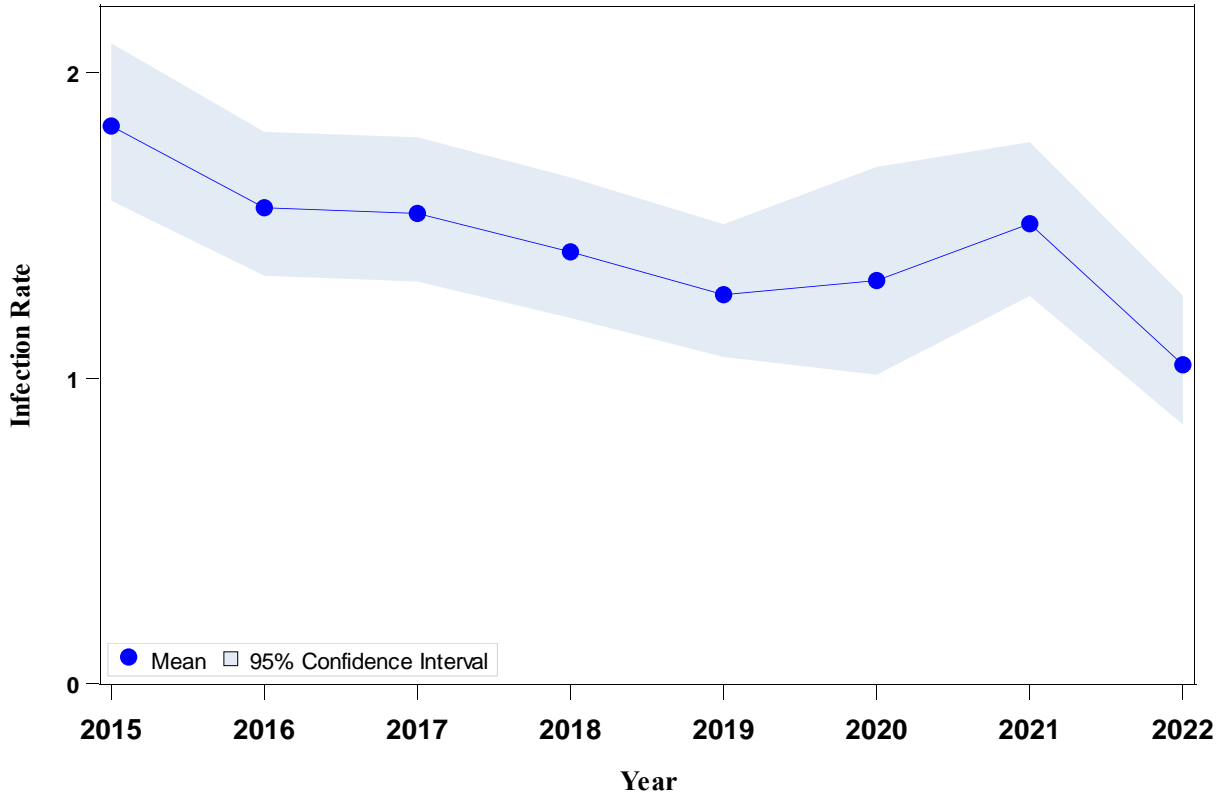
**Table 4. Method of detection of coronary artery bypass graft chest site SSIs by depth of infection, New York State 2022**

Extent (Row%) (Column%)	When Detected				
	Initial Hospitalization	Readmitted to the Same Hospital	Readmitted to Another Hospital	Post- Discharge Surveillance Not Readmitted	Total
<b>Superficial Incisional</b>	13 (24.5) 44.8)	19 (35.8) (31.7)	5 (9.4) (55.6)	16 (30.2) (69.6)	53 (43.8%)
<b>Deep Incisional</b>	8 (21.6) (27.6)	20 (54.0) (33.3)	3 (8.1) (33.3)	6 (16.2) (26.1)	37 (30.6%)
<b>Organ/Space</b>	8 (25.8) (27.6)	21 (67.7) (35.0)	1 (3.2) (11.1)	1 (3.2) (4.4)	31 (25.6%)
<b>Total</b>	29 (24.0%)	60 (49.6%)	9 (7.4%)	23 (19.0%)	121

New York State data reported as of June 15, 2023. Excludes infections present at time of surgery.

Trends in CABG chest SSI rates after deleting PATOS and PDS infections are shown in Figure 3. Between 2015 and 2022, the total number of CABG chest SSIs declined 43%, with 1.83 infections per 100 procedures in 2015, and 1.04 infections per 100 procedures in 2022. There was a 31% (significant) decrease observed from 2021 to 2022.

**Figure 3. Trend in coronary artery bypass graph chest site SSI rates, New York State 2015-2022**



Year	# Hospitals	# Infections	# Procedures	Infection Rate (95% Confidence Interval)
2015	38	196	10,735	1.83 (1.58, 2.10)
2016	37	172	11,040	1.56 (1.34, 1.81)
2017	36	167	10,849	1.54 (1.32, 1.79)
2018	37	149	10,542	1.41 (1.20, 1.66)
2019	36	132	10,627	1.24 (1.04, 1.47)
2020	35	61	4,623	1.32 (1.01, 1.69)
2021	35	141	9,365	1.51 (1.27, 1.77)
2022	35	98	9,392	1.04 (0.85, 1.27)

New York State data reported as of June 15, 2023.

Infection rate is the number of infections divided by the number of procedures, multiplied by 100.

In NYS, the most common microorganisms associated with CABG chest SSIs were *Staphylococcus aureus* and coagulase-negative staphylococci (Table 5).

**Table 5. Microorganisms identified in coronary artery bypass graft chest site infections, New York State 2022**

Microorganism	Number of Isolates	Percent of Infections
<i>Staphylococcus aureus</i>	25	20.5
- <i>Staphylococcus aureus</i> -MRSA	(10)	(8.2)
Coagulase negative staphylococci	15	12.3
Klebsiella spp.	15	12.3
Pseudomonas spp.	13	10.7
Enterobacter spp.	9	7.4
Escherichia coli	9	7.4
Enterococci	3	2.5
- VRE	(1)	(0.8)
Acinetobacter spp.	1	0.8
- MDRO-Acinetobacter	(1)	(0.8)
Other	28	23.0

New York State data reported as of June 15, 2023. Out of 122 infections (includes post-discharge surveillance). No microorganisms identified for 37 infections.

### **Risk Adjustment for CABG Chest SSIs**

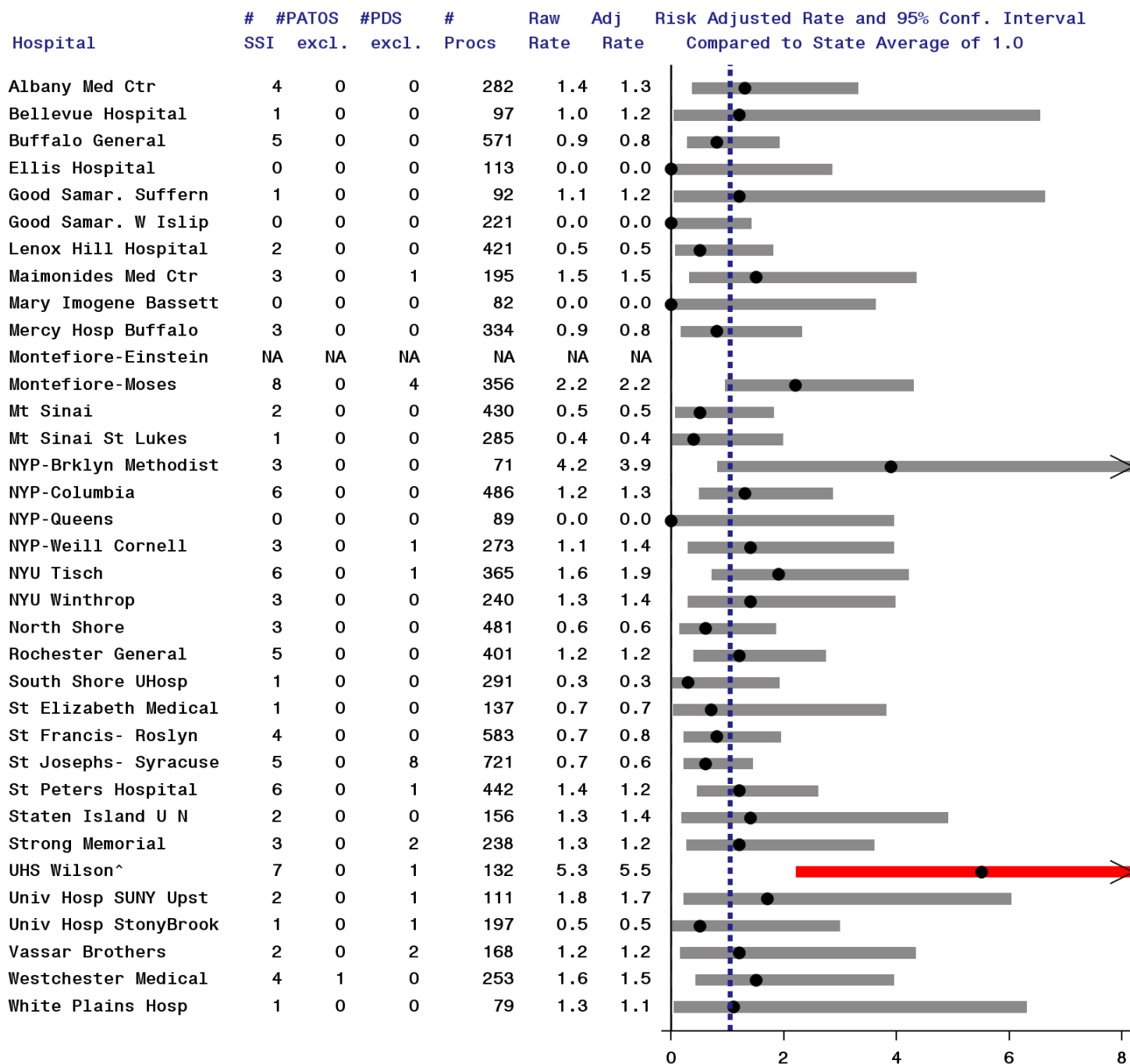
Certain patient and procedure-specific risk factors increased the risk of developing a chest SSI following CABG surgery. In 2022, the following risk factors were associated with SSIs and were included in the risk-adjustment:

- Patients with diabetes were 2.0 times more likely to develop an SSI than patients without diabetes.
- Patients with obesity (body mass index [BMI] greater than or equal to 30) were 2.2 times more likely to develop an SSI than patients with BMI less than 30.
- Females were 1.9 times more likely to develop an SSI than males.

## **Hospital-Specific CABG Chest SSI Rates**

Hospital-specific CABG chest SSI rates are provided in Figure 4. In 2022, of the 35 reporting hospitals, one (3%) had a CABG chest SSI rate that was statistically higher than the state average. This hospital is required to submit an improvement plan following the NYSDOH HAI Reporting Program's Policy for Facilities with Consecutive Years of High HAI Rates ([http://www.health.ny.gov/statistics/facilities/hospital/hospital\\_acquired\\_infections/](http://www.health.ny.gov/statistics/facilities/hospital/hospital_acquired_infections/)).

Figure 4. Coronary artery bypass graft chest site infection rates, New York 2022



Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^^ Significantly higher than state average. —\*\* Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using diabetes, obesity, and gender. Excludes SSIs present at time of surgery (PATOS) and non-readmitted cases identified using post discharge surveillance (PDS).

## CABG Donor Site Infections

In 2022, 35 hospitals reported a total of 40 CABG donor site infections out of 8,516 procedures, a rate of 0.47 infections per 100 procedures. NYSDOH excludes some of these SSIs and procedures from SSI rates before evaluating time trends and comparing hospital performance, as described below.

None of the infections were classified as PATOS. Of the 40 infections, 85% were superficial, and 15% were deep (Table 6). Over 42% of the SSIs were detected upon readmission to the same hospital; 5% were identified during the initial hospitalization; 20% involved readmission to another hospital; and 32.5% were detected using PDS and not readmitted. Detection of SSIs in outpatient locations is labor intensive and is not standardized across hospitals; therefore, the NYSDOH did not include these 13 PDS infections in the final SSI rate so as not to penalize facilities with the best surveillance systems.

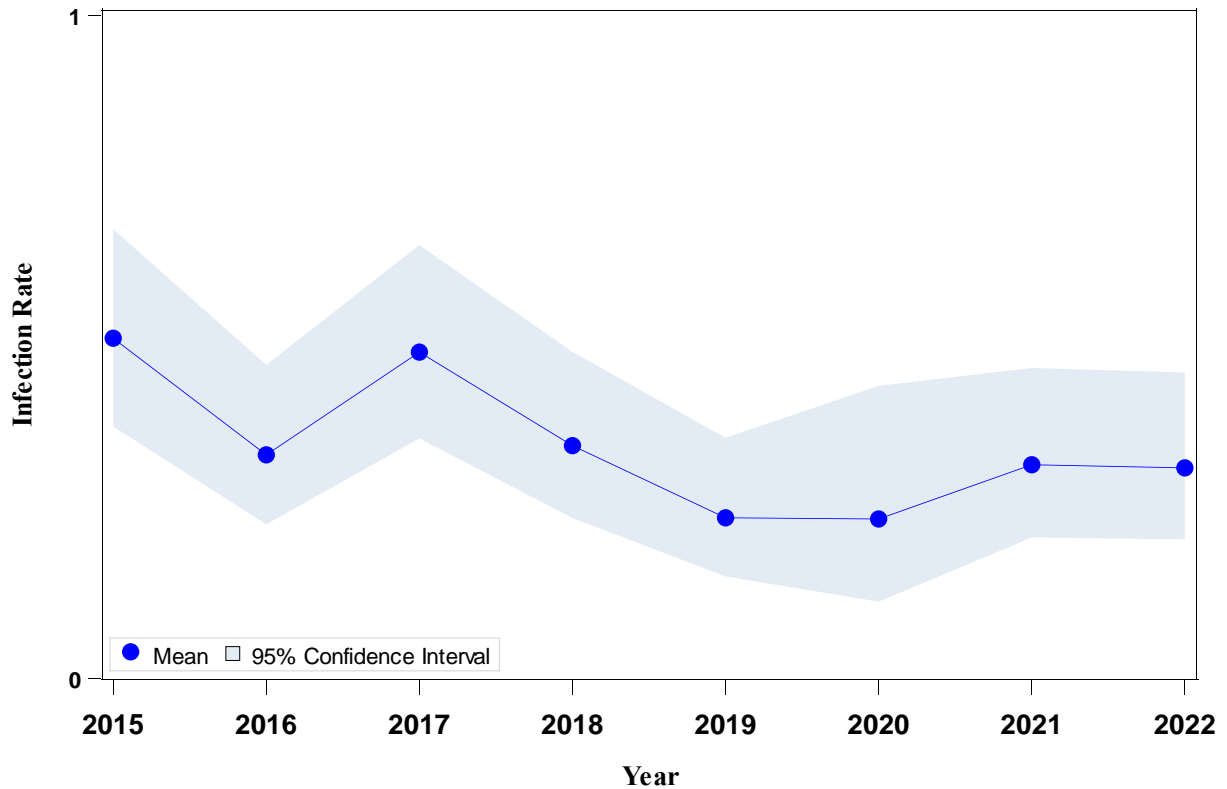
**Table 6. Method of detection for coronary artery bypass graft donor site infection by depth of infection, New York State 2022**

Extent (Row%) (Column%)	When Detected				Total
	Initial Hospitalization	Readmitted to the Same Hospital	Readmitted to Another Hospital	Post-Discharge Surveillance Not Readmitted	
<b>Superficial Incisional</b>	1 (2.9) (50.0)	14 (41.2) (82.4)	7 (20.6) (87.5)	12 (35.3) (92.3)	34 (85.0%)
<b>Deep Incisional</b>	1 (16.7) (50.0)	3 (50.0) (17.6)	1 (16.7) (12.5)	1 (16.7) (7.7)	6 (15.0%)
<b>Total</b>	2 (5.0%)	17 (42.5%)	8 (20.0%)	13 (32.5%)	40

New York State data reported as of June 15, 2023. Excludes infections present at time of surgery.

Trends in CABG SSI rates are shown in Figure 5. Between 2015 and 2022, the total number of CABG donor site infection rate decreased 37%, from 0.51 infections per 100 procedures in 2015, to 0.32 infections per 100 procedures in 2022 but between 2021 and 2022 there was no change.

**Figure 5. Trend in coronary artery bypass graft donor site surgical site infection rates, New York State 2015-2022**



Year	# Hospitals	# Infections	# Procedures	Infection Rate (95% Confidence Interval)
2015	38	49	9,558	0.51 (0.38, 0.68)
2016	37	33	9,801	0.34 (0.23, 0.47)
2017	36	47	9,559	0.49 (0.36, 0.65)
2018	36	33	9,413	0.35 (0.24, 0.49)
2019	36	23	9,464	0.24 (0.15, 0.36)
2020	35	10	4,168	0.24 (0.12, 0.44)
2021	35	27	8,391	0.32 (0.21, 0.47)
2022	35	27	8,516	0.32 (0.21, 0.46)

New York State data reported as of June 15, 2023. Infection rate is the number of infections divided by the number of procedures, multiplied by 100.

*Escherichia coli* (12.5%), *Klebsiella* spp. (10.0%), and *Staphylococcus aureus* (7.5%) were the most common microorganisms associated with CABG donor site SSIs.

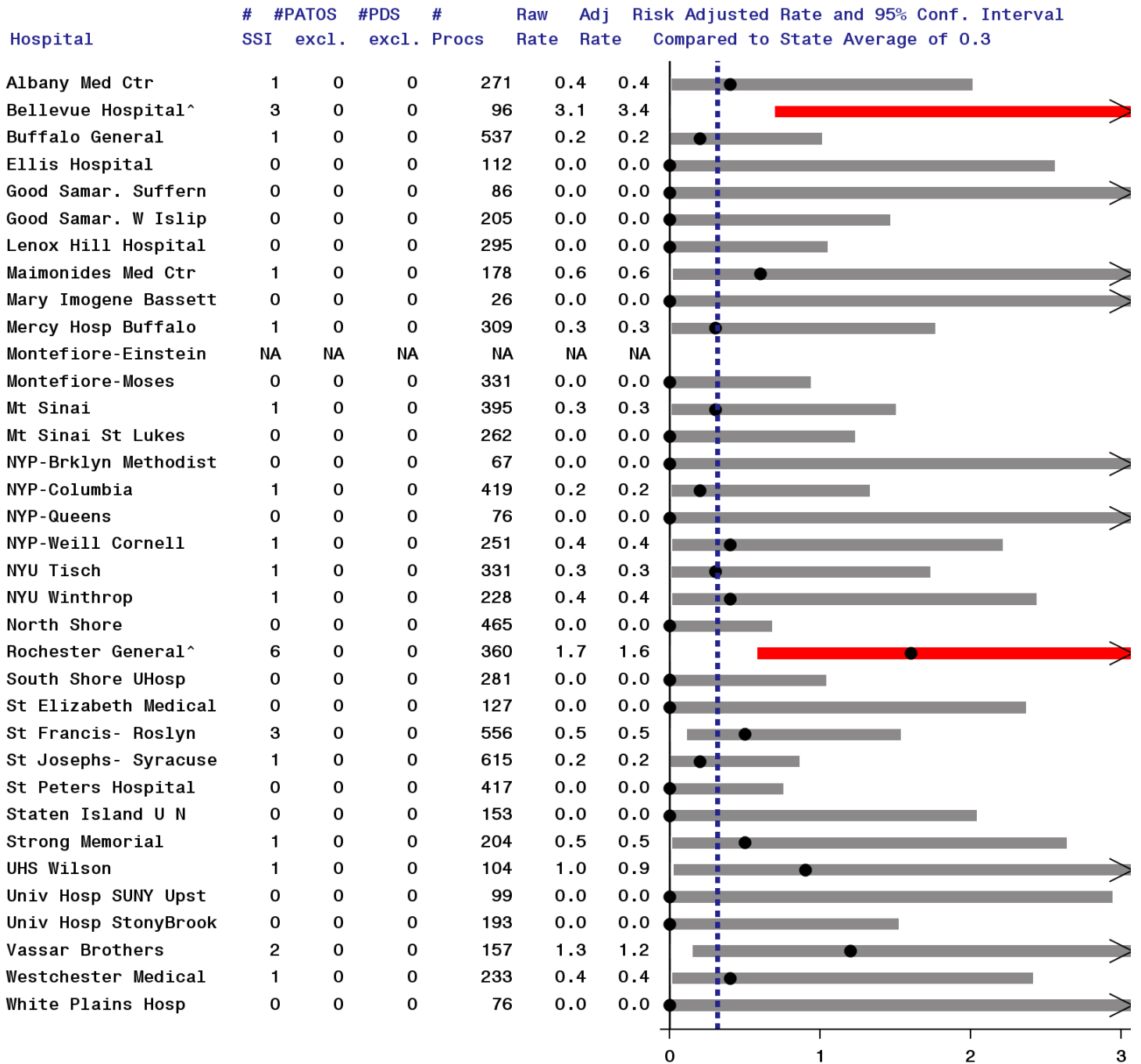
## **Risk Adjustment for CABG Donor Site SSIs**

Certain patient and procedure-specific factors increased the risk of developing a donor site SSI following CABG surgery. In 2022, after excluding SSIs identified using PDS that did not result in hospitalization, the following risk factors were associated with SSI. These variables were used to risk-adjust hospital-specific rates:

- Patients with obesity (with BMI at least 30) were 1.3 times more likely to develop an SSI than patients with BMI less than 30.

In 2022, two (6%) hospital was flagged for having a significantly high rate.

# Coronary Artery Bypass Graft Donor Site Infection Rates, New York 2022 (page 1 of 1)



Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^^ Significantly higher than state average. —\*\* Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using diabetes, obesity, and gender. Excludes SSIs present at time of surgery (PATOS) and non-readmitted cases identified using post discharge surveillance (PDS).

## Hip Replacement/Revision SSIs

In 2022, 153 hospitals reported a total of 319 hip replacement/revision SSIs out of 29,164 procedures, a rate of 1.1 infections per 100 procedures. NYSDOH excludes some of these SSIs and procedures from SSI rates before evaluating time trends and comparing hospital performance, as described below.

Of the 319 infections, 10 were classified as PATOS and excluded from further analysis, because PATOS infections are more difficult to prevent.

Of the remaining 309 infections, 30% were superficial, 24% were deep, and 46% were organ/space (Table 7). Most of the SSIs (79%) were detected upon readmission to the same hospital; 3% were identified during the initial hospitalization; 9% involved readmission to another hospital; and 9% were detected using PDS and not readmitted. The majority (64%) of the PDS infections were superficial. Detection of SSIs in outpatient locations is labor intensive and is not standardized across hospitals; therefore, the NYSDOH did not include these 28 PDS infections in the final SSI rate so as not to penalize facilities with the best surveillance systems.

**Table 7. Method of detection of hip surgical site infection by depth of infection, New York State 2022**

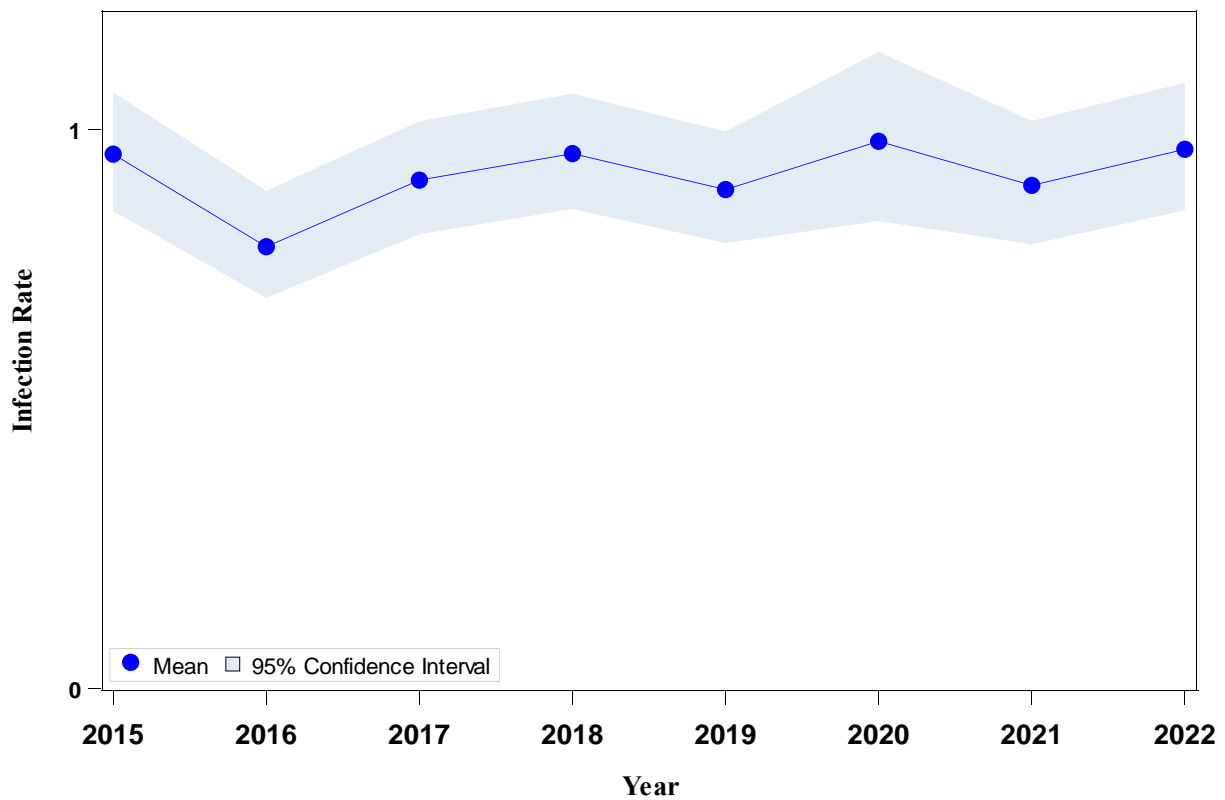
Extent (Row%) (Column%)	When Detected				
	Initial Hospitalization	Readmitted to the Same Hospital	Readmitted to Another Hospital	Post- Discharge Surveillance Not Readmitted	Total
<b>Superficial Incisional</b>	2 (2.2) (25.0)	59 (63.4) (24.1)	14 (15.0) (50.0)	18 (19.4) (64.3)	93 (30.1%)
<b>Deep Incisional</b>	3 (4.1) (37.5)	58 (79.4) (23.7)	3 (4.1) (10.7)	9 (12.3) (32.1)	73 (23.6%)
<b>Organ/Space</b>	3 (2.1) (37.5)	128 (89.5) (52.2)	11 (7.7) (39.3)	1 (0.7) (3.6)	143 (46.3%)
<b>Total</b>	8 (2.6%)	245 (79.2%)	28 (9.1%)	28 (9.1%)	309

New York State data reported as of June 15, 2023. Excludes infections present at time of surgery.

Trends in hip revision/replacement SSI rates after deleting PATOS and PDS infections are shown in Figure 6.

Between 2015 and 2022, the hip SSI rates ranged from 0.89 (2019) to 0.98 (2020) with 0.96 infections per 100 procedures in 2022.

**Figure 6. Trend in hip surgical site infection rates, New York State 2015-2022**



Year	# Hospitals	# Infections	# Procedures	Infection Rate (95% Confidence Interval)
2015	158	318	33,294	0.96 (0.85, 1.07)
2016	157	267	33,812	0.79 (0.70, 0.89)
2017	157	317	34,884	0.91 (0.81, 1.01)
2018	154	337	35,290	0.96 (0.86, 1.06)
2019	153	310	35,216	0.88 (0.78, 0.98)
2020	153	166	16,971	0.98 (0.84, 1.14)
2021	153	262	29,134	0.90 (0.79, 1.01)
2022	153	281	29,154	0.96 (0.86, 1.08)

New York State Data reported as of June 15, 2023.

Infection rate is the number of infections divided by the number of procedures, multiplied by 100.

## Microorganisms Associated with Hip SSIs

The most common microorganism associated with hip SSIs was *Staphylococcus aureus* (Table 8).

**Table 8. Microorganisms identified in hip replacement surgical site infections, New York State 2022**

Microorganism	Number of Isolates	Percent of Infections
<i>Staphylococcus aureus</i>	97	30.4
- <i>Staphylococcus aureus</i> -MRSA	(26)	(8.2)
Coagulase negative staphylococci	44	13.8
<i>Pseudomonas</i> spp.	35	11.0
<i>Proteus</i> spp.	29	9.1
Enterococci	27	8.5
- VRE	(6)	(1.9)
Streptococci	18	5.6
<i>Enterobacter</i> spp.	17	5.3
<i>Escherichia coli</i>	17	5.3
<i>Klebsiella</i> spp.	14	4.4
<i>Acinetobacter</i> spp.	2	0.6
Other	43	13.5

New York State data reported as of June 15, 2023. Out of 319 infections (includes post-discharge surveillance). No microorganisms identified for 62 infections.

## **Risk Adjustment for Hip SSIs**

Certain patient and procedure-specific factors increased the risk of developing an SSI following hip surgery. In 2022, after excluding SSIs identified using PDS that did not result in hospitalization, and SSIs that were PATOS, the following risk factors were associated with SSIs. These variables were used to risk-adjust hospital-specific rates.

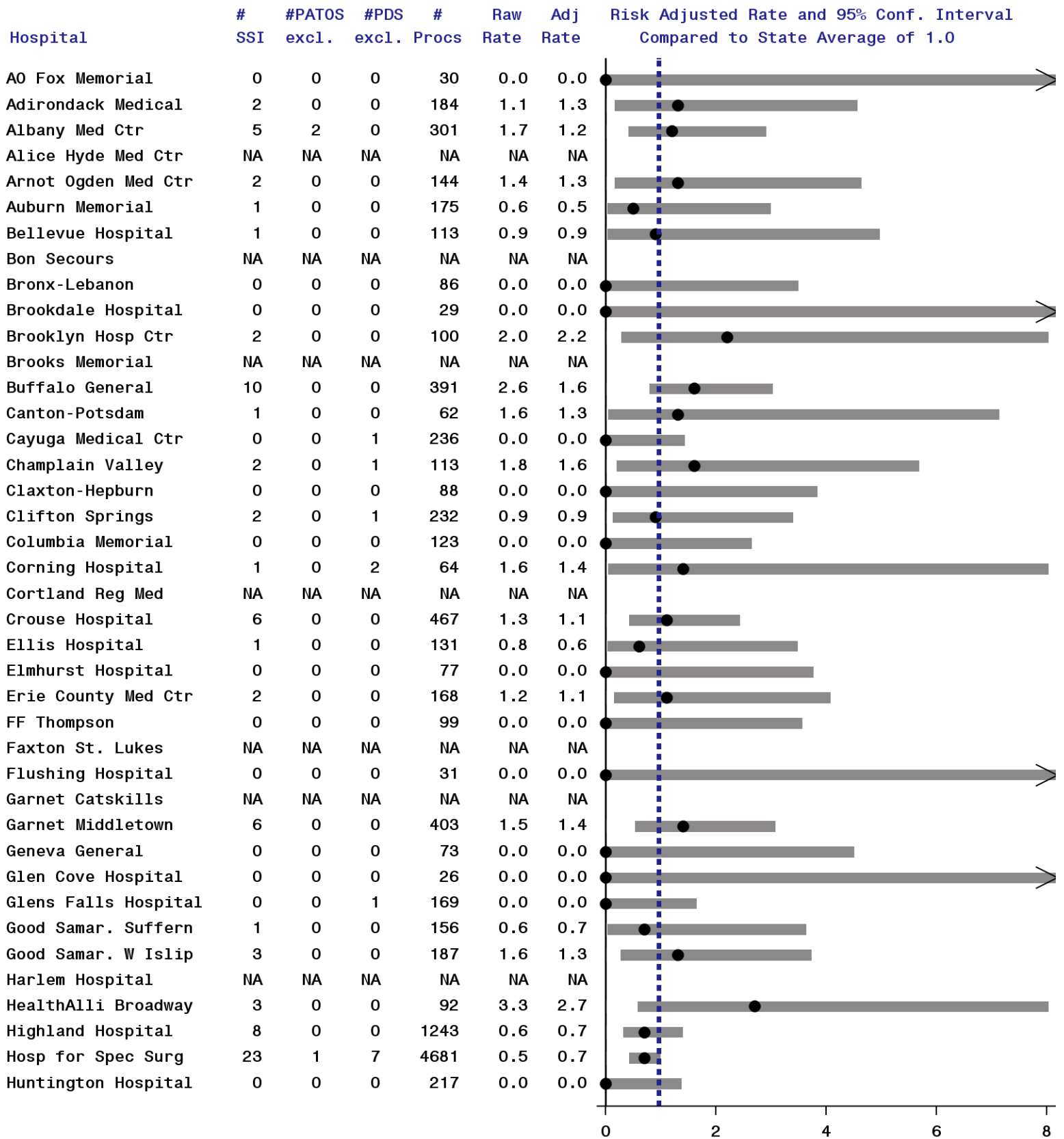
- Patients with severe systemic disease (ASA score of 3, 4, or 5) were 1.9 times more likely to develop an SSI than healthier patients (ASA score of 1 or 2).
- The risk of SSI varied by type of hip procedure. Compared to total and resurfacing primary hip replacement procedures, partial primary procedures were 1.4 times more likely to result in an SSI, revisions with no prior infection at the joint were 3.3 times more likely to result in an SSI, and revisions with prior infection at the joint were 2.5 times more likely to result in an SSI.
- Patients with severe obesity (BMI greater than or equal to 40) were 2.6 times more likely to develop an SSI, and patients with obesity (BMI between 30 and 39) were 1.6 times more likely to develop an SSI than patients with BMI less than 30.

## **Hospital-Specific Hip SSI Rates**

Hospital-specific hip SSI rates are provided in Figure 7. Of the 135 hospitals that reported more than twenty hip procedures in 2022, five hospitals (4%) had hip SSI rates that were statistically higher than the state average. These hospitals are required to submit improvement plans following the NYSDOH HAI Reporting Program's Policy for Facilities with Consecutive Years of High HAI Rates

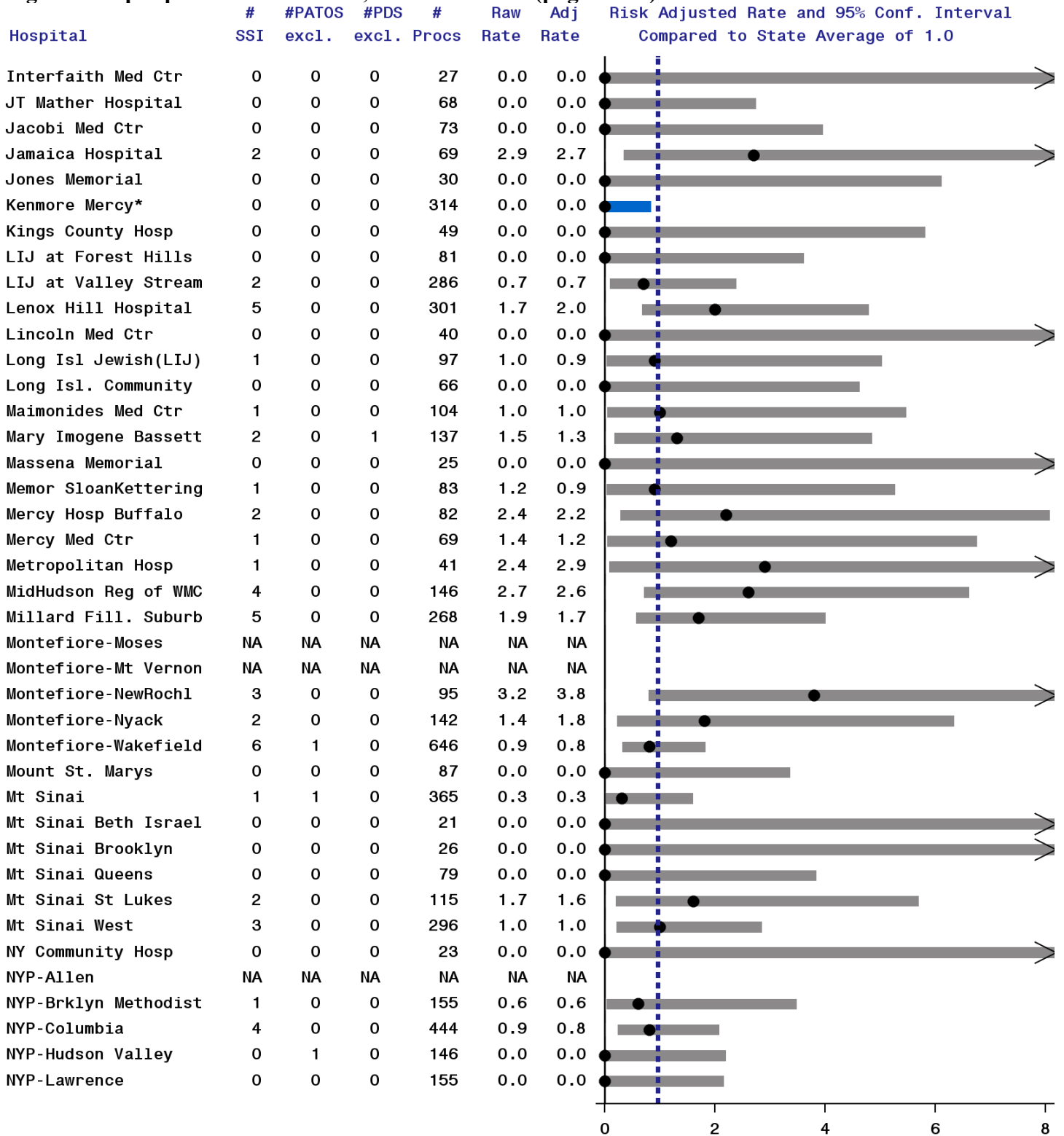
[http://www.health.ny.gov/statistics/facilities/hospital/hospital\\_acquired\\_infections/](http://www.health.ny.gov/statistics/facilities/hospital/hospital_acquired_infections/)). One hospital (0.7%) had an SSI rate significantly lower than the state average.

Figure 7. Hip replacement SSI rates, New York 2022 (page 1 of 4)



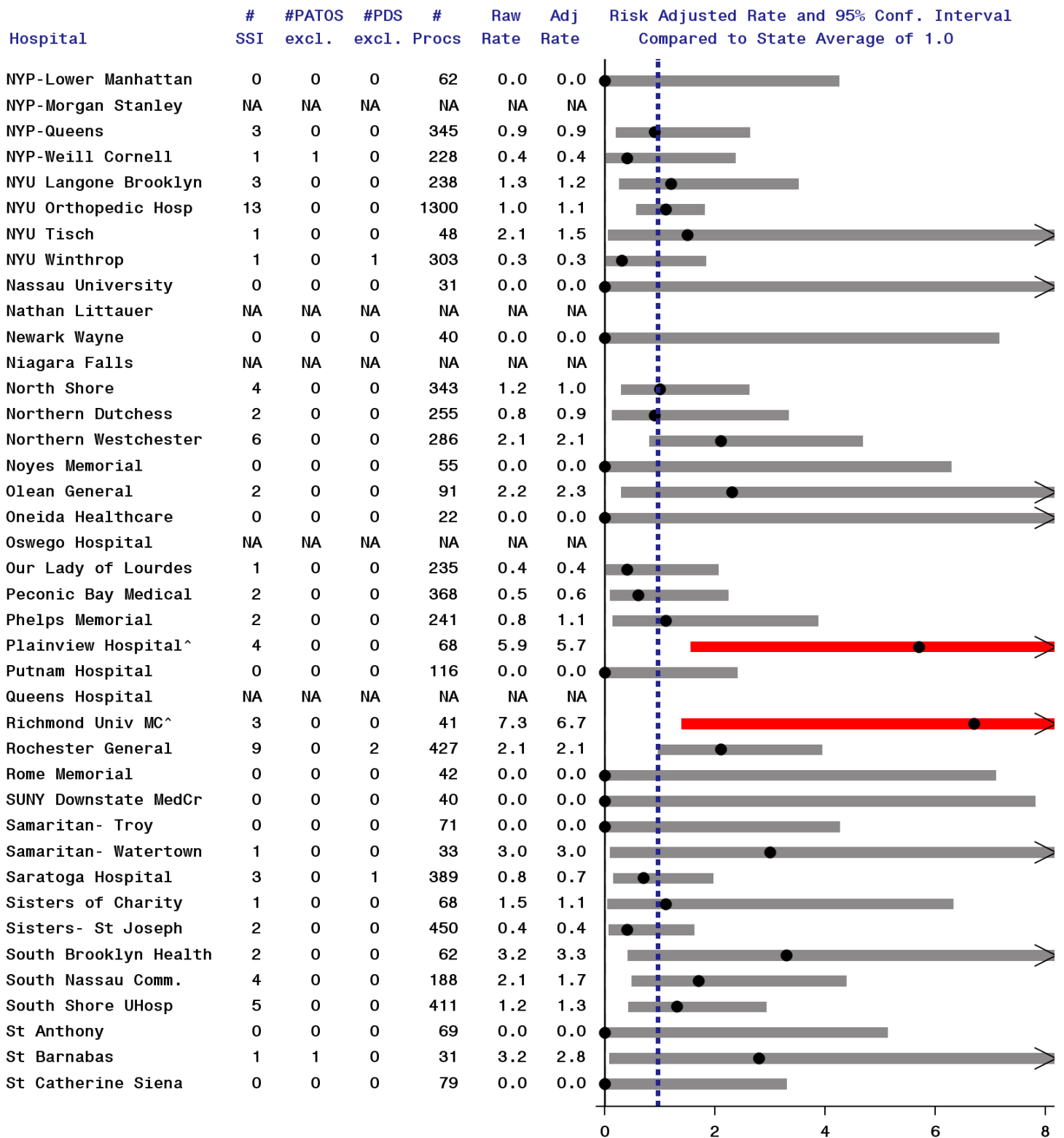
Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. — Significantly higher than state average. — Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using ASA score, procedure type, and obesity. Excludes SSIs present at time of surgery and non-readmitted cases identified using post discharge surveillance.

Figure 7. Hip replacement SSI rates, New York 2022 (page 2 of 4)



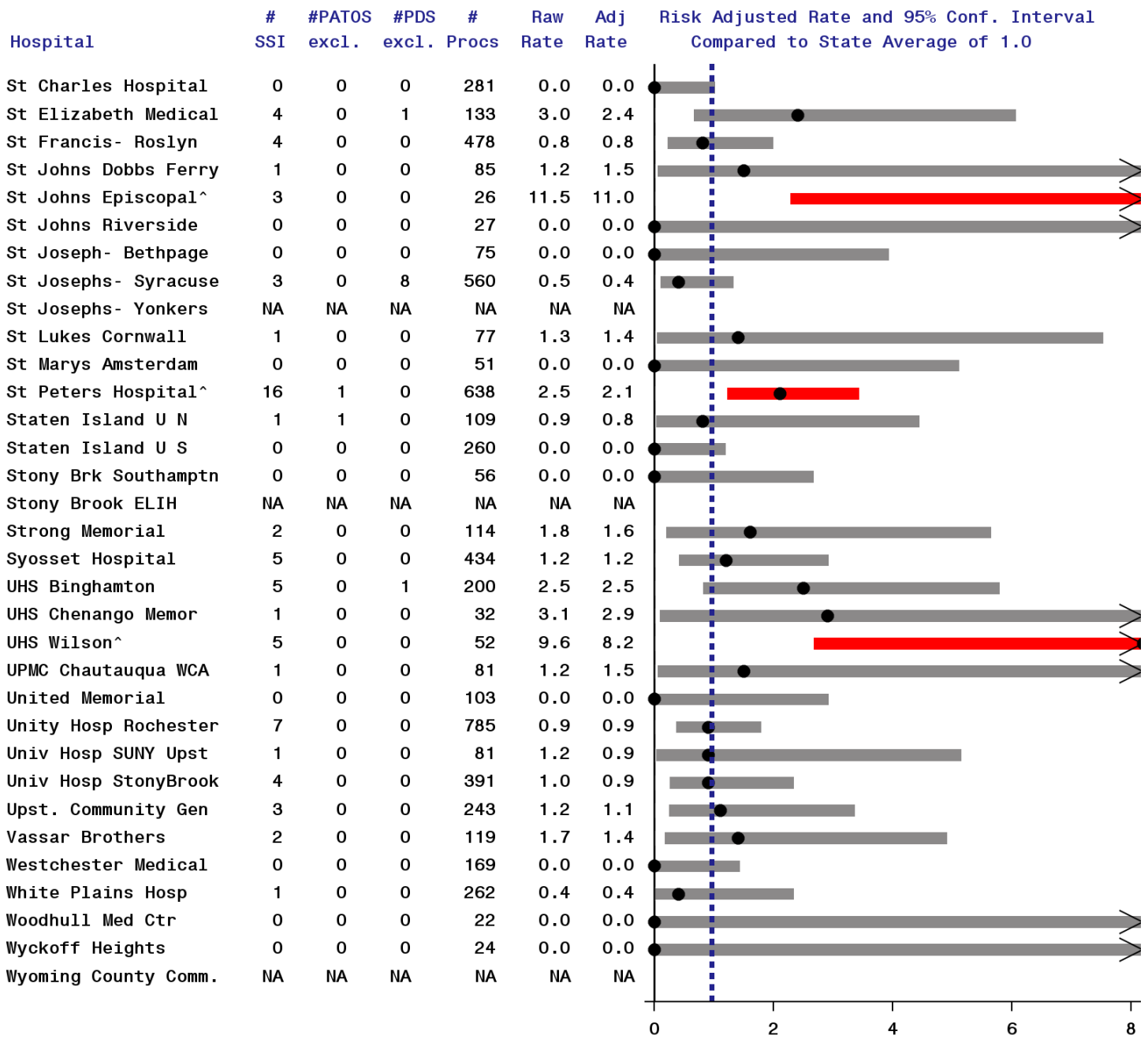
Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^^ Significantly higher than state average. —\*\* Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using ASA score, procedure type, and obesity. Excludes SSIs present at time of surgery and non-readmitted cases identified using post discharge surveillance.

Figure 7. Hip replacement SSI rates, New York 2022 (page 3 of 4)



Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^^ Significantly higher than state average. —\*\* Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using ASA score, procedure type, and obesity. Excludes SSIs present at time of surgery and non-readmitted cases identified using post discharge surveillance.

Figure 7. Hip replacement SSI rates, New York 2022 (page 4 of 4)



Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^^ Significantly higher than state average. —\*\* Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using ASA score, procedure type, and obesity. Excludes SSIs present at time of surgery and non-readmitted cases identified using post discharge surveillance.

## Abdominal Hysterectomy SSIs

In 2022, 146 hospitals reported a total of 186 abdominal hysterectomy SSIs out of 12,731 procedures, a rate of 1.5 infections per 100 procedures. NYSDOH excludes some of these SSIs and procedures from SSI rates before evaluating time trends and comparing hospital performance, as described below.

Of the 186 infections, 10 were classified as PATOS. PATOS SSIs/procedures were excluded from the final SSI rate because these infections are more difficult to prevent. Of the remaining 176 infections, 43% were superficial, 12% were deep, and 45% were organ/space (Table 9). Most of the SSIs (55%) were detected upon readmission to the same hospital; 7% were identified during the initial hospitalization; 8% involved readmission to another hospital; and 30% were detected using post-discharge surveillance and not readmitted. Most (77%) of the PDS infections were superficial. Detection of SSIs in outpatient locations is labor intensive and is not standardized across hospitals; therefore, the NYSDOH did not include these 53 PDS infections in the final SSI rate so as not to penalize facilities with the best surveillance systems.

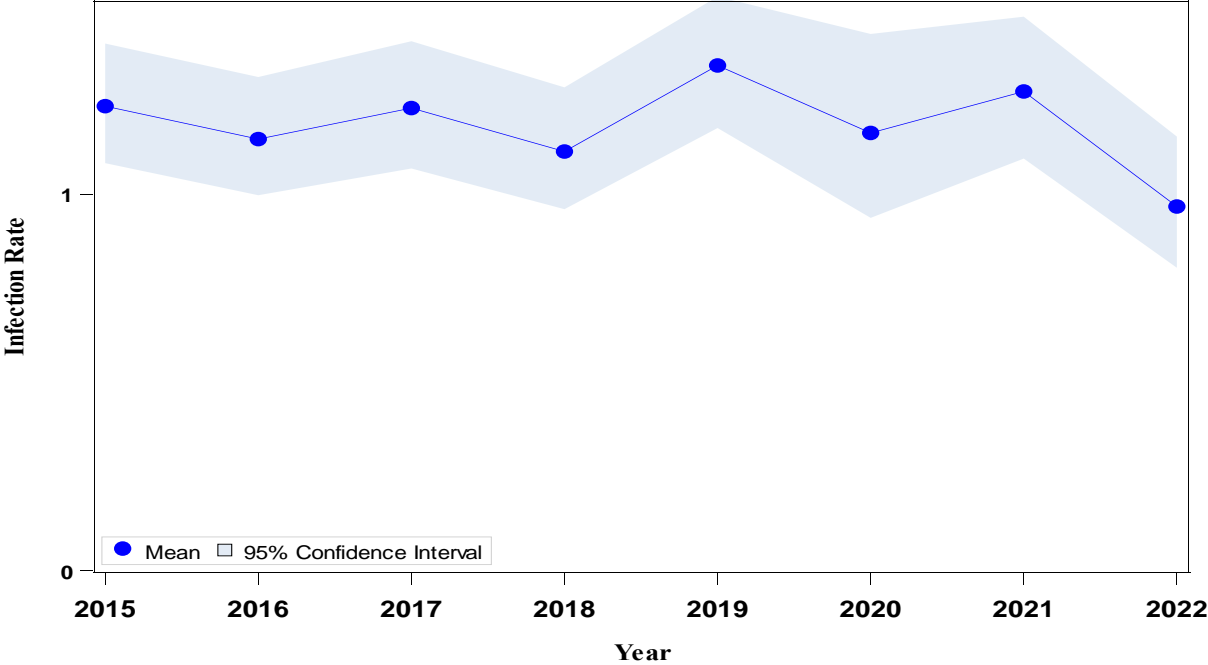
**Table 9. Method of detection of abdominal hysterectomy surgical site infection by depth of infection, New York State 2022**

Extent (Row%) (Column%)	When Detected				Total
	Initial Hospitalization	Readmitted to the Same Hospital	Readmitted to Another Hospital	Post- Discharge Surveillance Not Readmitted	
<b>Superficial Incisional</b>	5 (6.6) (41.7)	24 (31.5) (24.7)	6 (7.9) (42.9)	41 (54.0) (77.4)	76(43.2%)
<b>Deep Incisional</b>	3 (14.3) (25.0)	10 (47.6) (10.3)	3 (14.3) (21.4)	5 (23.8) (9.4)	21 (11.9%)
<b>Organ/Space</b>	4 (5.1) (33.3)	63 (79.7) (65.0)	5 (6.3) (35.7)	7 (8.9) (13.2)	79 (44.9%)
<b>Total</b>	12 (6.8%)	97 (55.1%)	14 (8.0%)	53 (30.1%)	176

New York State data reported as of June 15, 2023. Excludes infections present at time of surgery.

Trends in hysterectomy SSI rates after deleting PATOS and PDS infections are shown in Figure 8. Between 2015 and 2022 the total number of abdominal hysterectomy SSIs decreased 21%, from 1.23 infections per 100 procedures in 2015, to 0.97 infections per 100 procedures in 2022, decrease was statistically significant.

**Figure 8. Trend in abdominal hysterectomy SSI rates, New York State 2015-2022**



Year	# Hospitals	# Infections	# Procedures	Infection Rate (95% Confidence Interval)
2015	151	237	19,216	1.23 (1.08, 1.40)
2016	148	210	18,326	1.15 (1.00, 1.31)
2017	149	208	16,934	1.23 (1.07, 1.41)
2018	149	187	16,824	1.11 (0.96, 1.28)
2019	151	230	17,312	1.33 (1.16, 1.51)
2020	138	91	7,830	1.16 (0.94, 1.42)
2021	145	180	14,147	1.27 (1.09, 1.47)
2022	146	123	12,721	0.97 (0.80, 1.15)

New York State data reported as of June 15, 2023.  
 Infection rate is the number of infections divided by the number of procedures, multiplied by 100.

## Microorganisms Associated with Abdominal Hysterectomy SSIs

The most common microorganisms associated with hysterectomy SSIs were Enterococci and *E. coli* (Table 10).

**Table 10. Microorganisms identified in abdominal hysterectomy SSIs, New York State 2022**

Microorganism	Number of Isolates	Percent of Infections
Enterococci	24	12.9
- VRE	(1)	(0.5)
<i>Escherichia coli</i>	24	12.9
<i>Staphylococcus aureus</i>	23	12.4
- <i>Staphylococcus aureus</i> -MRSA	(6)	(3.2)
Streptococci	17	9.1
Klebsiella spp.	12	6.5
Pseudomonas spp.	11	5.9
Acinetobacter spp.	2	1.1
Enterobacter spp.	1	0.5
Other	53	28.5

New York State data reported as of June 15, 2023. Out of 186 infections (includes post-discharge surveillance). No microorganisms identified for 78 infections.

## **Risk Adjustment for Abdominal Hysterectomy SSIs**

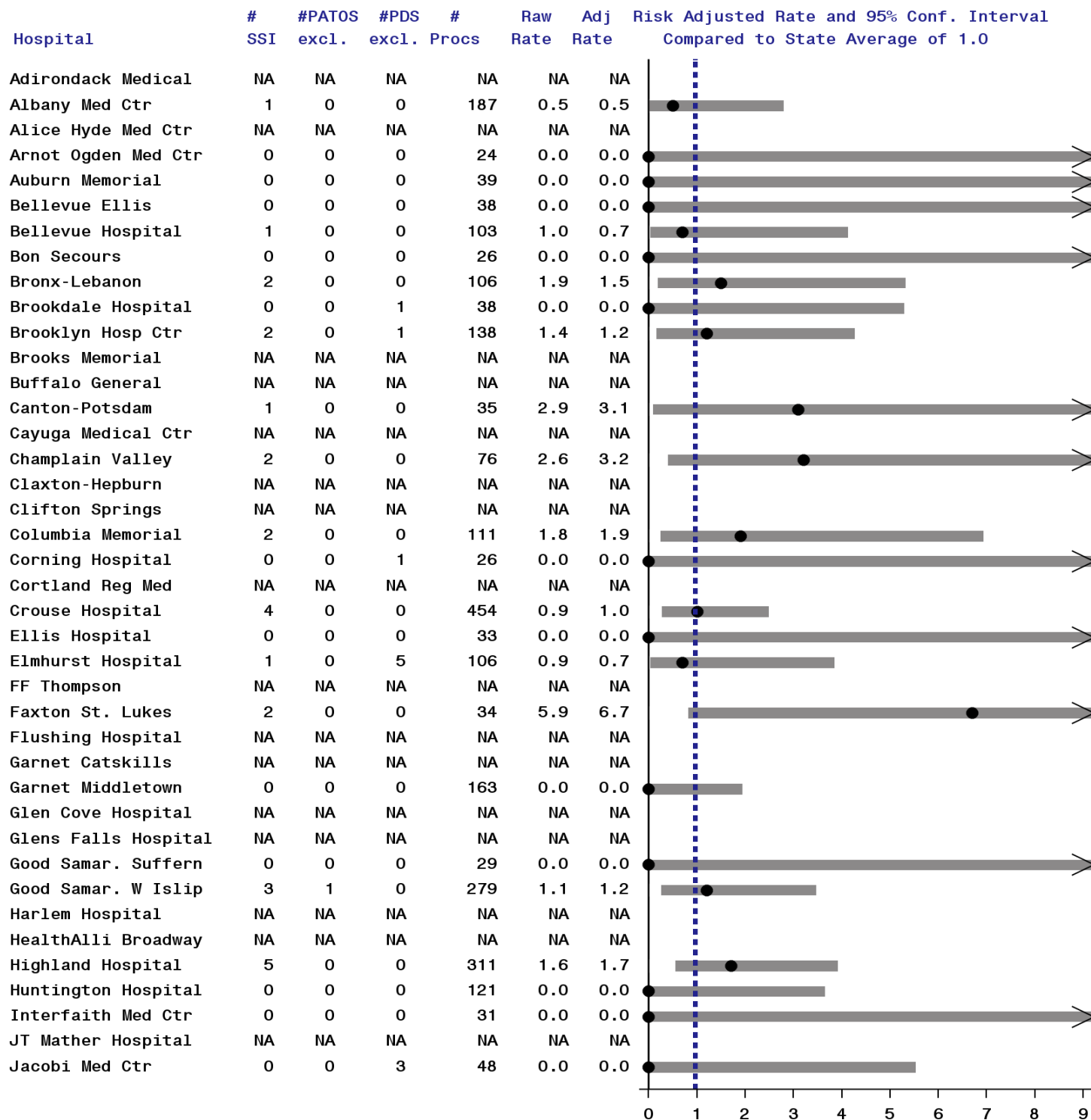
Certain patient and procedure-specific factors increased the risk of developing an SSI following abdominal hysterectomy. In 2022, after excluding SSIs identified using PDS that did not result in hospitalization and SSIs that were PATOS, the following risk factors were associated with SSIs. These variables were used to risk-adjust hospital-specific rates.

- Procedures that involved traditional surgical incisions were 1.7 times more likely to result in an SSI than procedures performed entirely laparoscopically.
- Patients with diabetes were 1.8 times more likely to develop an SSI than patients without diabetes.
- Patients with obesity (body mass index [BMI] greater than 30) were 1.9 times more likely to develop an SSI than patients with BMI less than or equal to 30.
- Procedures with duration greater than three hours were 1.7 times more likely to result in SSI than procedures less than three hours.

## **Hospital-Specific Abdominal Hysterectomy SSI Rates**

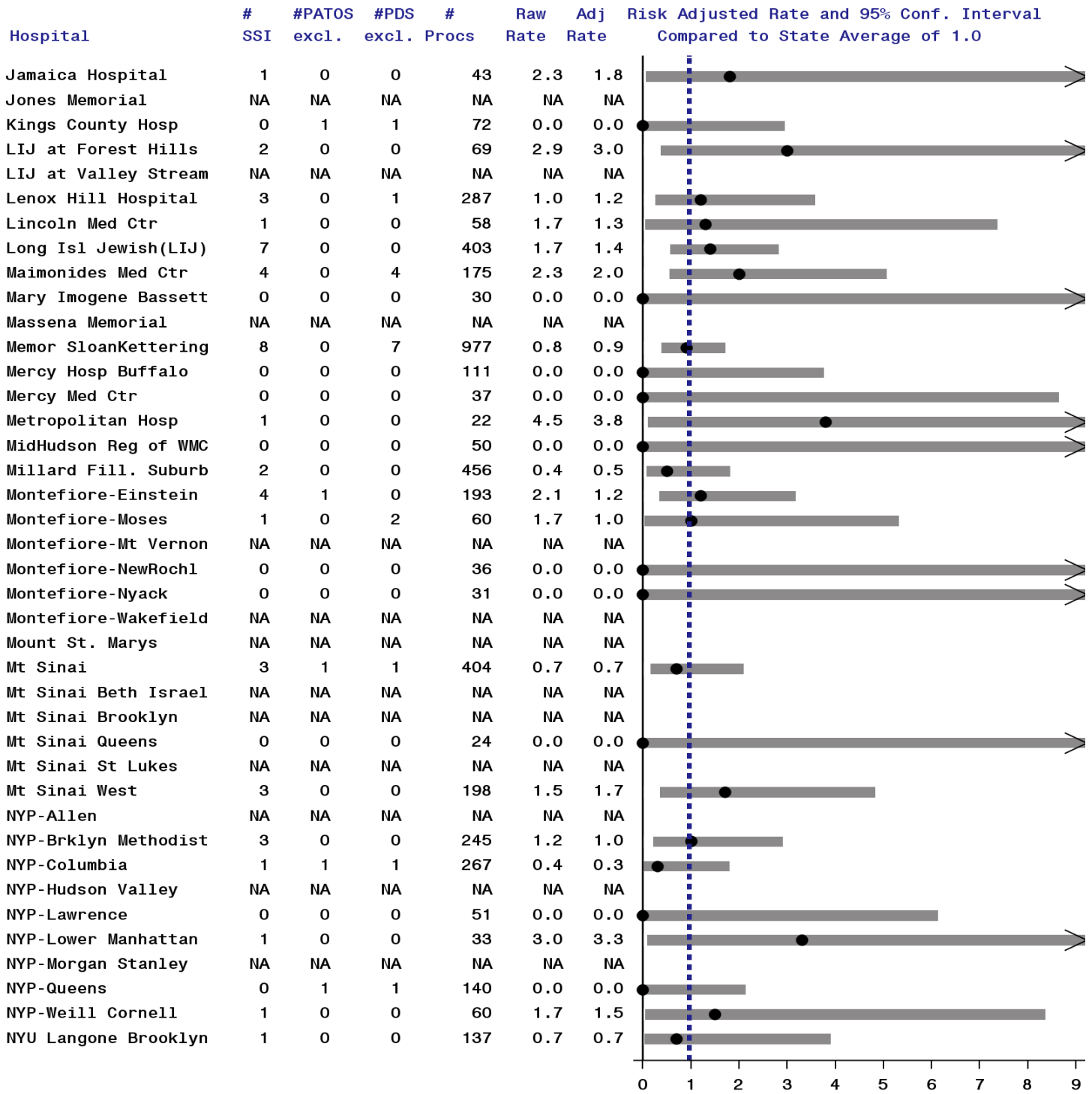
Hospital-specific abdominal hysterectomy SSI rates are provided in Figure 9. Of the 102 hospitals that reported more than 20 procedures in 2022, none of them had a hysterectomy SSI rate that was statistically higher/lower than the state average.

**Figure 9. Abdominal hysterectomy surgical site infection rates, New York 2022 (page 1 of 4)**



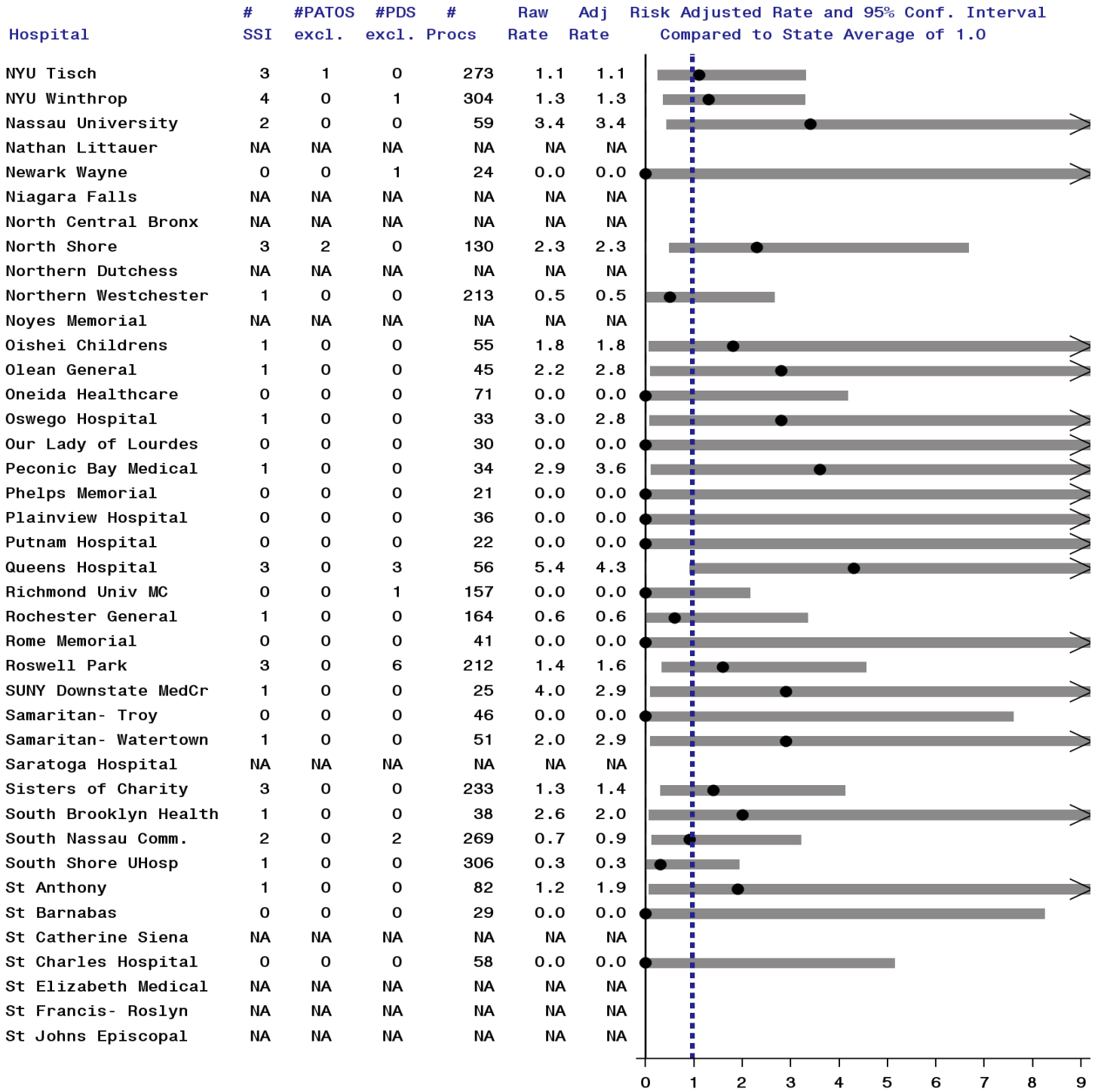
Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^^ Significantly higher than state average. —\*\* Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using ASA score, duration, diabetes, obesity, and endoscope. Excludes SSIs present at time of surgery (PATOS) and non-readmitted cases identified using post discharge surveillance (PDS).

Figure 9. Abdominal hysterectomy surgical site infection rates, New York 2022 (page 2 of 4)



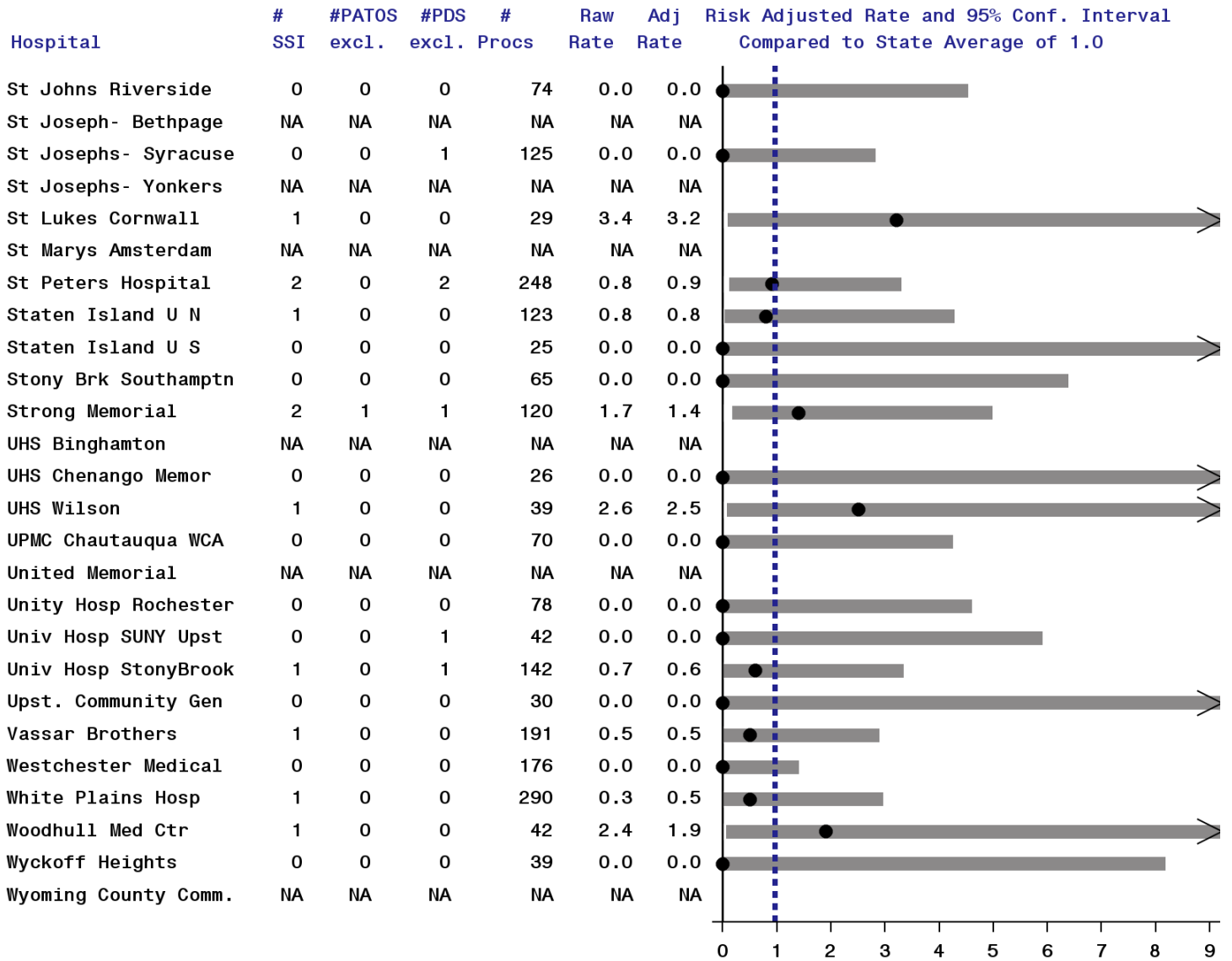
Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^^ Significantly higher than state average. —\* Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using ASA score, duration, diabetes, obesity, and endoscope. Excludes SSIs present at time of surgery (PATOS) and non-readmitted cases identified using post discharge surveillance (PDS).

**Figure 9. Abdominal hysterectomy surgical site infection rates, New York 2022 (page 3 of 4)**



Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^^ Significantly higher than state average. —\*\* Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using ASA score, duration, diabetes, obesity, and endoscope. Excludes SSIs present at time of surgery (PATOS) and non-readmitted cases identified using post discharge surveillance (PDS).

**Figure 9. Abdominal hysterectomy surgical site infection rates, New York 2022 (page 4 of 4)**



Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^^ Significantly higher than state average. —\*\* Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using ASA score, duration, diabetes, obesity, and endoscope. Excludes SSIs present at time of surgery (PATOS) and non-readmitted cases identified using post discharge surveillance (PDS).

## Spinal Fusion SSIs

In 2022, 110 hospitals reported a total of 400 spinal fusion SSIs out of 25,886 procedures, a rate of 1.6 infections per 100 procedures. NYSDOH excludes some of these SSIs and procedures from SSI rates before evaluating time trends and comparing hospital performance, as described below.

Of the 400 infections, 16 were classified as PATOS. PATOS/SSIs procedures were excluded from the final SSI rate because these infections are more difficult to prevent. Of the remaining 384 infections, 27% were superficial, 43% were deep, and 30% were organ/space (Table 11). Most of the SSIs (69%) were detected upon readmission to the same hospital; 12% were identified during the initial hospitalization; 9% involved readmission to another hospital; and 10% were detected using post-discharge surveillance and not readmitted. Most (65%) of the PDS infections were superficial. Detection of SSIs in outpatient locations is labor intensive and is not standardized across hospitals; therefore, the NYSDOH did not include these 37 PDS infections in the final SSI rate so as not to penalize facilities with the best surveillance systems.

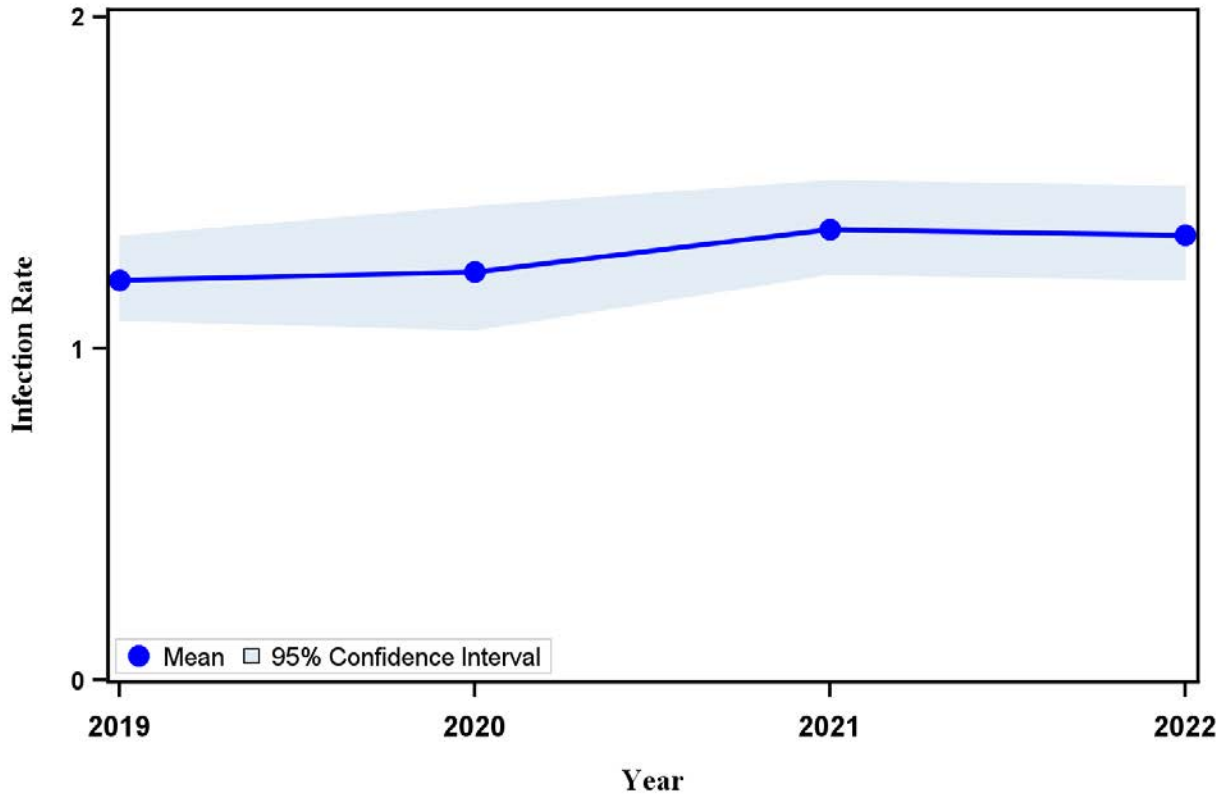
**Table 11. Method of detection of Spinal fusion surgical site infection by depth of infection, New York State 2022**

Extent (Row%) (Column%)	When Detected				Total
	Initial Hospitalization	Readmitted to the Same Hospital	Readmitted to Another Hospital	Post- Discharge Surveillance Not Readmitted	
<b>Superficial Incisional</b>	11 (10.7) (23.9)	61 (59.2) (22.9)	7 (6.8) (20.0)	24 (23.3) (64.9)	103 (26.8)
<b>Deep Incisional</b>	21 (12.7) (45.7)	120 (72.7) (45.1)	11 (6.7) (31.4)	13 (7.9) (35.1)	165 (43.0)
<b>Organ/Space</b>	14 (12.1) (30.4)	85 (73.3) (32.0)	17 (14.6) (48.6)	0 (0.0) (0.0)	116 (30.2)
<b>Total</b>	46 (12.0)	266 (69.3)	35 (9.1)	37 (9.6)	384

New York State data reported as of June 15, 2023. Excludes infections present at time of surgery.

Trends in fusion SSI rates after deleting PATOS and PDS infections are shown in Figure 10. Between 2019 and 2022 the total number of fusion SSIs increased 12%, from 1.18 infections per 100 procedures in 2019, to 1.34 infections per 100 procedures in 2022, though the increase was not statistically significant. Between 2021 and 2022, SSI rate decreased 1.36 to 1.34 (1.5%)

**Figure 10. Spinal fusion SSI rates, New York State 2019-2022**



Year	# Hospitals	# Infections	# Procedures	Infection Rate (95% Confidence Interval)
2019	118	343	29,036	1.18 (1.06, 1.31)
2020	109	170	13,812	1.23 (1.05, 1.43)
2021	111	352	25,908	1.36 (1.22, 1.51)
2022	110	347	25,870	1.34 (1.20, 1.49)

New York State data reported as of June 15, 2023.

Infection rate is the number of infections divided by the number of procedures, multiplied by 100.

## Microorganisms Associated with Spinal fusion SSIs

The most common microorganisms associated with hysterectomy SSIs was *Staphylococcus aureus* (Table 12).

**Table 12. Microorganisms identified in spinal fusion surgical site infections, New York State 2022**

Microorganism	Number of Isolates	Percent of Infections
<i>Staphylococcus aureus</i>	109	27.3
- <i>Staphylococcus aureus</i> -MRSA	(29)	(7.3)
Coagulase negative staphylococci	80	20.0
<i>Escherichia coli</i>	30	7.5
- CRE- <i>E. coli</i>	(1)	(0.3)
Klebsiella spp.	30	7.5
- CRE-Klebsiella	(2)	(0.5)
Enterococci	26	6.5
- VRE	(7)	(1.8)
Proteus spp.	25	6.3
Pseudomonas spp.	25	6.3
Cutibacterium spp.	15	3.8
Serratia spp.	13	3.3
Enterobacter spp.	12	3.0
Yeast	10	2.5
- <i>Candida auris</i>	(1)	(0.3)
Acinetobacter spp.	3	0.8
- MDRO-Acinetobacter	(1)	(0.3)
Other	58	14.5

New York State data reported as of June 15, 2023. Out of 400 infections (includes post-discharge surveillance). No microorganisms identified for 71 infections.

## **Risk Adjustment for Spinal Fusion SSIs**

Certain patient and procedure-specific factors increase the risk of developing an SSI following abdominal hysterectomy. In 2022, after excluding SSIs identified using PDS that did not result in hospitalization and SSIs that were PATOS, the following risk factors were associated with SSIs. These variables were used to risk-adjust hospital-specific rates.

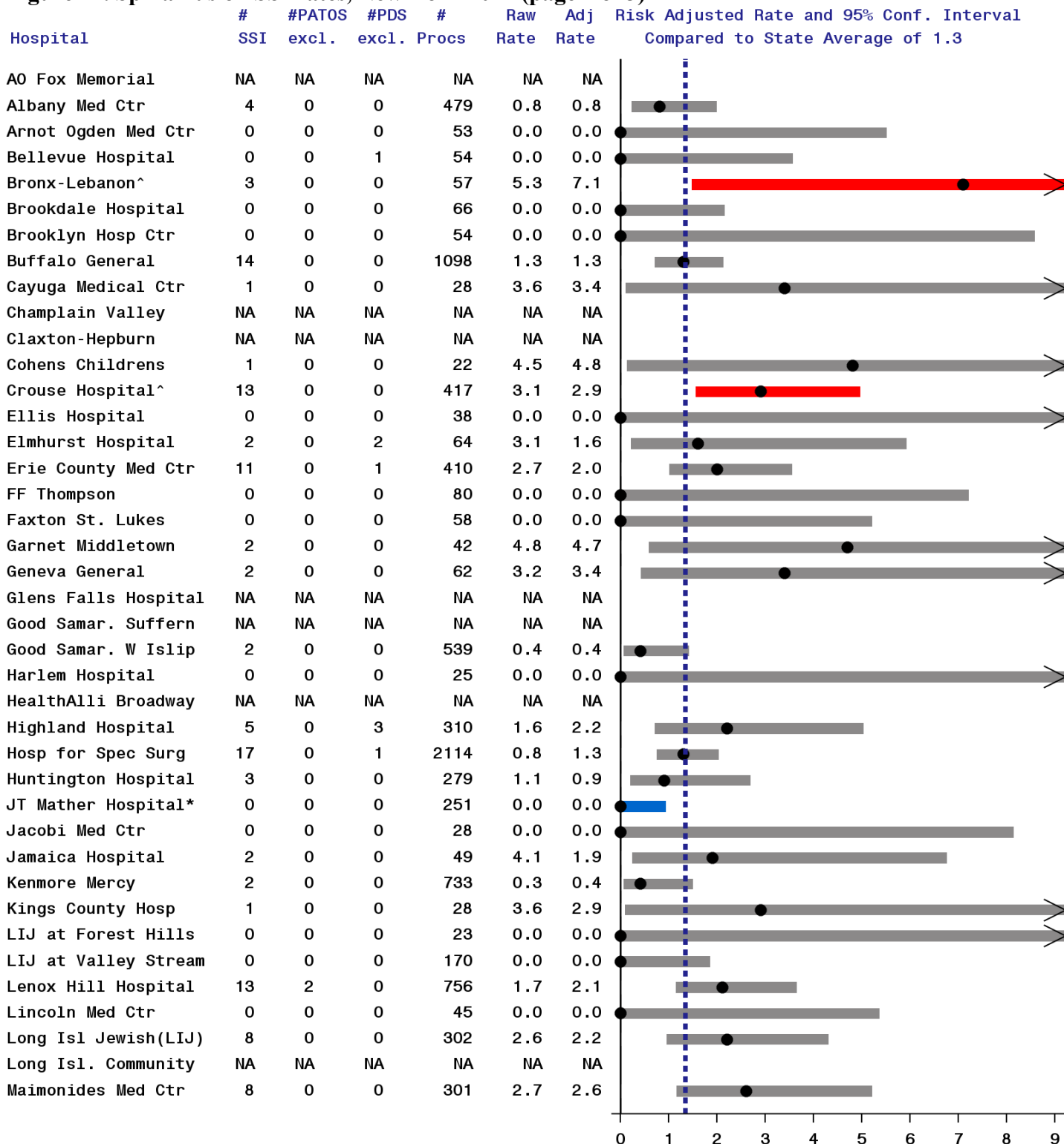
- For each unit increase in ASA score (1, 2, 3, 4/5), a measure of systemic disease, patients were 1.9 times more likely to develop an SSI.
- Patients with diabetes were 1.7 times more likely to develop an SSI than patients without diabetes.
- Patients with severe obesity (BMI greater than or equal to 40) were 2.0 times more likely to develop an SSI, and patients with obesity (BMI between 30 and 39) were 1.3 times more likely to develop an SSI than patients with BMI less than 30.
- For each additional hour of procedure (up to 10 hours), patients were 1.2 times more likely to develop an SSI.
- Patients who experienced trauma (i.e., a blunt or penetrating injury) before the procedure were 1.5 times more likely to develop an SSI.
- Procedures that involved a posterior or bidirectional approach were 3.5 times more likely to result in SSI than procedures performed entirely with an anterior approach.
- Procedures performed at the dorsal/dorsolumbar or cervical/dorsal/dorsolumbar levels were 1.5 times more likely to develop an SSI than procedures performed at the atlas-axis or cervical levels. There was no difference in infection rates between procedures performed at the lumbar/lumbosacral levels and those performed at the atlas-axis or cervical levels.

## **Hospital-Specific Spinal Fusion SSI Rates**

Hospital-specific spinal fusion SSI rates are provided in Figure 11. Of the 97 hospitals that reported more than 20 procedures in 2022, 6 hospitals (6%) had a spinal fusion SSI rate that was statistically higher than the state average. These hospitals are required to submit improvement plans following the NYSDOH HAI Reporting Program's Policy for Facilities with Consecutive Years of High HAI Rates

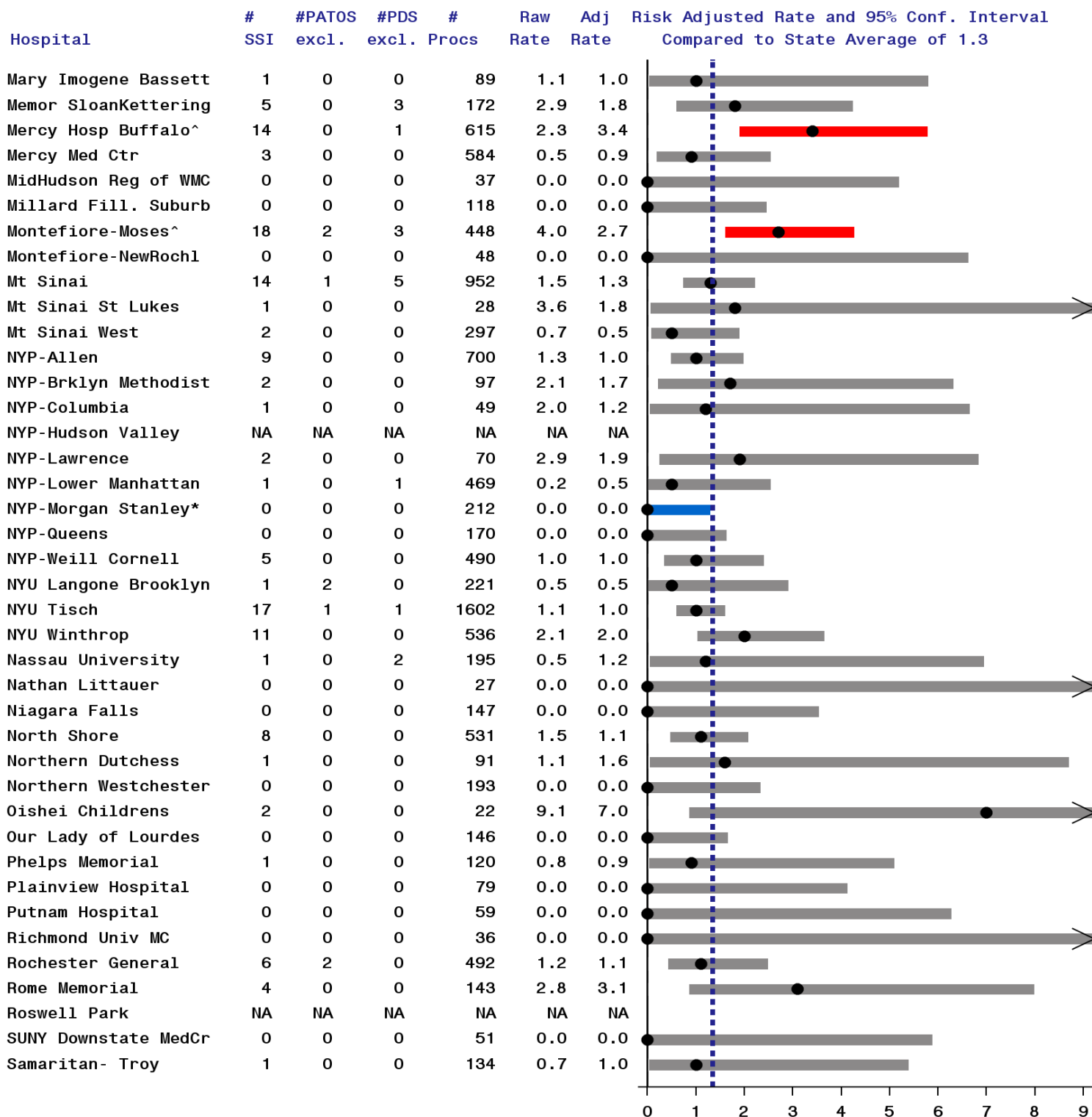
[http://www.health.ny.gov/statistics/facilities/hospital/hospital\\_acquired\\_infections/](http://www.health.ny.gov/statistics/facilities/hospital/hospital_acquired_infections/). Three hospitals (3%) had an SSI rate that was significantly lower than the state average.

Figure 11. Spinal fusion SSI rates, New York 2022 (page 1 of 3)



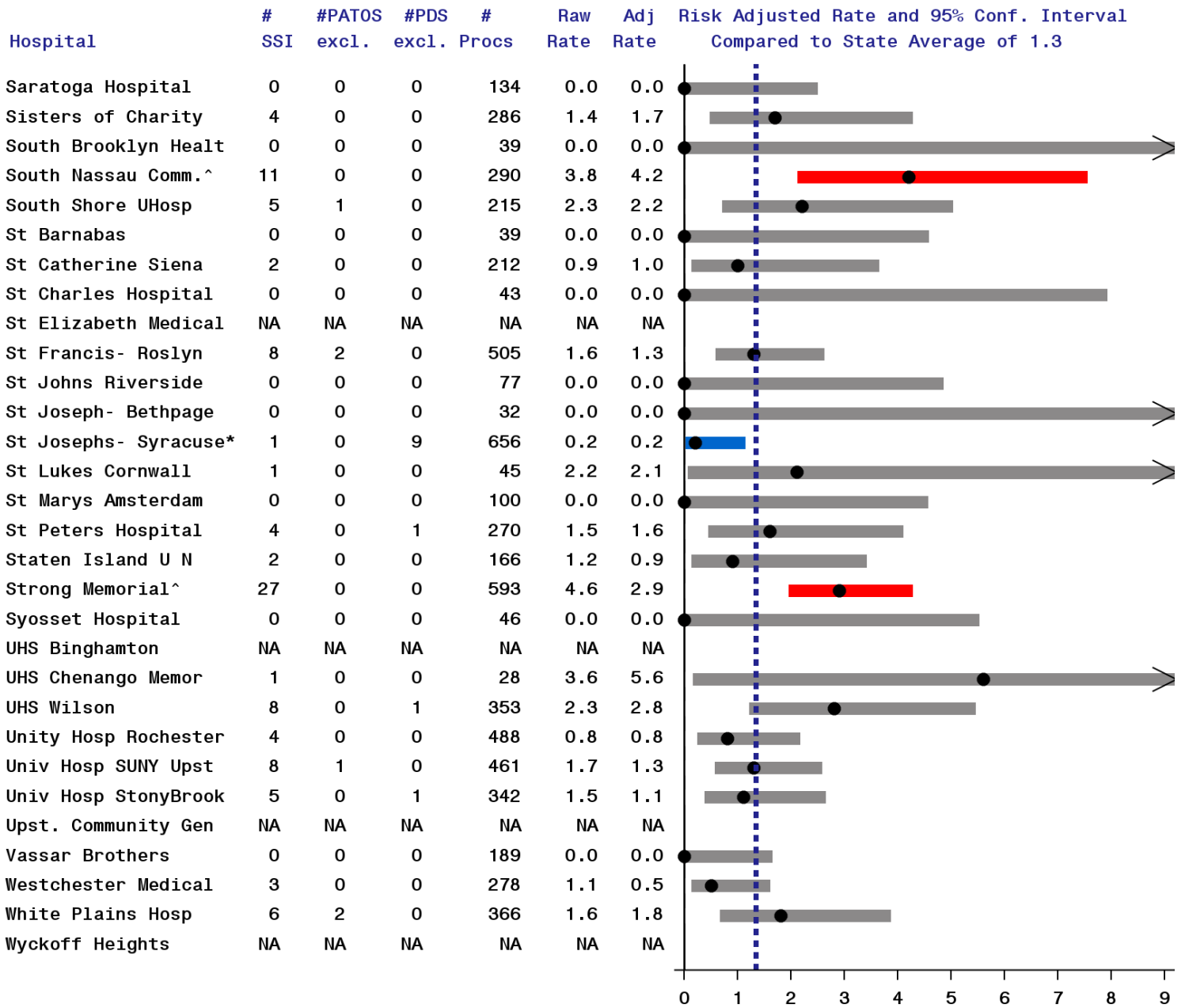
Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^^ Significantly higher than state average. —\*\* Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using ASA score, diabetes, obesity, duration, trauma, approach, and level. Excludes SSIs present at time of surgery (PATOS) and non-readmitted cases identified using post discharge surveillance (PDS).

Figure 11. Spinal fusion SSI rates, New York 2022 (page 2 of 3)



Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^^ Significantly higher than state average. —\*\* Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using ASA score, diabetes, obesity, duration, trauma, approach, and level. Excludes SSIs present at time of surgery (PATOS) and non-readmitted cases identified using post discharge surveillance (PDS).

**Figure 11. Spinal fusion SSI rates, New York 2022 (page 3 of 3)**



Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. ■ ^^ Significantly higher than state average. ■ \*\* Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. NA: less than 20 procedures. SSI: surgical site infections, Procs: procedures. Rates are per 100 procedures. Adjusted using ASA score, diabetes, obesity, duration, trauma, approach, and level. Excludes SSIs present at time of surgery (PATOS) and non-readmitted cases identified using post discharge surveillance (PDS).

# Central Line-Associated Bloodstream Infections (CLABSIs)

In 2022, a total of 1,943 CLABSIs were associated with 1,572,621 central line days, for an overall rate of 1.24 infections per 1,000 central line days in the selected ICUs and wards (Table 13). In 2015, NHSN began excluding BSIs occurring in patients with mucosal barrier injury (MBI). In 2018, BSIs involving ventricular assist devices (VAD) and/or extracorporeal membrane oxygenation (ECMO) were removed from CLABSI rates because patients with these devices are at increased risk of acquiring a BSI independent of the presence of a central line. Starting in 2019, observed or suspected patient injection into a vascular line (PATINJ), known or suspected Munchausen Syndrome by Proxy (MSbP), epidermolysis bullosa (EB), BSIs in patients with both a central line and another vascular access device, where an organism identified from pus at the other access site matches an organism identified in the blood (IVPUS), and group B Streptococcus BSIs in infants during the first 6 days of life were excluded from infection rate calculations. In 2022, hospitals reported 319 MBI-BSIs, 40 ECMO-BSIs, 52 VAD-BSIs, 9 PATINJ-BSI, one (1) MSbP-BSI, one (1) IVPUS-BIS and no (0) EB-BSI. Table 13 summarizes the total number of CLABSIs reported in 2022 by unit. The CLABSI rate in ICUs (1.04/1,000 central line days) was higher than the rate in wards (0.95/1,000 central line days).

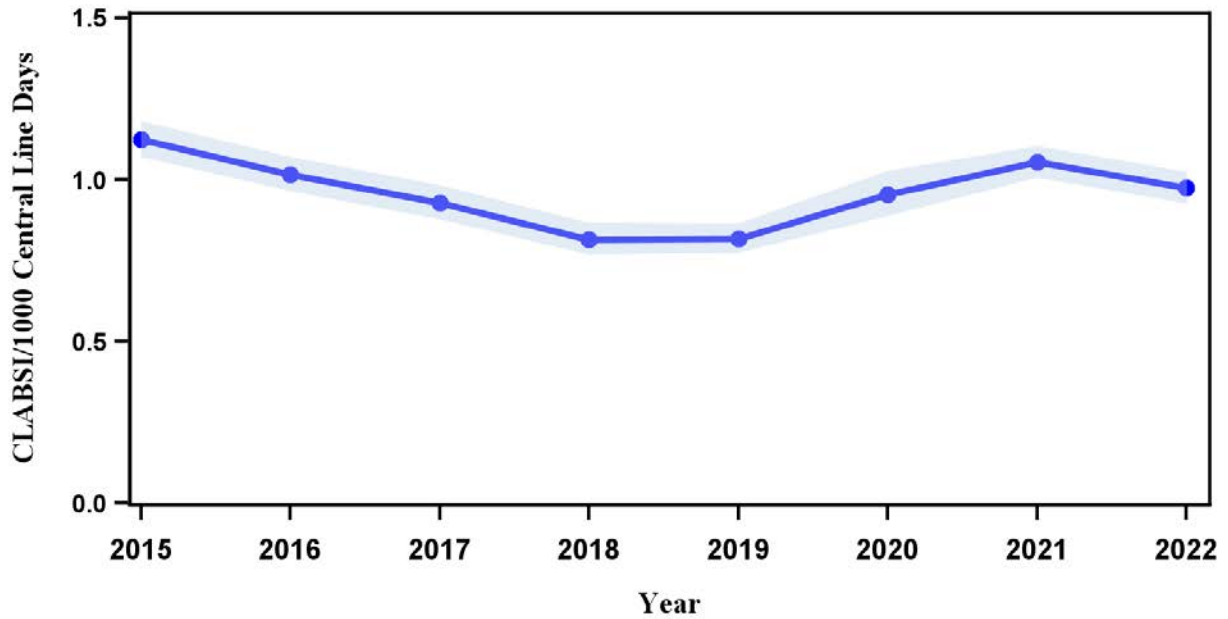
**Table 13. Central line-associated bloodstream infection (CLABSI) rates by unit,  
New York State 2022**

Unit	# Hospitals	# Exclusion	# CLABSI*	# Central Line Days	CLABSI Rate	# Patient Days	Device Utilization ratio
<b>Adult/Pediatric Intensive Care Units</b>							
Cardiothoracic ICU	28	30	44	69,527	0.63	107,113	64.9
Coronary ICU	33	9	68	37,541	1.81	99,675	37.7
Medical ICU	63	37	145	133,805	1.08	299,263	44.7
Medical Surgical ICU	92	5	125	129,836	0.96	310,257	41.8
Neurosurgical ICU	16	1	26	18,243	1.42	69,991	26.1
Pediatric ICU	27	12	43	35,996	1.20	99,094	36.3
Surgical ICU	40	10	67	75,758	0.88	177,117	42.8
<b>Subtotal Adult/Pediatric ICUs</b>	<b>152</b>	<b>104</b>	<b>518</b>	<b>500,706</b>	<b>1.04</b>	<b>1,162,510</b>	<b>43.1</b>
<b>Neonatal Intensive Care Units</b>							
Neonatal ICU Level II/III	13	0	3	3,526	0.85	31,177	11.3
Neonatal ICU Level III	24	0	16	11,440	1.40	88,674	12.9
Neonatal ICU RPC	17	1	50	58,839	0.85	255,761	23.0
<b>Subtotal Neonatal ICUs</b>	<b>54</b>	<b>1</b>	<b>69</b>	<b>73,805</b>	<b>0.94</b>	<b>375,612</b>	<b>19.6</b>
<b>Adult/Pediatric Wards</b>							
Medical Surgical Ward	126	13	195	261,923	0.74	2,555,796	10.2
Medical Ward	85	38	267	272,574	0.98	2,588,362	10.5
Pediatric ward	47	14	35	35,567	0.98	286,610	12.4
Surgical Ward	71	3	90	94,897	0.95	848,583	11.2
Step down unit	60	7	61	58,081	1.05	365,863	15.9
Mixed Acuity Ward	22	1	24	17,281	1.39	104,312	16.6
Oncology ward	24	231	250	230,035	1.09	464,248	49.6
Telemetry Ward	28	0	22	27,752	0.79	388,765	7.1
<b>Subtotal Adult/Pediatric Wards</b>	<b>160</b>	<b>307</b>	<b>944</b>	<b>998,110</b>	<b>0.95</b>	<b>7,602,539</b>	<b>13.1</b>
<b>Total Grand total</b>	<b>161</b>	<b>412</b>	<b>1,531</b>	<b>1,572,621</b>	<b>0.97</b>	<b>9,140,661</b>	<b>17.2</b>

<sup>1</sup>Excluding MBI, VAD, ECMO, PATINJ, MSbP, EB, IVPUS, and MSbP. New York State data as of June 15, 2023. CLABSI rates are per 1,000 central line days. Device utilization = 100\* central line days/patient days.

Figure 12 shows trends in CLABSI rates between 2015 and 2022. Between 2015 and 2022 the CLABSI rate decreased a statistically-significantly 13%, from 1.12 to 0.97 CLABSI per 1,000 central line days. CLABSI rates decreased a statistically-significantly 8% between 2021 and 2022 from 1.05 in 2021. CLABSI rates increased most likely due to longer hospital stays with severe co-morbidities requiring ICU admission with central lines during the COVID-19 pandemic in 2021 and recovering to pre-pandemic levels in 2022.

**Figure 12. Trends in central line-associated bloodstream infection (CLABSI) rates, New York State 2015-2022**



Year	# Hospitals	# CLABSI	# Central Line Days	CLABSI Rate (95% CI)	# Patient Days	Device Utilization ratio
2015	167	1,590	1,415,710	1.12 (1.07, 1.18)	8,178,130	17.3
2016	169	1,398	1,376,060	1.02 (0.96, 1.07)	8,122,132	16.9
2017	172	1,228	1,322,501	0.93 (0.88, 0.98)	8,077,737	16.4
2018	170	1,110	1,295,018	0.86 (0.81, 0.91)	8,248,580	15.7
2019	164	1,059	1,286,392	0.82 (0.77, 0.87)	8,244,594	15.6
2020	160	721	756,749	0.95 (0.88, 1.02)	4,171,360	18.1
2021	160	1,731	1,645,469	1.05 (1.00, 1.10)	9,179,052	17.9
2022	163	1,531	1,572,621	0.97 (0.92, 1.02)	9,140,661	17.2

New York State data as of June 15, 2023. Rates are per 1,000 central line days. Device utilization = 100\* central line days/patient days.

The distribution of microorganisms associated with CLABSIs is presented by location in Tables 14 and 15. Enterococci and yeast were the most common organisms identified in adult and pediatric ICUs and wards. The most common organism identified in neonatal ICUs was *Staphylococcus aureus*.

**Table 14. Microorganisms identified in CLABSIs, adult and pediatric intensive care units and wards, New York State 2022**

<b>Microorganism</b>	<b>Number of Isolates</b>	<b>Percent of Infections</b>
Enterococci	412	22.0
- VRE	(177)	(9.5)
Yeast	402	21.5
- <i>Candida auris</i>	(36)	(1.9)
Coagulase negative staphylococci	290	15.5
<i>Staphylococcus aureus</i>	208	11.1
- <i>Staphylococcus aureus</i> -MRSA	(74)	(4.0)
Klebsiella spp.	200	10.7
- CRE-Klebsiella	(21)	(1.1)
<i>Escherichia coli</i>	150	8.0
- CRE- <i>E. coli</i>	(1)	(0.1)
<i>Pseudomonas</i> spp.	73	3.9
Streptococci	68	3.6
<i>Enterobacter</i> spp.	59	3.2
- CRE- <i>Enterobacter</i>	(5)	(0.3)
<i>Proteus</i> spp.	38	2.0
<i>Serratia</i> spp.	32	1.7
<i>Stenotrophomonas</i> spp.	27	1.4
<i>Bacteroides</i> spp.	24	1.3
<i>Acinetobacter</i> spp.	19	1.0
- MDRO- <i>Acinetobacter</i>	(9)	(0.5)
<i>Citrobacter</i> spp.	13	0.7
<i>Fusobacterium</i> spp.	12	0.6
<i>Lactobacillus</i> spp.	12	0.6
Other	116	6.2

New York State data reported as of June 15, 2023. Out of 1,873 infections (includes MBI). No microorganisms identified for 0 infections. MRSA: methicillin-resistant *Staphylococcus aureus*; CRE: carbapenem-resistant Enterobacterales; spp: multiple species.

**Table 15. Microorganisms associated with CLABSIs, neonatal intensive care units, New York State 2022**

<b>Microorganism</b>	<b>Number of Isolates</b>	<b>Percent of Infections</b>
Coagulase negative staphylococci	19	27.1
<i>Staphylococcus aureus</i>	13	18.6
- <i>Staphylococcus aureus</i> -MRSA	(4)	(5.7)
Enterococci	10	14.3
<i>Escherichia coli</i>	8	11.4
Klebsiella spp.	8	11.4
Enterobacter spp.	1	1.4
Other	18	25.7

New York State data reported as of June 15, 2023. Out of 70 infections (includes MBI). No microorganisms identified for 0 infections. MRSA: methicillin-resistant *Staphylococcus aureus*; CRE: carbapenem-resistant Enterobacterales; spp: multiple species.

### **Risk Factors for CLABSIs**

Hospitals do not collect patient-specific risk factors for CLABSIs; NHSN requires reporting of only the total number of patient days and total number of central line days per month within each hospital location. CLABSI rates are stratified by location type. For CLABSIs in neonatal intensive care units (NICUs), the data are collected by birth weight group because babies with lower birth weights are more susceptible to CLABSIs than babies with higher birth weights. No risk adjustment is performed by birth weight group in Level II/III facilities due to the small number of CLABSIs. Babies weighing less than or equal to 1000 grams were 2.6 times more likely to develop a CLABSI than babies weighing 1001 grams or more.

### **Hospital-Specific, Location-Specific CLABSI Rates**

Within NYS, hospital specific CLABSI rates were compared to the state average by hospital location type. The CLABSI rates in Table 16 (ICUs) and Table 17 (wards) help hospitals target their CLABSI reduction efforts to specific locations. Overall, 25 high-rate flags will be addressed in CLABSI improvement plans by 17 affected hospitals.

**Table 16. Central line-associated bloodstream infection rates by intensive care unit type, New York State 2022**

Hospital	Coronary ICU		Cardiothoracic ICU		Medical ICU		Medical Surgical ICU		Surgical ICU		Neurosurgical ICU		Pediatric ICU		Neonatal ICU		
	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	NICU level	CLABSI/CL Days	Adj Rate
<b>State Average Rate</b>	<b>1.81</b>		<b>0.63</b>		<b>1.08</b>		<b>0.96</b>		<b>0.88</b>		<b>1.43</b>		<b>1.19</b>		<b>RPC=0.85, Lev 3=1.40, Lev 2/3=0.85</b>		
Adirondack Medical							1/371	2.7									
Albany Med Ctr	2/1858	1.1	2/2711	0.7	3/4077	0.7			1/5450	0.2			5/1922	2.6	RPC	2/3987	0.4
Arnot Ogden Med Ctr							1/1673	0.6							Lev 3	2/1347	1.8
Auburn Memorial							1/1563	0.6									
Bellevue Hospital	10/3175	3.1	1/843	1.2	5/2050	2.4			0/1430	0.0	2/729	2.7	0/230	0.0	RPC	5/1935	2.3
Bon Secours							0/260	0.0									
Bronx-Lebanon	0/586	0.0			5/2926	1.7							NA	NA	Lev 3	0/277	0.0
Brookdale Hospital	1/589	1.7			2/2332	0.9			2/2150	0.9	1/439	2.3	NA	NA	Lev 3	1/133	7.0
Brooklyn Hosp Ctr	0/490	0.0			0/1075	0.0							NA	NA	Lev 3	0/668	0.0
Brooks Memorial							0/817	0.0									
Buffalo General			2/3348	0.6	11/6644	1.7			2/1923	1.0	1/1503	0.7					
Canton-Potsdam							2/429	4.7									
Cayuga Medical Ctr							2/1059	1.9									
Champlain Valley							3/1852	1.6									
Claxton-Hepburn							0/794	0.0									
Clifton Springs					0/330	0.0											
Cohens Childrens													1/3219	0.3	RPC	2/4600	0.5
Columbia Memorial							3/924	3.2									
Corning Hospital							0/314	0.0									
Cortland Reg Med					0/257	0.0											
Crouse Hospital							0/3848	* 0.0							RPC	6/4249	1.2
Ellis Hospital					0/2483	0.0			0/2602	0.0							
Elmhurst Hospital	0/382	0.0			0/1035	0.0			0/856	0.0					Lev 2/3	0/295	0.0
Erie County Med Ctr					7/3529	2.0											
FF Thompson					3/1351	2.2											
Faxton St. Lukes							5/2555	2.0									
Flushing Hospital					3/1178	2.5	0/260	0.0							Lev 3	1/336	2.8
Garnet Catskills							1/673	1.5									
Garnet Middletown							1/3149	0.3									
Geneva General							0/1068	0.0									
Glen Cove Hospital							0/537	0.0									
Glens Falls Hospital							1/1807	0.6									
Good Samar. Suffern			0/648	0.0	0/1648	0.0			0/702	0.0							
Good Samar. W Islip	0/61	0.0	0/995	0.0	1/3500	0.3			0/2280	0.0	0/489	0.0	0/139	0.0	Lev 3	0/751	0.0
Harlem Hospital	1/462	2.2			0/134	0.0	4/1867	2.1					NA	NA	Lev 3	0/410	0.0
HealthAlli Broadway							2/1031	1.9									
Highland Hospital							7/2027	^ 3.5									
Hosp for Spec Surg							0/86	0.0									
Huntington Hospital	0/725	0.0			NA	NA	0/551	0.0									
Interfaith Med Ctr							1/1916	0.5									
JT Mather Hospital							2/2196	0.9									
Jacobi Med Ctr	1/904	1.1			2/1485	1.3			2/1271	1.6			NA	NA	Lev 3	1/1234	0.8

**Table 16. Central line-associated bloodstream infection rates by intensive care unit type, New York State 2022**

Hospital	Coronary ICU		Cardiothoracic ICU		Medical ICU		Medical Surgical ICU		Surgical ICU		Neurosurgical ICU		Pediatric ICU		Neonatal ICU		
	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	NICU level	CLABSI/CL Days	Adj Rate
<b>State Average Rate</b>	<b>1.81</b>		<b>0.63</b>		<b>1.08</b>		<b>0.96</b>		<b>0.88</b>		<b>1.43</b>		<b>1.19</b>		<b>RPC=0.85, Lev 3=1.40, Lev 2/3=0.85</b>		
Jamaica Hospital					2/2283	0.9			1/1105	0.9					Lev 3	1/544	1.5
Jones Memorial								0/216	0.0								
Kenmore Mercy								0/1532	0.0								
Kings County Hosp					7/2261	^ 3.1			5/1672	^ 3.0			0/58	0.0	Lev 2/3	0/760	0.0
LJ at Forest Hills					0/1657	0.0											
LJ at Valley Stream								2/1225	1.6								
Lenox Hill Hospital	5/961	5.2	2/2046	1.0	0/1113	0.0	NA	NA	2/918	2.2					Lev 2/3	0/666	0.0
Lincoln Med Ctr					5/3214	1.6			1/1054	0.9					Lev 3	1/274	3.9
Long Isl Jewish(LIJ)	2/607	3.3			2/2816	0.7	0/835	0.0	0/909	0.0							
Long Isl. Community	0/708	0.0			1/917	1.1			0/462	0.0							
Maimonides Med Ctr	4/1007	4.0	2/2099	1.0	2/1049	1.9			3/1093	2.7			1/431	2.3	RPC	0/1029	0.0
Mary Imogene Bassett								3/3055	1.0								
Memor SloanKettering								14/4719	^ 3.0				0/884	0.0			
Mercy Hosp Buffalo			0/1286	0.0				3/3000	1.0								
Mercy Med Ctr								0/1043	0.0						Lev 3	0/115	0.0
Metropolitan Hosp								1/867	1.2						Lev 2/3	0/313	0.0
MidHudson Reg of WMC								0/1735	0.0								
Millard Fill. Suburb								0/3262	* 0.0								
Montefiore-Einstein			1/505	2.0	3/2359	1.3			2/1069	1.9					RPC	8/2607	^ 2.7
Montefiore-Moses	7/1821	3.8	4/2643	1.5	4/1056	3.8			5/1301	^ 3.8			2/2653	0.8			
Montefiore-Mt Vernon								1/72	13.9								
Montefiore-NewRochl								2/1350	1.5								
Montefiore-Nyack					1/895	1.1			0/790	0.0							
Montefiore-Wakefield					0/1391	0.0									Lev 2/3	1/267	3.7
Mount St. Marys					0/1654	0.0											
Mt Sinai	5/1364	3.7	1/4640	0.2	0/1810	0.0			2/2081	1.0	2/1389	1.4	2/2220	0.9	RPC	3/3219	1.1
Mt Sinai Beth Israel	0/482	0.0						0/1656	0.0								
Mt Sinai Brooklyn								1/1113	0.9								
Mt Sinai Queens								0/575	0.0								
Mt Sinai St Lukes	1/1039	1.0	0/1035	0.0	1/1308	0.8			0/500	0.0							
Mt Sinai West					0/407	0.0		1/1405	0.7			0/179	0.0		Lev 3	0/966	0.0
NY Community Hosp								0/832	0.0								
NYP-Allen								4/1087	^ 3.7								
NYP-Brklyn Methodist	1/731	1.4	0/1049	0.0				1/3233	0.3			NA	NA	Lev 3	2/1109	1.6	
NYP-Columbia	4/4823	0.8	3/7372	0.4	8/4735	1.7			2/2899	0.7	4/1561	2.6					
NYP-Hudson Valley								1/1183	0.8						Lev 2/3	NA	NA
NYP-Lawrence					1/1503	0.7											
NYP-Lower Manhattan								2/1266	1.6								
NYP-Morgan Stanley												14/6655	2.1	RPC	5/7260	0.8	
NYP-Queens			0/807	0.0				0/2549	0.0					Lev 3	0/401	0.0	
NYP-Weill Cornell	2/3188	0.6	1/4506	0.2	5/3718	1.3			4/2366	1.7	5/1165	4.3	3/2021	1.5	RPC	3/3476	1.0
NYU Langone Brooklyn					0/721	0.0			0/503	0.0	0/558	0.0			Lev 2/3	0/56	0.0

**Table 16. Central line-associated bloodstream infection rates by intensive care unit type, New York State 2022**

Hospital	Coronary ICU		Cardiothoracic ICU		Medical ICU		Medical Surgical ICU		Surgical ICU		Neurosurgical ICU		Pediatric ICU		Neonatal ICU		
	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	NICU level	CLABSI/CL Days	Adj Rate
<b>State Average Rate</b>	<b>1.81</b>		<b>0.63</b>		<b>1.08</b>		<b>0.96</b>		<b>0.88</b>		<b>1.43</b>		<b>1.19</b>		<b>RPC=0.85, Lev 3=1.40, Lev 2/3=0.85</b>		
NYU Orthopedic Hosp									0/83	0.0							
NYU Tisch	4/2146	1.9			4/4448	0.9			4/6867	0.6	0/1148	0.0	5/4578	1.1	RPC	1/2912	0.4
NYU Winthrop					1/2217	0.5			2/2593	0.8	2/466	4.3	0/377	0.0	RPC	0/1344	0.0
Nassau University	1/758	1.3			0/1376	0.0			2/1093	1.8					Lev 3	0/274	0.0
Nathan Littauer								0/297	0.0								
Newark Wayne					2/1143	1.7											
Niagara Falls								2/1267	1.6								
North Central Bronx								2/912	2.2								
North Shore	5/2208	2.3	2/4473	0.4	4/2831	1.4			2/2288	0.9	2/1157	1.7			RPC	0/1554	0.0
Northern Dutchess								2/598	3.3								
Northern Westchester								0/575	0.0						Lev 3	NA	NA
Noyes Memorial								0/647	0.0								
Oishei Childrens													0/2219	0.0	RPC	0/4947	* 0.0
Olean General								2/1216	1.6								
Oneida Healthcare								0/605	0.0								
Oswego Hospital					0/399	0.0											
Our Lady of Lourdes								1/890	1.1								
Peconic Bay Medical								0/852	0.0								
Phelps Memorial								1/840	1.2								
Plainview Hospital								0/1236	0.0								
Queens Hospital					2/2227	0.9									Lev 3	1/353	2.7
Richmond Univ MC	0/423	0.0			7/2757	2.5			0/1323	0.0			NA	NA	Lev 3	1/550	1.6
Rochester General	1/1342	0.7	2/3101	0.6	2/4169	0.5			5/2110	2.4							
Rome Memorial								0/382	0.0								
Roswell Park								2/2379	0.8								
SUNY Downstate MedCr	1/552	1.8			2/1281	1.6							0/145	0.0	RPC	0/796	0.0
Samaritan- Troy								5/2650	1.9								
Samaritan- Watertown								0/880	0.0								
Saratoga Hospital					3/1489	2.0											
Sisters of Charity								2/1513	1.3						Lev 3	2/651	3.1
South Brooklyn Healt	2/834	2.4			5/2330	2.1		NA	NA	2/1526	1.3				Lev 2/3	NA	NA
South Nassau Comm.								3/3125	1.0								
South Shore UHosp			0/1220	0.0				1/2314	0.4			0/307	0.0				
St Anthony								0/243	0.0								
St Barnabas					0/1299	0.0				0/820	0.0				Lev 2/3	1/191	5.2
St Catherine Siena	0/853	0.0						0/773	0.0								
St Charles Hospital					0/522	0.0											
St Elizabeth Medical			0/1684	0.0				2/2443	0.8								
St Francis- Roslyn			3/4061	0.7	0/1989	0.0				2/1746	1.1						
St Johns Episcopal	2/598	3.3			4/590	^ 6.8											
St Johns Riverside								2/1718	1.2								
St Joseph- Bethpage								0/1732	0.0								

**Table 16. Central line-associated bloodstream infection rates by intensive care unit type, New York State 2022**

Hospital	Coronary ICU		Cardiothoracic ICU		Medical ICU		Medical Surgical ICU		Surgical ICU		Neurosurgical ICU		Pediatric ICU		Neonatal ICU		
	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	NICU level	CLABSI/CL Days	Adj Rate
<b>State Average Rate</b>	<b>1.81</b>		<b>0.63</b>		<b>1.08</b>		<b>0.96</b>		<b>0.88</b>		<b>1.43</b>		<b>1.19</b>		<b>RPC=0.85, Lev 3=1.40, Lev 2/3=0.85</b>		
St Josephs- Syracuse					3/3538	0.8			0/4993	* 0.0					Lev 2/3	0/187	0.0
St Josephs- Yonkers							1/778	1.3									
St Lukes Cornwall							2/2625	0.8									
St Marys Amsterdam							1/722	1.4									
St Peters Hospital			0/1839	0.0	1/3252	0.3									Lev 3	3/400	^10.0
Staten Island U N			1/1215	0.8			6/4260	1.4	3/2144	1.4			0/93	0.0	Lev 3	0/228	0.0
Staten Island U S							4/1410	2.8									
Stony Brk Southamptn	0/50	0.0			2/617	3.2											
Stony Brook ELIH							NA	NA									
Strong Memorial			8/5281	^ 1.5	8/7745	1.0			9/5139	1.8			7/5338	1.3	RPC	8/6274	1.3
Syosset Hospital							0/526	0.0									
UHS Binghamton							1/424	2.4									
UHS Chenango Memor							0/240	0.0									
UHS Wilson			3/2443	1.2			6/2562	2.3							Lev 2/3	1/258	3.9
UPMC Chautauqua WCA					2/1180	1.7											
United Memorial							0/1021	0.0									
Unity Hosp Rochester							2/4795	0.4									
Univ Hosp SUNY Upst			1/2810	0.4	2/7127	* 0.3			0/2431	0.0	3/4675	0.6	0/1003	0.0			
Univ Hosp StonyBrook	1/891	1.1	1/1499	0.7	2/1935	1.0			0/1944	0.0	1/418	2.4	0/573	0.0	RPC	3/4046	0.8
Upst. Community Gen							0/1964	0.0									
Vassar Brothers							1/3933	0.3							Lev 2/3	0/339	0.0
Westchester Medical	5/923	5.4	4/3368	1.2	5/2913	1.7			2/1272	1.6	3/2060	1.5	3/1122	2.7	RPC	4/4604	0.9
White Plains Hosp							1/1454	0.7							Lev 3	0/60	0.0
Woodhull Med Ctr							0/1363	0.0							Lev 2/3	0/186	0.0
Wyckoff Heights					0/1526	0.0									Lev 3	0/339	0.0
Wyoming County Comm.							0/154	0.0									

New York State data reported as of June 15, 2023. — Significantly higher than state average. — Significantly lower than state average. — Same as state average. Rates are per 1000 central line days (CLDAYS). Excludes mucosal barrier injury (MBI)-CLABSIs and bloodstream infections associated with use of extracorporeal membrane oxygenation and ventricular assist devices, observed or suspected patient injection into a vascular line, known or suspected Munchausen Syndrome by Proxy (MSbP), epidermolysis bullosa (EB), pus at another vascular access device site matches an organism identified in the blood and Group B *Streptococcus* BSIs in infants during the first 6 days of life.

**Table 17. Central line-associated bloodstream infection rates by ward type, New York State 2022**

Hospital	Medical Wards		Medical Surgical Wards		Surgical Wards		Step Down Units		Pediatric Wards		Oncology Wards		Mixed Acuity Wards		Telemetry Wards	
	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate
<b>State Average Rate</b>	<b>0.98</b>		<b>0.74</b>		<b>0.95</b>		<b>1.05</b>		<b>0.98</b>		<b>1.09</b>		<b>1.39</b>		<b>0.79</b>	
AO Fox Memorial	0/418	0.0														
Adirondack Medical			0/723	0.0												
Albany Med Ctr	9/13627	0.7	1/2109	0.5	4/6937	0.6	1/1736	0.6	2/2503	0.8						
Alice Hyde Med Ctr			1/315	3.2									0/56	0.0		
Arnot Ogden Med Ctr			3/2057	1.5												
Auburn Memorial			0/1177	0.0	1/1076	0.9										
Bellevue Hospital	8/4639	1.7	1/1653	0.6	0/1168	0.0	4/1378	2.9	0/96	0.0						
Blithedale Childrens									2/3045	0.7						
Bon Secours			0/250	0.0	NA	NA										
Bronx-Lebanon	4/3952	1.0	8/2528	^ 3.2			2/334	6.0	NA	NA				1/554	1.8	
Brookdale Hospital	3/4753	0.6			2/983	2.0	0/426	0.0	0/53	0.0						
Brooklvn Hosp Ctr	0/1712	0.0	1/641	1.6			1/1325	0.8	NA	NA				2/255	^ 7.8	
Brooks Memorial			1/553	1.8												
Buffalo General	16/9723	1.6	4/1825	2.2	5/2274	2.2	13/5079	^ 2.6							3/2842	1.1
Canton-Potsdam			1/1122	0.9												
Cayuga Medical Ctr			0/1670	0.0					NA	NA						
Champlain Valley			3/2744	1.1			1/2044	0.5								
Claxton-Hepburn			0/1291	0.0												
Clifton Springs	1/594	1.7			0/295	0.0										
Cohens Childrens									3/2110	1.4	2/4919	0.4				
Columbia Memorial	0/790	0.0	3/2263	1.3												
Cornine Hospital	0/479	0.0			0/504	0.0										
Cortland Reg Med	0/330	0.0	0/525	0.0												
Crouse Hospital			2/8482	0.2												
Ellis Hospital	0/3427	* 0.0			0/808	0.0										
Elmhurst Hospital	1/3038	0.3	0/132	0.0	1/685	1.5			NA	NA			1/871	1.1		
Erie County Med Ctr			8/9923	0.8			1/2314	0.4								
EF Thompson	1/2360	0.4														
Faxton St. Lukes			0/1457	0.0	3/1348	2.2	1/1666	0.6	0/85	0.0	0/1565	0.0			0/860	0.0
Flushing Hospital			1/2211	0.5					NA	NA					0/456	0.0
Garnet Catskills			0/298	0.0	NA	NA										
Garnet Middletown	4/4844	0.8	0/941	0.0											1/964	1.0
Geneva General	0/652	0.0	1/672	1.5			0/51	0.0								
Glen Cove Hospital			0/399	0.0	0/73	0.0										
Glens Falls Hospital	1/2233	0.4	NA	NA	0/893	0.0					1/1821	0.5				
Good Samar. Suffern			2/3184	0.6												
Good Samar. W Islin	0/1887	0.0	2/1185	1.7	1/488	2.0	0/81	0.0	NA	NA	1/1607	0.6			1/1302	0.8
Harlem Hospital	0/1370	0.0			0/87	0.0			NA	NA						
HealthAlli Broadway	0/507	0.0	1/492	2.0	1/502	2.0										
Highland Hospital	3/4529	0.7	8/4348	^ 1.8	6/3043	2.0							5/3137	1.6		
Hosp for Spec Surg			0/1556	0.0			0/124	0.0	NA	NA						
Huntington Hospital	0/513	0.0	0/947	0.0	0/351	0.0			NA	NA	0/1031	0.0			0/145	0.0
Interfaith Med Ctr			0/3325	0.0												

**Table 17. Central line-associated bloodstream infection rates by ward type, New York State 2022**

Hospital	Medical Wards		Medical Surgical Wards		Surgical Wards		Step Down Units		Pediatric Wards		Oncology Wards		Mixed Acuity Wards		Telemetry Wards	
	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate
<b>State Average Rate</b>	<b>0.98</b>		<b>0.74</b>		<b>0.95</b>		<b>1.05</b>		<b>0.98</b>		<b>1.09</b>		<b>1.39</b>		<b>0.79</b>	
JT Mather Hospital			0/2628	0.0	0/782	0.0	0/932	0.0								
Jacobi Med Ctr	0/3373	* 0.0	1/1682	0.6	0/445	0.0	0/405	0.0	0/96	0.0						
Jamaica Hospital			5/2791	1.8	0/716	0.0							3/1083	2.8		
Jones Memorial			0/349	0.0												
Kenmore Mercv			0/3393	0.0	0/95	0.0										
Kings County Hosp	2/3658	0.5	2/3987	0.5	0/1004	0.0			0/92	0.0						
LJI at Forest Hills	0/1855	0.0	NA	NA	0/196	0.0									1/178	5.6
LJI at Vallev Stream			4/1655	2.4	NA	NA	NA	NA							0/280	0.0
Lenox Hill Hospital	1/2017	0.5	0/444	0.0	2/1603	1.2	2/721	2.8								
Lincoln Med Ctr	2/1826	1.1			2/1479	1.4	0/1560	0.0	NA	NA			NA	NA		
Long Isl Jewish(LIJ)	2/5724	0.3	0/1835	0.0	2/1825	1.1	NA	NA							2/3672	0.5
Long Isl. Community	3/1691	1.8	0/634	0.0									0/664	0.0		
Maimonides Med Ctr	19/5220	^ 3.6	3/577	^ 5.2			2/853	2.3	1/425	2.4					0/1136	0.0
Marv Imogene Bassett	2/1135	1.8	1/875	1.1	2/1614	1.2	0/1248	0.0					NA	NA		
Massena Memorial			0/154	0.0												
Memor SloanKettering											**/80964	1.3				
Mercv Hosp Buffalo	3/2530	1.2	0/650	0.0	3/1899	1.6	0/1245	0.0								
Mercv Med Ctr	2/306	6.5	0/124	0.0	NA	NA	1/315	3.2			1/739	1.4			0/689	0.0
Metronolitan Hosp	1/1003	1.0			0/400	0.0			NA	NA						
MidHudson Reg of			1/1011	1.0			1/507	2.0	NA	NA						
Millard Fill. Suburb			4/7865	0.5												
Montefiore-Einstein	8/4447	1.8			2/2304	0.9					5/1243	^ 4.0			0/1934	0.0
Montefiore-Moses	27/10407	^ 2.6	1/1108	0.9	7/2419	^ 2.9			6/4124	1.5	0/3977	* 0.0				
Montefiore-Mt Vernon			0/61	0.0			NA	NA								
Montefiore-NewRochl			1/524	1.9	1/581	1.7	1/724	1.4								
Montefiore-Nvack			1/1829	0.5			0/570	0.0	0/527	0.0						
Montefiore-Wakefield	3/2971	1.0	0/462	0.0											1/445	2.2
Mount St. Marvs			0/1781	0.0												
Mt Sinai	7/4688	1.5	10/4775	^ 2.1	8/2861	^ 2.8	7/1640	^ 4.3	2/627	3.2	18/13909	1.3			0/380	0.0
Mt Sinai Beth Israel	0/1492	0.0	0/224	0.0	0/476	0.0							NA	NA	0/410	0.0
Mt Sinai Brooklvn	0/2378	0.0			0/563	0.0	0/238	0.0								
Mt Sinai Queens	2/1399	1.4	0/934	0.0			0/229	0.0								
Mt Sinai St Lukes	2/2218	0.9	1/522	1.9	0/880	0.0										
Mt Sinai West	0/1929	0.0	1/1924	0.5	1/612	1.6										
NY Community Hosp			0/184	0.0			1/764	1.3								
NYP-Allen	3/1998	1.5	0/554	0.0												
NYP-Brklvn	2/3213	0.6	3/3898	0.8	1/861	1.2	0/231	0.0	0/133	0.0						
NYP-Columbia	27/10335	^ 2.6	7/7786	0.9	3/4252	0.7					9/12049	0.7				
NYP-Hudson Valle			1/1908	0.5									0/633	0.0		
NYP-Lawrence			3/3234	0.9					NA	NA						
NYP-Lower			0/1189	0.0												
NYP-Morgan Stanley									10/8057	1.2						
NYP-Queens	0/5594	* 0.0	NA	NA	0/1555	0.0	0/96	0.0								

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Hospital	Medical Wards		Medical Surgical Wards		Surgical Wards		Step Down Units		Pediatric Wards		Oncology Wards		Mixed Acuity Wards		Telemetry Wards	
	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate
<b>State Average Rate</b>	<b>0.98</b>		<b>0.74</b>		<b>0.95</b>		<b>1.05</b>		<b>0.98</b>		<b>1.09</b>		<b>1.39</b>		<b>0.79</b>	
NYP-Weill Cornell	10/9504	1.1	1/3924	0.3	2/3129	0.6	0/577	0.0	0/1024	0.0	21/13374	1.6				
NYU Langone	0/3536	* 0.0			0/335	0.0	1/285	3.5	NA	NA						
NYU Orthopedic Hosp	1/345	2.9														
NYU Tisch	7/7952	0.9			8/8301	1.0			2/2277	0.9	2/5244	0.4				
NYU Winthrop	4/8641	0.5	1/879	1.1	1/2296	0.4			0/426	0.0						
Nassau University	2/2624	0.8	0/123	0.0	0/165	0.0			NA	NA						
Nathan Littauer			0/273	0.0												
Newark Wavne	0/1616	0.0													1/389	2.6
Niagara Falls					1/600	1.7	1/676	1.5								
North Central Bronx	0/536	0.0														
North Shore	2/4272	0.5	1/2126	0.5	5/3690	1.4	NA	NA			12/8787	1.4	1/559	1.8	1/1202	0.8
Northern Dutchess	NA	NA	0/1097	0.0												
Northern Westchester	1/1985	0.5			0/565	0.0			NA	NA						
Noves Memorial	0/832	0.0	0/145	0.0												
Oishei Childrens									1/1125	0.9	0/1775	0.0				
Olean General	1/2129	0.5			0/444	0.0										
Oneida Healthcare			1/1135	0.9												
Oswego Hospital			0/623	0.0												
Our Lady of Lourdes	4/4444	0.9	1/616	1.6	0/1468	0.0	0/78	0.0								
Peconic Bay Medical			0/2667	0.0			0/220	0.0								
Phelps Memorial	1/762	1.3	0/1033	0.0									NA	NA		
Plainview Hosnital	0/1264	0.0	0/1061	0.0			NA	NA							0/880	0.0
Putnam Hospital			1/1018	1.0									1/833	1.2		
Queens Hospital	1/2577	0.4	0/1493	0.0	0/788	0.0	0/469	0.0								
Richmond Univ MC	2/1912	1.0			0/318	0.0			NA	NA			3/842	3.6		
Rochester General	19/8421	^ 2.3	6/7453	0.8	4/4886	0.8	4/3176	1.3			5/4915	1.0	0/339	0.0	4/2997	1.3
Rome Memorial	0/373	0.0	0/341	0.0					NA	NA						
Roswell Park											25/27455	0.9				
SUNY Downstate	0/2022	0.0			0/503	0.0	1/899	1.1	0/84	0.0						
Samaritan- Troy			6/3655	1.6			0/1033	0.0								
Samaritan- Watertown	NA	NA	2/2825	0.7									NA	NA		
Saratoga Hospital	2/3340	0.6			0/240	0.0										
Sisters of Charity	0/2336	0.0	1/1735	0.6	0/1346	0.0										
Sisters- St Joseph					NA	NA										
South Brooklyn Healt	1/3477	0.3	0/178	0.0	0/1155	0.0	0/274	0.0								
South Nassau Comm.			5/5693	0.9			3/3750	0.8	NA	NA						
South Shore UHosp	0/551	0.0	5/3311	1.5			1/1180	0.8	NA	NA					NA	NA
St Anthonv			0/271	0.0												
St Barnabas	0/399	0.0	1/2298	0.4	0/242	0.0	0/693	0.0								
St Catherine Siena	3/2029	1.5			0/270	0.0										
St Charles Hospital			0/675	0.0												
St Elizabeth Medical			1/2193	0.5			1/1536	0.7								
St Francis- Roslyn			4/6218	0.6			0/1419	0.0								

**Table 17. Central line-associated bloodstream infection rates by ward type, New York State 2022**

Hospital	Medical Wards		Medical Surgical Wards		Surgical Wards		Step Down Units		Pediatric Wards		Oncology Wards		Mixed Acuity Wards		Telemetry Wards	
	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate	CLABSI/CL Days	Rate
<b>State Average Rate</b>	<b>0.98</b>		<b>0.74</b>		<b>0.95</b>		<b>1.05</b>		<b>0.98</b>		<b>1.09</b>		<b>1.39</b>		<b>0.79</b>	
St Johns Dobbs Ferry			NA	NA												
St Johns Episcopal			4/1953	2.0												
St Johns Riverside	1/1645	0.6	0/978	0.0											0/563	0.0
St Josephs- Bethpage			1/480	2.1			0/191	0.0					0/90	0.0	1/383	2.6
St Josephs- Syracuse			4/9307	0.4							1/1788	0.6			0/1242	0.0
St Josephs- Yonkers			0/616	0.0												
St Lukes Cornwall			4/3713	1.1									NA	NA		
St Marvs Amsterdam			1/521	1.9	0/484	0.0										
St Peters Hospital	4/7283	0.5	0/4316	* 0.0			1/2523	0.4			1/3082	0.3	4/2766	1.4		
Staten Island U N			10/2706	^ 3.7	1/492	2.0	NA	NA	0/191	0.0					1/360	2.8
Staten Island U S			0/457	0.0												
Stony Brk Southamptn			1/1329	0.8												
Stony Brook ELIH			0/121	0.0												
Strone Memorial	19/17002	1.1			4/4277	0.9	0/603	0.0	1/3933	0.3	17/14922	1.1				
Sunnyview Rehab			0/88	0.0												
Svosset Hospital	0/279	0.0			NA	NA										
UHS Binghamton			1/1464	0.7												
UHS Chenango			0/256	0.0												
UHS Wilson			2/2285	0.9			0/463	0.0			2/2078	1.0	2/613	3.3	1/2306	0.4
UPMC Chautauqua	1/1398	0.7	2/1535	1.3									0/392	0.0		
United Memorial	0/993	0.0			0/704	0.0										
Unity Hosp Rochester			8/16423	0.5												
Univ Hosp SUNY	3/6984	0.4	2/6513	0.3			1/1830	0.5	1/1252	0.8	11/10255	1.1				
Univ Hosp	5/5188	1.0			6/6997	0.9	0/426	0.0	2/420	4.8	3/5108	0.6	2/1422	1.4		
Unst. Community Gen	0/1800	0.0	0/1001	0.0												
Vassar Brothers			0/5823	* 0.0					NA	NA			2/2882	0.7		
Westchester Medical	4/2291	1.7	12/9979	1.2			5/3934	1.3	2/2624	0.8	9/7428	1.2				
White Plains Hosp			1/3252	0.3			1/2011	0.5								
Woodhull Med Ctr			1/2303	0.4	0/196	0.0	1/592	1.7	NA	NA						
Wyckoff Heights			1/2826	0.4			1/331	3.0	NA	NA					1/928	1.1

New York State data reported as of June 15, 2023. — Significantly higher than state average. — Significantly lower than state average. — Same as state average. Rates are per 1000 central line days (CLDAYS). Excludes mucosal barrier injury (MBI)-CLABSIs and bloodstream infections associated with use of extracorporeal membrane oxygenation and ventricular assist devices, observed or suspected patient injection into a vascular line, known or suspected Munchausen Syndrome by Proxy (MSbP), epidermolysis bullosa (EB), pus at another vascular access device site matches an organism identified in the blood and Group B *Streptococcus* BSIs in infants during the first 6 days of life.

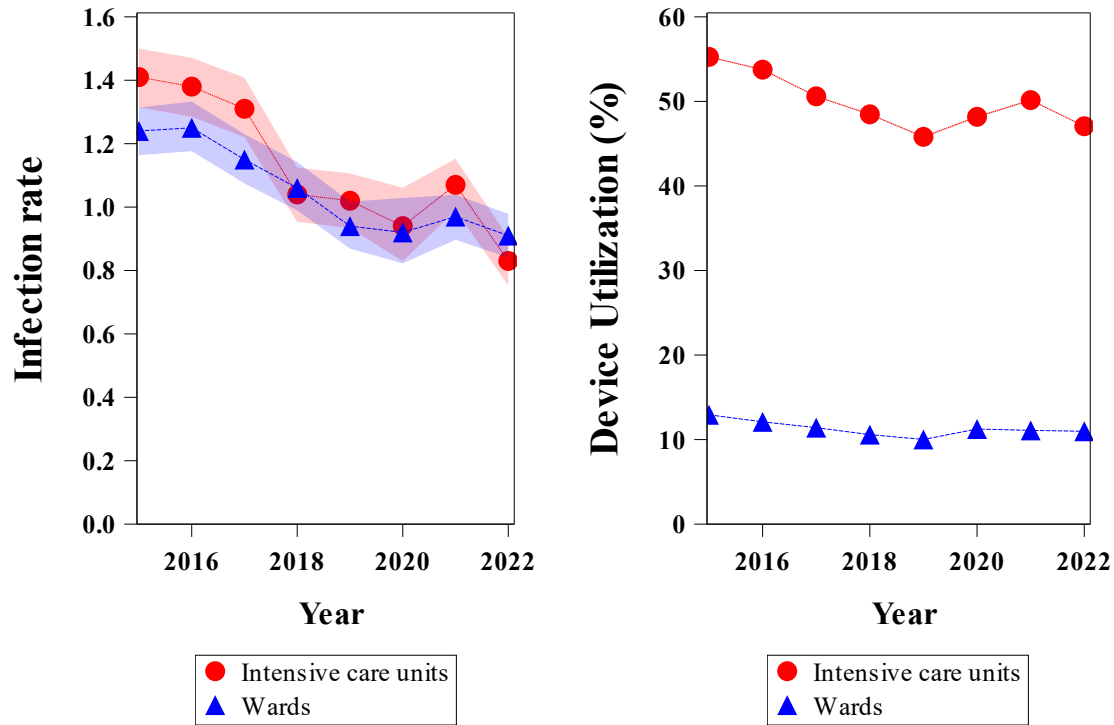
# Catheter-Associated Urinary Tract Infections (CAUTIs)

To determine if a patient has a healthcare associated CAUTI, the CDC developed surveillance definitions based on urinary catheter usage, symptoms, and laboratory results. These definitions are used by all facilities entering data into NHSN. Hospitals track the number of CAUTIs, the number of urinary catheter days, and the number of patient days per month.

While CAUTI reporting is not required by NYSDOH, these data are available via the CDC-NYS Data Use Agreement (DUA). This DUA prohibits NYSDOH from publishing hospital-specific rates. NYSDOH does not audit these data.

Between 2015 and 2022, the CAUTI rate declined a statistically-significantly 33%, from 1.31 infections per 1,000 urinary catheter days in 2015, to 0.87 infections per 1,000 urinary catheter days in 2022. The decline was slightly greater in ICUs (41%) than in wards (25%). Urinary catheter utilization decreased from 55% to 47% in ICUs, and from 13% to 11% in wards (Figure 13). Between 2021 and 2022 CAUTI rates and device utilization decreased slightly both in ICUs and wards.

Figure 13. CAUTIs and device utilization rates, New York State 2015-2022



year	Location	# Hospitals	# Catheter associated urinary tract infections	# Urinary catheter days	Catheter associated urinary tract infection rate <sup>1</sup>	# Patient days	Device utilization rate
2015	Intensive Care Unit	157	901	641,269	1.41	1,160,365	55.3
2021	Intensive Care Unit	154	675	632,372	1.07	1,262,015	50.1
2022	Intensive Care Unit	152	467	565,521	0.83	1,201,632	47.1
2015	Medical and Surgical Ward	167	987	812,276	1.22	6,332,292	12.8
2021	Medical and Surgical Ward	161	725	749,647	0.97	6,766,240	11.1
2022	Medical and Surgical Ward	160	678	747,073	0.91	6,803,418	11.0
2015	Total	169	1888	1,453,545	1.30	7,492,657	19.4
2021	Total	164	1400	1,382,019	1.01	8,028,255	17.2
2022	Total	163	1145	1,312,594	0.87	8,005,050	16.4

<sup>1</sup> Infection rate is the number of infections divided by the number of urinary catheter days, multiplied by 1,000.

<sup>2</sup> Device utilization is the number of urinary catheter days divided by the number of patient days.

Data reported as of June 15, 2023.

The most common microorganism identified in CAUTIs in intensive care units and medical surgical wards was *E. coli*. (Table 18).

**Table 18. Microorganisms identified in CAUTIs, New York State 2022**

<b>Microorganism</b>	<b>Number of Isolates</b>	<b>Percent of Infections</b>
<i>Escherichia coli</i>	324	29.8
- CRE- <i>E. coli</i>	(2)	(0.2)
Klebsiella spp.	238	21.9
- CRE-Klebsiella	(12)	(1.1)
Pseudomonas spp.	197	18.1
Enterococci	190	17.5
- VRE	(62)	(5.7)
Proteus spp.	77	7.1
Enterobacter spp.	46	4.2
- CRE-Enterobacter	(7)	(0.6)
Coagulase negative staphylococci	26	2.4
Citrobacter spp.	17	1.6
<i>Staphylococcus aureus</i>	14	1.3
- <i>Staphylococcus aureus</i> -MRSA	(5)	(0.5)
<i>Morganella morganii</i>	13	1.2
Serratia spp.	12	1.1
Acinetobacter spp.	11	1.0
- MDRO-Acinetobacter	(5)	(0.5)
Other	29	2.7

New York State data reported as of June 15, 2023. Out of 1,087 infections, no microorganisms identified for 0 infections.

CRE: carbapenem-resistant Enterobacterales.

MDR: multidrug resistant; MRSA: methicillin-resistant *Staphylococcus aureus*;

VRE: vancomycin-resistant Enterococci; spp: multiple species

# Infections from *Clostridioides difficile* and Multidrug Resistant Organisms (MDROs)

NYS requires hospitals to track *Clostridioides difficile* infections (CDIs) and carbapenem-resistant Enterobacterales (CRE) infections. CMS programs require hospitals to report methicillin-resistant *Staphylococcus aureus* (MRSA). *Candida auris* is an emerging healthcare-associated fungal pathogen.

CDI, CRE, and MRSA are reported following NHSN's *Laboratory-Identified (LabID) Event Reporting* protocol ([http://www.cdc.gov/nhsn/pdfs/pscmanual/12pscmdro\\_cdadcurrent.pdf](http://www.cdc.gov/nhsn/pdfs/pscmanual/12pscmdro_cdadcurrent.pdf)). The LabID surveillance method is a simple approach where cases are identified based on laboratory testing and hospital admission and discharge data, rather than by clinical chart review. Only specimens collected for clinical purposes are included (i.e., results of active surveillance testing on asymptomatic patients are excluded).

LabID numerator data (i.e., admission date and specimen date) and denominator data (i.e., number of outpatient encounters, inpatient admissions, and patient days) are reported based on the location where the specimen was collected. Because CMS reporting programs are specific to certain types of locations, hospitals' inpatient areas are split for NHSN reporting purposes when they have specific CMS certification numbers. The NHSN reporting areas are:

- Outpatient (OP)
  - Emergency department (ED)
  - Observation units (OBS) – Location used to evaluate whether patients require an inpatient stay. Decision is typically made within 24 hours.
- Inpatient rehabilitation facilities or units (IRF) - These units care for patients following traumatic physical injuries (e.g., joint replacement surgery), neurological problems (e.g., stroke, traumatic brain injury and spinal cord injury), and cardiopulmonary illness (e.g., ventilator weaning).
- Inpatient psychiatric facilities or units (IPF) - These units cover multiple behavioral health issues including mental illness and alcohol/drug addiction. If the units do not have a separate CMS certification number from the hospital, they are reported as FWI.
- Facility-wide inpatient (FWI) – all inpatient areas excluding IRF and IPFs. For CDI reporting, well baby nurseries and neonatal ICUs are also excluded from surveillance because babies may carry *Clostridioides difficile* naturally.

# ***Clostridioides difficile* Infections (CDI)**

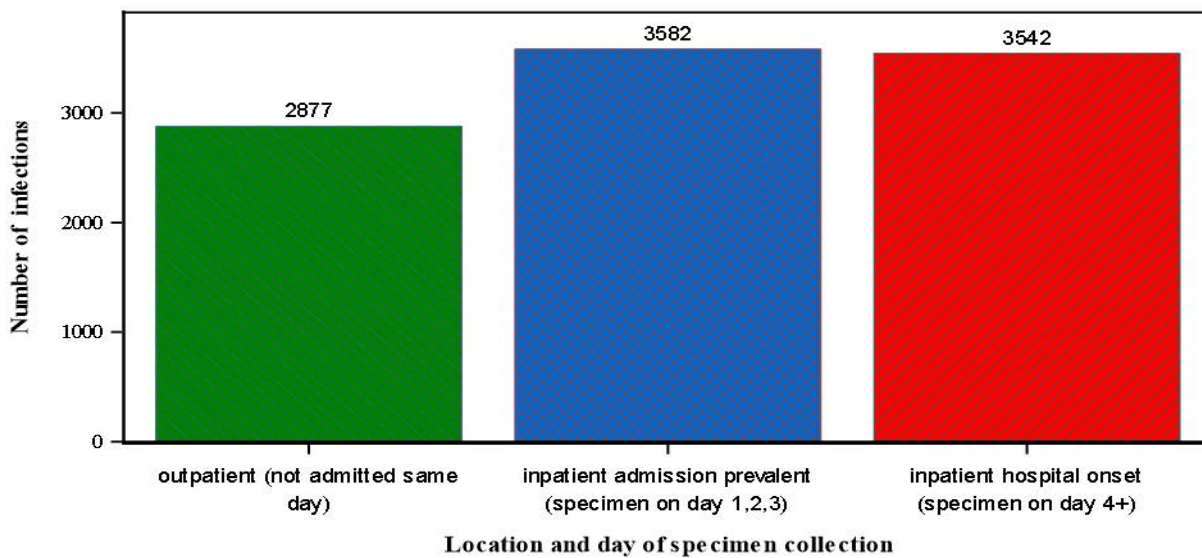
In NHSN, CDI cases are identified as a positive laboratory test in a facility and is known as a LabID event.

CDI cases are categorized based on when the specimen is collected in relation to the admission date. In this report,

- “Outpatient” are cases where the positive stool sample was obtained in the emergency department (ED) or observation unit (OBS).
- “Admission prevalent” are cases where the positive stool sample was obtained during the first three days of the patient’s inpatient stay.
- “Community onset” (CO) cases are LabID events identified within the first 3 days of admission where the patient was not discharged from the same hospital within the previous 4 weeks.
- “Community-onset healthcare facility-associated” (CO-HCFA) cases are LabID events identified within the first 3 days of admission in a person with a documented overnight stay in a healthcare facility in the previous 12 weeks.
- “Hospital-onset (HO)” cases are where the positive stool sample was obtained on day 4 or later of the hospital stay.

CDI cases are also classified based on whether the patient recently had another positive CDI test. Cases occurring more than 8 weeks after a previous positive test in the same patient at the same hospital are considered “incident” (i.e., new), as are cases when the positive test is the first for that patient. Cases occurring more than 2 weeks and less than or equal to 8 weeks after a previous positive test are considered “recurrent”. Cases occurring less than or equal to 2 weeks after a previous positive are considered duplicates (1). In 2022, 10,0001 CDI events were reported by acute care hospitals: 29% were identified in ED/OBS units (outpatient), 36% were identified in the facility wide inpatient (FWI) areas during the first 3 days of hospitalization, and 35% were identified in the FWI areas after the first 3 days of inpatient stay (Figure 14).

**Figure 14. *Clostridioides difficile* infections, New York State, 2022**



Data reported as of June 15, 2023. Includes recurrent cases. Excludes inpatient rehabilitation and inpatient psychiatric facilities.

## Laboratory Testing for CDI

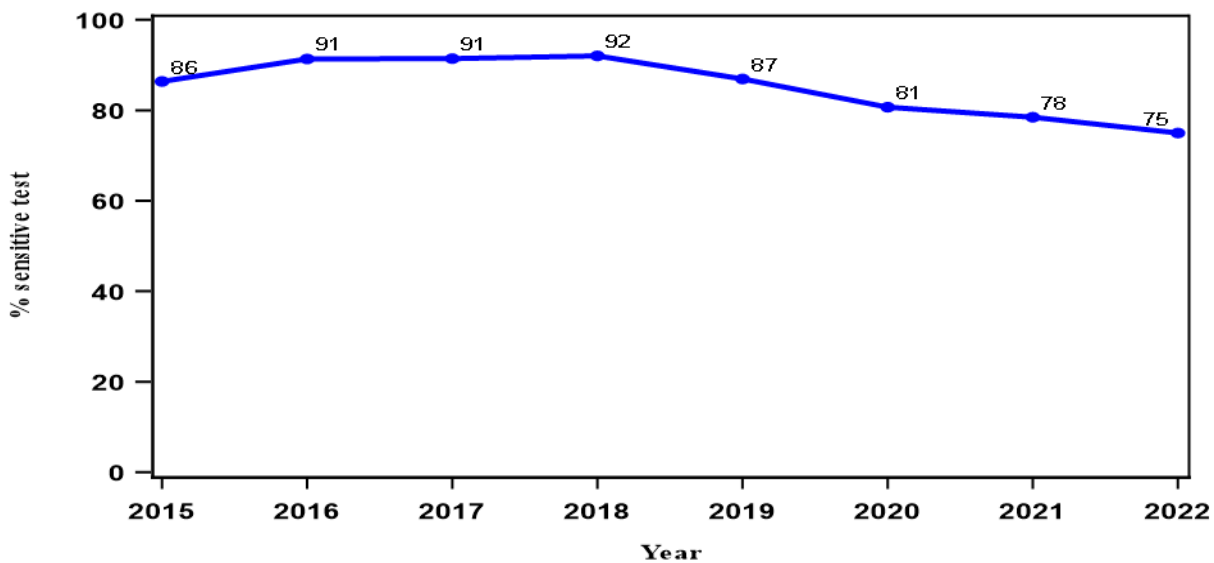
Several CDI laboratory testing methods are available. The methods vary in sensitivity (ability to detect a true positive), specificity (ability to detect a true negative), timeliness, and cost. Testing methods may have an impact on observed CDI rates, with an increased number of cases detected with a change to a more sensitive test method such as nucleic acid amplification tests (NAAT). Table 19 summarizes the testing methods reported by hospitals in December 2022.

**Table 19. *C. difficile* test method, New York State Hospitals, December 2022**

Test method	Sensitive or less sensitive	Number (%) of hospitals
Enzyme immunoassay (EIA) for toxin	Less sensitive	6 (4%)
Glutamate dehydrogenase (GDH) antigen plus EIA for toxin (2-step algorithm)	Less sensitive	9 (5%)
Nucleic acid amplification tests (NAAT) plus EIA, if NAAT-positive (2-step algorithm)	Less sensitive	31 (19%)
GDH plus EIA for toxin, followed by NAAT for discrepant results	Sensitive	45 (27%)
GDH plus NAAT (2-step algorithm)	Sensitive	1 (1%)
NAAT	Sensitive	72 (44%)

The percentage of patient days surveilled using more sensitive tests decreased by 4% between 2021 and 2022 (Figure 15).

**Figure 15. Percent of sensitive laboratory test method usage for *C. difficile* in the summary data, New York State 2015-2022**



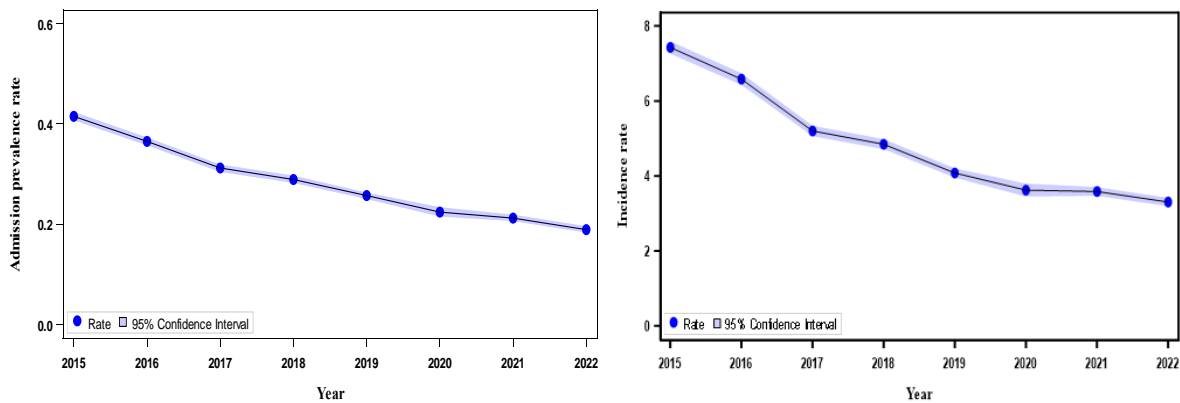
Data reported as of June 15, 2023.

## Admission prevalence and hospital onset CDI rates

The admission prevalence rate describes the percentage of patients admitted to hospitals with CDIs. In 2022, there were 3,585 of these cases out of 1,892,705 admissions, for a rate of 0.19% (Figure 16). This was a decrease of 54% compared to 2015.

The HO rate is defined as the number of incident events identified more than 3 days after hospital admission, per 10,000 patient-days, where an incident event is the first event for that patient in the same hospital or one that has been obtained more than 8 weeks after the most recent event for that patient in the same hospital. The HO rate was 3.30 per 10,000 patient-days in 2022 (Figure 17), a decrease of 53% compared to 2015.

**Figure 16. Trend in *C. difficile* admission prevalence and hospital onset incidence, New York State 2015-2022**



Data reported as of June 15, 2023. Excludes cases identified in the emergency room, inpatient rehabilitation facilities, and inpatient psychiatric facilities. Rate is number of nonduplicate CDI events per patient per month identified  $\leq 3$  days after admission to the facility per 100 admissions. HO Rate is number of incident CDI events identified  $>3$  days after admission to the facility per 10,000 patient days.

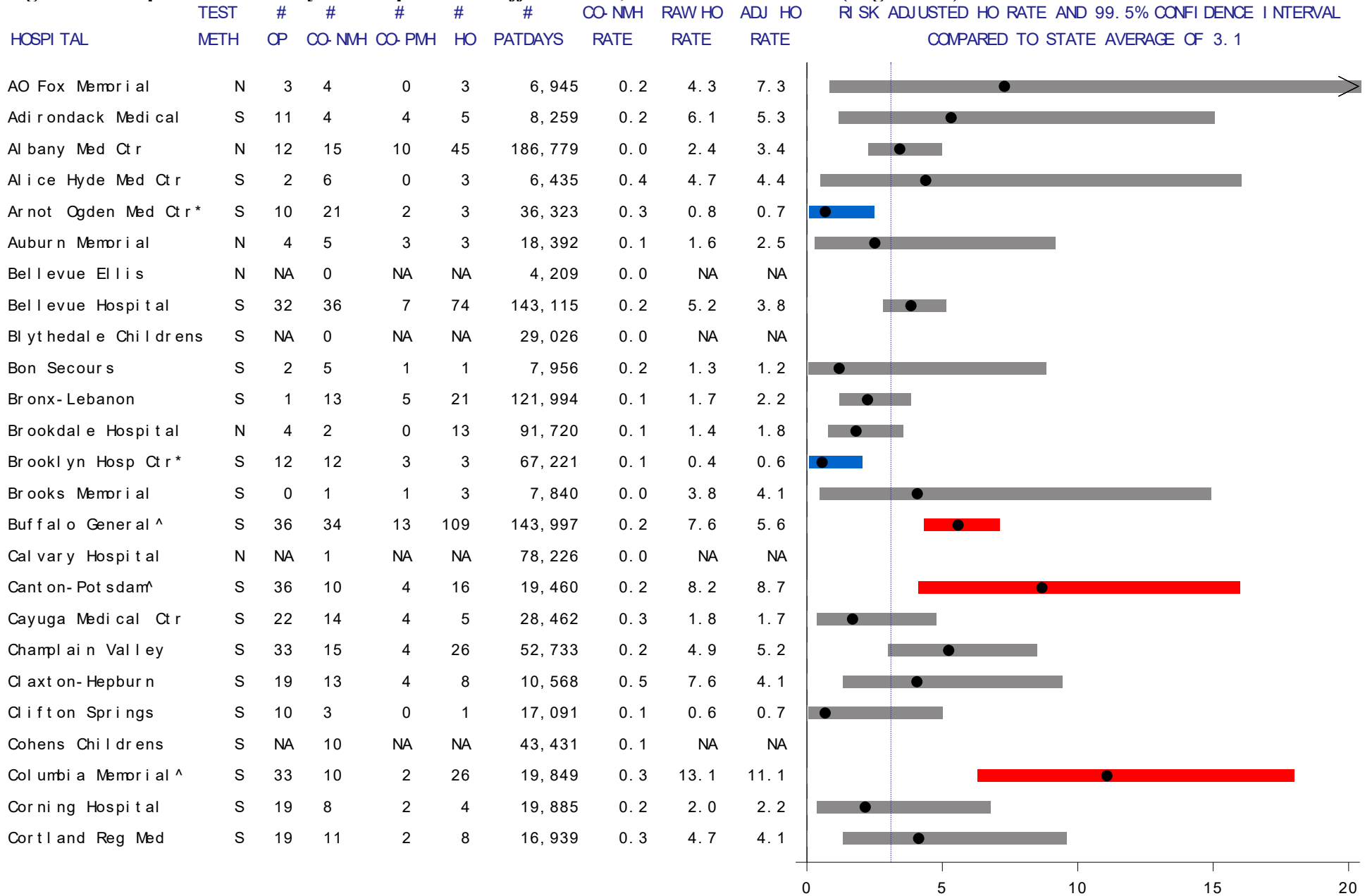
Year	# Hospitals	Admission Prevalence			Hospital Onset		
		Infection	Admissions	Prevalence rate	Infections	Patient Days	Hospital Onset Rate
2015	175	8,746	2,106,161	0.42	7,870	10,590,347	7.43
2016	178	7,698	2,111,418	0.36	6,932	10,525,449	6.59
2017	177	6,756	2,167,024	0.31	5,449	10,470,731	5.20
2018	175	6,237	2,157,554	0.29	5,058	10,450,692	4.84
2019	167	5,476	2,133,298	0.26	4,241	10,412,350	4.07
2020	165	2,139	952,832	0.22	1,708	4,717,353	3.62
2021	165	4,157	1,960,606	0.21	3,708	10,342,872	3.59
2022	164	3,585	1,892,705	0.189	3,402	10,297,945	3.30

## Risk Adjustment

Risk factors were identified by developing logistic regression models, and factors that were found to be statistically significantly associated with CDI incidence rates were used to calculate a risk-adjusted incidence rate. These facility-level rates were compared to the state incidence rate. The latest model included CDI test type, medical facility bed size, facility CO prevalence rate, and percent of patient days in adult ICUs, calculated by dividing the number of adult ICU patient days (from the CLABSI summary data) by the number of CDI patient days (from the MDRO summary data) in each facility as risk adjustment variables.

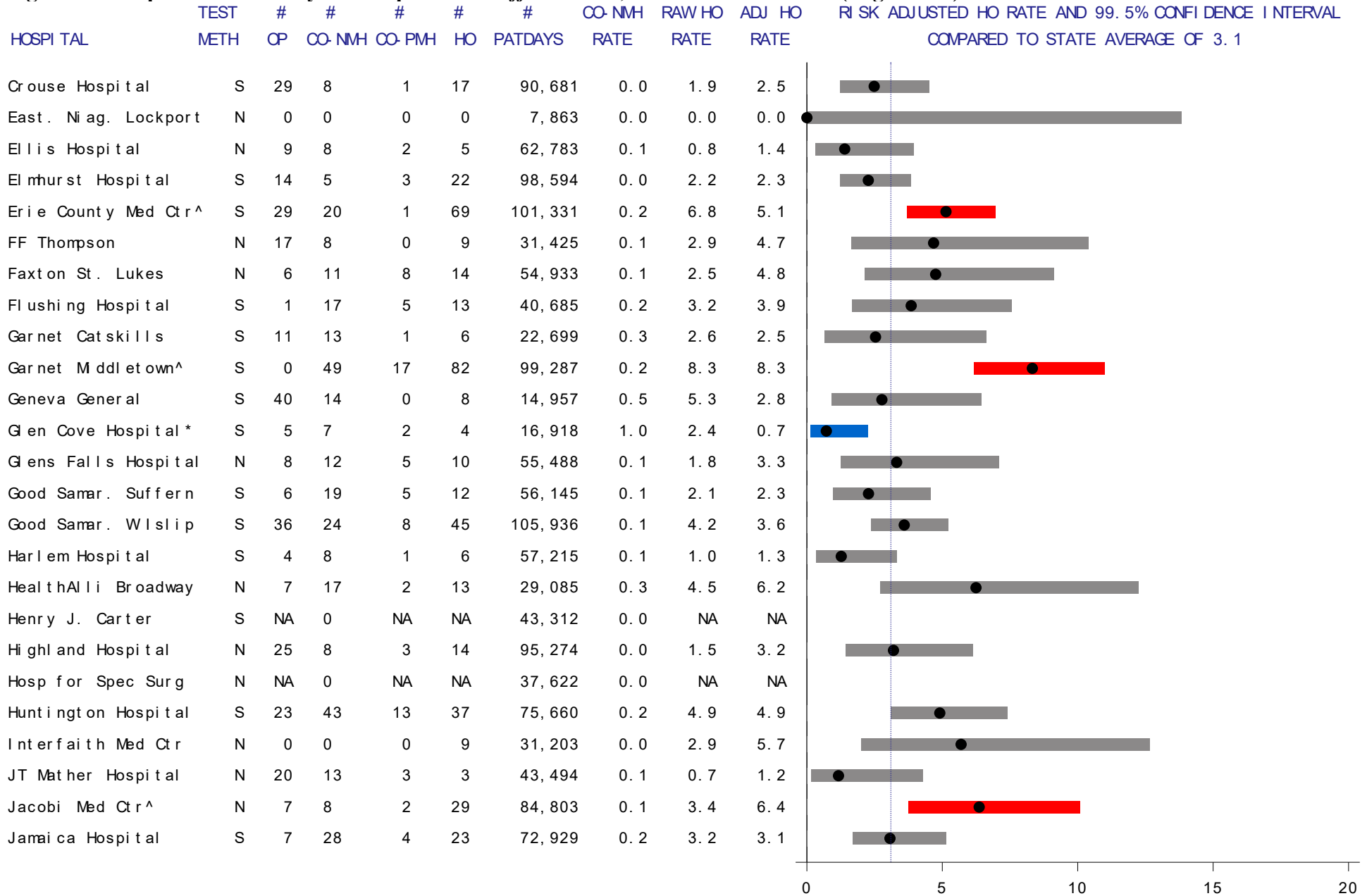
Hospitals were flagged as having adjusted rates significantly higher or lower than the state average if the 99% confidence interval excluded the state average HO rate. In 2022, 17 out of 153 hospitals (11%) were flagged with adjusted rates significantly higher than the state average; these hospitals are required to submit improvement plans following the NYSDOH HAI Reporting Program's Policy for Facilities with Consecutive Years of High HAI Rates [http://www.health.ny.gov/statistics/facilities/hospital/hospital\\_acquired\\_infections/](http://www.health.ny.gov/statistics/facilities/hospital/hospital_acquired_infections/). Sixteen hospitals (10%) were flagged significantly lower than average.

**Figure 18. Hospital onset facility-wide inpatient *C. difficile* rates, New York State 2022 (Page 1 of 7)**



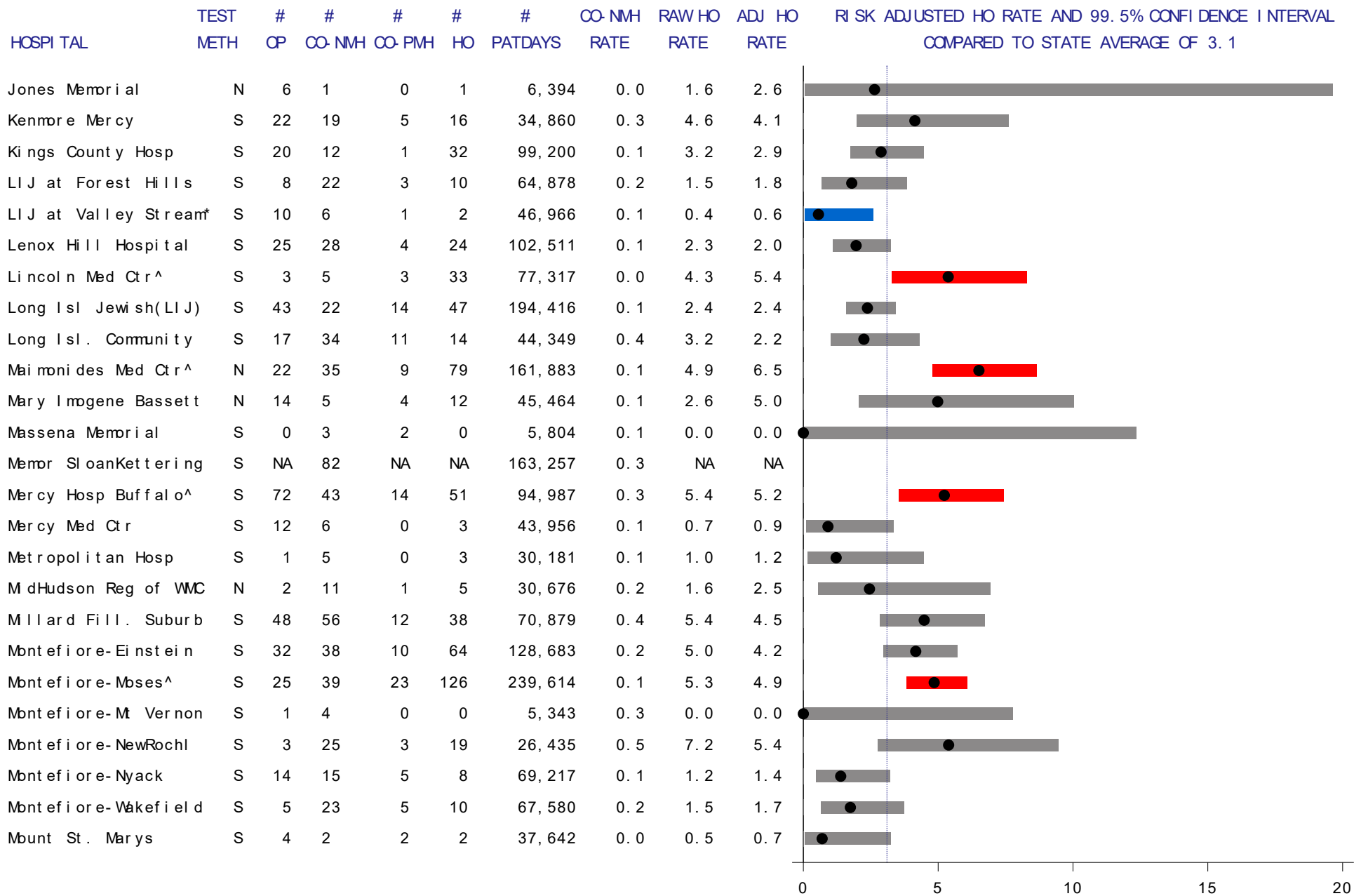
Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. — ^Significantly higher than state average. — \*\*Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. Test method: N = less sensitive test (e.g. enzyme immunoassay), S = sensitive test (e.g. nucleic acid amplification test). OP: Outpatient, CO-NMH: community onset-not my hospital, CO-PMH: incident community onset-possibly my hospital, HO: hospital onset, HO rate is per 10,000 patient days. HO rate adjusted using test method, CO-NMH rate, number of beds, and percent of patient days in adult intensive care units.

**Figure 18. Hospital onset facility-wide inpatient *C. difficile* rates, New York State 2022 (Page 2 of 7)**



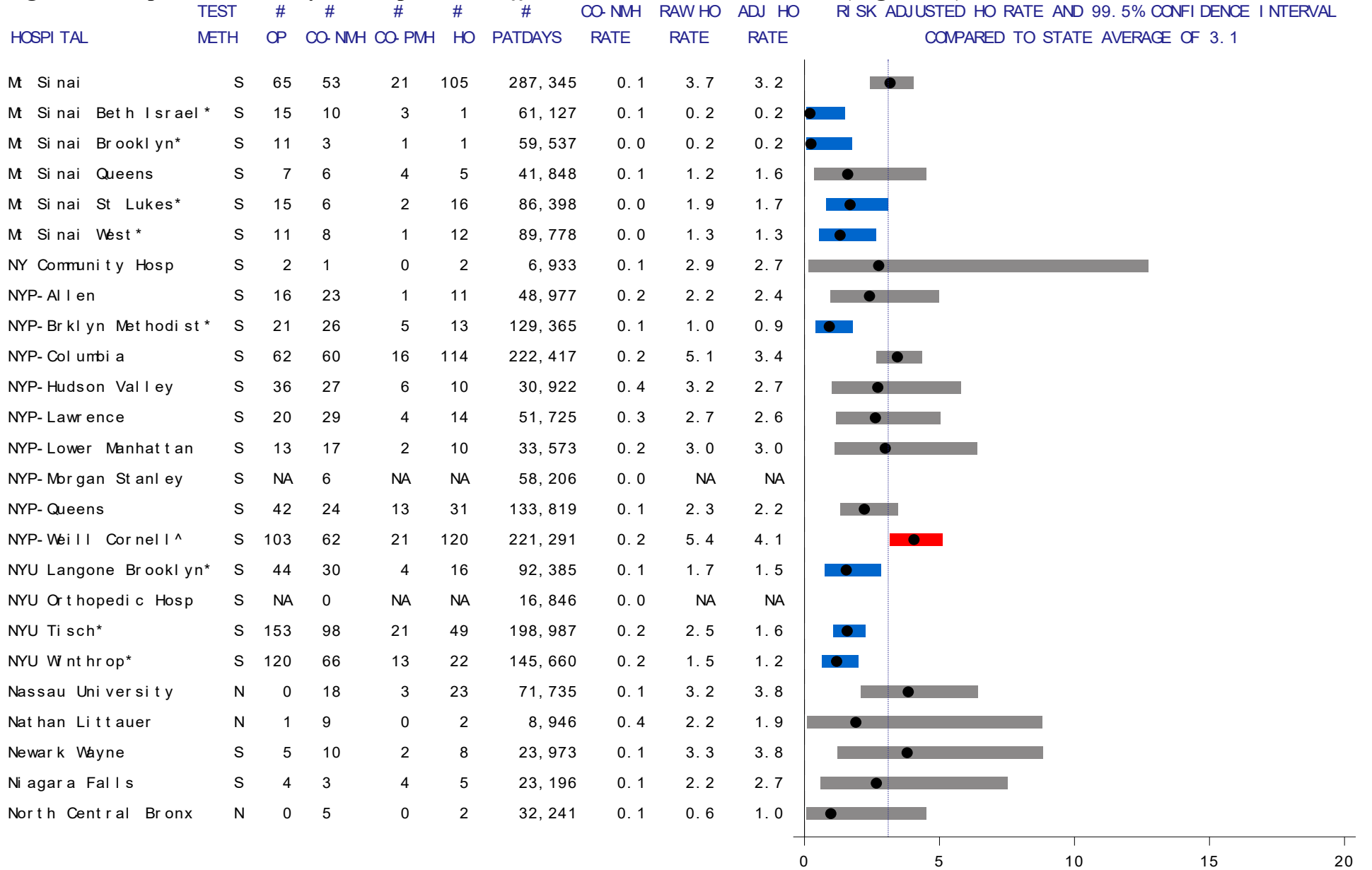
Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^Significantly higher than state average. —\*\*Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. Test method: N = less sensitive test (e.g. enzyme immunoassay), S = sensitive test (e.g. nucleic acid amplification test). OP: Outpatient, CO-NMH: community onset-not my hospital, CO-PMH: incident community onset-possibly my hospital, HO: hospital onset, HO rate is per 10,000 patient days. HO rate adjusted using test method, CO-NMH rate, number of beds, and percent of patient days in adult intensive care units.

**Figure 18. Hospital onset facility-wide inpatient *C. difficile* rates, New York State 2022 (Page 3 of 7)**



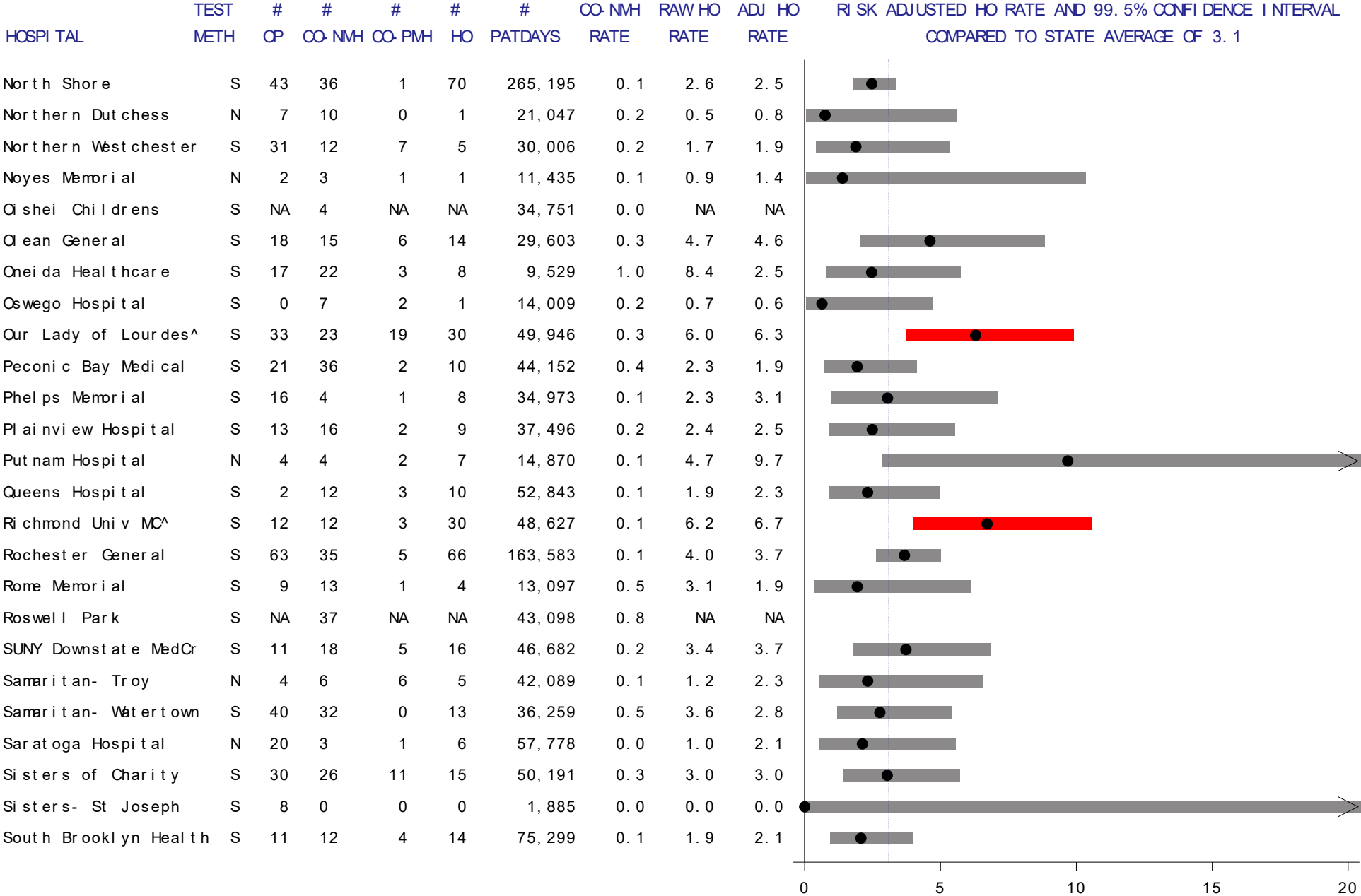
Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^Significantly higher than state average. —\*\*Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. Test method: N = less sensitive test (e.g. enzyme immunoassay), S = sensitive test (e.g. nucleic acid amplification test). OP: Outpatient, CO-NMH: community onset-not my hospital, CO-PMH: incident community onset-possibly my hospital, HO: hospital onset, HO rate is per 10,000 patient days. HO rate adjusted using test method, CO-NMH rate, number of beds, and percent of patient days in adult intensive care units.

**Figure 18. Hospital onset facility-wide inpatient *C. difficile* rates, New York State 2022 (Page 4 of 7)**



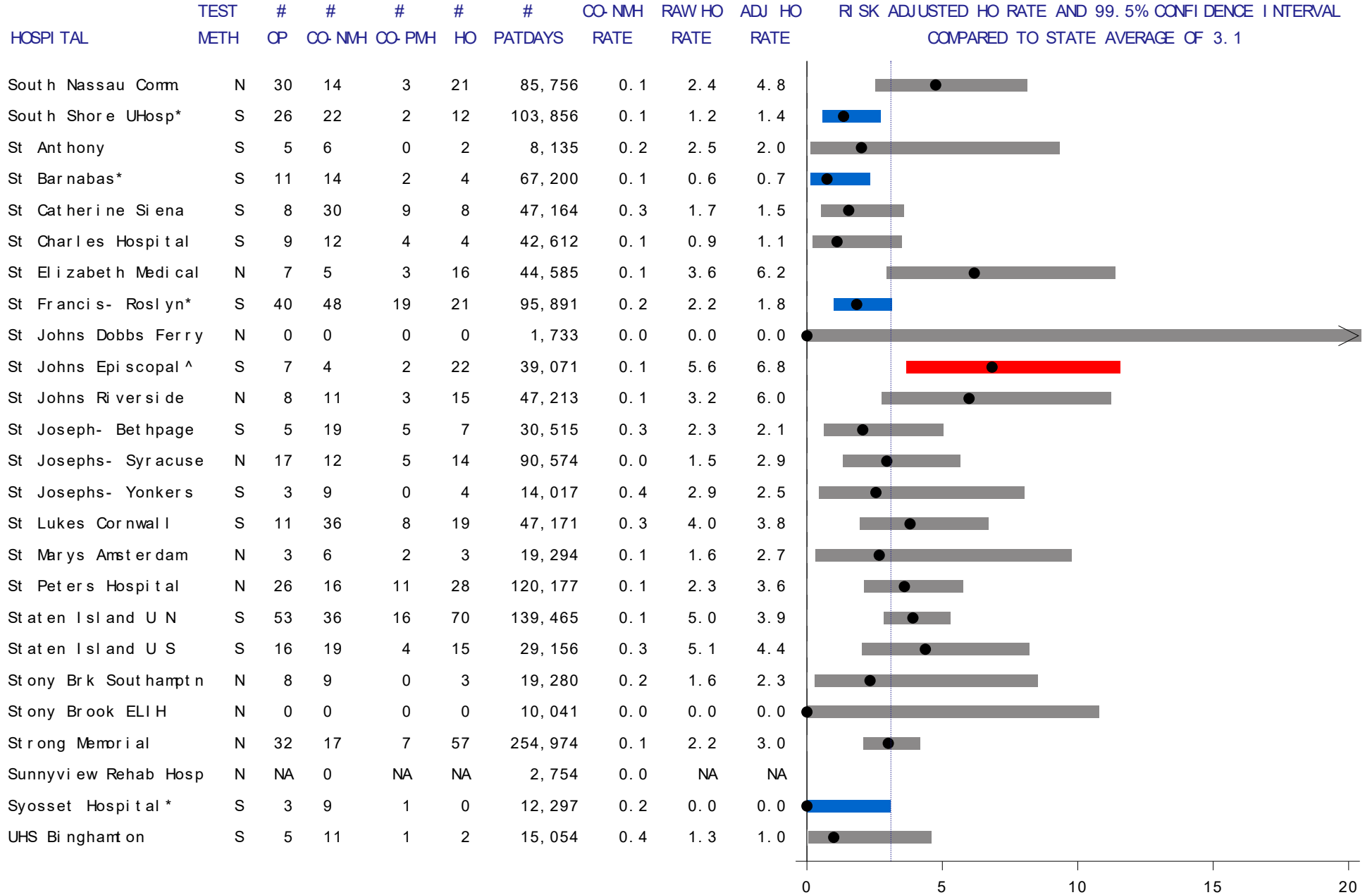
Data reported as of June 15, 2023. ■ State Average. ● Risk-adjusted Infection rate. ■ ^Significantly higher than state average. ■ \*\*Significantly lower than state average.  
 — Average. > Upper confidence limit exceeds graph area. Test method: N = less sensitive test (e.g. enzyme immunoassay), S = sensitive test (e.g. nucleic acid amplification test). OP: Outpatient, CO-NMH: community onset-not my hospital, CO-PMH: incident community onset-possibly my hospital, HO: hospital onset, HO rate is per 10,000 patient days. HO rate adjusted using test method, CO-NMH rate, number of beds, and percent of patient days in adult intensive care units.

**Figure 18. Hospital onset facility-wide inpatient *C. difficile* rates, New York State 2022 (Page 5 of 7)**



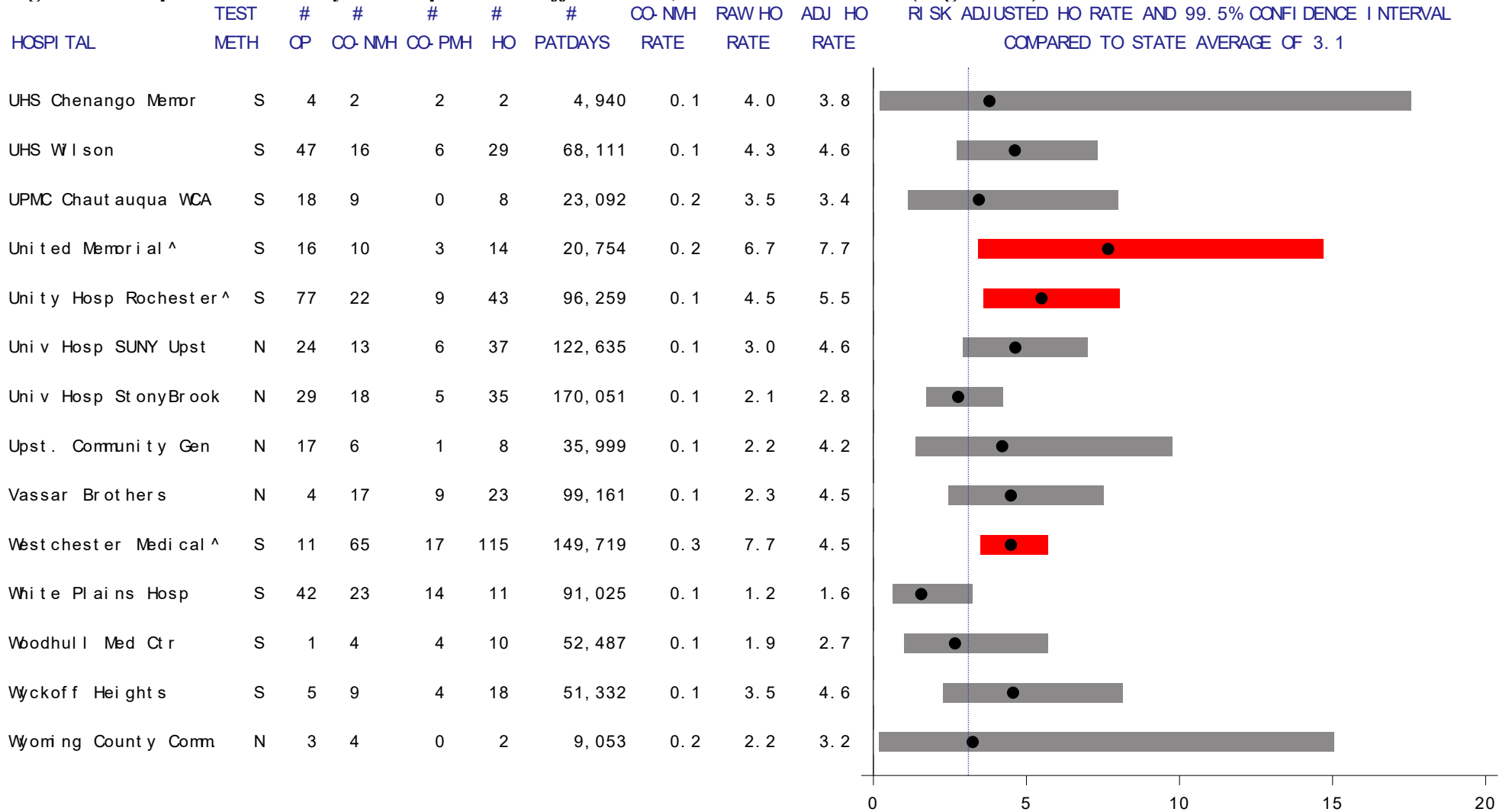
Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^Significantly higher than state average. —\*\*Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. Test method: N = less sensitive test (e.g. enzyme immunoassay), S = sensitive test (e.g. nucleic acid amplification test). OP: Outpatient, CO-NMH: community onset-not my hospital, CO-PMH: incident community onset-possibly my hospital, HO: hospital onset, HO rate is per 10,000 patient days. HO rate adjusted using test method, CO-NMH rate, number of beds, and percent of patient days in adult intensive care units.

**Figure 18. Hospital onset facility-wide inpatient *C. difficile* rates, New York State 2022 (Page 6 of 7)**



Data reported as of June 15, 2023. ■ State Average. ● Risk-adjusted Infection rate. ■ ^Significantly higher than state average. ■ \*\*Significantly lower than state average. — Average. > Upper confidence limit exceeds graph area. Test method: N = less sensitive test (e.g. enzyme immunoassay), S = sensitive test (e.g. nucleic acid amplification test). OP: Outpatient, CO-NMH: community onset-not my hospital, CO-PMH: incident community onset-possibly my hospital, HO: hospital onset, HO rate is per 10,000 patient days. HO rate adjusted using test method, CO-NMH rate, number of beds, and percent of patient days in adult intensive care units.

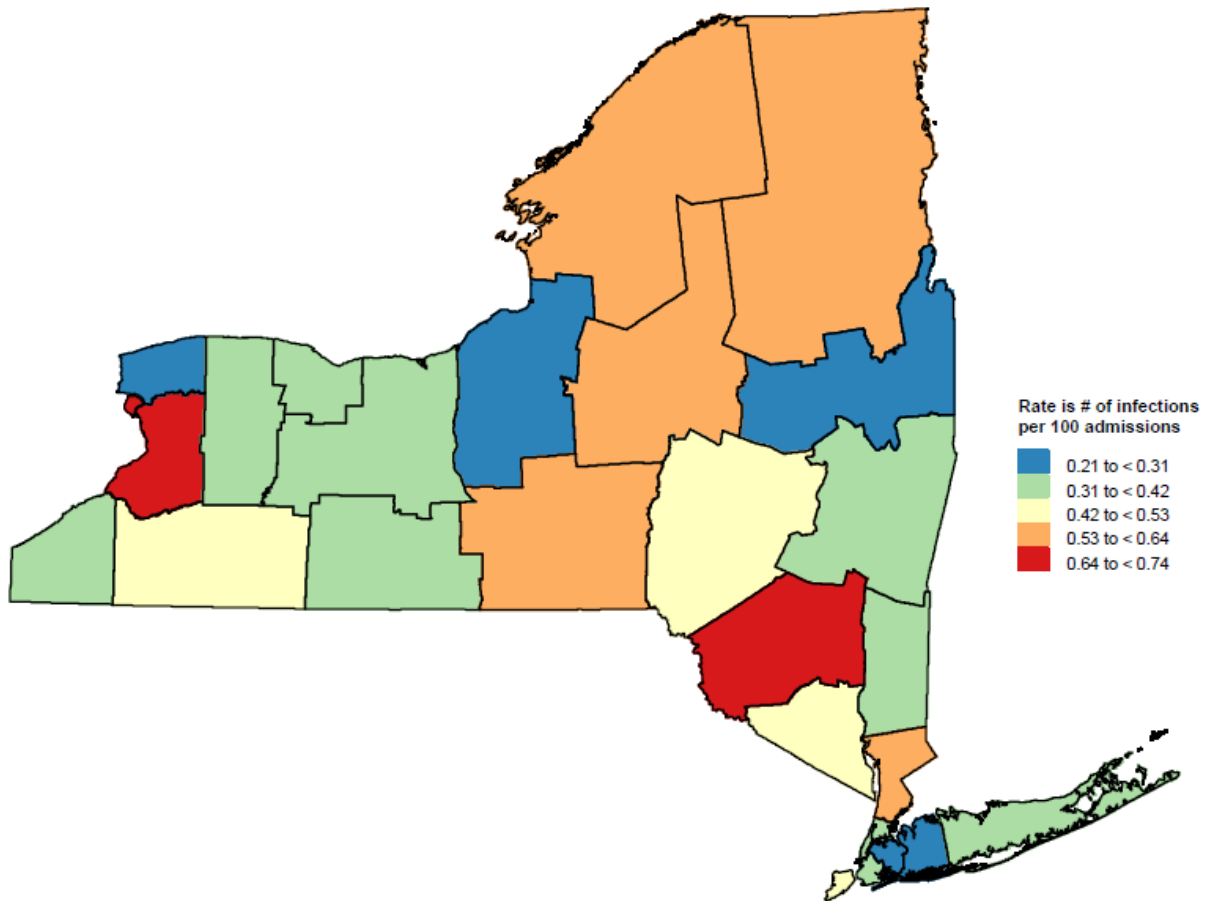
**Figure 18. Hospital onset facility-wide inpatient *C. difficile* rates, New York State 2022 (Page 7 of 7)**



Data reported as of June 15, 2023. | State Average. ● Risk-adjusted Infection rate. —^ Significantly higher than state average. —\*\* Significantly lower than state average.  
 — Average. > Upper confidence limit exceeds graph area. Test method: N = less sensitive test (e.g. enzyme immunoassay), S = sensitive test (e.g. nucleic acid amplification test). OP: Outpatient, CO-NMH: community onset-not my hospital, CO-PMH: incident community onset-possibly my hospital, HO: hospital onset, HO rate is per 10,000 patient days. HO rate adjusted using test method, CO-NMH rate, number of beds, and percent of patient days in adult intensive care units.

Figure 19 shows the FWI CDI overall patient prevalence rate by county (or merged county for those with few or no hospitals). The prevalence of CDI is low in New York City (NYC) and varies in the upstate area.

**Figure 19. Facility-wide inpatient CDI prevalence rate, New York State 2022**



Data reported as of June 15, 2023. Excludes specialty hospitals, inpatient rehabilitation facilities, and inpatient psychiatric facilities. Specimens identified in the outpatient setting are not included. The number of cases reported in hospitals performing less sensitive tests was multiplied by 1.5 to approximate the number of cases expected if a more sensitive test was used.

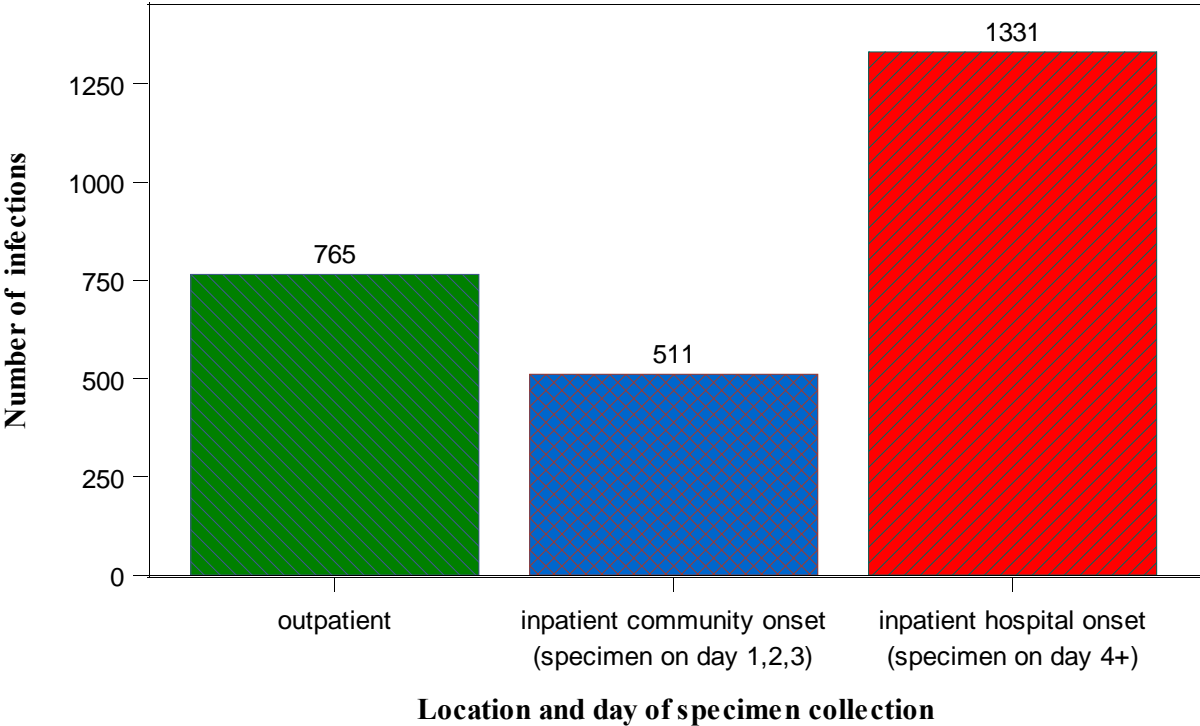
# Carbapenem-resistant Enterobacterales (CRE) Infections

The NHSN LabID CRE surveillance definition is:

Any *Escherichia coli*, *Klebsiella oxytoca*, *Klebsiella pneumoniae*, or *Enterobacter* spp. testing showing resistance to imipenem, meropenem, doripenem, or ertapenem by standard susceptibility testing methods (i.e., minimum inhibitory concentrations (MICs) of  $\geq 4$  mcg/mL for doripenem, imipenem and meropenem or  $\geq 2$  mcg/mL for ertapenem) OR by production of a carbapenemase demonstrated using a recognized test.

In 2022, 2,607 CRE cases were reported: 29% were identified in ED/OBS units, 20% were identified in the FWI area during the first 3 days of hospitalization, and 51% were identified in the FWI area after the first 3 days of inpatient stay (Figure 21).

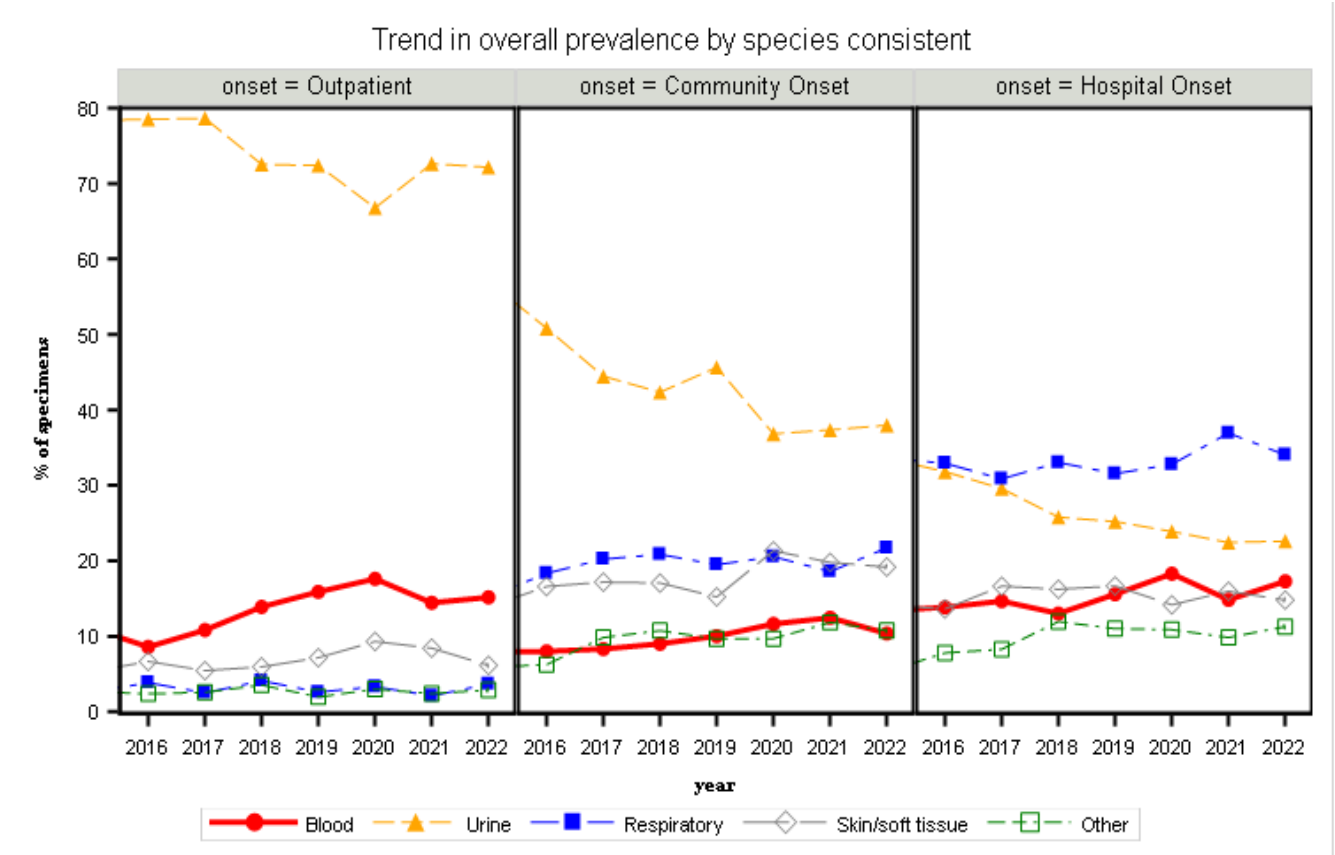
**Figure 21. CRE infection onset, NYS 2022**



Data reported as of June 15, 2023. Excludes cases identified in inpatient rehabilitation facilities and inpatient psychiatric facilities. Specimens identified in the outpatient setting and admitted the next day are counted as outpatient.

In OP and CO cases, the most common specimen site was by far the urinary tract; among HO cases, respiratory specimens were most common (Figure 22).

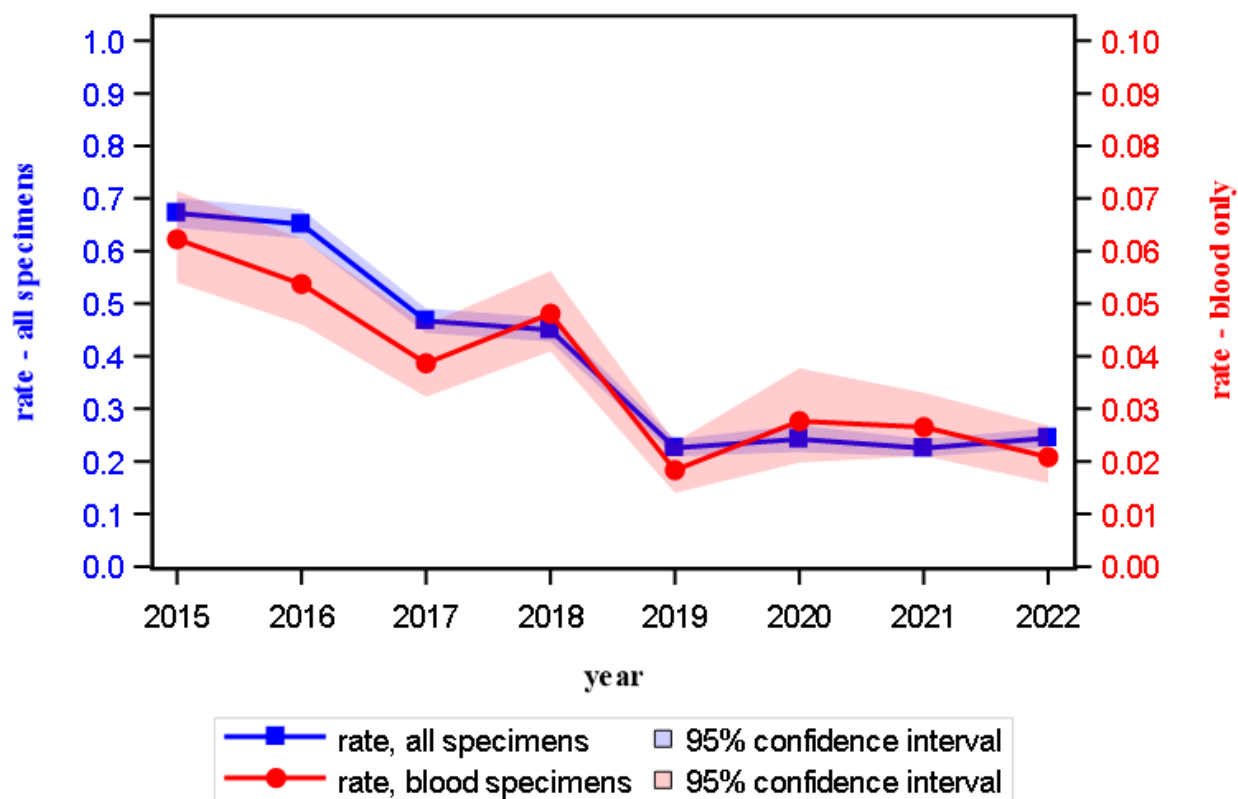
**Figure 22. CRE by specimen site, NYS 2015-2022**



Data reported as of June 15, 2023.

The admission prevalence rate describes the percentage of patients admitted to hospitals with CRE. In 2022, there were 505 of these cases out of 2,066,051 admissions, for a rate of 0.24 infections per 1,000 admissions. The overall admission prevalence rate decreased 64% between 2015 and 2022 although there was slight increase in rates between 2021 and 2022. The BSI rate decreased 67% over the same time but there was decrease 22% between 2021 and 2022. (Figure 22).

**Figure 23. Facility-wide inpatient CRE admission prevalence infection rates, New York State 2015-2022**



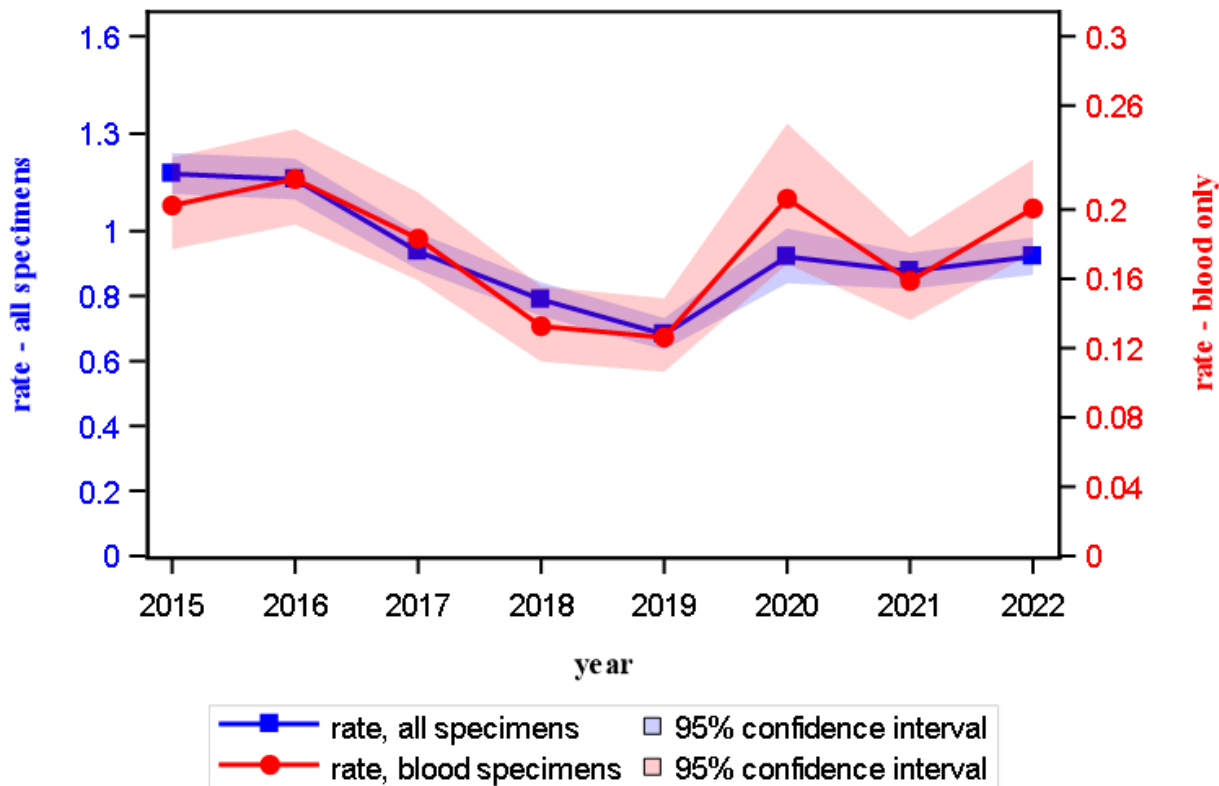
Year	# Bloodstream infections	# Total Infections	# Admissions	Bloodstream Infection Admission Prevalence Rate	All-Specimen Admission Prevalence Rate
2015	145	1,565	2,329,051	0.062	0.672
2016	125	1,515	2,326,264	0.054	0.651
2017	92	1,112	2,379,863	0.039	0.467
2018	113	1,069	2,375,584	0.048	0.450
2019	44	530	2,347,976	0.019	0.226
2020	29	254	1,048,540	0.028	0.242
2021	57	484	2,149,402	0.026	0.225
2022	43	505	2,066,051	0.0208	0.244

Data reported as of June 15, 2023. Bloodstream Infection Admission Prevalence Rate = number of unique (no others in previous 14 days) blood source infections per patient per month identified  $\leq 3$  days after admission to the hospital / Number of patient admissions to the hospital x 1000. All Specimen Admission Prevalence Rate = number of first infections per patient per month identified  $\leq 3$  days after admission to the hospital / Number of patient admissions to the hospital x 1000. Excludes inpatient rehabilitation and inpatient psychiatric locations and cases identified in the emergency room if admitted the same day.

The longer a person stays in the hospital, the higher the cumulative risk of acquiring an infection in the hospital, so the incidence rates are reported using a denominator of patient days. Both all-

specimen incidence (5%) and BSI incidence (26%) increased between 2021 and 2022. (Figure 24). The 2022 all-specimen incidence rate was 4.6 times higher than the BSI incidence rate.

**Figure 24. Facility-wide inpatient CRE infection incidence rates, New York State 2015-2021**

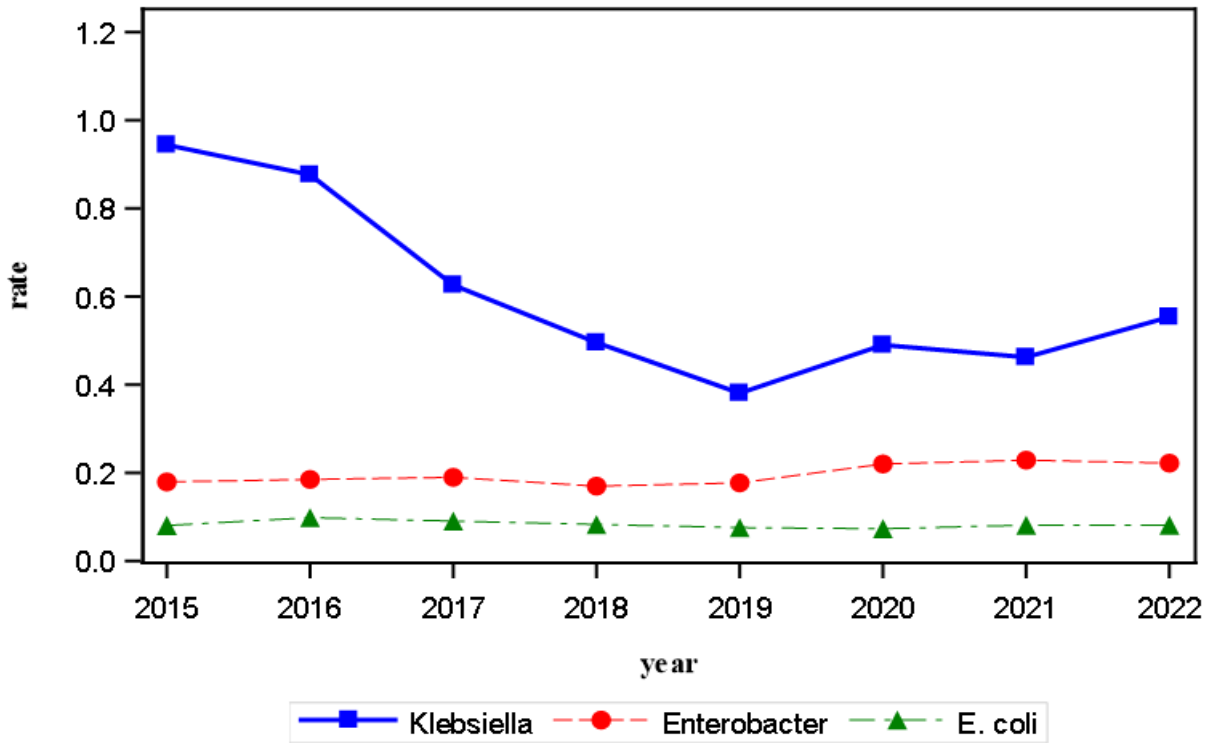


Year	# Bloodstream Infections	# Total Infections	# Patient Days	Bloodstream Infection Incidence Rate	All Specimen Infection/Colonization Incidence Rate
2015	232	1,349	11,466,593	0.202	1.176
2016	248	1,321	11,397,102	0.218	1.159
2017	208	1,064	11,355,485	0.183	0.937
2018	150	892	11,328,988	0.132	0.787
2019	142	767	11,262,506	0.126	0.681
2020	105	469	5,091,653	0.206	0.921
2021	176	972	11,089,397	0.159	0.877
2022	220	1011	10,967,475	0.200	0.922

Data reported as of June 15, 2023. Bloodstream Infection Incidence Rate = Number of all unique (no others in previous 14 days) blood source infections per patient per month identified > 3 days after admission to the hospital / Number of patient days x 10,000. All Specimen Infection/Colonization Incidence Rate = Number of first events per patient among those with no event with this specific organism type reported in a previous month at this hospital and identified > 3 days after admission to the hospital / Number of patient days x 10,000. Excludes inpatient rehabilitation and inpatient psychiatric locations.

Overall patient prevalence includes both admission prevalent and hospital onset cases. Overall patient prevalence rates by year and species are summarized in Figure 25. Between 2015 and 2022, the prevalence of *Klebsiella* decreased 36%, the prevalence of *Enterobacter* spp. increased 25%, and the prevalence of *E. coli* increased to the 2015 level.

**Figure 25. Trends in overall patient prevalence CRE infection rates by species, NYS 2015-2022**



Year	<i>Klebsiella oxytoca</i> and <i>K. pneumoniae</i>	<i>Enterobacter</i> spp.	<i>E. coli</i>	Total
2015	0.944	0.179	0.081	1.204
2016	0.877	0.185	0.098	1.160
2017	0.626	0.190	0.091	0.907
2018	0.495	0.170	0.083	0.748
2019	0.380	0.176	0.076	0.632
2020	0.490	0.220	0.073	0.784
2021	0.463	0.229	0.081	0.773
2022	0.554	0.222	0.081	0.857

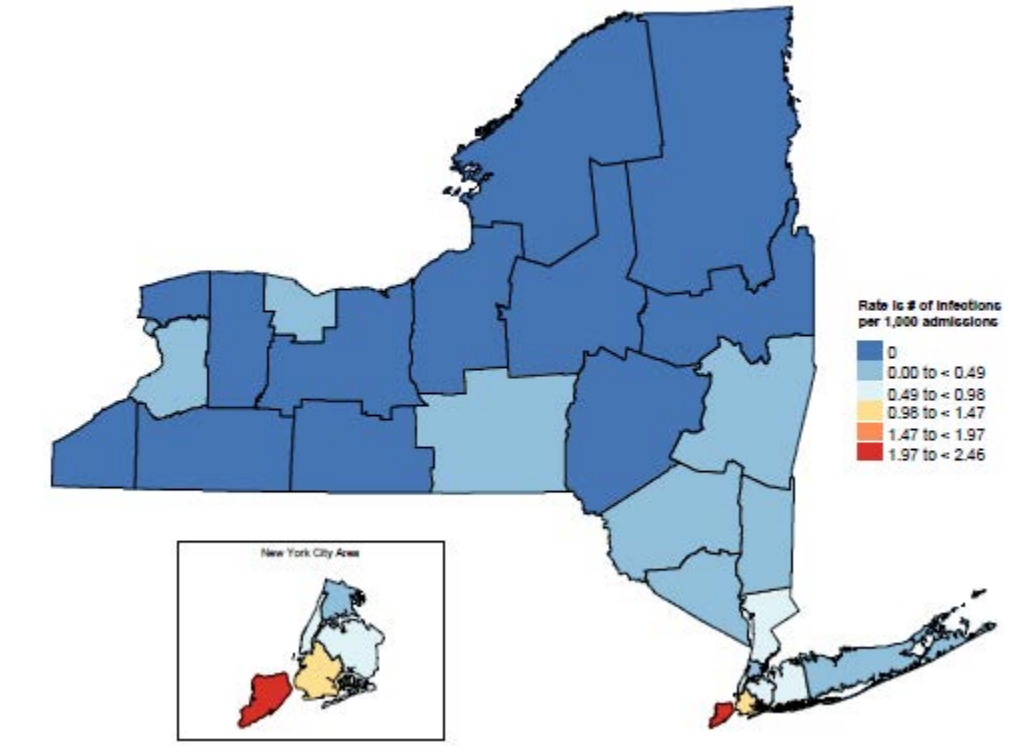
Data reported as of June 15, 2023. Inpatient rehab and psychiatric facility data excluded. Overall patient prevalence rate is the number of first LabID Events per patient per month (e.g., admission prevalent or hospital onset) / Number

of patient admissions to the hospital x 1000. Does not include cases identified in the emergency room if admitted the same day.

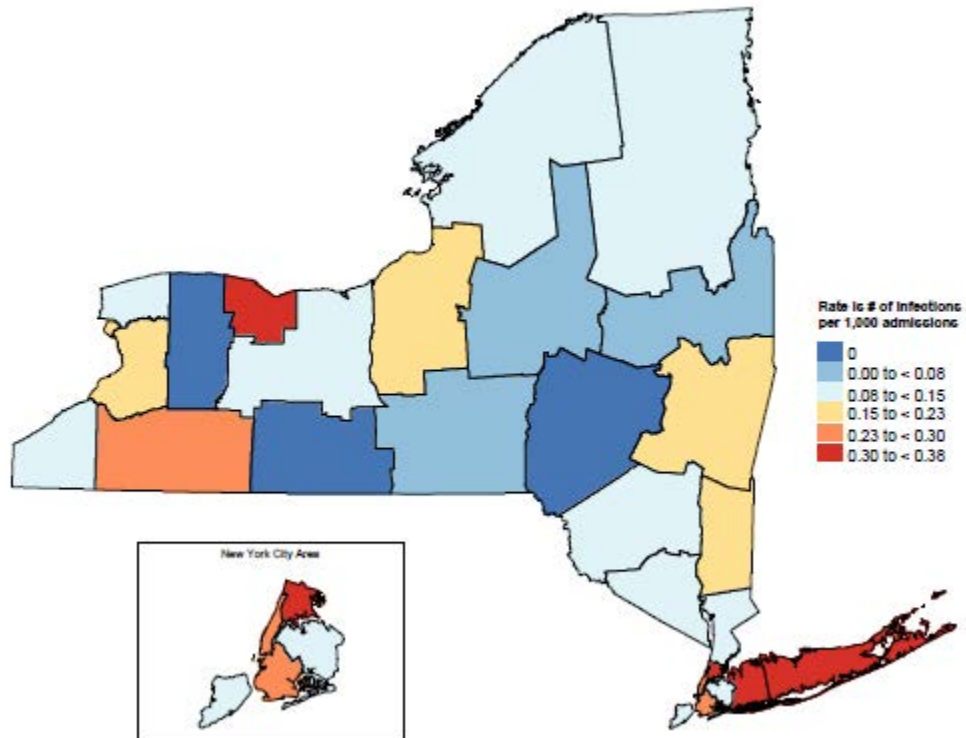
Figures 26 (a, b, and c) show the FWI CRE patient prevalence rate by species and county (or merged county for those with few or no hospitals). FWI CRE-*Klebsiella* and CRE-*E. coli* patient prevalence rates are highest in the New York City area. CRE-*Enterobacter* rates showed some spikes in western and northern NYS. Note that all maps were made to show areas with zero reported cases in the darkest shade of blue, followed by five equal ranges; if the CRE-*E. coli* map used the same scale as the CRE-*Klebsiella* map, it would be entirely in the three shades of blue.

**Figure 26 a-c. Facility-wide inpatient carbapenem-resistant Enterobacterales patient prevalence rates, New York State 2022**

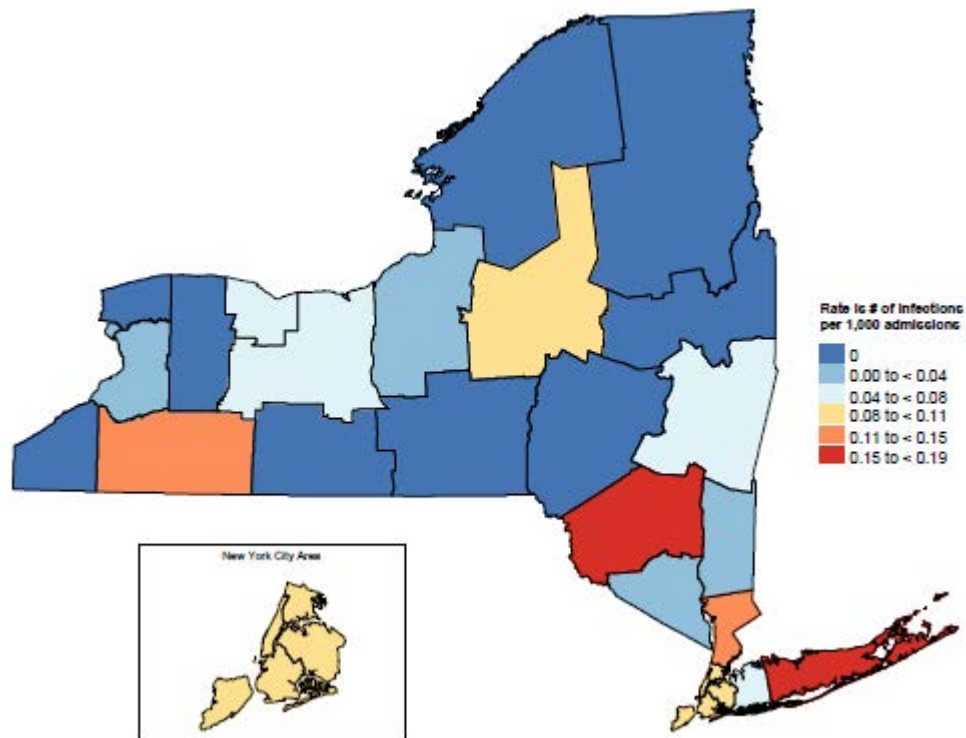
**(a) CRE-*Klebsiella* overall patient prevalence rate 2022**



**(b) CRE-*Enterobacter* overall patient prevalence rate 2022**



**(c) CRE-*E. coli* overall patient prevalence rate 2022**



Data reported as of June 15, 2023. Small counties have been merged.

## **Laboratory Testing Methods**

Breakpoints for determining whether a microorganism is susceptible, intermediate, or resistant to an antibiotic are published by the Clinical Laboratory Standards Institute (CLSI). However, the CLSI breakpoints are updated more frequently than they can be adopted by manufacturers of susceptibility testing systems because of additional approvals required by the Food and Drug Administration (FDA). According to the 2022 NHSN survey, 91% of facilities used the newer more sensitive breakpoints (CLSI M22 or M23 standard) in 2022, while 9% continued to use the former breakpoints. The facilities using the former breakpoints may follow screening algorithms that incorporate additional testing to approximate the newer breakpoints.

Identification of carbapenemases (enzymes that bacteria produce that destroy carbapenem antibiotics), can also be used to meet the CRE LabID definition. On the 2022 NHSN survey, 35% of facilities reported that their labs perform a special test for carbapenemase production. However, based on the list of 2022 CRE infections reported to NHSN, approximately 31% of specimens were tested for the presence of a carbapenemase. Among those tested, a carbapenemase was identified 78% of the time.

Facilities using the former breakpoints or not detecting carbapenemases might be undercounting CRE, and testing differences might reduce the inter-facility comparability of CRE rates.

There might also be variation in the extent to which facilities identify and perform susceptibility testing of non-sterile specimens. Laboratory identification of CRE can be achieved through several methods, all of which have benefits and drawbacks. There is no standardization for which method should be used in individual healthcare facility laboratories. As such, hospital-specific CRE rates, particularly in non-blood specimens, may vary based on testing methods.

## **Hospital-specific CRE rates**

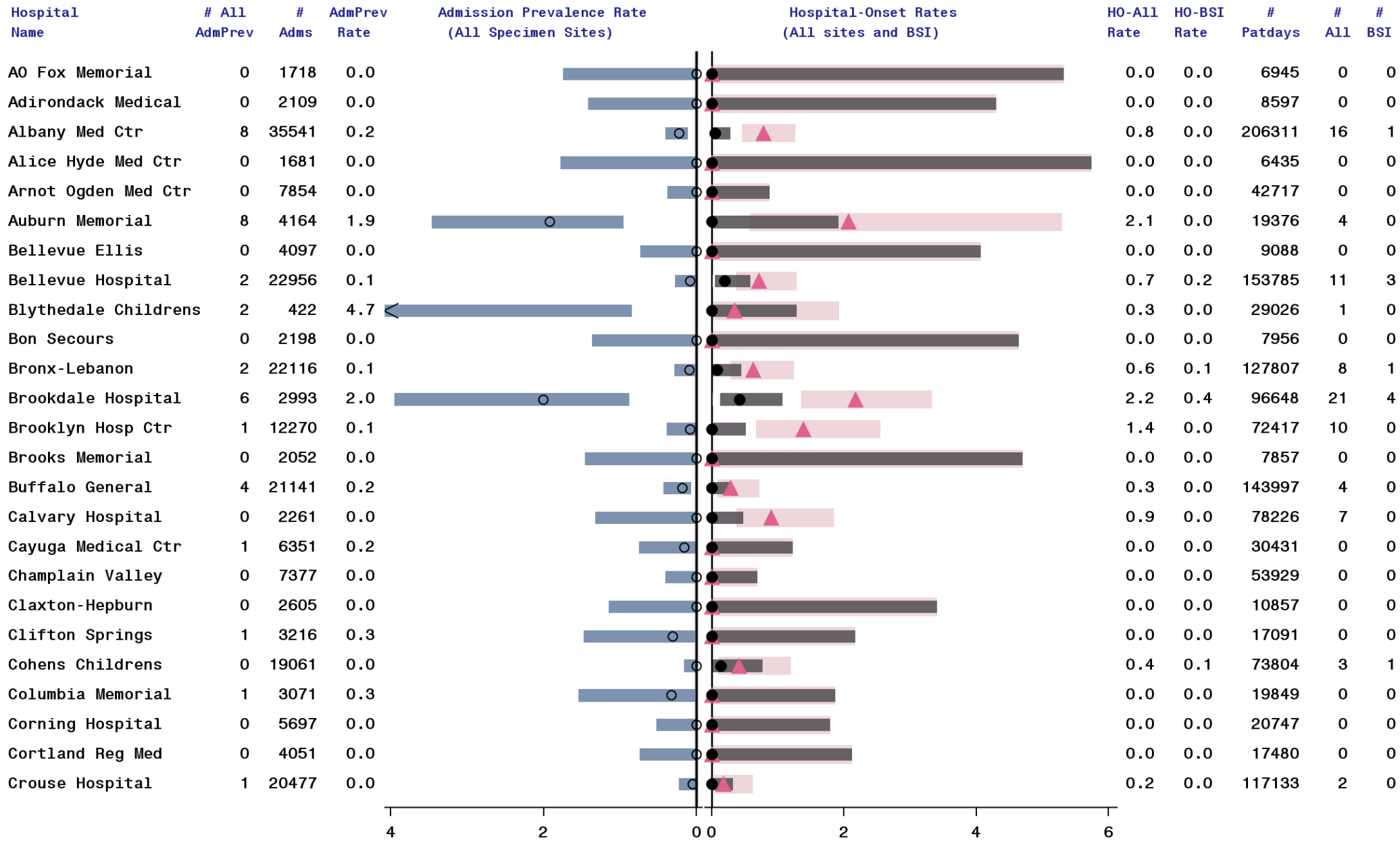
The primary HAI indicator of interest for evaluating hospital performance is the HO BSI rate, because 1) blood specimens are more consistently screened by laboratories; and 2) BSIs are very serious and more likely reflect clinical disease than CRE detected from nonsterile body sites such as wounds<sup>1</sup>. The prevalence of CRE among patients newly admitted to facilities is also reported because this burden of admission prevalent cases is related to the risk of spread within the facility.

Hospitals should review their HO BSI rates in relation to their admission prevalence rates as shown in Figure 27. For example, hospitals with high HO rates and low admission prevalence rates should examine whether they are testing patients promptly (days 1-3) and if their cases were clustered. With respect to interpreting the all-site rates, note there are variations in the types

of specimens reported among hospitals. For example, some hospitals reported a large proportion of urinary tract infections/colonizations, others reported a large proportion of skin or respiratory infections/colonizations. The hospital- and region-specific admission prevalence rate, bed size, and percent intensive care unit patient-days do not predict the HO BSI rate strongly; therefore, risk-adjusted rates are not presented. More research is needed on CRE risk adjustment to balance the importance of accuracy and fairly comparing rates with the need for having a measure to identify hospitals with higher than predicted rates for public health assistance and quality improvement programs.

Hospitals should continue to evaluate their infection prevention and control practices in relation to CDC recommendations. Challenges include sub-optimal compliance with hand hygiene, delays and/or variations in implementing Contact Precautions and appropriately cohorting patients, delays in discontinuing invasive devices when they are no longer needed, and lack of established protocols to screen epidemiologically linked contacts and perform active surveillance testing in high-risk areas. In addition, the pressures of broad-spectrum antibiotic usage along with the interdependence of acute and long-term care facilities in the spread and transmission of CRE<sup>2</sup> and challenges with promptly communicating infection control issues at the time of inter-facility transfer compound the complexity of CRE containment and prevention.

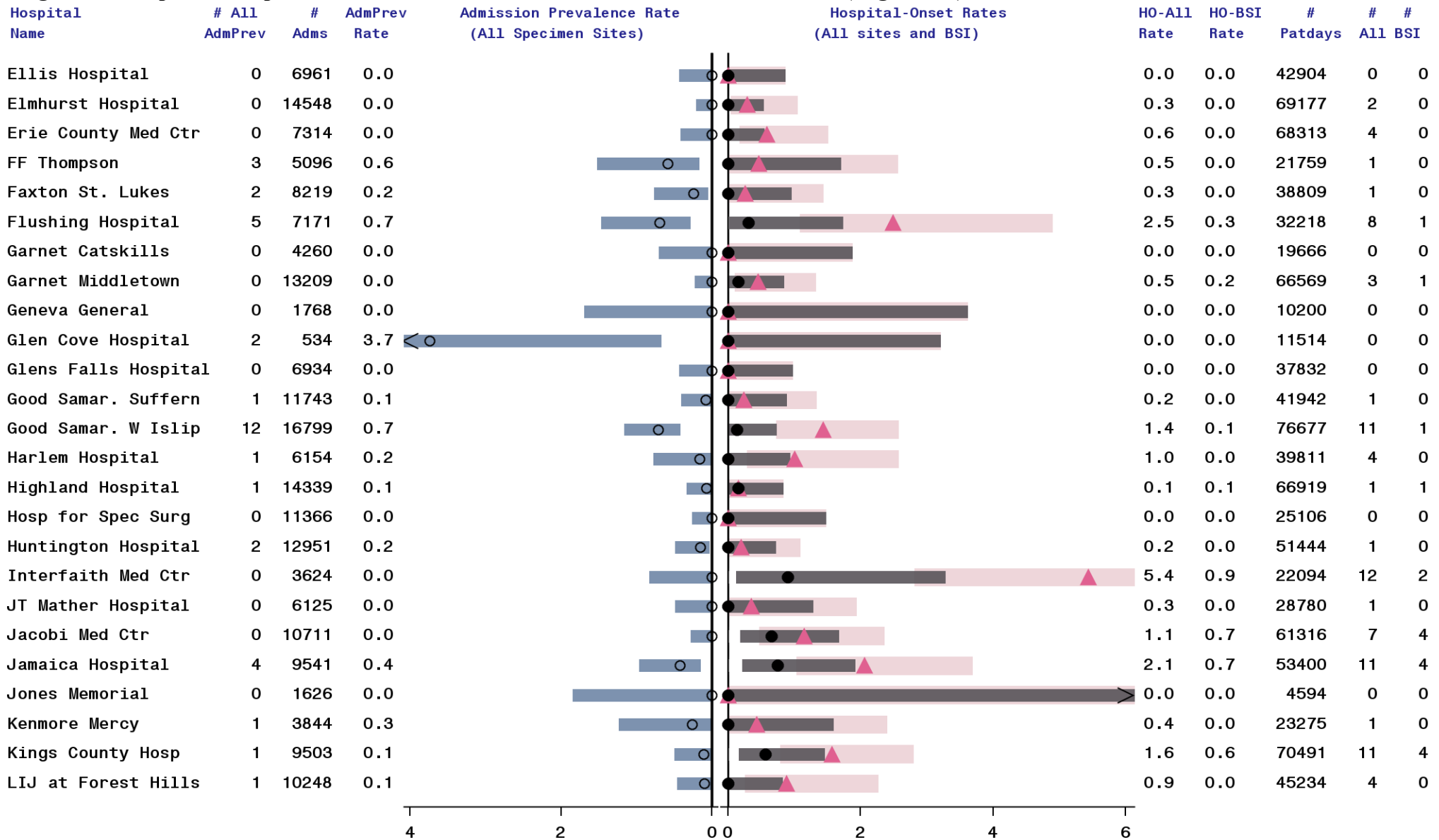
**Figure 27. Hospital CRE infection rates, NYS 2022 (Page 1 of 7)**



Data reported as of June 15, 2023. Facility-wide inpatient only, rehab and behavioral health units excluded

- ▲ HO-All: hospital onset CRE incidence rate all sites per 10,000 patient days and 95% confidence interval (state average = 0.92)
- HO-BSI: hospital onset CRE blood incidence rate per 10,000 patient days and 95% confidence interval (state average = 0.20)
- All-Admprev: all body site CRE admissions prevalence rate per 1,000 admissions and 95% confidence interval (state average = 0.24)

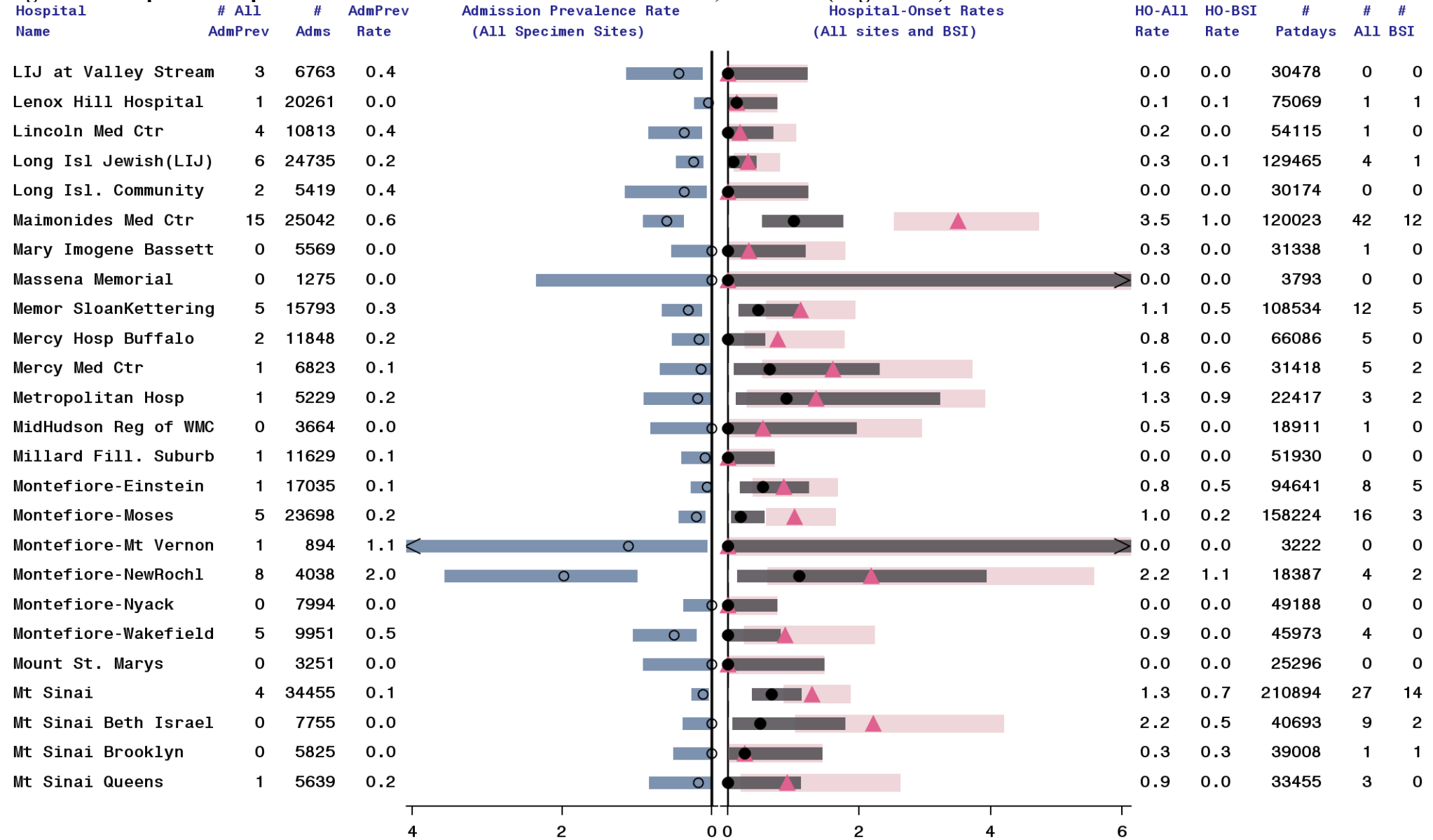
**Figure 27. Hospital carbapenem-resistant Enterobacterales infection rates, NYS 2022 (Page 2 of 7)**



Data reported as of June 15, 2023 Facility-wide inpatient only, rehab and behavioral health units excluded

- ▲ HO-All: hospital onset CRE incidence rate all sites per 10,000 patient days and 95% confidence interval (state average = 0.92)
- HO-BSI: hospital onset CRE blood incidence rate per 10,000 patient days and 95% confidence interval (state average = 0.20)
- All-Admprev: all body site CRE admissions prevalence rate per 1,000 admissions and 95% confidence interval (state average = 0.24)

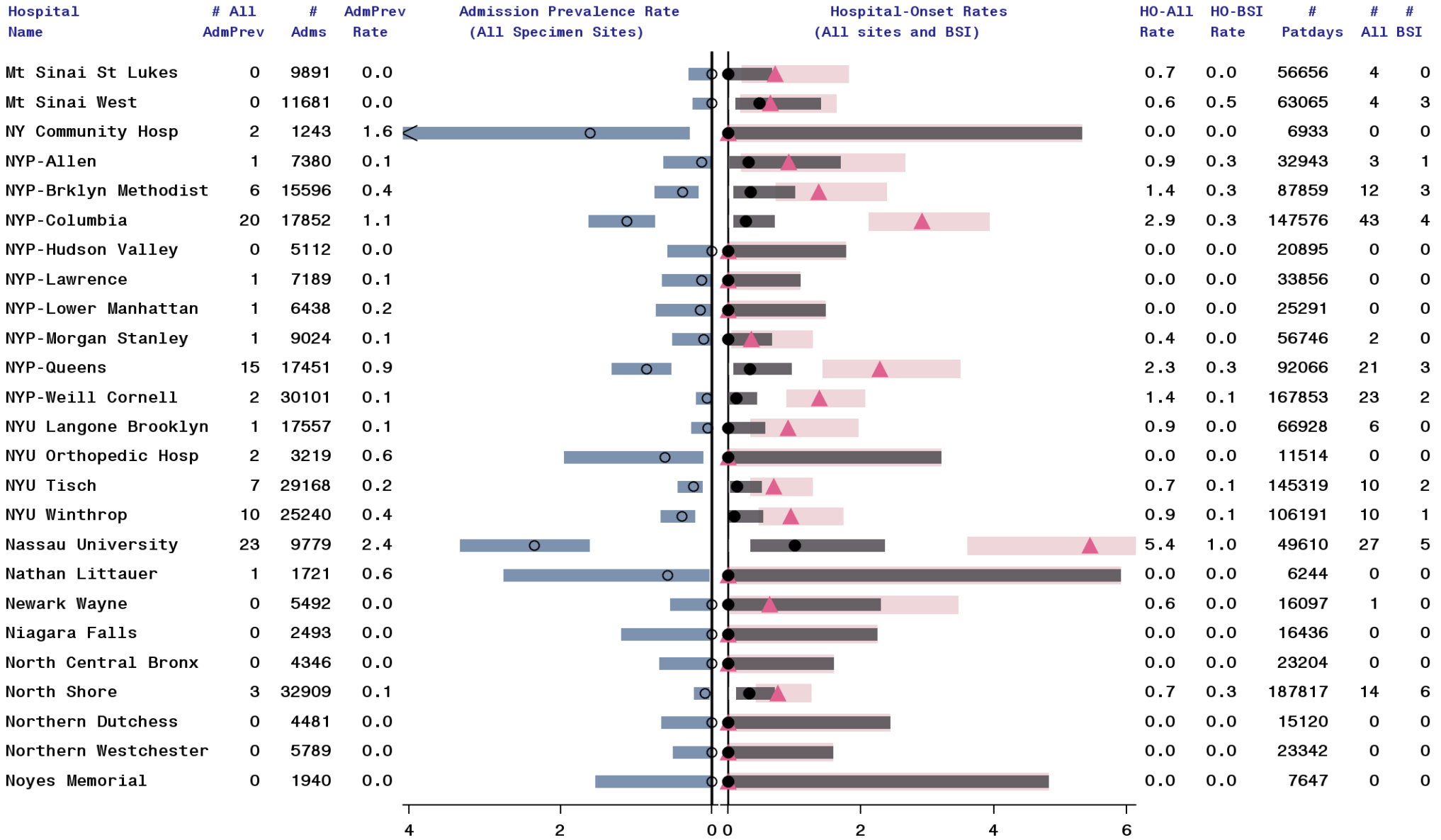
**Figure 27. Hospital carbapenem-resistant Enterobacterales infection rates, NYS 2022 (Page 3 of 7)**



Data reported as of June 15, 2023. Facility-wide inpatient only, rehab and behavioral health units excluded

- HO-All: hospital onset CRE incidence rate all sites per 10,000 patient days and 95% confidence interval (state average = 0.92)
- HO-BSI: hospital onset CRE blood incidence rate per 10,000 patient days and 95% confidence interval (state average = 0.20)
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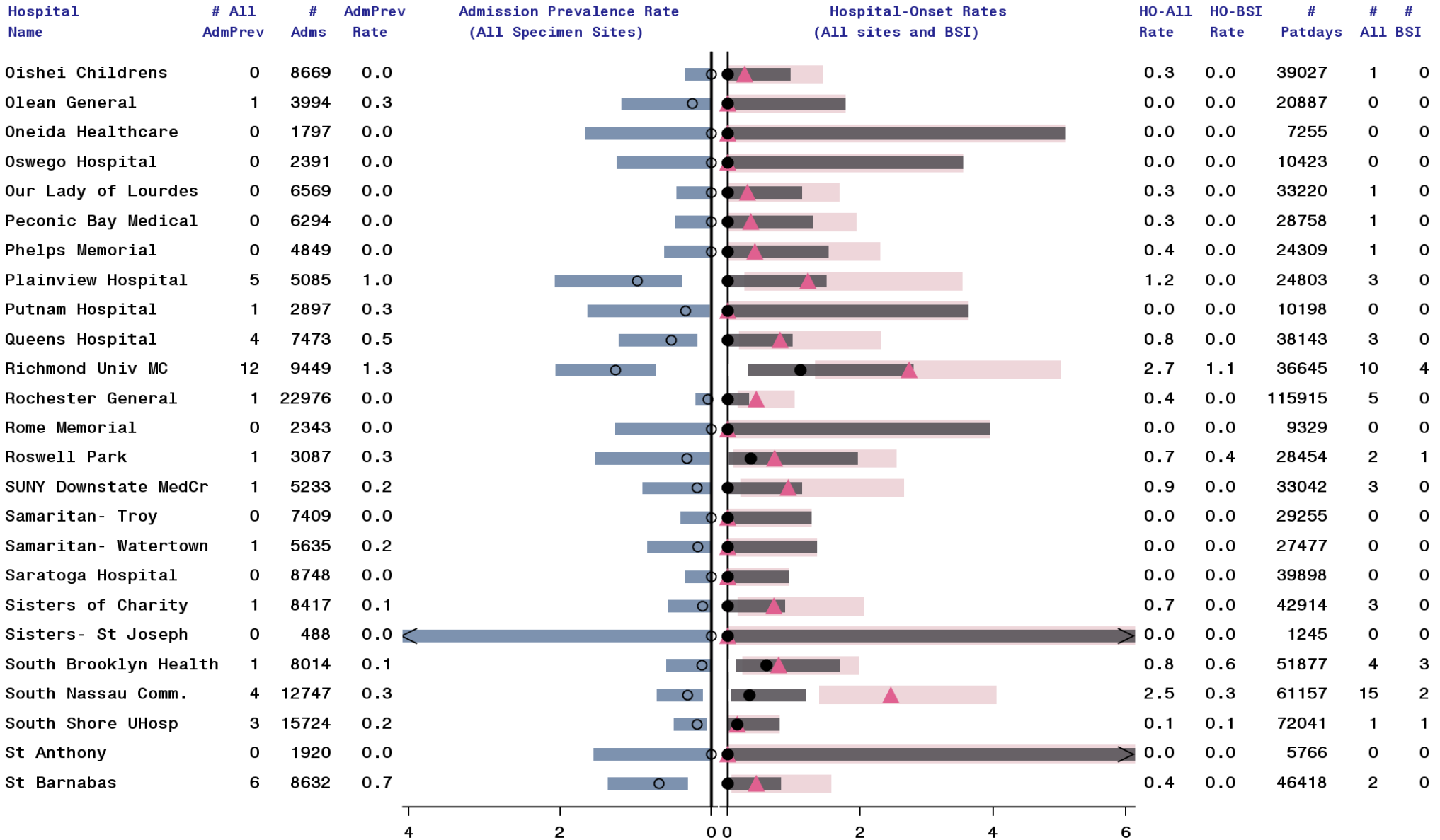
**Figure 27. Hospital carbapenem-resistant Enterobacterales infection rates, NYS 2022 (Page 4 of 7)**



Data reported as of June 15, 2023. Facility-wide inpatient only, rehab and behavioral health units excluded

- ▲ HO-All: hospital onset CRE incidence rate all sites per 10,000 patient days and 95% confidence interval (state average = 0.92)
- HO-BSI: hospital onset CRE blood incidence rate per 10,000 patient days and 95% confidence interval (state average = 0.20)
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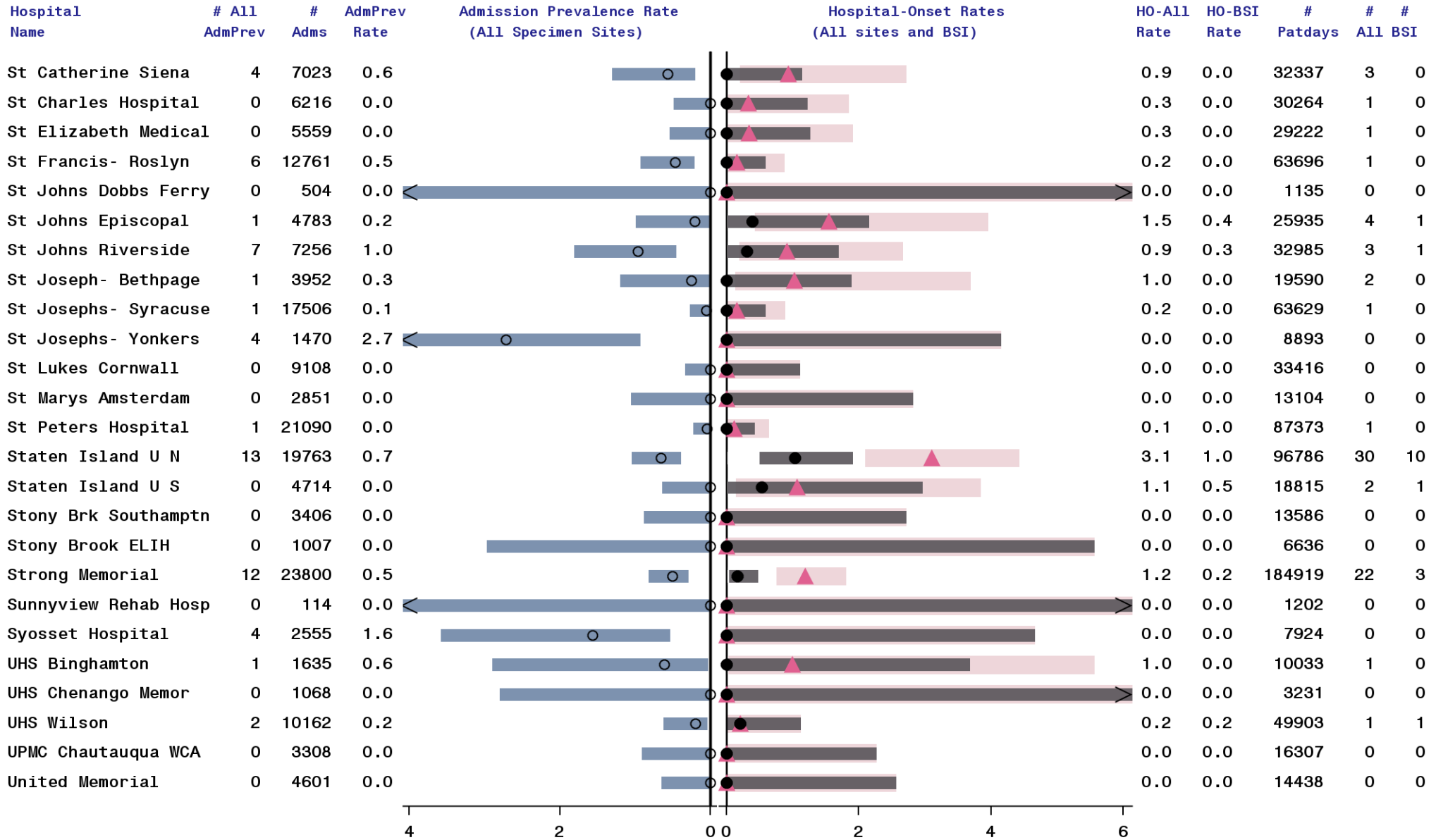
**Figure 27. Hospital carbapenem-resistant Enterobacterales infection rates, NYS 2022 (Page 5 of 7)**



Data reported as of June 15, 2023, Facility-wide inpatient only, rehab and behavioral health units excluded

- ▲ HO-All: hospital onset CRE incidence rate all sites per 10,000 patient days and 95% confidence interval (state average = 0.92)
- HO-BSI: hospital onset CRE blood incidence rate per 10,000 patient days and 95% confidence interval (state average = 0.20)
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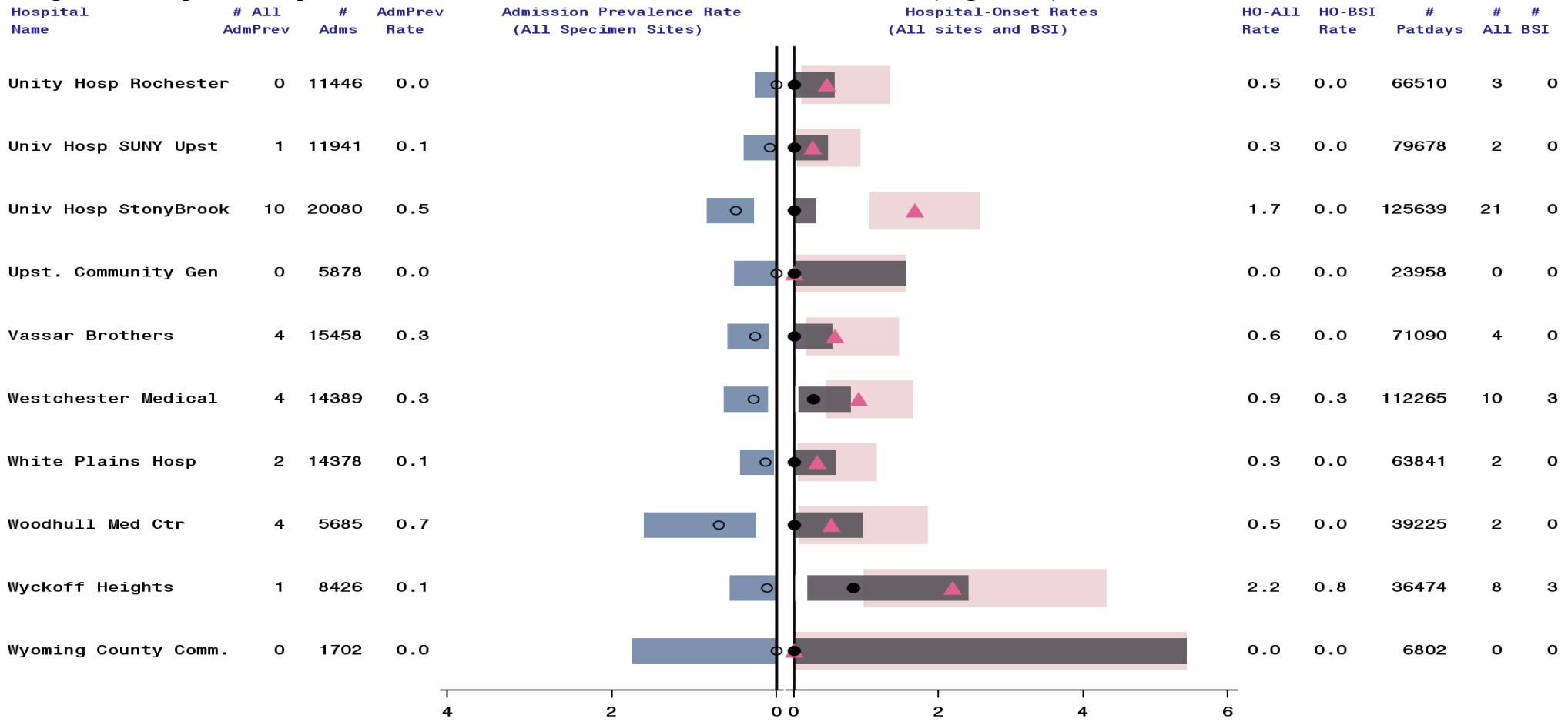
**Figure 27. Hospital carbapenem-resistant Enterobacterales infection rates, NYS 2022 (Page 6 of 7)**



Data reported as of June 15, 2023. Facility-wide inpatient only, rehab and behavioral health units excluded

- HO-All: hospital onset CRE incidence rate all sites per 10,000 patient days and 95% confidence interval (state average = 0.92)
- HO-BSI: hospital onset CRE blood incidence rate per 10,000 patient days and 95% confidence interval (state average = 0.20)
- All-Admprev: all body site CRE admissions prevalence rate per 1,000 admissions and 95% confidence interval (state average = 0.24)

**Figure 27. Hospital carbapenem-resistant Enterobacterales infection rates, NYS 2022 (Page 7 of 7)**



Data reported as of June 15, 2023. Facility-wide inpatient only, rehab and behavioral health units excluded

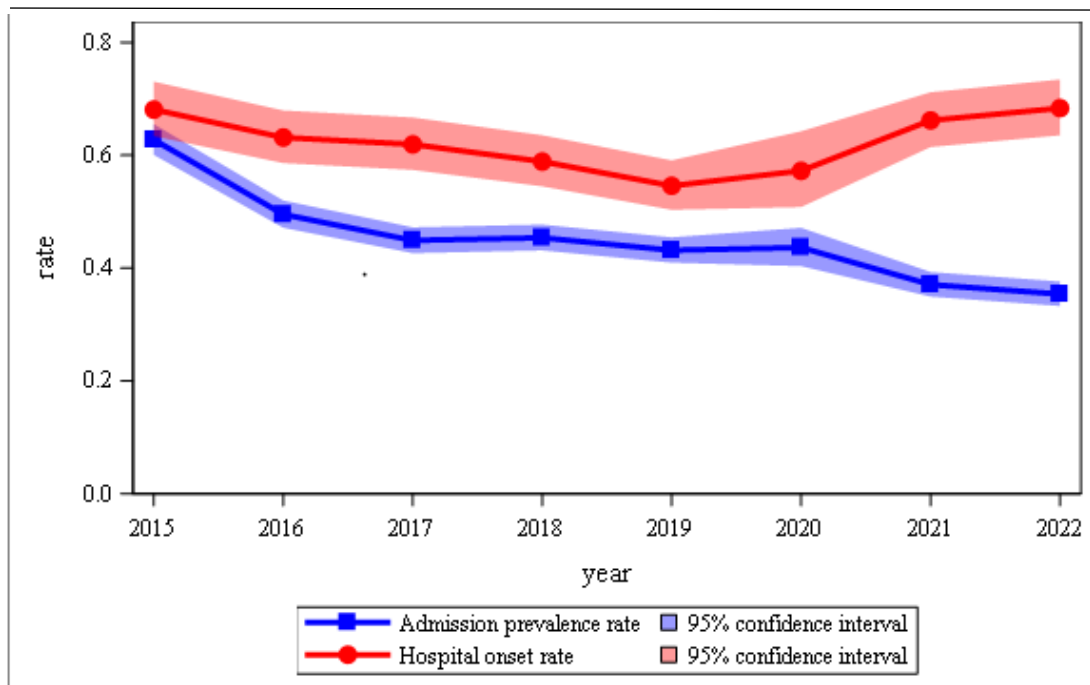
- ▲ HO-All: hospital onset CRE incidence rate all sites per 10,000 patient days and 95% confidence interval (state average = 0.92)
- HO-BSI: hospital onset CRE blood incidence rate per 10,000 patient days and 95% confidence interval (state average = 0.20)
- All-Admprev: all body site CRE admissions prevalence rate per 1,000 admissions and 95% confidence interval (state average = 0.24)

## Methicillin-resistant *Staphylococcus aureus* (MRSA) bloodstream infections

*Staphylococcus aureus* is a common bacteria found on the skin or in the nose of many healthy individuals. When *Staphylococcus aureus* is resistant to the antibiotics oxacillin, ceftaxime, or methicillin, it is called MRSA. In 2022, 165 hospitals reported MRSA BSIs for participation in CMS incentive programs; small hospitals that do not meet NYS reporting requirements were excluded. While reporting single cases of MRSA is not required by NYS, NYSDOH has access to these data through the DUA and therefore NYSDOH does not audit the data and hospital-specific MRSA rates cannot be published by NYSDOH.

Between 2015 and 2022, the admission prevalence MRSA BSI rate decreased 44%. The hospital onset MRSA rate decreased 3% between 2015 and 2021 but increased in 2022 (Figure 28).

**Figure 28. MRSA bloodstream infections, New York State 2015-2022**

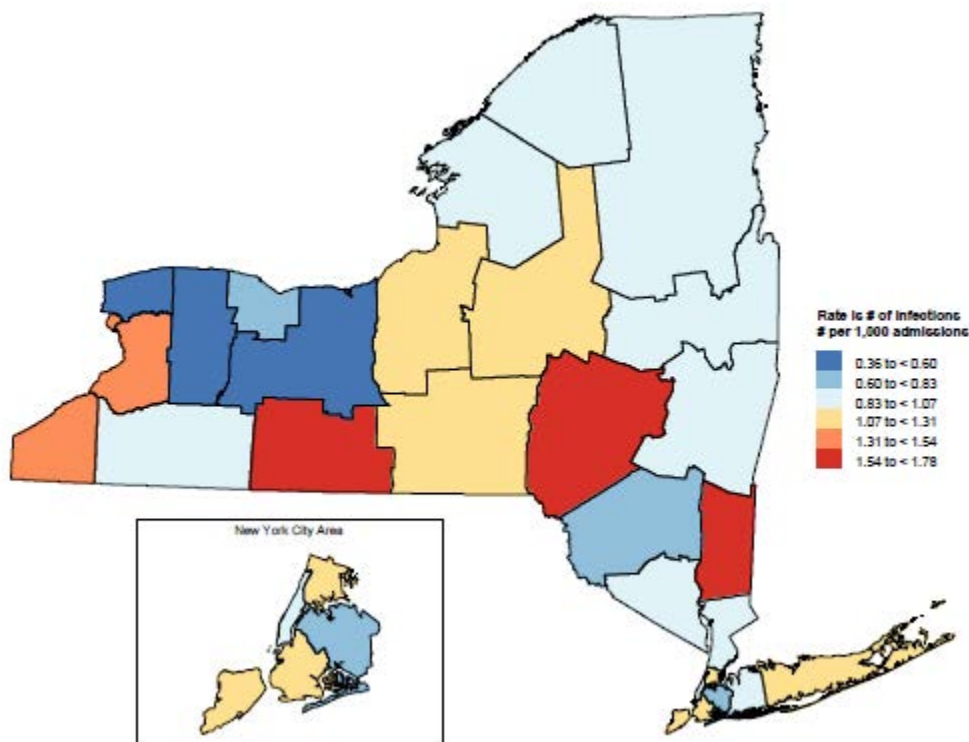


Year	# Hosp	# Emergency Dept. Infections	# Admission Prevalent Infections	# Admissions	Admission Prevalence Rate (per 1,000 admissions)	# Hospital Onset Infections	# Patient Days	Hospital Onset Incidence Rate (per 10,000 patient days)
2015	174	1,464	1,459	2,325,035	0.628	777	11,410,301	0.681
2016	177	1,921	1,154	2,330,860	0.495	718	11,369,649	0.632
2017	175	2,069	1,057	2,376,628	0.445	695	11,250,134	0.618
2018	173	2,239	1,077	2,372,129	0.454	661	11,222,947	0.589
2019	165	2,010	938	2,148,918	0.436	554	10,214,721	0.546
2020	165	1,124	747	1,047,398	0.437	289	5,047,808	0.572
2021	165	2,293	1,523	2,146,879	0.371	727	10,986,148	0.662
2022	165	2,537	1,480	2,071,472	0.354	747	10,928,210	0.684

Facility-wide inpatient data reported as of June 15, 2023.

Figure 29 shows the FWI MRSA patient prevalence rate by county (or merged county for those with few or no hospitals).

**Figure 29. Facility-wide inpatient MRSA bloodstream infection patient prevalence rates, New York State 2022**



Facility-wide inpatient data reported as of June 15, 2023. Small counties were merged.

## ***Candida auris* infections**

*Candida auris* (*C. auris*) is a globally emerging, multidrug-resistant yeast that has caused healthcare-associated outbreaks of invasive infections with high mortality.

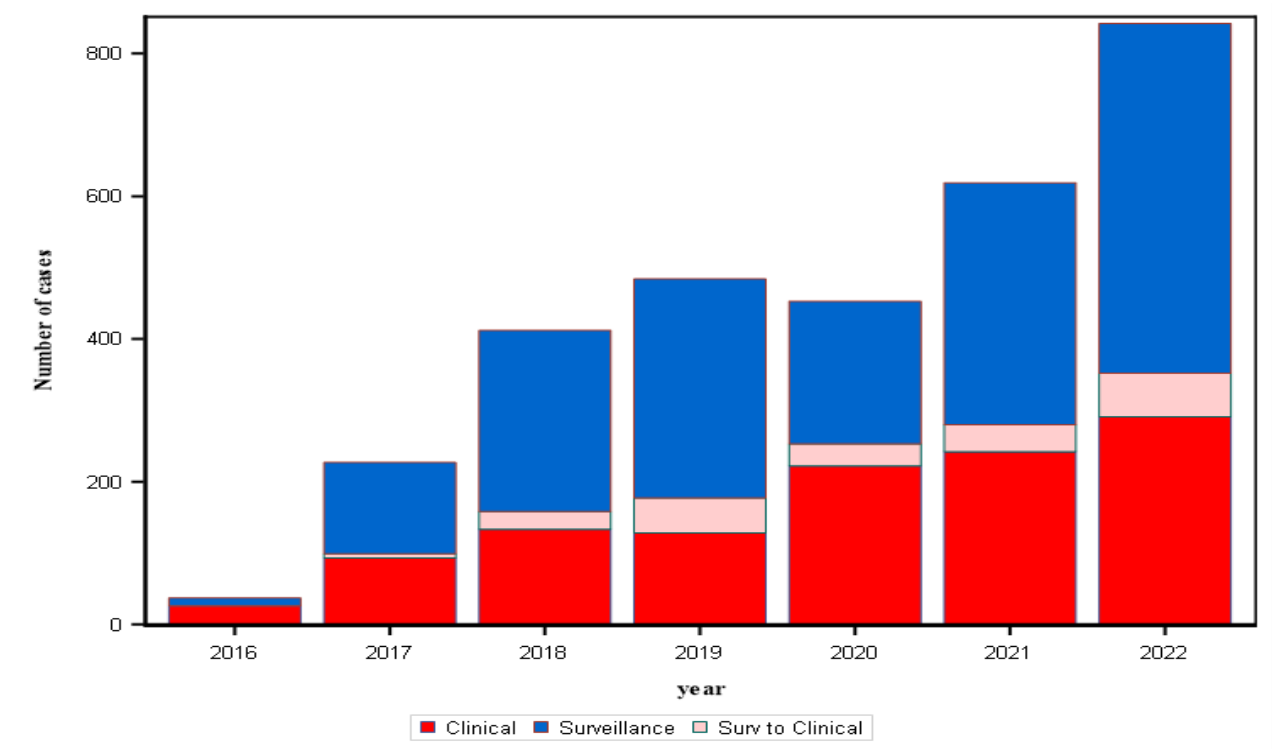
Epidemiologic and laboratory evidence continue to show that *C. auris* has been transmitted within healthcare facilities in New York City and the surrounding Metropolitan area of NYS. The New York City (NYC)/Metropolitan area is one of the areas in the United States where the most *C. auris* cases have been detected; *C. auris* may already be endemic in healthcare facilities in some of the most impacted localities. Other upstate regions have begun to see *C. auris* cases, with at least one case identified in every region of NYS.

To curb further spread of *C. auris*, NYS developed a special team to address *C. auris* activity in the NYC/Metropolitan region. Working with senior staff in both regional and central offices, this team has been investigating cases of *C. auris*. Activities include conducting on-site investigations; reviewing patient medical records; developing lists of close contacts of confirmed cases; providing infection prevention and control education and recommendations to facilities with cases of *C. auris*; collecting laboratory specimens from patients/residents and monitoring to ensure facility compliance with infection prevention and control recommendations; and implementing training programs on infection prevention and control issues, including training for hospitals, nursing homes, and other health care facilities, focusing on multidrug resistant fungi/yeast and general infection prevention and control; and providing guidance on environmental cleaning and disinfection.

This section summarizes the laboratory test results confirmed by Wadsworth Center, NYS's public health laboratory. Clinical cases are defined as persons with a positive *C. auris* culture from specimens collected to diagnose or treat disease in the normal course of care. Starting in 2019, this includes specimens from non-invasive sites such as wounds, urine, and the respiratory tract, where presence of *C. auris* may simply represent colonization and not true infection. Screening/surveillance cases are defined as persons without signs or symptoms of infection but have a positive *C. auris* culture from specimens collected from point prevalence surveys, admission screening, and/or contact tracing. Some surveillance cases later developed clinical illness and so are also counted as surveillance-to-clinical cases. For example, if an asymptomatic person was identified as a surveillance case in 2021 then develops clinical illness in 2022, the person is counted both as a 2021 surveillance case and as a surveillance-to-clinical case in 2022. For consistency, if a person is identified as a surveillance case in 2022 and develops clinical illness later in 2022, the person is counted as both a surveillance case and as a surveillance-to-clinical case in 2022.

In 2022 there were 490 surveillance cases, 291 clinical cases, and 61 clinical cases that were also previously counted as surveillance cases (Figure 30). A total of 175 patients had BSIs. The average patient age was 67 (range 19 to 101 years). Most cases (73%) were first identified by hospitals; patients transfer frequently between hospitals and LTCFs and diagnosis location may not represent where an individual acquired *C. auris*.

**Figure 30. *Candida auris* cases, New York State facilities 2016-2022**



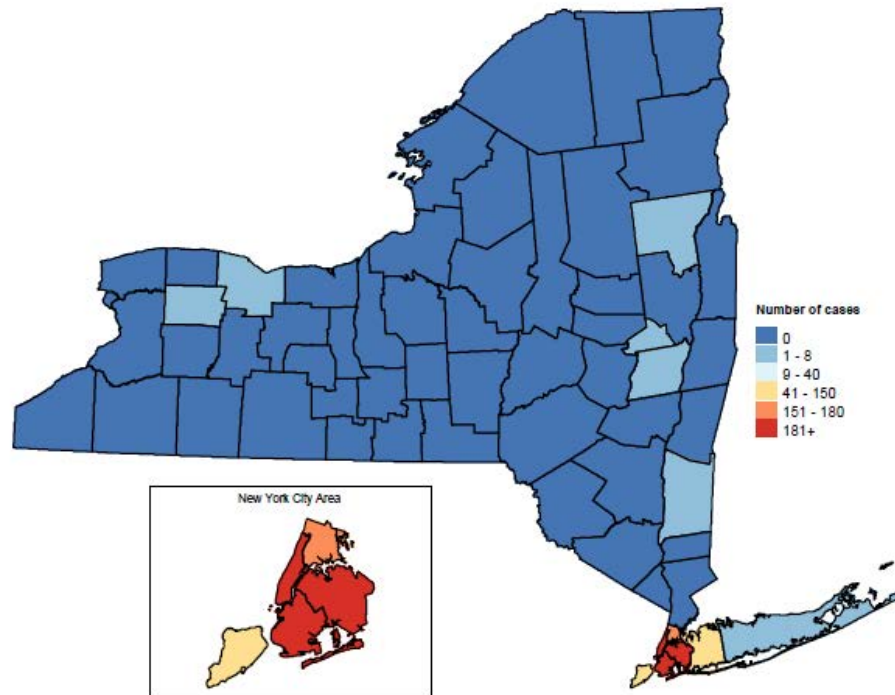
year	# Clinical cases	# Surveillance to clinical	# Surveillance cases	# Total
2016	26	0	11	37
2017	93	6	128	227
2018	133	25	254	412
2019	128	49	307	484
2020	222	21	200	453
2021	242	38	339	619
2022	490	61	291	842

Samples reported as of October 15, 2023. First positive per person per specimen type (clinical/surveillance). Includes cases identified in hospitals, nursing homes, and other facility types.

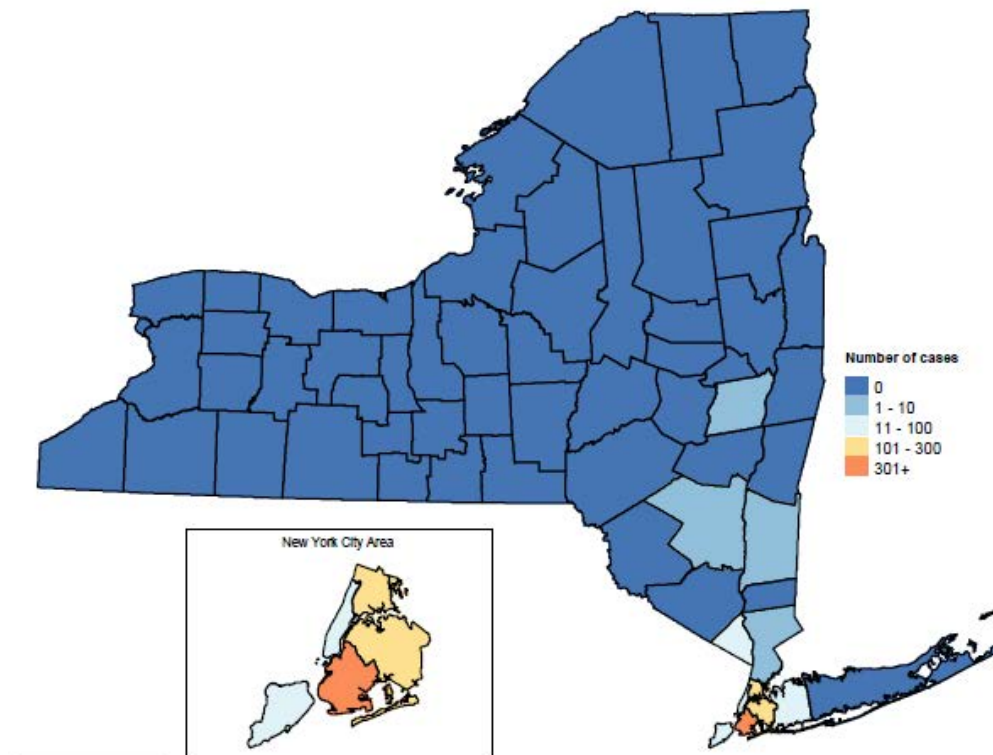
Clinical and surveillance cases are mapped by county of diagnosis in Figure 31. Cases were concentrated in New York City.

**Figure 31. Cumulative number of patients colonized or infected with *Candida auris*, New York State 2016-2022**

a) Clinical cases



b) Surveillance cases



Samples reported as of October 15, 2023. First positive per person per specimen type (clinical/surveillance). Includes cases identified in hospitals and LTCFs.

In 2022, 64 hospitals and 24 LTCFs were known to have cared for a person infected, colonized, or possibly colonized with *C. auris* within 90 days before diagnosis. This count is likely underestimated because of the resource-intensive nature of patient tracking. *C. auris* is not a problem particular to any one facility but rather a challenge for all facilities in the region, regardless of whether *C. auris* has thus far been identified there. When a hospital or LTCF cares for patients or residents whose positive colonization status is known, NYSDOH personnel work with the facility to institute the appropriate infection prevention and control measures and, in certain situations, to conduct point prevalence surveys to detect other patients and residents who might be colonized. Because of these activities, transmission is less likely to occur when a person's positive colonization status is known.

## Mortality related to CDI and MDROs

NHSN does not collect data on mortality associated with CDI or MDROs. However, by applying information published in the scientific literature to the NYS population, it is possible to estimate the number of deaths associated with these infections in NYS.

The attributable mortality rate is the death rate among a group of people with the infection minus the death rate among a similar (matched) group of people without the infection. The attributable death rates for five types of infections are summarized in Table 20. More details on the derivation of these rates are provided in Appendix 2.

To estimate how many deaths were attributable to these infections in NYS, the attributable mortality rate derived from the scientific literature was multiplied by the total number of reported infections. Only BSIs were counted for CRE. The number of deaths caused by *C. auris* was not included because the data are not reported by onset the same way as the other indicators. Based on this analysis, CDI resulted in the largest number of deaths; even though the attributable death rate is relatively low, the number of people with CDI is very large. The total number of estimated deaths from CDI, MRSA, and CRE (804), greatly exceeds the number of deaths due to other well-known infections such as acquired immune deficiency syndrome (AIDS) of 405, reported in NYS in 2021.<sup>3</sup>

**Table 20. New York State hospital mortality estimates, 2022**

Infection <sup>1</sup>	% Attributable Deaths <sup>2</sup>	# Cases Total <sup>3</sup>	# Hospital Onset Cases	# Deaths Total	# Deaths from Hospital Onset Cases
<i>Clostridioides difficile</i>	6%	6987	3,402	419	204
MRSA BSI	20%	1,480	747	296	149
CRE BSI	34%	263	220	89	75
Total		8,730	4,369	804	248

NHSN facility-wide inpatient data downloaded June 15, 2023. BSI = bloodstream infection. <sup>1</sup> CDI and CRE data were deduplicated to one infection per person, MRSA data did not contain unique identifiers and may contain duplicates. <sup>2</sup> Based on estimations from scientific literature, see Appendix 2. <sup>3</sup> Total cases = community and hospital onset.

# MDRO Prevention Practices

NHSN requires all facilities to submit an annual survey. Table 21 summarizes the self-reported 2022 survey results related to MDRO prevention practices.

**Table 21. MDRO Prevention Practice Survey, New York State Hospitals 2022**

Patients infected or colonized with MRSA are routinely placed on Contact Precautions?	
No	22%
Yes, all infected or colonized	41%
Yes, only all infected	20%
Yes, only those with high risk	17%
Patients infected or colonized with CRE are routinely placed on Contact Precautions?	
No	1%
Yes, all infected or colonized	91%
Yes, only all infected	5%
Yes, only those with high risk	4%
Facility routinely performs screening cultures for CRE?	13%
Facility routinely performs screening cultures for MRSA in non-NICU settings (e.g., on pre-operative patients to prevent SSI, or on high-risk patients)	30%
Facility routinely performs screening cultures for MRSA in patients admitted to NICUs	21%
Facility routinely uses chlorhexidine gluconate bathing to prevent transmission of MDROs?	78%
Facility routinely uses a combination of topical chlorhexidine gluconate and intranasal mupirocin to prevent transmission of MRSA? (Note: this does not include the use of these agents in preoperative patients or dialysis patients.)	43%

National Healthcare Safety Network Surveys, downloaded June 15, 2023. All 164 (in NHSN-NYS group) hospitals responded.

Although 91% of facilities responded that they put all patients who are colonized and/or infected with CRE on Contact Precautions, this data should be interpreted cautiously, especially in areas of high CRE prevalence and incidence. The implementation of “Contact Precautions”, i.e., the donning of personal protective equipment (PPE - gowns, gloves, and in some cases masks/eye protection), has many variations between and even within facilities. Some policies require all persons, i.e., healthcare workers and visitors, who enter the room of someone on Contact Precautions to don PPE; others exclude visitors from wearing PPE.

# Antimicrobial Stewardship and Use

The CDC’s *Core Elements of Hospital Antibiotic Stewardship Programs* outline structural and procedural components that are associated with successful antibiotic stewardship programs, which was updated in 2019 to reflect new evidence and lessons learned from implementing programs. In 2021, nearly 95% of U.S. hospitals had antibiotic stewardship programs that met all seven of the CDC’s Core Elements. To continue enhancing hospital antibiotic stewardship programs, CDC has released *Priorities for Hospital Core Element Implementation* (Priorities) in 2022 to help enhance the quality and impact of existing antibiotic stewardship programs. The Priorities table below highlights highly effective implementation approaches and are supported by evidence and stewardship experts. (Hospital Core Elements, ASPs)<sup>4,5</sup> (Table 22).

**Table 22. Percentage of antimicrobial stewardship core elements and priorities met in NYS hospitals, 2022**

Hospital Core Elements	% Met	Priorities for Core Element Implementation	% Met
<b>Hospital Leadership Commitment</b>			
Dedicate necessary human, financial, and information technology resources.	99%	Antibiotic stewardship physician and/or pharmacist leader(s) have antibiotic stewardship responsibilities in their contract, job description, or performance review.	81%
<b>Accountability</b>			
Appoint a leader or co-leaders, such as a physician and pharmacist, responsible for program management and outcomes.	99%	Antibiotic stewardship program is co-led by a physician and pharmacist.	72%
<b>Pharmacy/Stewardship Expertise</b>			
Appoint a pharmacist, ideally as the co-leader of the stewardship program to help lead implementation efforts to improve antibiotic use.	99%	Antibiotic stewardship physician and/or pharmacist leader(s) have completed infectious diseases specialty training, a certificate program, or other training on antibiotic stewardship.	89%
<b>Action</b>			
Implement interventions, such as prospective audit and feedback or preauthorization, to improve antibiotic use.	100%	Antibiotic stewardship program has facility-specific treatment recommendations for common clinical condition(s) and performs prospective audit/feedback or preauthorization.	81%
<b>Tracking</b>			
Monitor antibiotic prescribing, impact of interventions, and other important outcomes, like CDIs and resistance patterns.	99%	Hospital submits antibiotic use data to the NHSN Antimicrobial Use option.	0%
<b>Reporting</b>			
Regularly report information on antibiotic use and resistance to prescribers, pharmacists, nurses, and hospital leadership.	99%	Antibiotic use reports are provided at least annually to target feedback to prescribers. In addition, the antibiotic stewardship program monitors adherence to facility-specific treatment recommendations for at least one common clinical condition.	30%
<b>Education</b>			
Educate prescribers, pharmacists, nurses, and patients about adverse reactions from antibiotics, antibiotic resistance, and optimal prescribing.	100%	No implementation priority identified.	
<b>All 7 elements met</b>	<b>98%</b>	<b>All 6 priorities met</b>	<b>17%</b>

Annual survey data downloaded from National Healthcare Safety Network on June 15, 2023. A total of 164 hospitals responded.

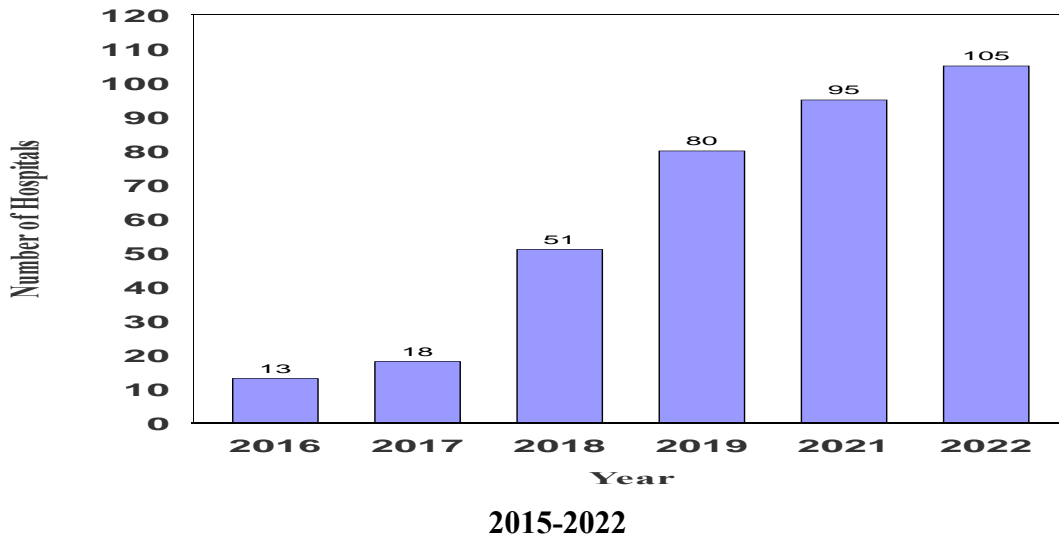
\* All seven core elements are met if a facility has “Yes” for all seven core elements.

\*\* All six priorities for hospital core elements are met if a facility has “Yes” for all six priorities.

## Measuring antimicrobial use

Measuring the impact of antimicrobial stewardship programs (ASPs) may be accomplished several ways, including measuring antimicrobial use (AU), appropriate antimicrobial selection, patient outcomes, adverse events, or expenditures. NYSDOH strongly recommends that hospitals measure antimicrobial use using the NHSN established definition for days of therapy (DOT) per 1,000 patient days to establish baseline data and identify opportunities for targeted interventions. Eighty-one percent of hospitals reported using DOT per 1000 patient days or days present to track antimicrobial use as part of an ASP. Between 2015 and 2022, the number NYS of hospitals that submitted AU data to NHSN increased from 13 to 105 (Figure 32). These data are visible to NYSDOH via the CDC-NYS DUA, but the DUA prohibits NYSDOH from publishing hospital-specific data.

**Figure 32. Number of hospitals reporting antimicrobial use data to the NHSN, New York State**



In 2022, NYS hospitals participating in NHSN reported an average antimicrobial usage rate of 558 DOT per 1,000 days present in adult medical, medical-surgical, and surgical ICUs and wards, step down units, and oncology units. DOT are the number of days for which any amount of a specific antimicrobial was administered to a patient in a specific location. Days present are the number of days in which a patient spent any time in a location and are always greater than the total number of patient days reported in the rest of this report.

NHSN provides a metric called the standardized antimicrobial administration ratio (SAAR) that compares the observed DOT to the predicted DOT in the referent population (voluntary reporters in United States, 2017) after adjusting for patient care location. The 2022 NYS SAAR of 0.90 (Table 23) indicates that NYS antimicrobial use data was 10% lower than antimicrobial use in the 2017

referent population. The SAAR alone is not a definitive measure of the appropriateness of antimicrobial use but suggests areas for further evaluation by stewardship programs. Trends are not shown because the group of participating hospitals changed over time.

**Table 23. Antimicrobial usage and standardized antimicrobial administration ratio (SAAR) in NYS hospitals in 2022, adult medical, medical-surgical, and surgical ICUs and wards, step down units, and oncology units**

	Antimicrobial days observed	Antimicrobial days predicted	Days present	Antimicrobial use per 1,000 days present	SAAR based on national data 2017
<sup>1</sup> All antibacterial agents	3,894,983	4,340,625	6,986,483	558	0.90
<sup>2</sup> Broad spectrum antibacterial agents predominantly used for hospital-onset infections	1,135,890	1,083,451	6,986,483	163	1.05
<sup>3</sup> Broad spectrum antibacterial agents predominantly used for community-acquired infections	783,098	959,678	6,986,483	112	0.82
<sup>4</sup> Antibacterial agents predominantly used for resistant Gram-positive infections	543,612	700,545	6,986,483	78	0.78
<sup>5</sup> Narrow spectrum beta-lactam agents	582,776	627,679	6,986,483	83	0.93
<sup>6</sup> Antibacterial agents posing the highest risk for CDI	1,028,790	1,209,202	6,986,483	147	0.85
<sup>7</sup> Antifungal agents predominantly used for invasive candidiasis	155,655	179,599	6,986,483	22	0.87

National Healthcare Safety Network data reported as of June 15, 2023.

<sup>1</sup> excluding delafloxacin, meropenem/vaborbactam, piperacillin, ticarcillin/clavulanate

<sup>2</sup> amikacin (intravenous (IV) only), aztreonam (IV only), ceftazidime, doripenem, gentamicin (IV only), imipenem/cilastatin, meropenem, piperacillin/tazobactam, tobramycin (IV only)

<sup>3</sup> cefaclor, cefdinir, cefixime, cefotaxime, cefpodoxime, cefprozil, ceftriaxone, ciprofloxacin, cefuroxime, ertapenem, gemifloxacin, levofloxacin, moxifloxacin

<sup>4</sup> ceftaroline, dalbavancin, daptomycin, linezolid, oritavancin, quinupristin/dalfopristin, tedizolid, telavancin, vancomycin (IV only)

<sup>5</sup> amoxicillin, amoxicillin/clavulanate, ampicillin, ampicillin/sulbactam, cefadroxil, cefazolin, cefotetan, cefoxitin, cephalixin, dicloxacillin, nafcillin, oxacillin, penicillin G, penicillin V

<sup>6</sup> cefdinir, ceftazidime, cefixime, cefotaxime, cefpodoxime, ceftriaxone, ciprofloxacin, clindamycin, gemifloxacin, levofloxacin, moxifloxacin

<sup>7</sup> anidulafungin, caspofungin, fluconazole, micafungin

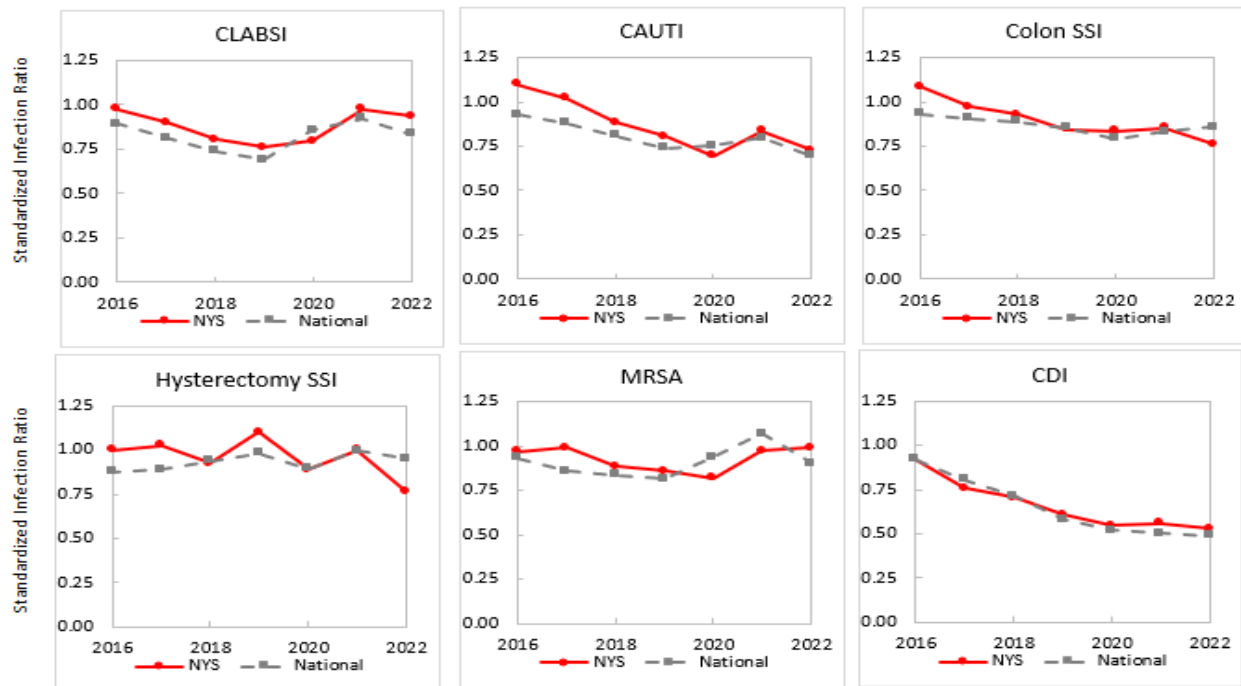
Measurement of antibiotic use and evaluation and intervention to ensure appropriate use are important in healthcare, including hospitals, long term care, and ambulatory/outpatient care settings.<sup>6,7,8</sup> Guidelines and numerous training programs are available through federal and state partners, as well as professional associations. Efforts across healthcare settings to use antibiotics appropriately will contribute to public health goals to reduce antimicrobial resistance.

Patients should understand and be provided education on the consequences of inappropriate antibiotic use. Antibiotics are life-saving medications when used appropriately; misuse of antibiotics can cause harm. Consequences of using antibiotics when they are not needed can include antibiotic resistant infections that are difficult to treat, altering the bacteria in the gut thereby increasing the risk of infection with *C. difficile*, and experiencing adverse reactions (e.g., allergic reactions or diarrhea) to the medication. CDC's *Be Antibiotics Aware* campaign contains patient-centered education to address patient concerns and provide information about appropriate use of antibiotics.

# Comparison of NYS HAI Rates with National HAI Rates

Approximate comparisons of concurrent state and national HAI rates are available in annual progress reports published by CDC<sup>9</sup>. Figure 32 summarizes data from the 2015-2022 CDC reports.

**Figure 33. Trends in New York State and National Standardized Infection Ratios**



Type of Hospital-Acquired Infection	2022 New York SIR <sup>^</sup>	2022 National SIR <sup>^</sup>
Central-line associated bloodstream infections (CLABSIs)*	0.937	0.836
Catheter-associated urinary tract infections (CAUTI)	0.728	0.697
Colon surgical site infections (SSIs)*	0.763	0.858
Abdominal hysterectomy SSIs*	0.765	0.951
MRSA bacteremia	0.990	0.904
<i>Clostridioides difficile</i> infections (CDI)*	0.527	0.488

Source of data: CDC. 2015 - 2022 National and State Healthcare-associated Infection Data Reports.

<sup>^</sup> Standardized Infection Ratio is compared to national 2015 baseline

\* Data audited by New York State

Between 2015 and 2022 both state and national HAI rates improved or remained without significant change for all indicators except CLABSI, CAUTI and MRSA BSIs. Figure 33 shows that most rates in NYS tend to track slightly higher than national rates, except for colon and abdominal hysterectomy SSI. Multiple factors may affect this trend:

1. Many states do not audit NHSN data, thereby missing infections that would be found on audit.
2. NYSDOH audit protocols may be more rigorous than those of other states and CMS in terms of the number of hospitals audited, the number of records audited in each hospital, and the methods used to efficiently target the records most likely to have errors.
3. Data validation processes in general often identify additional infections that were missed by hospital IPs. These missed infections are then reported through NHSN, resulting in higher reported rates.
4. Training conducted during audits may increase the skills of the hospital IPs, leading to better identification of HAIs, and therefore higher reported case rates.
5. The presence of a validation process in a state might encourage increased care and thoroughness in reporting, which could result in higher reported case rates.
6. NYS might truly have higher rates.

# Summary

Table 24 summarizes the total number of each type of HAI for NYS in 2022. The table is sorted from most common to least common.

**Table 24. Inpatient infections reported by New York State hospitals in 2022**

Type of infection	Number	Rate
Hospital onset <i>Clostridioides difficile</i> infections (CDIs)	3,402	3.30/10,000 patient days
Surgical site infections (SSIs) following:		
Colon surgery <sup>B</sup>	682	3.63/100 procedures
Spinal fusion surgery <sup>N</sup>	347	1.34/100 procedures
Hip replacement or revision surgery <sup>N</sup>	281	0.96/100 procedures
Abdominal hysterectomy surgery <sup>B</sup>	123	0.97/100 procedures
Coronary artery bypass graft (CABG) - chest site <sup>N</sup>	98	1.04/100 procedures
CABG - donor site <sup>N</sup>	27	0.32/100 procedures
Central line-associated bloodstream infections (CLABSIs) in intensive care units and medical and surgical wards <sup>B</sup> and step down, oncology, and mixed acuity and telemetry units <sup>N</sup>	1,531	0.97/1,000 line days
Catheter-associated urinary tract infections (CAUTIs) in intensive care units, and medical/surgical wards	1,145	0.87/1,000 urinary catheter days
Hospital onset methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) bloodstream infections <sup>C</sup>	747	0.68/10,000 patient days
Hospital onset carbapenem-resistant <i>Klebsiella</i> , <i>E. coli</i> , and <i>Enterobacter</i> (CRE) bloodstream infections <sup>N</sup>	220	0.20/10,000 patient days

N = required by NYS, C = required by Centers for Medicare and Medicaid Services (CMS; these data are accessible through a data use agreement but cannot be used for public reporting or regulatory action), B = required by both NYS and CMS. CDI, CRE, and MRSA events are from facility-wide inpatient location only. Data reported June 15, 2023. Data from inpatient rehabilitation and psychiatric facilities were excluded. SSI data exclude infections present at time of surgery or detected in outpatient settings without readmission. CLABSI data exclude mucosal barrier injury, ventricular assist device, and extracorporeal membrane oxygenation-associated BSI.

Table 25 summarizes the rates of improvement, number of prevented infections, and direct cost savings associated with the NYS indicators, sorted by cost savings. The greatest improvement is seen in CDIs, with a 51% decreased incidence. Cost savings are estimated with a range because HAIs vary in severity, and studies upon which estimates are based differ somewhat in their cost estimates. Between 2015 and 2022, 23,544 infections were prevented because of reductions in HAI rates; this was related to a cost savings of \$276 to \$503 million.

Table 25 also compares NYS progress to national and state prevention goals. NYS met the 2022 CDI and colon SSI goals but did not meet goals for the other indicators.

**Table 25. Cost savings associated with change in HAI rates between 2015 and 2022**

Type of Infection	National/State 2015-2019 Prevention Goal	2022 Improvement Since 2015 (Compared to 2020 Goal)	# Prevented Infections	Direct Cost Savings (in millions)	
				Min	Max
Hospital onset <i>Clostridioides difficile</i> infections (CDI)	30%	improved 56% (goal met)	19,643	\$206.3	\$293.7
Colon surgery SSIs	30%	improved 35.5% (goal met)	1,843	\$36.2	\$105.8
Coronary artery bypass graft chest SSIs	30%	improved 43% (goal met)	172	\$5.8	\$16.8
Central line-associated bloodstream infections (CLABSIs)	50%	improved 13% (goal not met)	1,616	\$19.5	\$78.0
Hospital onset carbapenem-resistant Enterobacterales (CRE) bloodstream infections	25%	improved 1% (goal not met)	218	\$7.1	\$8.5
Abdominal hysterectomy surgery SSIs	30%	improved 21% (goal not met)	55	\$1.1	\$3.1
Hip replacement or revision surgery SSIs	30%	no improvement (goal not met)	-3	0.0	-0.1
Total			23,544	\$276	\$503.5

Cost ranges for CDI, SSI, and CLABSI are from Scott RD. The direct medical costs of healthcare-associated infections in U.S. hospitals and the benefits of prevention. CDC, Division of Healthcare Quality Promotion, Atlanta GA, March 2009. Report CS200891-A.

Cost ranges for CRE are from Bartsch SM et. al. Potential economic burden of carbapenem-resistant Enterobacterales (CRE) in the United States. Clin Microbiol Infect. 2017; 48:9-48.16.

All costs converted to 2016 dollars based on the Consumer Price Index for Hospital Inpatient Services.

Cells are shaded yellow if 2019 prevention goal was met, green if on track to meet 2019 prevention goal, and pink if not on track.

**Table 26. Summary of Hospital-Acquired Infections, New York State, 2021 and 2022.**

Type of Hospital-Acquired Infection	2021 Rate	2022 Rate	Change
Central-line associated bloodstream infections (CLABSIs)*	1.05	0.97	8% improvement
Surgical site infections (SSIs)			
Colon surgery	3.82	3.63	5% improvement
Coronary Artery Bypass Graft (Chest)	1.51	1.04	31% improvement
Hip replacement/revision surgery	0.90	0.96	7% worse
Abdominal hysterectomy	1.27	0.97	24% improvement
Spinal fusion surgery	1.36	1.34	1.5% improvement
Hospital onset <i>Clostridioides difficile</i> infections (CDI)	3.59	3.30	8% improvement
Hospital onset carbapenem-resistant Enterobacterales (CRE)	0.88	0.92	5% worse

Compared to 2021 data, most HAI rates showed some improvements in 2022. There was a (not significant) increase in HPRO-SSI and hospital onset CRE rates between 2021 and 2022. However,

hospital onset CDI rate and SSI rates for CABG and HYST showed a significant improvement between 2021 and 2022 (Table 26).

# Recommendations and Next Steps

NYSDOH continues to monitor and report HAI rates to encourage continued reduction in HAIs. Following the NYSDOH HAI program's policy on hospitals that have significantly high rates (available at [http://www.health.ny.gov/statistics/facilities/hospital/hospital\\_acquired\\_infections/](http://www.health.ny.gov/statistics/facilities/hospital/hospital_acquired_infections/)), NYSDOH continues to work with hospitals that are underperforming to ensure that they implement effective improvement plans and show progress in decreasing infection rates. NYSDOH also continues to notify hospitals of current issues in surveillance and infection prevention and control practices through email communication and webinars.

NYSDOH continues to work with the HAI TAW to seek guidance on the selection of reporting indicators, methods of risk adjustment, presentation of hospital-identified data, and overall planning for the reduction of HAIs in NYS.

NYSDOH continues to conduct medical record audits to verify appropriate use of surveillance definitions and accurate reporting by hospitals. Valid data are important for the analysis of HAI rates within the state, as well as for the analysis of NYS rates in comparison with other states' rates.

Efforts to combat the spread of CRE and *Candida auris* (and other MDROs) in NYS healthcare facilities continue. NYSDOH continues to conduct site visits to hospitals and LTCFs to evaluate and discuss infection surveillance and prevention and control practices, barriers to implementation, antibiotic stewardship activities, and other strategies intended to reduce facility incidence rates, and to assist as needed.

# Appendix 1: List of Abbreviations

AIDS – Acquired immune deficiency syndrome  
ASA – American Society of Anesthesiologists’  
ASP – Antimicrobial stewardship program  
BMI – Body mass index  
BSI – Bloodstream infection  
CABG – Coronary artery bypass graft surgery  
CAUTI – Catheter-associated urinary tract infection  
CDC – Centers for Disease Control and Prevention  
CDI – *Clostridioides difficile* infection  
*C. auris* – *Candida auris*  
*C. difficile* – *Clostridioides difficile*  
CI – Confidence interval  
CLABSI – Central line-associated bloodstream infection  
CLSI - Clinical Laboratory Standards Institute  
CMS – Centers for Medicare and Medicaid Services  
CO – Community onset  
CO-NMH – Community onset-not my hospital  
CO-PMH – Community onset-possibly my hospital  
CRE – Carbapenem-resistant Enterobacterales  
DOH – Department of Health  
DOT – Days of therapy  
DUA – Data use agreement  
EB – Epidermolysis bullosa  
ECMO – Extracorporeal membrane oxygenation  
ED – Emergency department  
EIA – Enzyme immunoassay  
FWI – Facility-wide inpatient  
HAI – Hospital-acquired infection  
HO – Hospital-onset  
ICU – Intensive care unit  
IP – Infection preventionist  
IPF – Inpatient psychiatric facility  
IRF – Inpatient rehabilitation facility  
IV – Intravenous  
LabID – Laboratory identified  
LTCF – Long term care facility  
MBI – Mucosal barrier injury  
MDR – Multidrug resistant  
MDRO – Multidrug resistant organism  
MRSA – Methicillin-resistant *Staphylococcus aureus*  
NAAT – Nucleic acid amplification test  
NICU – Neonatal intensive care unit  
NHSN – National Healthcare Safety Network  
NYC – New York City  
NYS – New York State  
NYSDOH – New York State Department of Health  
OBS – Observation unit

OP – Outpatient  
PATOS – Present at time of surgery  
PDS – Post-discharge surveillance  
PPE – Personal protective equipment  
RPC – Regional Perinatal Center  
SAAR – Standardized antimicrobial administration ratio  
SIR – Standardized infection ratio  
SPARCS – Statewide Planning and Research Cooperative System  
Spp. – Species (plural)  
SSI – Surgical site infection  
TAW – Technical Advisory Workgroup  
UTI – Urinary tract infection  
VAD – Ventricular assist device  
VRE – Vancomycin-resistant Enterococci

## Appendix 2: Glossary of Terms

**ASA score:** This is a scale used by the anesthesiologist to classify the patient's physical condition before surgery. It uses the American Society of Anesthesiologist (ASA) Classification of Physical Status. It is one of the factors that help determine a patient's risk of possibly developing an SSI. Here is the ASA scale:

- 1 - Normally healthy patient
- 2 - Patient with mild systemic disease
- 3 - Patient with severe systemic disease
- 4 - Patient with an incapacitating systemic disease that is a constant threat to life
- 5 - A patient who is not expected to survive with or without the operation.

**Admission prevalence rate:** The percent of patients that are admitted to the hospital already carrying an infection. This is calculated as the number of admission prevalent cases divided by the number of admissions.

**Birth weight categories:** the weight of an infant at the time of birth. Infants remain in their birth weight category even if they gain weight. Birth weight category is important because the lower the birth weight, the higher the risk of developing an infection.

**Body mass index (BMI):** a measure of the relationship between a person's weight and their height. The formula to calculate BMI is  $\text{weight (kg)}/[\text{height (m)}]^2$ .

**Catheter-associated urinary tract infection (CAUTI):** an infection of the bladder or kidneys associated with the use of a urinary catheter. Hospitalized patients may have a urinary catheter, a thin tube inserted into the bladder through the urethra, to drain urine when they cannot urinate.

**Carbapenem:** a potent antibiotic. There are four carbapenem antibiotics: ertapenem, meropenem, doripenem, and imipenem. Carbapenems are considered antibiotics of near last resort by medical professionals.

**Carbapenem-resistant Enterobacterales (CRE):** Bacteria in the Enterobacterales family that are resistant to carbapenems.

**Central line:** A central line is a long thin tube that is placed into a large vein, usually in the neck, chest, arm, groin, or umbilical cord. The tube is threaded through this vein until it reaches a large vein near the heart. A central line is used to give fluids or medication, withdraw blood, provide nutrition, and monitor the patient's condition.

**Central line-associated bloodstream infection (CLABSI):** A bloodstream infection that occurs when microorganisms travel around and through a central line or umbilical catheter and then enter the blood.

**Central line-associated bloodstream infection (CLABSI) rate:** The total number of central line-associated bloodstream infections divided by the number of central line days multiplied by 1,000. Lower rates are better.

**Central line days (device days):** The total number of days a central line is used. A daily count of patients with a central line in place is performed at the same time each day. Each patient with one or more central lines at the time the daily count is performed is counted as one central line day.

***Clostridioides difficile***: A bacterium that naturally resides in the bowels of some people without symptoms of infection, but which can cause infections in some situations. Overgrowth of *C. difficile* in the bowel sometimes occurs after a patient takes antibiotics, which can kill good bacteria in the bowel. Sometimes people become infected with *C. difficile* from touching their mouth after coming in contact with contaminated environmental surfaces or patient care items. Symptoms range from mild to severe diarrhea; in some instances, death can occur.

**Colon surgery**: A procedure performed on the lower part of the digestive tract also known as the large intestine or colon.

**Community onset (CO)**: Documented infection occurring within 3 days of hospital admission.

**Community onset - not my hospital (CO-NMH)**: Documented infection occurring within 3 days of hospital admission and more than 4 weeks after discharge from the same hospital.

**Community onset – possibly my hospital (CO-PMH)**: Documented infection occurring within three days of readmission to the same hospital when a discharge from the same hospital occurred within the last four weeks.

**Confidence interval (CI)**: The range around a measurement that is a measure of conciseness. A 95% CI means that one can be 95% confident that the true measurement falls within the interval. If hospital A reports 1 infection out of 20 procedures (i.e., 5%, with 95% CI: 0% to 25%), and hospital B reports 10 infections out of 200 procedures (i.e. 5% with 95% CI: 2% to 9%), one can see that both hospitals have the same rate, but one is less confident that the rate is truly 5% at hospital A because it was based on only 1 infection.

**Coronary artery bypass graft (CABG) surgery**: A treatment for heart disease in which a vein or artery from another part of the body is used to create an alternate path for blood to flow to the heart, bypassing a blocked artery.

**Deep incisional SSI**: An infection that involves the deep soft tissues (e.g., fascial and muscle layers) of the incision and meets the NHSN criteria as described in the NHSN Patient Safety Manual.

**Device utilization ratio**: The number of device days divided by the number of patient days. It is calculated for central line utilization and urinary catheter utilization.

**Diabetes**: A disease in which the body does not produce or properly use insulin. Insulin is needed to control the amount of sugar normally released into the blood.

**Donor incision site for coronary artery bypass graft (CABG)**: CABG surgery with a chest incision and donor site incisions (donor sites include the patient's leg or arm) from which a blood vessel is removed to create a new path for blood to flow to the heart. CABG surgical incision site infections involving the donor incision site are reported separately from CABG surgical chest incision site infections.

**Duration**: The time between skin incision and suturing or stapling the skin closed. In the NHSN protocol, if a person has another operation through the same incision within 24 hours of the end of the original procedure, only one procedure is entered into NHSN, and the total duration of the procedure is assigned as the sum of the two durations. Infection risk tends to increase with duration of surgery.

**Epidermolysis bullosa (EB):** A group of genetic disorders characterized by blister formation after minor trauma to the skin.

**Higher than state average:** The risk adjusted rate for each hospital is compared to the state average to determine if it is significantly higher or lower than the state average. A rate is significantly higher than the state average if the confidence interval around the risk adjusted rate falls entirely above the state average.

**Hip replacement surgery:** Removing damaged cartilage and bone from the hip joint and replacing them with new, artificial parts.

**Hospital-acquired infection (HAI):** An infection that occurs in a patient as a result of being in a hospital setting after having medical or surgical treatments.

**Hospital Onset (HO):** Documented infection occurring after the third day of hospital admission.

**Hysterectomy:** The surgical removal of a person's uterus.

**Infection control and prevention processes:** These are routine measures to prevent infections that can be used in all healthcare settings. Some hospitals make the processes mandatory. Examples include:

- Complete and thorough hand hygiene.
- Use of personal protective equipment such as gloves, gowns, and/or masks when caring for patients in selected situations to prevent the spread of infections.
- Use of an infection prevention checklist when inserting central lines. The list reminds healthcare workers to perform meticulous hand hygiene; clean the patient's skin before insertion with the correct type of skin cleanser; wear the recommended sterile gown, gloves and mask; and place sterile barriers around the insertion site, etc.
- Monitoring to ensure that employees and visitors follow the proper infection prevention and control procedures.

**Infection preventionist (IP):** Health professional that has special training in infection prevention and control and monitoring.

**Intensive care unit (ICU):** Hospital units that provide intensive observation and treatment for patients either suffering from, or at risk of developing life-threatening problems. ICUs are described by the type of patient care needed. Many hospitals care for patients with both medical and surgical conditions in a combined medical/surgical ICU, while others have separate ICUs for medical, surgical, and other specialties based on the patient care services provided by the hospital.

**Lower than state average:** The risk adjusted rate for each hospital is compared to the state average to determine if it is significantly higher or lower than the state average. A rate is significantly lower than the state average if the confidence interval around the risk adjusted rate falls entirely below the state average.

**Methicillin-resistant *Staphylococcus aureus* (MRSA):** *Staphylococcus aureus* (SA) is a common bacterium normally found on the skin or in the nose of 20 to 30 percent of healthy individuals. When SA is resistant to the antibiotics oxacillin, cefoxitin, or methicillin, it is defined as MRSA for surveillance purposes.

**Munchausen Syndrome by Proxy (MSbP):** A condition where a patient or caregiver makes up or causes an illness, for example deliberate contamination of a sterile device such as a central line.

**National Healthcare Safety Network (NHSN):** This is a secure, internet-based national data reporting system that NYS hospitals must use to report HAIs. The NHSN is managed by the CDC's Division of Healthcare Quality Promotion.

**Neonatal intensive care units:** Patient care units that provide care to newborns.

- **Level II/III Units:** Provide care to newborns at Level II (moderate risk) and Level III (requiring increasingly complex care).
- **Level III Units:** Provide highly specialized care to newborns with serious illness, including premature birth and low birth weight.
- **Regional Perinatal Centers (RPC):** Level IV units, providing all the services and expertise required by the most acutely sick or at-risk pregnant women and newborns. RPCs provide or coordinate maternal-fetal and newborn transfers of high-risk patients from their affiliate hospitals to the RPC and are responsible for support, education, consultation, and improvements in the quality of care in the affiliate hospitals within their region.

**Obesity:** Obesity is a condition in which a person has too much body fat that can lower the likelihood of good health. It is commonly defined as a body mass index (BMI) of 30 kg/m<sup>2</sup> or higher.

**Organ/space SSI:** A surgical site infection that involves a part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure.

**Patient day:** The number of hospitalizations multiplied by the length of stay of each hospitalization. One patient hospitalized for 6 days will contribute 6 patient days to the hospital total, as will two patients each hospitalized for 3 days.

**Post discharge surveillance:** The process IPs use to identify infections after patients have been discharged from the hospital. It includes screening a variety of data sources, including re-admissions, emergency department visits and/or contacting the patient's healthcare provider.

**Raw rate:** Rates that are not adjusted to account for differences in the patient populations.

- **Bloodstream infections:** Raw rate is the number of infections (the numerator) divided by the number of line days (the denominator) then multiplied by 1000 to give the number of infections per 1000 line days.
- **Surgical site infections:** Raw rate is the number of infections (the numerator) divided by the number of procedures (the denominator) then multiplied by 100 to give the number of infections per 100 operative procedures.
- **Admission Prevalent infection:** Raw rate is the number of infections (the numerator) divided by the number of admissions (the denominator) then multiplied by 100 to give the number of infections per 100 admissions.
- **Hospital onset infection:** Raw rate is the number of infections (the numerator) divided by the number of patient days (the denominator) then multiplied by 10,000 to give the number of infections per 10,000 patient days.

**Risk adjustment:** Accounts for differences in patient populations and allows hospitals to be compared. A hospital that performs a large number of complex procedures on very sick patients would be expected to have a higher infection rate than a hospital that performs more routine procedures on healthier patients.

**Risk-adjusted rate:** Based on a comparison of the actual (observed) rate and the rate that would be predicted if, statewide, the patients had the same distribution of risk factors as the hospital.

**Statewide Planning and Research Cooperative System (SPARCS):** A comprehensive data reporting system established in 1979 as a result of cooperation between the health care industry and NYS government. Initially created to collect information on discharges from hospitals, SPARCS currently collects patient level detail on patient characteristics, diagnoses and treatments, services, and charges for every hospital discharge, ambulatory surgery procedure and emergency department admission in NYS.

**Standardized infection ratio (SIR):** Compares infection rates in a smaller population with infection rates in a larger standard population, after adjusting for risk factors that might affect the chance of developing an infection. In this report, the SIR is used to compare NYS to the National standard. The SIR is calculated by dividing the actual number of infections in the smaller group by the number of infections that would be statistically predicted if the standard population had the same risk distribution as the observed population.

- An SIR of 1.0 means the observed number of infections is equal to the number of predicted infections.
- An SIR above 1.0 means that the infection rate is higher than that found in the standard population. The difference above 1.0 is the percentage by which the infection rate exceeds that of the standard population. For example, a hospital SIR of 1.12 indicates that the hospital performed 12% worse than the state average.
- An SIR below 1.0 means that the infection rate is lower than that of the standard population. The difference below 1.0 is the percentage by which the infection rate is lower than that experienced by the standard population. For example, a hospital SIR of 0.85 indicates that the hospital performed 15% better than the state average.

**Superficial incisional SSI:** An infection that involves only skin and soft tissue layers of the incision and meets NHSN criteria as described in the NHSN Patient Safety Protocol.

**Surgical site infection (SSI):** An infection that occurs after the operation in the part of the body where the surgery took place (incision).

**Validation:** A way of making sure the HAI data reported to NYS are complete and accurate. Complete reporting of HAIs, total numbers of surgical procedures performed, central line days, and patient information to assign risk scores must all be validated. The accuracy of reporting is evaluated by visiting hospitals and reviewing patient records. The purpose of the validation visits is to:

- Assess the accuracy and quality of the data submitted to NYS.
- Provide hospitals with information to help them use the data to improve and decrease HAIs.
- Provide education to the IPs and other hospital employees and doctors, to improve reporting accuracy and quality.
- Look for unreported HAIs.
- Make recommendations for improving data accuracy and/or patient care quality issues.

# Appendix 3: Methods

For more details on the HAI surveillance protocols used to collect this data, please see the NHSN website at <http://www.cdc.gov/nhsn/>. This section of the report focuses on NYS-specific methods and provides additional information helpful for interpreting the results.

## Data Validation

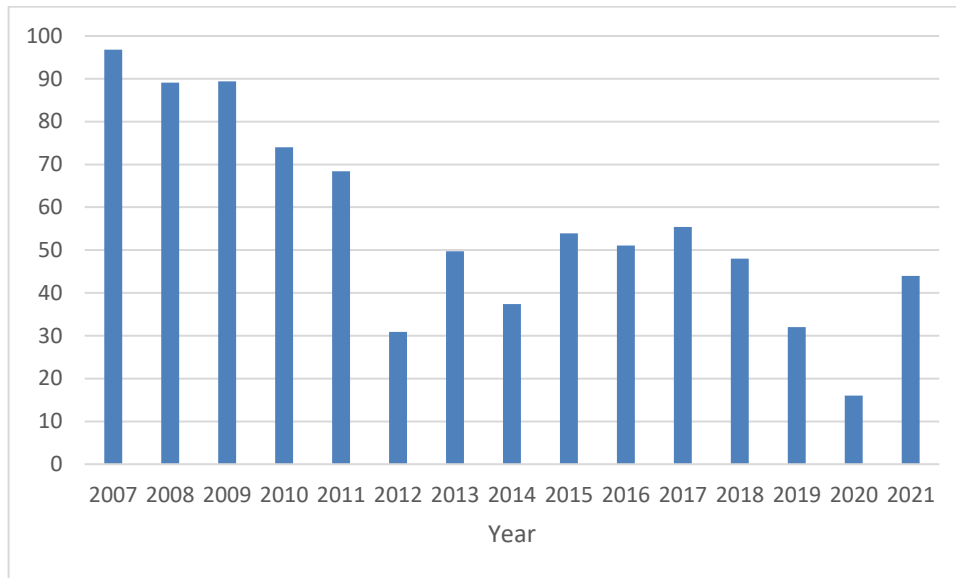
Data reported to the NHSN are validated by the NYSDOH using several methods.

Point of entry checks - NHSN is a national, web-based data reporting and analysis program that includes validation routines for many data elements, reducing common data entry errors. Hospitals can view, edit, and analyze their data at any time.

Bi-monthly checks for internal consistency – Every other month, NYS HAI staff download the data from NHSN and run it through a computerized data validation code. Data that are missing, unusual, inconsistent, or duplicate are identified and investigated through email or telephone communication with hospital staff. Hospitals are given the opportunity to verify and/or correct the data.

Audits – Audits of a sample of medical records are conducted by the NYSDOH to assess compliance with reporting requirements. In addition, the purposes of the audit are to enhance the reliability and consistency of applying the surveillance definitions; evaluate the adequacy of surveillance methods to detect infections; and evaluate intervention strategies designed to reduce or eliminate specific infections. Audits have been an important component of the NYSDOH program since its inception in 2007 and are conducted routinely. Figure 34 summarizes the percentage of hospitals audited by year. A hospital was more likely to be audited in a given year if it had significantly high or low rates in the previous year, was not audited the previous year, performed poorly during the previous audit, or hired new hospital IP staff. Audits for 2019 and 2020 data were disrupted by the COVID-19 pandemic and only small percentage of hospitals were audited.

**Figure 34. Percent of hospitals audited each year, New York State**



For CLABSI audits, NYSDOH staff review the medical records of patients identified as having a positive blood culture during a specified time period. For CDI and CRE audits, NYSDOH staff review a laboratory list of positive laboratory reports during a specified time period. For SSI audits, NYSDOH staff review a targeted selection of medical records to efficiently identify under reporting. Specifically, the SPARCS database is used to preferentially select patients with an infection reported to the SPARCS billing database but not NHSN.

The 2021 audit results are summarized in this annual report. In 2021, NYSDOH staff reviewed 2,994 records and agreed with the hospital-reported infection status 94.7 % of the time. Table 27 summarizes the number of inconsistencies in reporting infections out of the total number of qualified records reviewed. The number of unqualified records (e.g., bloodstream infections with no central lines (for CLABSI auditing) and procedures that should not have been reported (for SSI auditing)) that underwent partial review are not included in the summary. Hospitals are more likely to under report than over report infections. The overall agreement rates for this sample should not be used to infer the overall agreement for NYS data because 1) hospitals were not randomly selected for audit 2) the sample of records within each hospital is not random.

**Table 27. Brief summary of 2021 HAI audit**

Type of Infection	# Qualified <sup>1</sup> Records Reviewed	Hospital Said HAI = Y; Auditor Agreed	Hospital Said HAI = Y; Auditor Disagreed	Hospital Said HAI = N; Auditor Agreed	Hospital Said HAI = N; Auditor Disagreed	Overall % Agreement
FUSN	284	34	0	239	11	96.1%
CABG SSI	112	14	0	96	2	98.2%
COLO SSI	349	52	1	261	35	89.7%
HPRO SSI	367	23	2	338	4	98.4%
HYST SSI	308	24	0	275	9	97.1%
CLABSI	396	124	1	218	53	86.4%
CDI	905	816	0	47	42	95.4%
CRE	273	239	0	34	0	100.0%
Total	2994	1326	4	1508	156	94.7%

The 2021 audit was conducted between October 2021 and July 2022 and predominantly covered 2021 data.

SSI = surgical site infection; CLABSI = central line associated bloodstream infection; CDI = *Clostridioides difficile* infection; CRE = carbapenem resistant Enterobacterales.

<sup>1</sup> Unqualified records are not shown; these included patients with no central lines (for CLABSI auditing) and procedures that should not have been reported (for SSI auditing).

## Thresholds for Reporting Hospital-Specific Infection Rates

This report contains data from 164 hospitals reporting complete data for 2022. Hospitals that perform very few procedures or have ICUs with very few patients with central lines have infection rates that fluctuate greatly over time. This is because even a few cases of infection will yield a numerically high rate in the rate calculation when the denominator is small. To assure a fair and representative set of data, the NYSDOH adopted minimum thresholds.

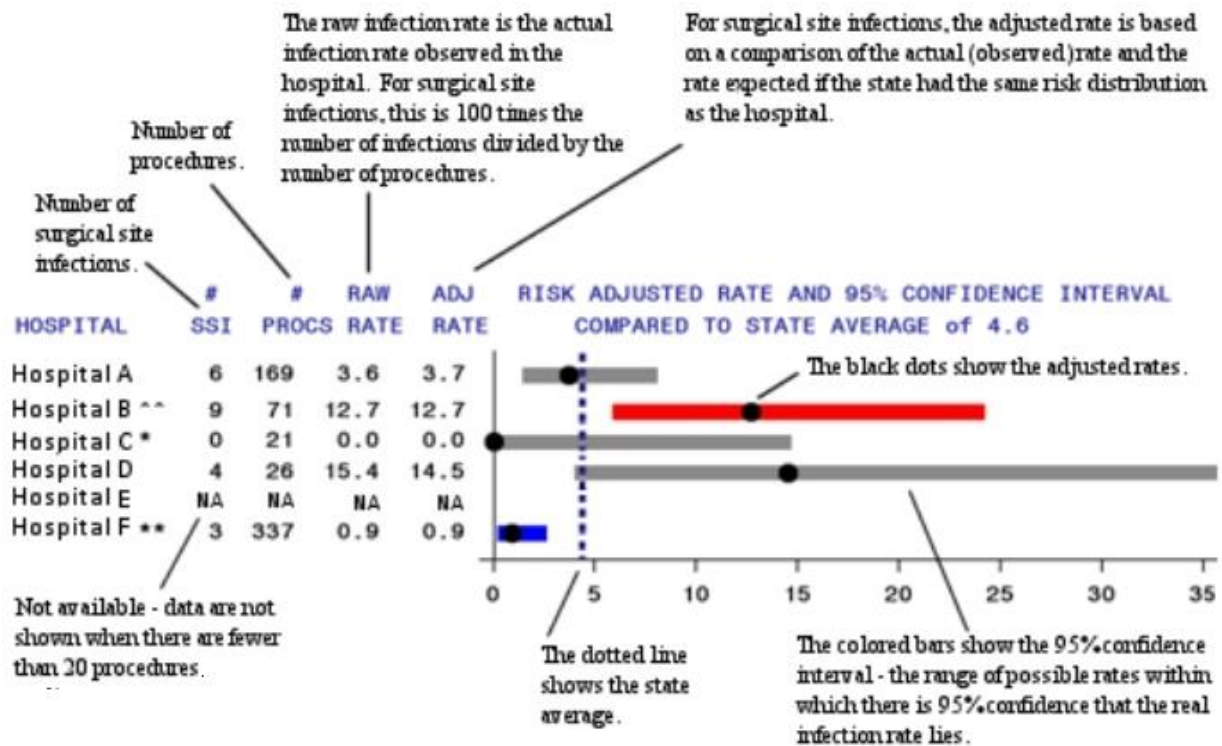
- For surgical site infections there must be a minimum of 20 patients undergoing a surgical procedure.
- For CLABSIs there must be a minimum of 50 central line days. Central line days are the total number of days central lines are used for each patient in a location over a given time.
- For CDI and CRE there must be a minimum of 50 patient days.

## Risk Adjustment

Risk adjustment is a statistical technique that allows hospitals to be more fairly compared. The adjustment considers the differences in patient populations related to severity of illness and other factors that may affect the risk of developing an HAI. A hospital that performs many complex procedures on very sick patients would be expected to have a higher infection rate than a hospital that performs more routine procedures on healthier patients. Therefore, before comparing the infection rates of hospitals, it is important to adjust for the proportion of high- and low-risk patients.

Risk-adjusted rates for SSIs in each hospital are calculated using a two-step method. First, all the data for the state is pooled to develop a logistic regression model predicting the risk of infection based on patient-specific risk factors. Second, that model is used to calculate the predicted number of infections for each hospital. The observed infection rate is then divided by the hospital's predicted infection rate. If the resulting ratio is larger than one, the hospital has a higher infection rate than expected based on its patient mix. If it is smaller than one, the hospital has a lower infection rate than expected from its patient mix. For each hospital, the ratio is then multiplied by the overall statewide infection rate to obtain the hospital's risk-adjusted rate. This method of risk adjustment is called "indirect adjustment." Hospitals with risk-adjusted rates significantly higher or lower than the state average are identified using 95% confidence intervals for all indicators. All data analyses were performed using SAS version 9.4 (SAS Institute, Cary NC). Figure 35 provides an example of how to interpret the hospital-specific SSI infection rate tables.

**Figure 35. How to read hospital-specific SSI rate**



Hospital A had an adjusted infection rate very similar to the state average. The grey bar (95% confidence interval) goes over the dotted line representing the state average, indicating no statistical difference in the rates.

Hospital B has an adjusted infection rate that is significantly higher than the state average, because the red bar is entirely to the right (representing higher rates) of the dotted line.

Hospital C had zero infections, but this was not considered to be statistically lower than the state average because the grey bar goes over the dotted line. All hospitals that observed zero infections get a \*, because they do deserve acknowledgement for achieving zero infections.

Hospital D had the highest infection rate, but this was not statistically higher than the state average.

Hospital E - The data are not shown because the hospital performed fewer than 20 procedures, and therefore the rates are not stable enough to be reported.

Hospital F had an adjusted infection rate that is statistically lower than the state average, because the blue bar is entirely to the left (representing lower rates) of the dotted line.

## Attributable Mortality of CDI/MDROs

Attributable mortality rates were calculated using the data in Table 28. The attributable mortality rate for each indicator was calculated as the average attributable mortality rate over the relevant journal articles, weighted by the number of MDROs considered in each analysis.

**Table 28. Attributable mortality estimates from literature review**

MDRO	Reference	# MDROs	% Deaths MDROs	% Deaths Controls	Attributable Mortality %
CDI	Dodek 2013 <sup>10</sup>	227	29	27	2.0
	Gravel 2009 <sup>11</sup>	1430	N/A	N/A	5.7
	Kenneally 2007 <sup>12</sup>	278	36.7	30.6	6.1
	Loo 2005 <sup>13</sup>	1703	N/A	N/A	6.9
	Pepin 2005 <sup>14</sup>	161	23	7	16.0
	Tabak 2013 <sup>15</sup>	255	11.8	7.3	4.5
	Dubberke 2008 <sup>16</sup>	353	36	30.3	5.7
	Hensgens 2013 <sup>17</sup>	317	14.8	5.4	9.4
	Barbut 2017 <sup>18</sup>	482	9	5	4.0
	<b>Weighted average</b>				
CRE	Borer 2009 <sup>19</sup>	32	71.9	21.9	50.0
	Mouloudi 2014 <sup>20</sup>	37	NA	NA	27.0
	Gallagher 2014 <sup>21</sup>	43	45	18	27
	<b>Weighted average</b>				
MRSA	Harbarth 1998 <sup>22</sup>	39	36	28	8.0
	DeKraker 2011 <sup>23</sup>	242	30.6	8.4	22.2
	<b>Weighted average</b>				

## Comparison of NYS and CMS HAI Reporting

In addition to the indicators required by NYS law, hospitals are encouraged by the Centers for Medicaid and Medicare Services (CMS) to report HAI data. The CMS Hospital Inpatient Quality Reporting Program offers financial incentives to hospitals that report HAI data and publishes the nationwide data on the Hospital Compare website ([Hospital Quality Initiative Public Reporting | CMS](#)). The CMS website compares hospital-specific CLABSI, CAUTI, colon SSI, hysterectomy SSI, MRSA bloodstream infection, and CDI infection rates to national benchmarks. The HAI rates reported by NYS and CMS may differ.

The first important difference is the peer group to which each hospital is compared.

- In the NYS 2022 report, each hospital's 2022 data is compared to 2022 data reported by other hospitals in NYS.
- In CMS Hospital Compare, each hospital's 2022 data is compared to 2015 data reported by other hospitals in the United States.

In general, NYS hospital Standardized Infection Ratios (SIRs) tend to be higher than CMS SIRs for two reasons.

- HAI rates decrease over time as infection prevention practices improve; the NYS benchmark is expected to decrease over time (but the average SIR is always 1.0 because comparison is in the same year), while the CMS benchmark remains the same (SIRs decrease over time).
- NYS HAI data are audited more than data from other states. Auditing is likely to increase HAI rates because missed infections are identified and entered into the National Healthcare Surveillance Network (NHSN), and training efforts lead to better identification of HAIs.

We also note that by comparing data within the same year, NYS ensures that the same protocol is followed for identification of a hospital's data and the data to which it is compared. There have been several small changes and clarifications in the protocol between 2015 and 2022.

Finally, the statistical models used to predict HAI rates in NYS and CMS models are slightly different. These differences are described in Table 29. For HAI rates published on Hospital Compare we show the CMS model, and for HAI rates not published on Hospital Compare, we show a model available through the NHSN application that hospitals may or may not use for internal benchmarking.<sup>24</sup>

Each approach has advantages and disadvantages and may be implemented for different purposes. NYS assesses hospital-specific performance each year, while CMS and NHSN measure improvement over time. NYS often avoids using hospital-level risk adjustment variables (e.g., teaching hospital vs. not) because these are effects we are interested in measuring, while NHSN may include these variables to increase the homogeneity of the groups under comparison. NYS includes superficial infections (except those identified from post-discharge surveillance) because they have been found to be similar to deeper infections in terms of infectious etiologies and length of stay, while CMS focuses on deeper infections because they may be reported more consistently across facilities<sup>25</sup>.

**Table 29. Comparison of New York State and Centers for Medicare and Medicaid Services (CMS) Methods for 2022 Hospital-Acquired Infection Reports**

Indicator	Report	Exclusions	Risk Adjustment
CLABSI	NYS	*MBI, ECMO, VAD, Patient Injection, EB, MSbP, Pus at the vascular site	In adult/pediatric units, CLABSI rates are compared within each CDC location independently. In NICUs, CLABSI rates are compared by level (RPC, Level 3, Level 2/3) and birthweight group. Hospital compared to NYS 2022 average.
	CMS	*MBI, ECMO, VAD, Patient Injection, EB, MSbP, Pus at the vascular site	In adult/pediatric units, negative binomial regression model with location type, facility bed size, medical school affiliation, and facility type. In NICUs, only birthweight group. Hospital compared to National 2015 average.
Colon SSI	NYS	SSIs detected by post discharge surveillance (PDS) or present at time of surgery (PATOS)	ASA, duration, BMI, laparoscope. Hospital compared to NYS 2022 average.
	CMS	Complex 30-day SSI model: age<18, superficial SSIs, PATOS, outliers	Diabetes, ASA, gender, age, BMI, closure technique, oncology hospital. Hospital compared to National 2015 average.
Hysterectomy SSI	NYS	PDS, PATOS	Diabetes, ASA, BMI, duration, laparoscope. Hospital compared to NYS 2022 average.
	CMS	Complex 30-day SSI model: age<18, superficial SSIs, PATOS, outliers	Diabetes, ASA, BMI, age, cancer hospital. Hospital compared to National 2015 average.
Hip SSI	NYS	PDS, PATOS	ASA, BMI, procedure type. Hospital compared to NYS 2022 average.
	NHSN	Complex admission/readmission model: superficial SSIs, PDS, PATOS, outliers	Adults: Diabetes, trauma, anesthesia, ASA, wound class, medical school affiliation, hospital bed size, age, duration, BMI, procedure type. Children: intercept only. Hospital compared to National 2015 average.
CABG chest SSI	NYS	PDS, PATOS	Diabetes, BMI, gender. Hospital compared to NYS 2022 average.
	NHSN	Complex admission/readmission model: superficial SSIs, PDS, PATOS, outliers, children.	Diabetes, gender, ASA, trauma, wound class, medical school affiliation, hospital bed size, age duration, BMI, age-gender interaction. Hospital compared to National 2015 average.
CABG donor SSI	NYS	PDS, PATOS	BMI, diabetes. Hospital compared to NYS 2022 average.
	NHSN	No model	No model
<i>Clostridioides difficile</i>	NYS	Outlier community onset (CO) prevalence rate	CDI test type, CO admission prevalence rate, hospital bed size, % patient days in adult ICUs. Hospital compared to NYS 2022 average.
	CMS	Outlier CO prevalence rate	Hospitals: CDI test type, CO admission prevalence rate, medical school affiliation, number of ICU beds, facility type, facility bed size, reporting from ED. LTACHs: CDI test type, CO rate, % ventilator, % single occupancy. Hospital compared to National 2015 average.

\*Mucosal barrier injury (MBI)-CLABSIs and bloodstream infections associated with use of extracorporeal membrane oxygenation and ventricular assist devices, observed or suspected patient injection into a vascular line, known or suspected Munchausen Syndrome by Proxy

(MSbP), epidermolysis bullosa (EB), pus at another vascular access device site matches an organism identified in the blood and Group B Streptococcus BSIs in infants during the first 6 days of life.

Appendix 4: List of Hospitals by County

Table 30 lists the hospitals individually identified in this report. Additional information on the hospitals can be obtained from the NYSDOH Hospital Profile at <https://profiles.health.ny.gov/hospital/>.

**Table 30. List of hospitals included in this report**

County	PFI	CMS ID	Hospital name	Hospital name in the report
Albany	0001	330013	Albany Medical Center Hospital	Albany Med Ctr
	0005	330057	St. Peter's Hospital	St Peters Hospital
Allegany	0039	330096	Memorial Hosp of Wm F & Gertrude F Jones A/K/A Jones Memorial Hosp	Jones Memorial
Bronx	1169	330059	Montefiore Medical Center - Henry & Lucy Moses Div	Montefiore-Moses
	1178	330009	BronxCare Hospital Center	Bronx-Lebanon
	1176	330399	SBH Health System	St Barnabas
	1186	330385	North Central Bronx Hospital	North Central Bronx
	1165	330127	Jacobi Medical Center	Jacobi Med Ctr
	1168	330059	Montefiore Medical Center-Wakefield Hospital	Montefiore-Wakefield
	1172	330080	Lincoln Medical & Mental Health Center	Lincoln Med Ctr
	3058	330059	Montefiore Med Center - Jack D Weiler Hosp of A Einstein College Div	Montefiore-Einstein
Broome	1175	332006	Calvary Hospital Inc	Calvary Hospital
	0058	330394	United Health Services Hospitals Inc. - Wilson Medical Center	UHS Wilson
	0043	330011	Our Lady of Lourdes Memorial Hospital	Our Lady of Lourdes
	0042	330394	United Health Services Hospitals Inc. - Binghamton General Hospital	UHS Binghamton
Cattaraugus	0066	330103	Olean General Hospital	Olean General
Cayuga	0085	330235	Auburn Community Hospital	Auburn Memorial
Chautauqua	0103	330239	UPMC Chautauqua at WCA	UPMC Chautauqua WCA
	0098	330229	Brooks-TLC Hospital System, Inc.	Brooks Memorial
Chemung	0116	330090	Arnot Ogden Medical Center	Arnot Ogden Med Ctr
Chenango	0128	330033	Chenango Memorial Hospital Inc	UHS Chenango Memor
Clinton	0135	330250	The University of Vermont Health Network - Champlain Valley Physicians Hospital	Champlain Valley
Columbia	0146	330094	Columbia Memorial Hospital	Columbia Memorial
Cortland	0158	330175	Guthrie Cortland Medical Center	Cortland Reg Med
Dutchess	0192	330049	Northern Dutchess Hospital	Northern Dutchess
	0180	330067	Mid-Hudson Valley Division of Westchester Medical Center	MidHudson Reg of WMC
	0181	330023	Vassar Brothers Medical Center	Vassar Brothers

County	PFI	CMS ID	Hospital name	Hospital name in the report
Erie	0292	330078	Sisters of Charity Hospital - St. Joseph Campus	Sisters- St Joseph
	0213	330279	Mercy Hospital of Buffalo	Mercy Hosp Buffalo
	0267	330102	Kenmore Mercy Hospital	Kenmore Mercy
	0218	330078	Sisters of Charity Hospital	Sisters of Charity
	0207	330005	Buffalo General Medical Center	Buffalo General
	3067	330005	Millard Fillmore Suburban Hospital	Millard Fill. Suburb
	0208	330005	John R. Oishei Children's Hospital	Oishei Childrens
	0210	330219	Erie County Medical Center	Erie County Med Ctr
	0216	330354	Roswell Park Cancer Institute	Roswell Park
Franklin	0324	330079	Adirondack Medical Center-Saranac Lake Site	Adirondack Medical
	0325	330084	The University of Vermont Health Network - Alice Hyde Medical Center	Alice Hyde Med Ctr
Fulton	0330	330276	Nathan Littauer Hospital	Nathan Littauer
Genesee	0339	330073	United Memorial Medical Center North Street Campus	United Memorial
Jefferson	0367	330157	Samaritan Medical Center	Samaritan- Watertown
Kings	1320	330350	University Hospital of Brooklyn	SUNY Downstate MedCr
	1324	330169	Mount Sinai Brooklyn	Mt Sinai Brooklyn
	1301	330202	Kings County Hospital Center	Kings County Hosp
	1306	330236	NewYork-Presbyterian Brooklyn Methodist Hospital	NYP-Brklyn Methodist
	1305	330194	Maimonides Medical Center	Maimonides Med Ctr
	1294	330196	Coney Island Hospital	South Brooklyn Health
	1304	330306	NYU Langone Hospital-Brooklyn	NYU Langone Brooklyn
	1318	330221	Wyckoff Heights Medical Center	Wyckoff Heights
	1692	330396	Woodhull Medical & Mental Health Center	Woodhull Med Ctr
	1286	330233	Brookdale Hospital Medical Center	Brookdale Hospital
	1288	330056	Brooklyn Hospital Center - Downtown Campus	Brooklyn Hosp Ctr
	1309	330397	Interfaith Medical Center	Interfaith Med Ctr
	1293	330019	New York Community Hospital of Brooklyn, Inc	NY Community Hosp
Livingston	0393	330238	Nicholas H. Noyes Memorial Hospital	Noyes Memorial
Madison	0397	330115	Oneida Health Hospital	Oneida Healthcare
Monroe	0411	330125	Rochester General Hospital	Rochester General
	0413	330285	Strong Memorial Hospital	Strong Memorial
	0409	330164	Highland Hospital	Highland Hospital
	0471	330226	The Unity Hospital of Rochester	Unity Hosp Rochester
Montgomery	0484	330047	St. Mary's Healthcare	St Marys Amsterdam
Nassau	0528	330027	Nassau University Medical Center	Nassau University
	0550	330106	Syosset Hospital	Syosset Hospital
	0552	330331	Plainview Hospital	Plainview Hospital
	0490	330181	Glen Cove Hospital	Glen Cove Hospital
	0518	330372	Long Island Jewish Valley Stream	LIJ at Valley Stream
	0541	330106	North Shore University Hospital	North Shore
	0551	330332	St. Joseph Hospital	St Joseph- Bethpage
	0527	330198	Mount Sinai South Nassau	South Nassau Comm.
	0563	330182	St Francis Hospital	St Francis- Roslyn
	0511	330167	NYU Winthrop Hospital	NYU Winthrop
0513	330259	Mercy Medical Center	Mercy Med Ctr	

County	PFI	CMS ID	Hospital name	Hospital name in the report
New York	1438	330204	Bellevue Hospital Center	Bellevue Hospital
	1439	330169	Mount Sinai Beth Israel	Mt Sinai Beth Israel
	1454	330199	Metropolitan Hospital Center	Metropolitan Hosp
	1469	330046	Mount Sinai Morningside	Mt Sinai St Lukes
	1466	330046	Mount Sinai West	Mt Sinai West
	1450	330119	Lenox Hill Hospital	Lenox Hill Hospital
	1437	330064	New York-Presbyterian/Lower Manhattan Hospital	NYP-Lower Manhattan
	1456	330024	Mount Sinai Hospital	Mt Sinai
	1463	330214	NYU Langone Hospitals	NYU Tisch
	1453	330154	Memorial Hospital for Cancer and Allied Diseases	Memor SloanKettering
	1464	330101	New York-Presbyterian Hospital - Columbia Presbyterian Center	NYP-Columbia
	3975	330101	New York-Presbyterian Hospital - Allen Hospital	NYP-Allen
	1464	330101	New York-Presbyterian Hospital - Columbia Presbyterian Center	NYP-Morgan Stanley
	1458	330101	New York-Presbyterian Hospital - New York Weill Cornell Center	NYP-Weill Cornell
	1445	330240	Harlem Hospital Center	Harlem Hospital
	1446	330214	NYU Langone Orthopedic Hospital	NYU Orthopedic Hosp
	1447	330270	Hospital for Special Surgery	Hosp for Spec Surg
	1486	332008	Henry J. Carter Specialty Hospital	Henry J. Carter
Niagara	0583	330188	Mount St Marys Hospital and Health Center	Mount St. Marys
	0565	330163	Eastern Niagara Hospital - Lockport Division	East. Niag. Lockport
	0574	330065	Niagara Falls Memorial Medical Center	Niagara Falls
Oneida	0598	330245	St Elizabeth Medical Center	St Elizabeth Medical
	0599	330044	Faxton-St Lukes Healthcare St Lukes Division	Faxton St. Lukes
	0589	330215	Rome Memorial Hospital, Inc	Rome Memorial
Onondaga	0636	330203	Crouse Hospital	Crouse Hospital
	0635	330241	University Hospital SUNY Health Science Center	Univ Hosp SUNY Upst
	0628	330241	UPSTATE University Hospital at Community General	Upst. Community Gen
	0630	330140	St. Joseph's Hospital Health Center	St Josephs- Syracuse
Ontario	0678	330074	F.F. Thompson Hospital	FF Thompson
	0676	330265	Clifton Springs Hospital and Clinic	Clifton Springs
	0671	330058	Geneva General Hospital	Geneva General
Orange	0699	330126	Garnet Health Medical Center	Garnet Middletown
	0694	330264	St Luke's Cornwall Hospital/Newburgh	St Lukes Cornwall
	0708	330135	Bon Secours Community Hospital	Bon Secours
	0704	330205	St Anthony Community Hospital	St Anthony
Oswego	0727	330218	Oswego Hospital	Oswego Hospital
Otsego	0746	330136	Mary Imogene Bassett Hospital	Mary Imogene Bassett
	0739	330085	A.O. Fox Memorial Hospital	AO Fox Memorial
Putnam	0752	330273	Putnam Hospital	Putnam Hospital

County	PFI	CMS ID	Hospital name	Hospital name in the report
Queens	1633	330231	Queens Hospital Center	Queens Hospital
	1635	330395	St Johns Episcopal Hospital So Shore	St Johns Episcopal
	1638	330353	Long Island Jewish Forest Hills	LIJ at Forest Hills
	1630	330195	Long Island Jewish Medical Center	Long Isl Jewish(LIJ)
	1629	330014	Jamaica Hospital Medical Center	Jamaica Hospital
	1628	330193	Flushing Hospital Medical Center	Flushing Hospital
	1639	330024	Mount Sinai Hospital - Mount Sinai Hospital of Queens	Mt Sinai Queens
	1637	330055	NewYork-Presbyterian/Queens	NYP-Queens
	1626	330128	Elmhurst Hospital Center	Elmhurst Hospital
	3376	330195	Cohens Childerns Hospital	Cohens Childrens
Rensselaer	0756	330180	Samaritan Hospital	Samaritan- Troy
Richmond	1740	330160	Staten Island University Hosp-North	Staten Island U N
	1738	330028	Richmond University Medical Center	Richmond Univ MC
	1737	330160	Staten Island University Hosp-South	Staten Island U S
Rockland	0779	330158	Good Samaritan Hospital of Suffern	Good Samar. Suffern
	0776	330104	Montefiore Nyack	Montefiore-Nyack
Saratoga	0818	330222	Saratoga Hospital	Saratoga Hospital
Schenectady	0829	330153	Ellis Hospital	Ellis Hospital
	0831	330406	Sunnyview Hospital and Rehabilitation Center	Sunnyview Rehab Hosp
	0848	330153	Ellis Hospital - Bellevue Woman's Care Center Division	Bellevue Ellis
St.Lawrence	0798	330211	Claxton-Hepburn Medical Center	Claxton-Hepburn
	0815	330197	Canton-Potsdam Hospital	Canton-Potsdam
	0804	330223	Massena Hospital, Inc.	Massena Memorial
Steuben	0866	330277	Corning Hospital	Corning Hospital
Suffolk	0885	330141	Long Island Community Hospital	Long Isl. Community
	0938	330107	Peconic Bay Medical Center	Peconic Bay Medical
	0891	330088	Stony Brook Eastern Long Island Hospital	Stony Brook ELIH
	0925	330286	Good Samaritan Hospital Medical Center	Good Samar. W Islip
	0943	330401	St Catherine of Siena Hospital	St Catherine Siena
	0896	330246	St. Charles Hospital	St Charles Hospital
	0924	330043	South Shore University Hospital	South Shore UHosp
	0889	330340	Stony Brook Southampton Hospital	Stony Brk Southampton
	0245	330393	Stony Brook University Hospital	Univ Hosp StonyBrook
	0913	330045	Huntington Hospital	Huntington Hospital
	0895	330185	John T Mather Memorial Hospital of Port Jefferson New York Inc	JT Mather Hospital
Sullivan	0971	330386	Garnet Health Medical Center - Catskills	Garnet Catskills
Tompkins	0977	330307	Cayuga Medical Center at Ithaca	Cayuga Medical Ctr
Ulster	0990	330004	HealthAlliance Hospital Broadway Campus	HealthAlli Broadway
Warren	1005	330191	Glens Falls Hospital	Glens Falls Hospital
Wayne	1028	330030	Newark-Wayne Community Hospital	Newark Wayne

County	PFI	CMS ID	Hospital name	Hospital name in the report
Westchester	1045	330304	White Plains Hospital Center	White Plains Hosp
	1139	330234	Westchester Medical Center	Westchester Medical
	1129	330261	Phelps Hospital	Phelps Memorial
	1117	330162	Northern Westchester Hospital	Northern Westchester
	1039	330267	NewYork-Presbyterian/Hudson Valley Hospital	NYP-Hudson Valley
	1097	330208	SJRH - St Johns Division	St Johns Riverside
	1061	330086	Montefiore Mount Vernon Hospital	Montefiore-Mt Vernon
	1098	330006	St. Joseph's Medical Center	St Josephs- Yonkers
	1122	330061	New York-Presbyterian Lawrence Hospital	NYP-Lawrence
	1072	330184	Montefiore New Rochelle Hospital	Montefiore-NewRochl
	1138	333301	Blythedale Childrens Hospital	Blythedale Childrens
	1124	330208	SJRH - Dobbs Ferry Pavillion	St Johns Dobbs Ferry
Wyoming	1153	330008	Wyoming County Community Hospital	Wyoming County Comm.

# Acknowledgements

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