Health Care Associated Infections in 2017 Acute Care Hospitals

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Healthcare-associated infections (HAIs) are infections that patients acquire during the course of receiving treatment for other conditions within a healthcare setting.

HAIs are among the leading causes of preventable death in the United States, affecting 1 in 25 hospitalized patients, accounting for an estimated 722,000 infections and an associated 75,000 deaths during hospitalization.*

The Massachusetts Department of Public Health (DPH) developed this data update as a component of the Statewide Infection Prevention and Control Program created pursuant to Chapter 58 of the Acts of 2006.

- Massachusetts law provides DPH with the legal authority to conduct surveillance, and to investigate and control the spread of communicable and infectious diseases. (MGL c. 111,sections 6 & 7)

- DPH implements this responsibility in hospitals through the hospital licensing regulation. (105 CMR 130.000)

- Section 51H of chapter 111 of the Massachusetts General Laws authorizes the Department to collect HAI data and disseminate the information publicly to encourage quality improvement. (https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXVI/Chapter111/Section51H)

Magill SS, Edwards JR, Bamberg W, et al. Multistate point-prevalence survey of health care-associated infections. N Engl J Med. 2014; 370:1198-208.

This HAI presentation is the ninth annual Public Health Council update:

- It is an important component of larger efforts to reduce preventable infections in health care settings;

- It presents an analysis of progress on infection prevention within Massachusetts acute care hospitals;

- It is based upon work supported by state funds and the Centers for Disease Control and Prevention (CDC); and

- It provides an overview of antibiotic resistance and stewardship activities.

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This data summary includes the following statewide measures for the 2017 calendar year (January 1, 2017 – December 31, 2017) as reported to the CDC's National Healthcare Safety Network (NHSN).

The DPH required measures are consistent with the Centers for Medicare and Medicaid Services quality reporting measures.

- Central line associated bloodstream infections (CLABSI) in intensive care units

- Catheter associated urinary tract infections (CAUTI) in intensive care units

- Specific surgical site infections (SSI); and

- Specific facility wide laboratory identified events (LabID).

*National baseline data for each measure are based on a statistical risk model derived from 2015 national data.

*All data were extracted from NHSN on June 11th, 2018.

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- Standardized Infection Ratio (SIR)*

  $$\text{Standardized Infection Ratio (SIR)} = \frac{\text{Actual Number of Infections}}{\text{Predicted Number of Infections}}$$

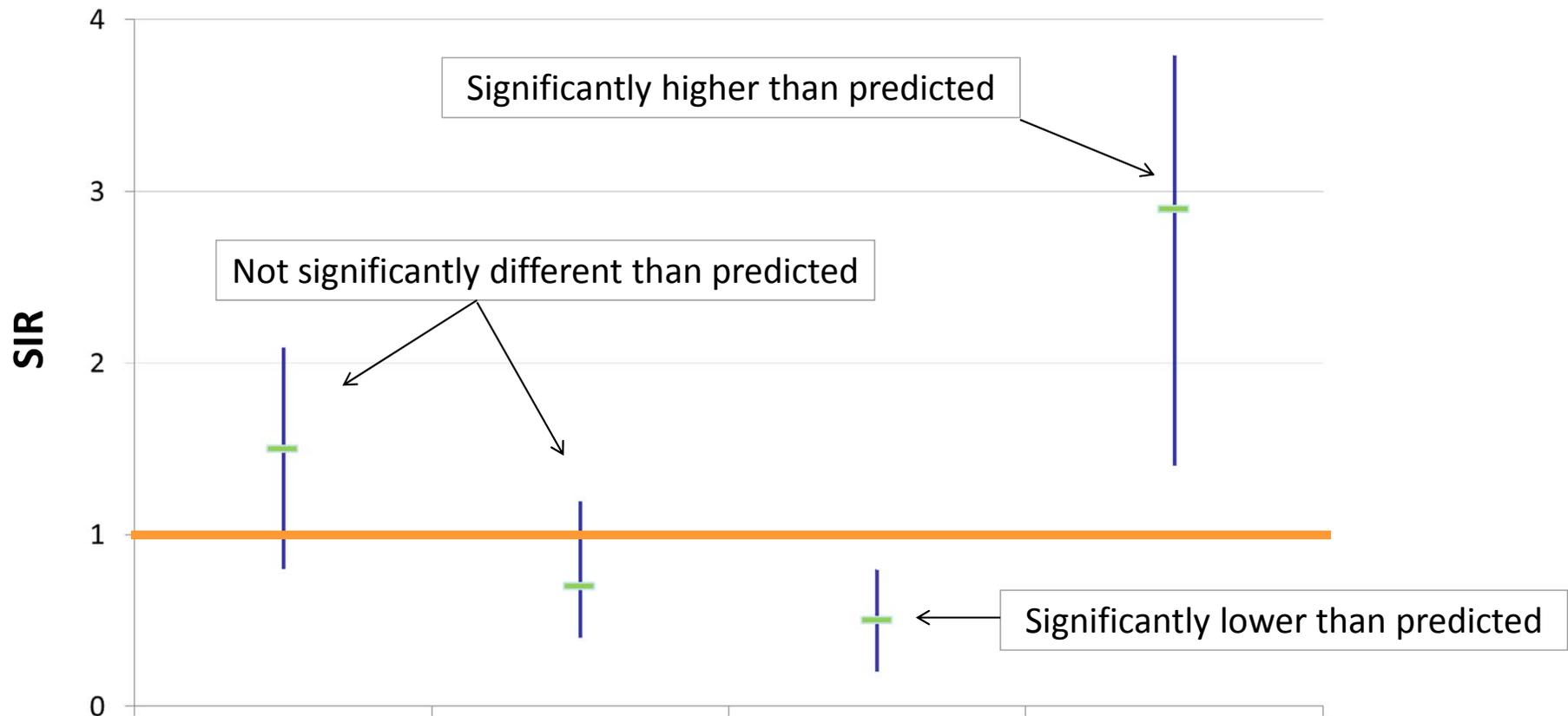 * When the actual number is equal to the predicted number the SIR = 1.0

- Central Line Utilization Ratio

  $$\text{Central Line Utilization Ratio} = \frac{\text{Number of Central Line Days}}{\text{Number of Patient Days}}$$

- Urinary Catheter Utilization Ratio

  $$\text{Urinary Catheter Utilization Ratio} = \frac{\text{Number of Urinary Catheter Days}}{\text{Number of Patient Days}}$$

The **green** horizontal bar represents the SIR, and the **blue** vertical bar represents the 95% confidence interval (CI). The 95% CI measures the probability that the true SIR falls between the two parameters.

- If the blue vertical bar crosses 1.0 (highlighted in **orange**), then the actual rate is <u>not</u> statistically significantly different from the predicted rate.
- If the blue vertical bar is completely above or below 1.0, then the actual is statistically significantly different from the predicted rate.

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Massachusetts Central Line-Associated Bloodstream Infection (CLABSI) SIR, by ICU Type
January 1, 2017-December 31, 2017

Key Findings

Three ICU types experienced a significantly lower number of infections than predicted, based on 2015 national aggregate data:

Medical (T)

Medical /Surgical (T)

Surgical

One ICU type experienced a significantly higher number of infections than predicted, based on 2015 national aggregate data:

Burn

NT=Not major teaching
T= Major teaching

SIR   Upper and Lower Limit

Calendar Year 2016
January 1, 2016 – December 31, 2016
n=176

- Staphylococcus aureus (not MRSA) 7%
- Methicillin-resistant Staphylococc 5%
- Coagulase-negative Staphylococcus 17%
- Enterococcus sp. 16%
- Gram-positive bacteria (other) 6%
- Gram-negative bacteria 17%
- Multiple Organisms 11%
- Candida albicans 10%
- Yeast/Fungus (other) 11%

Calendar Year 2017
January 1, 2017 – December 31, 2017
n=165

- Staphylococcus aureus (not MRSA) 8%
- Methicillin-resistant Staphylococc 2%
- Coagulase-negative Staphylococcus 16%
- Enterococcus sp. 9%
- Gram-positive bacteria (other) 5%
- Gram-negative bacteria 24%
- Multiple Organisms 10%
- Candida albicans 12%
- Yeast/Fungus (other) 14%

Key Findings

Infants weighing 1001 grams-1500 grams at birth experienced a significantly higher number of infections than predicted, based on 2015 national aggregate data.

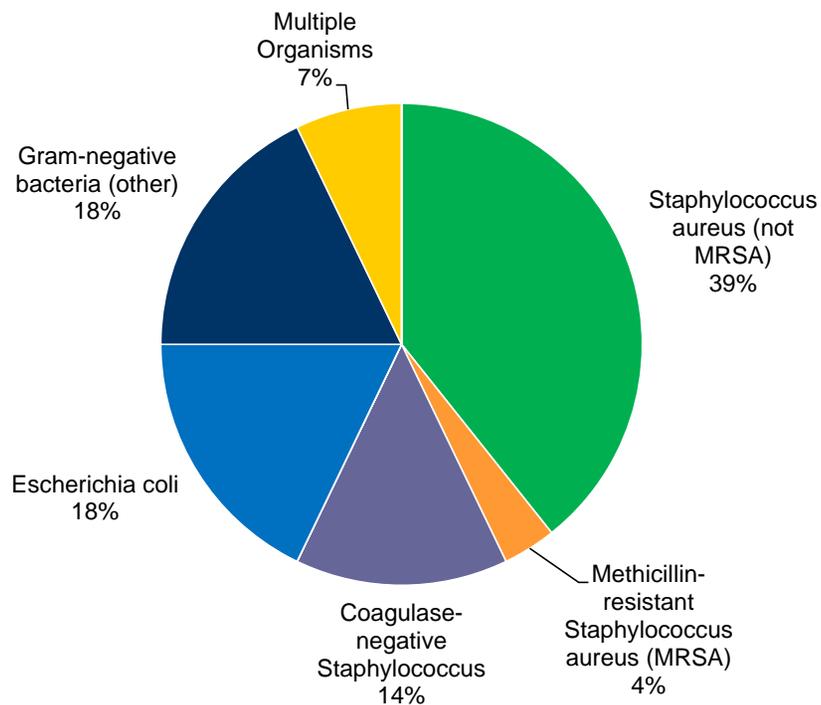There were 20 CLABSIs reported in this ICU type.
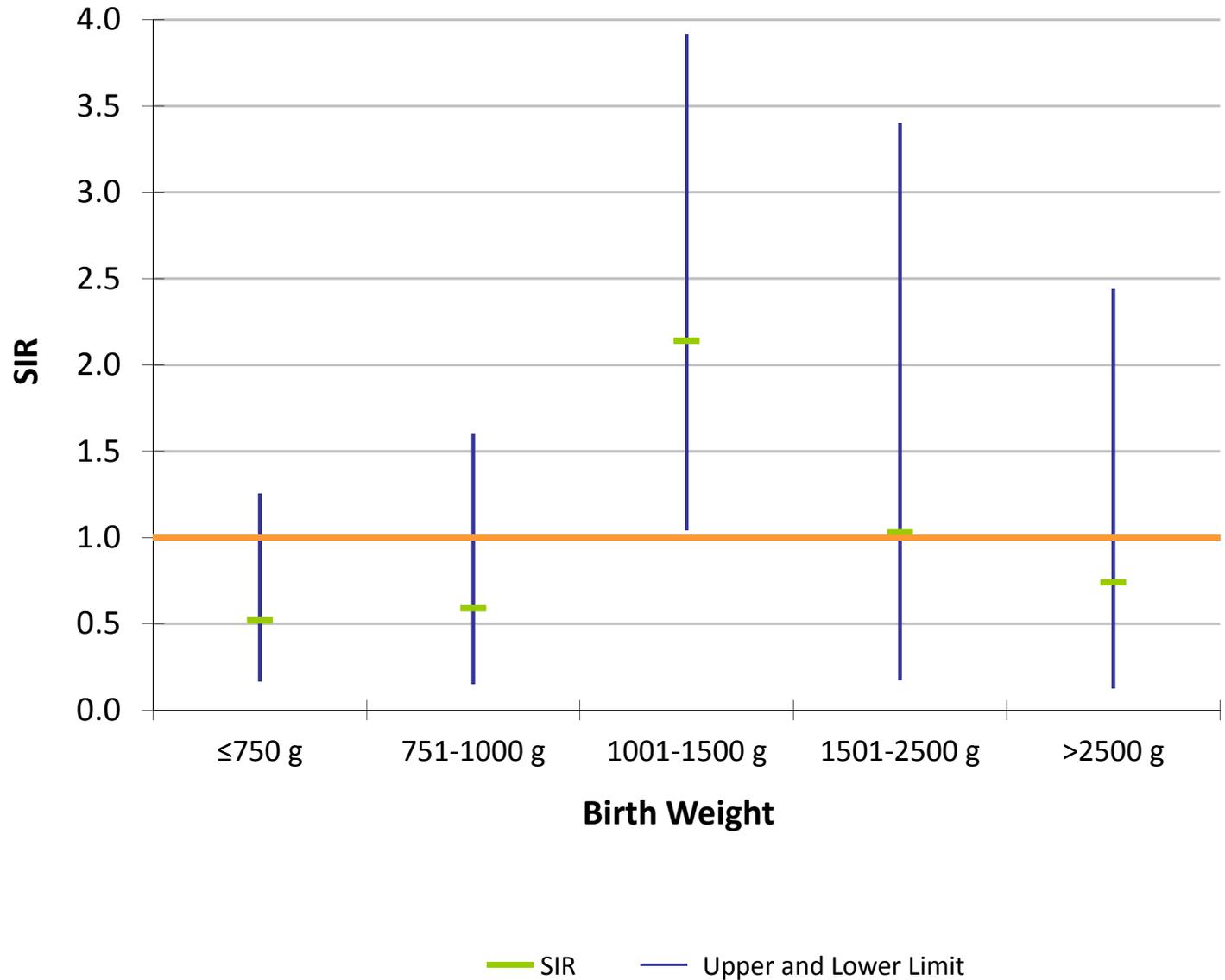
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Calendar Year 2016

January 1, 2016– December 31, 2016

n=28

- Multiple Organisms 7%
- Gram-negative bacteria (other) 18%
- Escherichia coli 18%
- Coagulase-negative Staphylococcus 14%
- Methicillin-resistant Staphylococcus aureus (MRSA) 4%
- Staphylococcus aureus (not MRSA) 39%

Calendar Year 2017

January 1, 2017– December 31, 2017

n=20

- Candida and other Yeast/Fungus 5%
- Multiple Organisms 10%
- Gram-negative bacteria (other) 10%
- Escherichia coli 5%
- Enterococcus sp. 5%
- Coagulase-negative Staphylococcus 25%
- Staphylococcus aureus (not MRSA) 40%
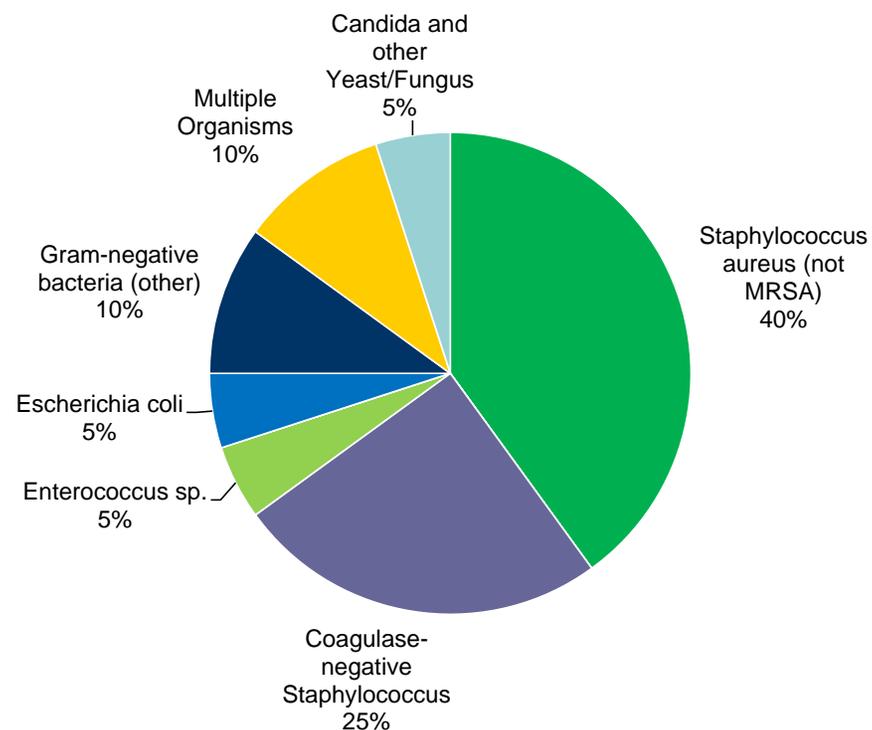
Key Findings

For the past three years, adult ICUs experienced a significantly lower number of infections than predicted, based on 2015 national aggregate data.

Over the past three years, neonatal ICUs have seen a decrease in the number of infections.

Key Findings

Discontinuing unnecessary central lines can reduce the risk for infection.
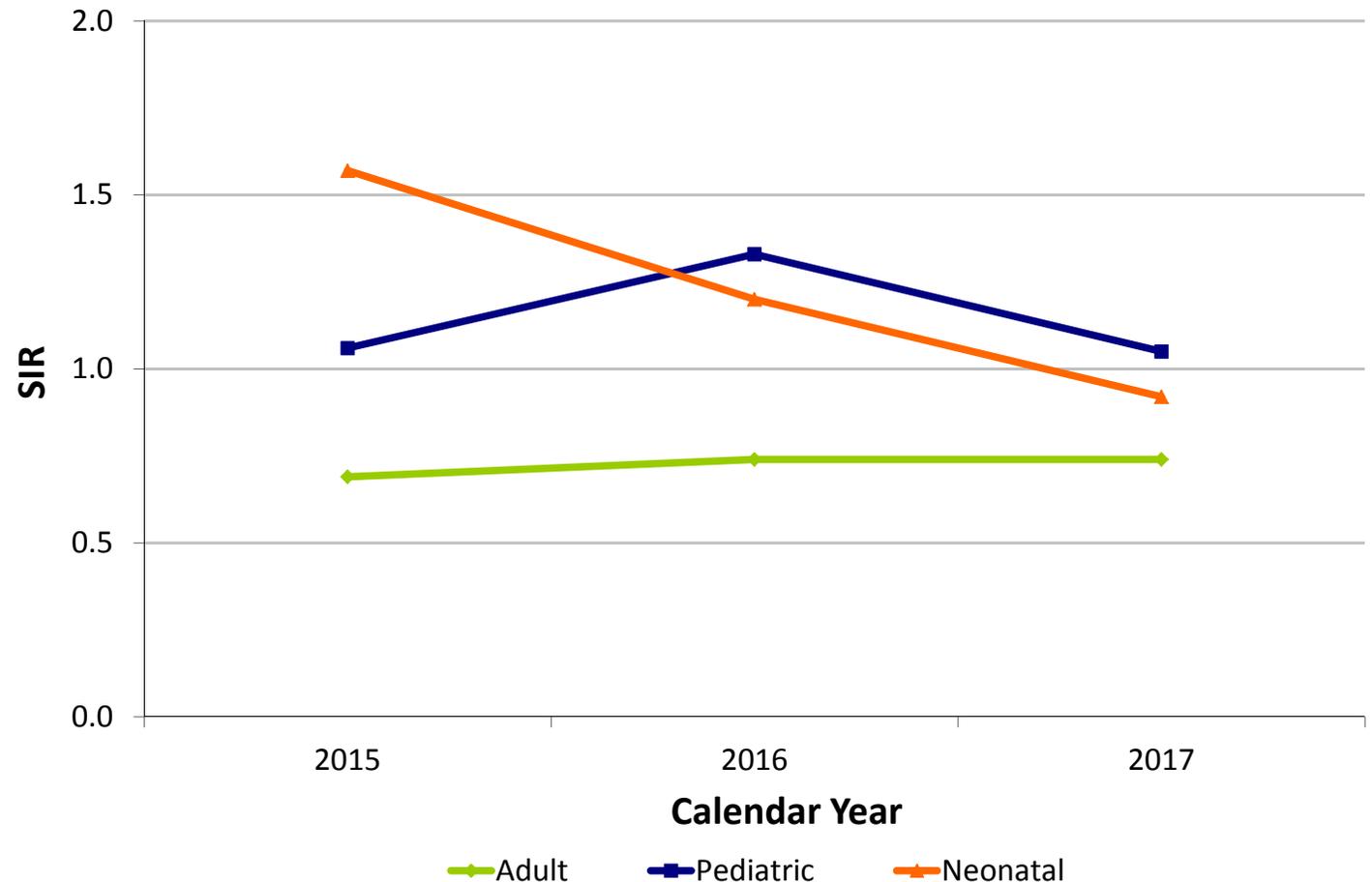
Central line (CL) utilization has remained relatively unchanged between 2015 and 2017.

*The CL utilization ratio is calculated by dividing the number of CL days by the number of patient days.
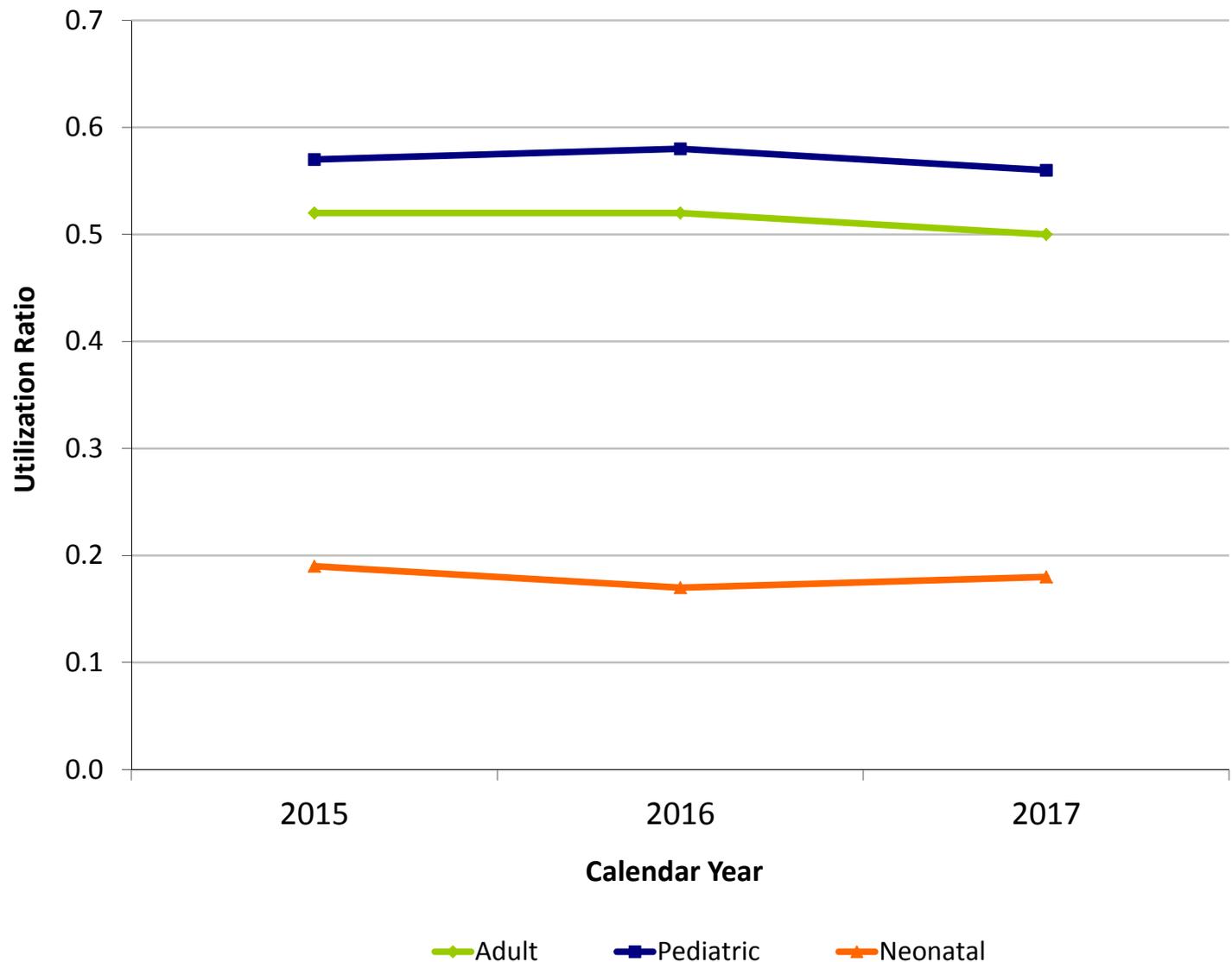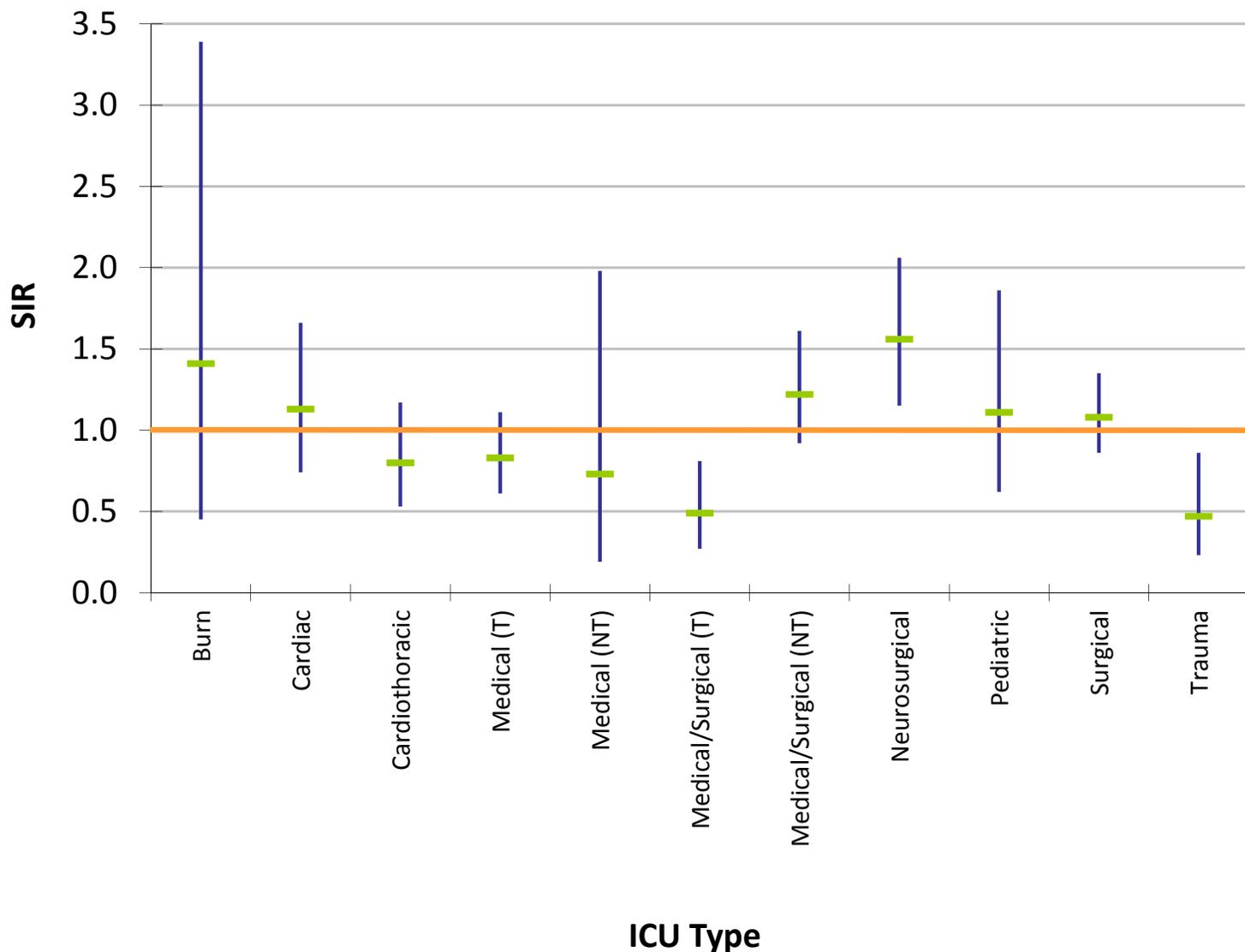
Key Findings

Two ICU types experienced a significantly lower number of infections than predicted, based on 2015 national aggregate data:

Medical /Surgical (T)

Trauma

One ICU type experienced a significantly higher number of infections than predicted, based on 2015 national aggregate data:

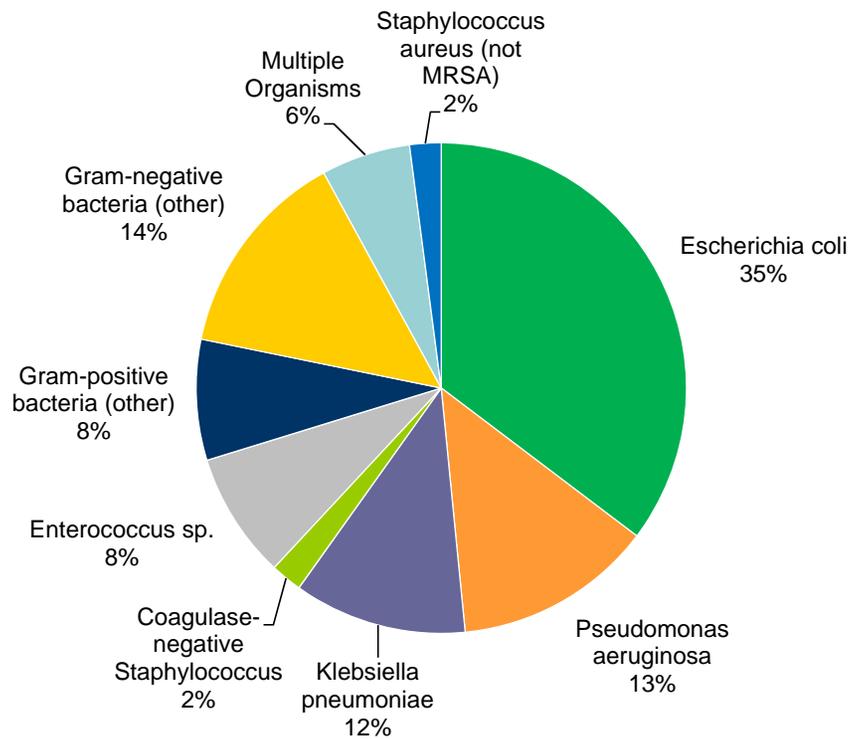Neurosurgical

NT=Not major teaching
T= Major teaching

SIR —— Upper and Lower Limit

Calendar Year 2016
January 1, 2016 – December 31, 2016
n=290

- Escherichia coli 35%
- Pseudomonas aeruginosa 13%
- Klebsiella pneumoniae 12%
- Coagulase-negative Staphylococcus 2%
- Enterococcus sp. 8%
- Gram-positive bacteria (other) 8%
- Gram-negative bacteria (other) 14%
- Multiple Organisms 6%
- Staphylococcus aureus (not MRSA) 2%

Calendar Year 2017
January 1, 2017 – December 31, 2017
n=305

- Escherichia coli 34%
- Pseudomonas aeruginosa 12%
- Klebsiella pneumoniae 10%
- Coagulase-negative Staphylococcus 3%
- Enterococcus sp. 10%
- Gram-positive bacteria (other) 8%
- Gram-negative bacteria (other) 13%
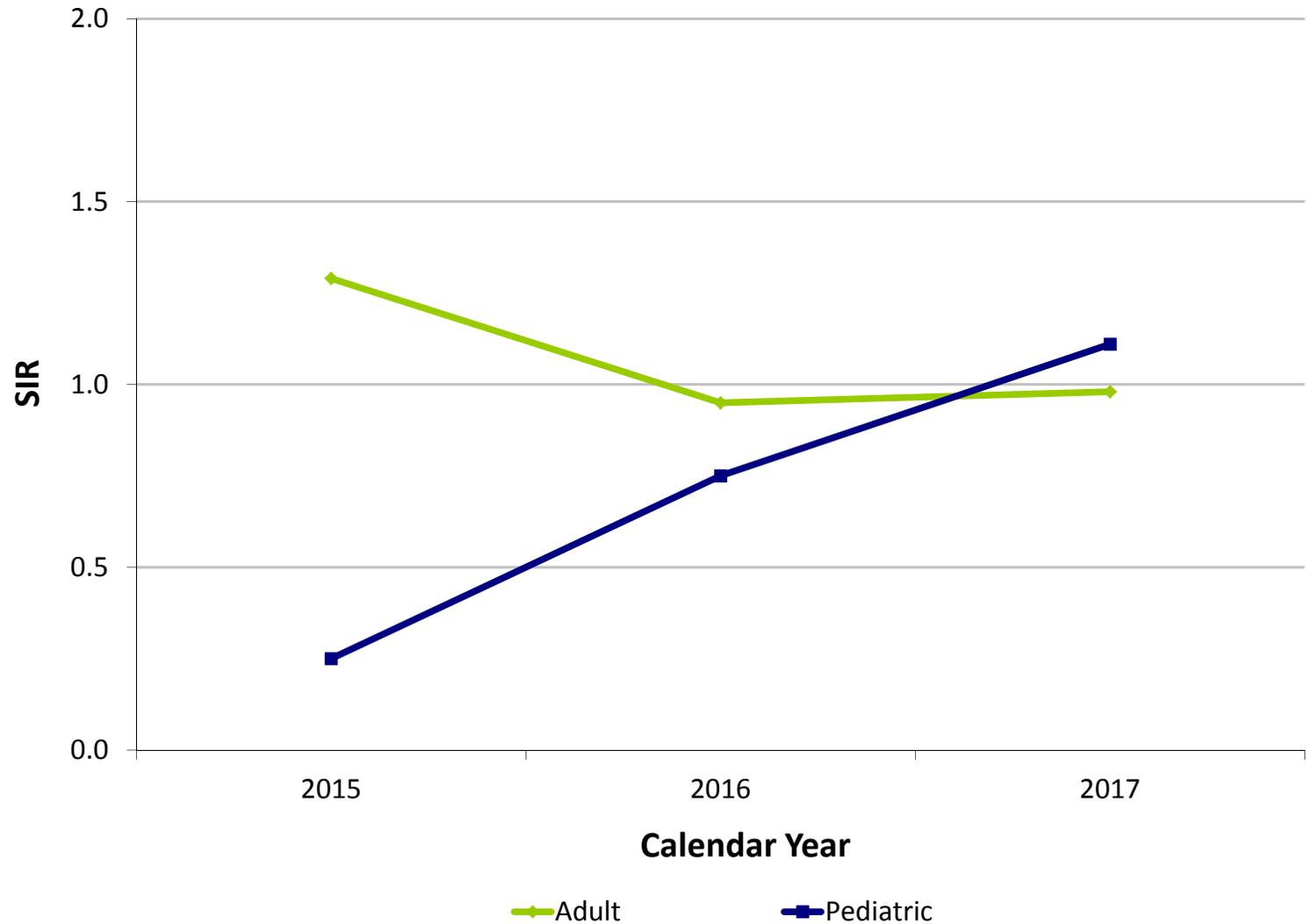- Multiple Organisms 8%
- Staphylococcus aureus (not MRSA) 2%
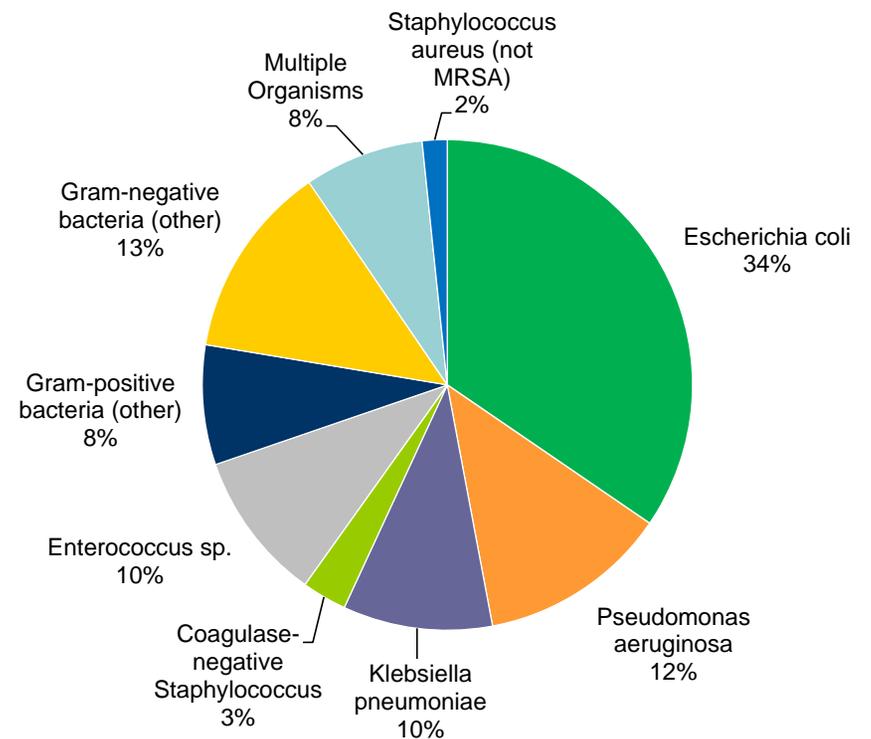
Key Findings

Over the past three years, pediatric ICUs have seen an increase in the number of infections but are no different than predicted, based on 2015 national aggregate data.

There were 13 CAUTIs reported by 10 pediatric ICUs.

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Key Findings

Discontinuing unnecessary urinary catheters can reduce the risk for infection.

Urinary catheter utilization in adult and pediatric ICUs has remained relatively unchanged between 2015 and 2017.

*The urinary catheter utilization ratio is calculated by dividing the number of catheter days by the number of patient days.
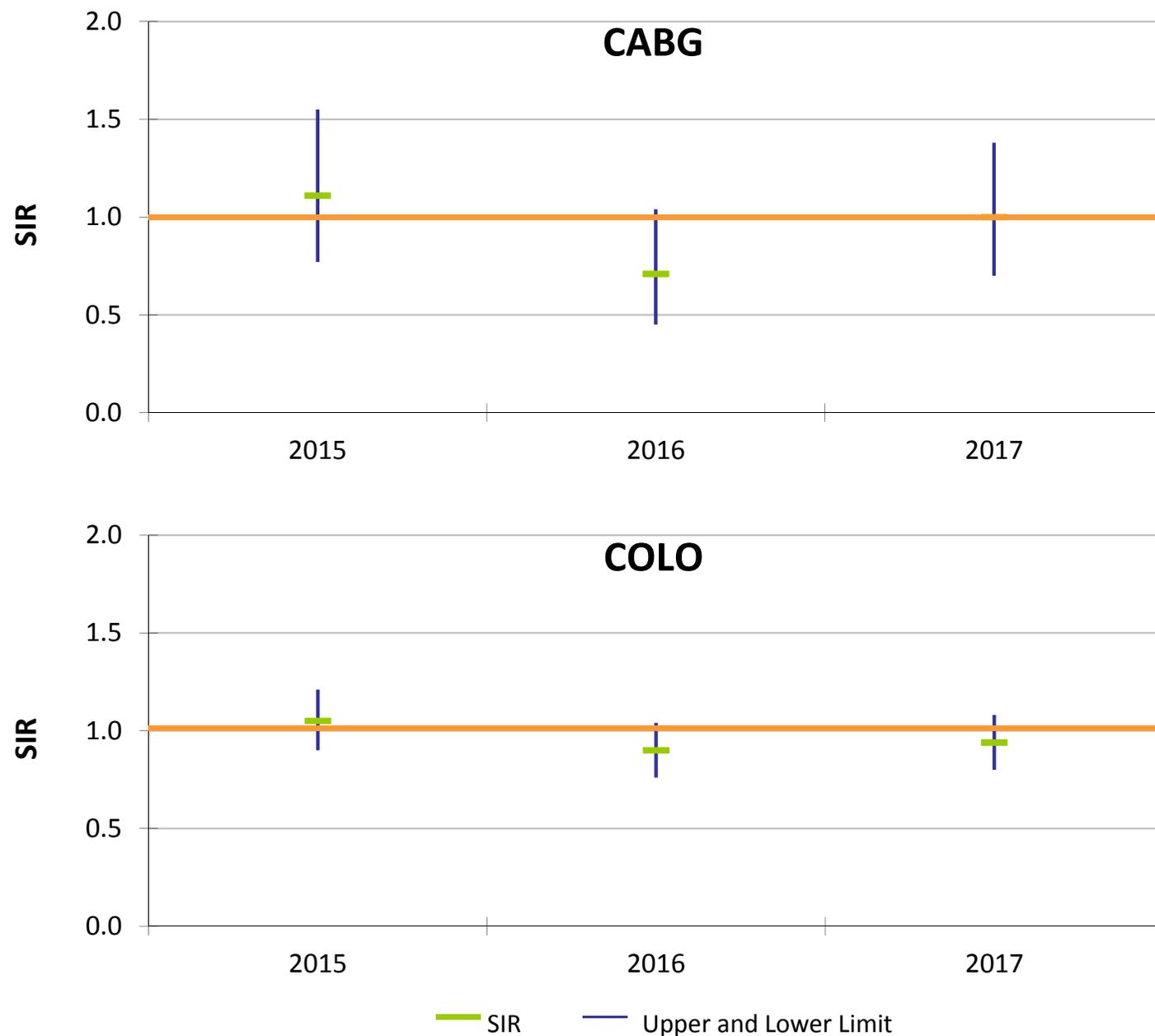

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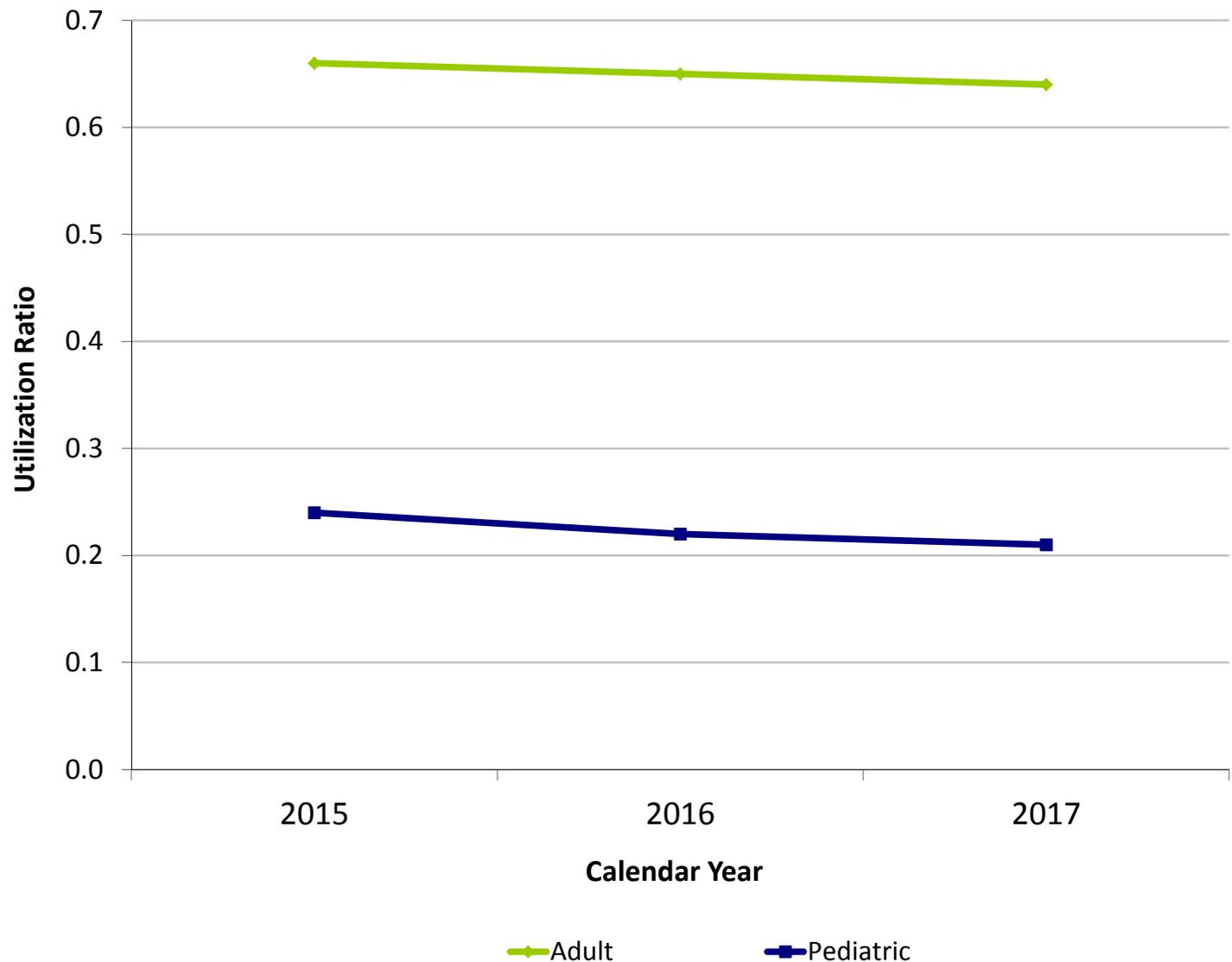
Key Findings

For the past three years, MA acute care hospitals performing coronary artery bypass graft procedures (CABG) and colon procedures (COLO) experienced the same number of infections as predicted, based on 2015 national aggregate data.

There were 33 CABG SSIs reported in 2017.
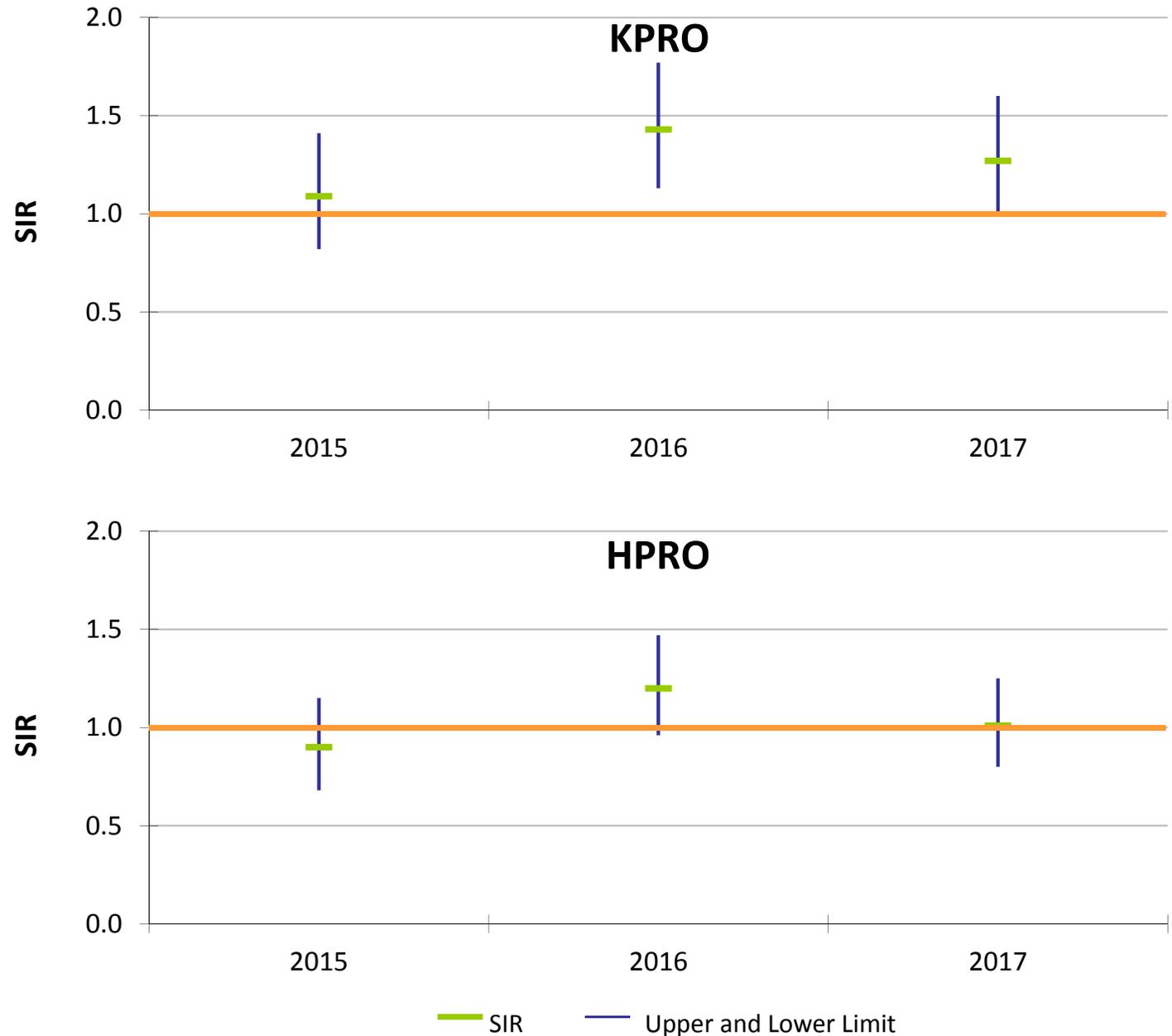
There were 173 COLO SSIs reported in 2017.

Key Findings

In 2017, Massachusetts acute care hospitals performing knee prosthesis procedures (KPRO) and hip prosthesis procedures (HPRO) experienced the same number of infections as predicted, based on 2015 national aggregate data.

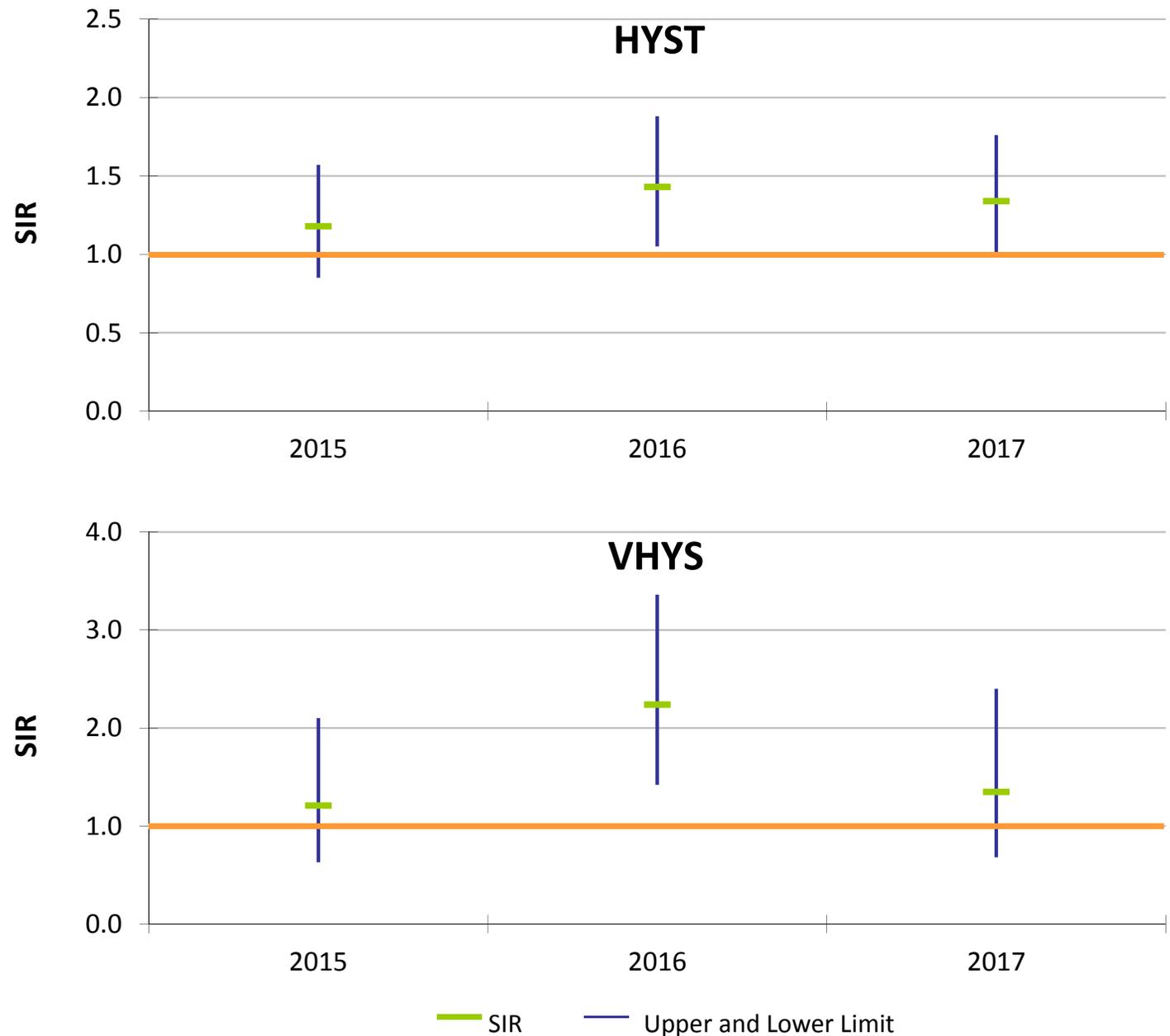There were 69 KPRO SSIs and 76 HPRO SSIs reported in 2017.

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Key Findings

In 2017, Massachusetts acute care hospitals performing abdominal hysterectomy (HYST) and vaginal hysterectomy (VHYS) procedures experienced the same number of infections as predicted, based on 2015 national aggregate data.

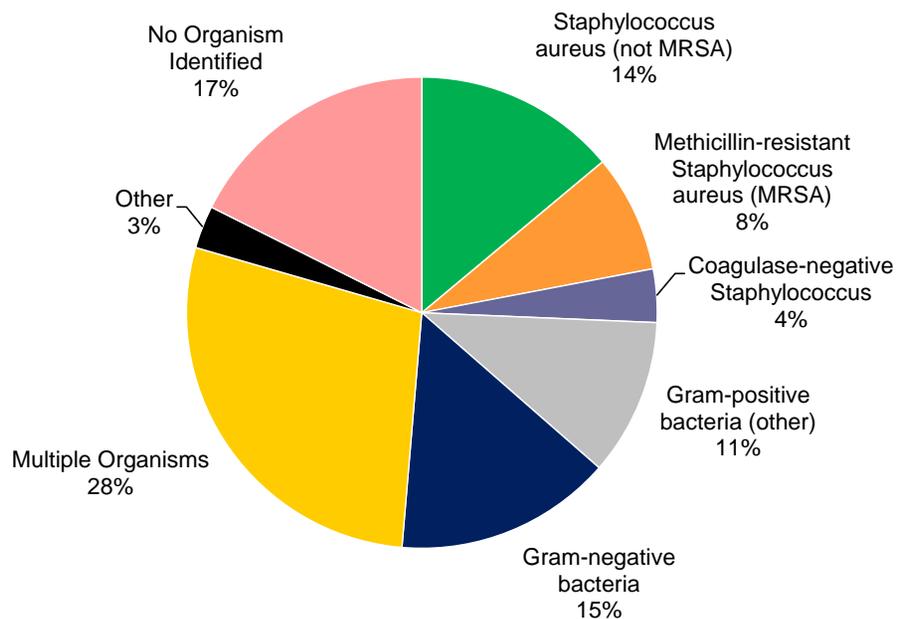There were 47 HYST SSIs and 10 VHYS SSIs reported in 2017.

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Calendar Year 2016
January 1, 2016– December 31, 2016
n=409

Staphylococcus aureus (not MRSA) 14%

Methicillin-resistant Staphylococcus aureus (MRSA) 8%

Coagulase-negative Staphylococcus 4%

Gram-positive bacteria (other) 11%

Gram-negative bacteria 15%

Multiple Organisms 28%

Other 3%

No Organism Identified 17%

Calendar Year 2017
January 1, 2017 – December 31, 2017
n=408

Staphylococcus aureus (not MRSA) 11%

Methicillin-resistant Staphylococcus aureus (MRSA) 5%

Coagulase-negative Staphylococcus 6%

Gram-positive bacteria (other) 11%

Gram-negative bacteria 20%

Multiple Organisms 29%

Other 1%

No Organism Identified 17%

Significantly Higher than Predicted

The number of infections reported is higher than the number of predicted infections.

**CABG HYST
KPRO VHYS
HPRO COLO**

Same as Predicted

The number of infections reported is the same as the number of predicted infections.

Significantly Lower than Predicted

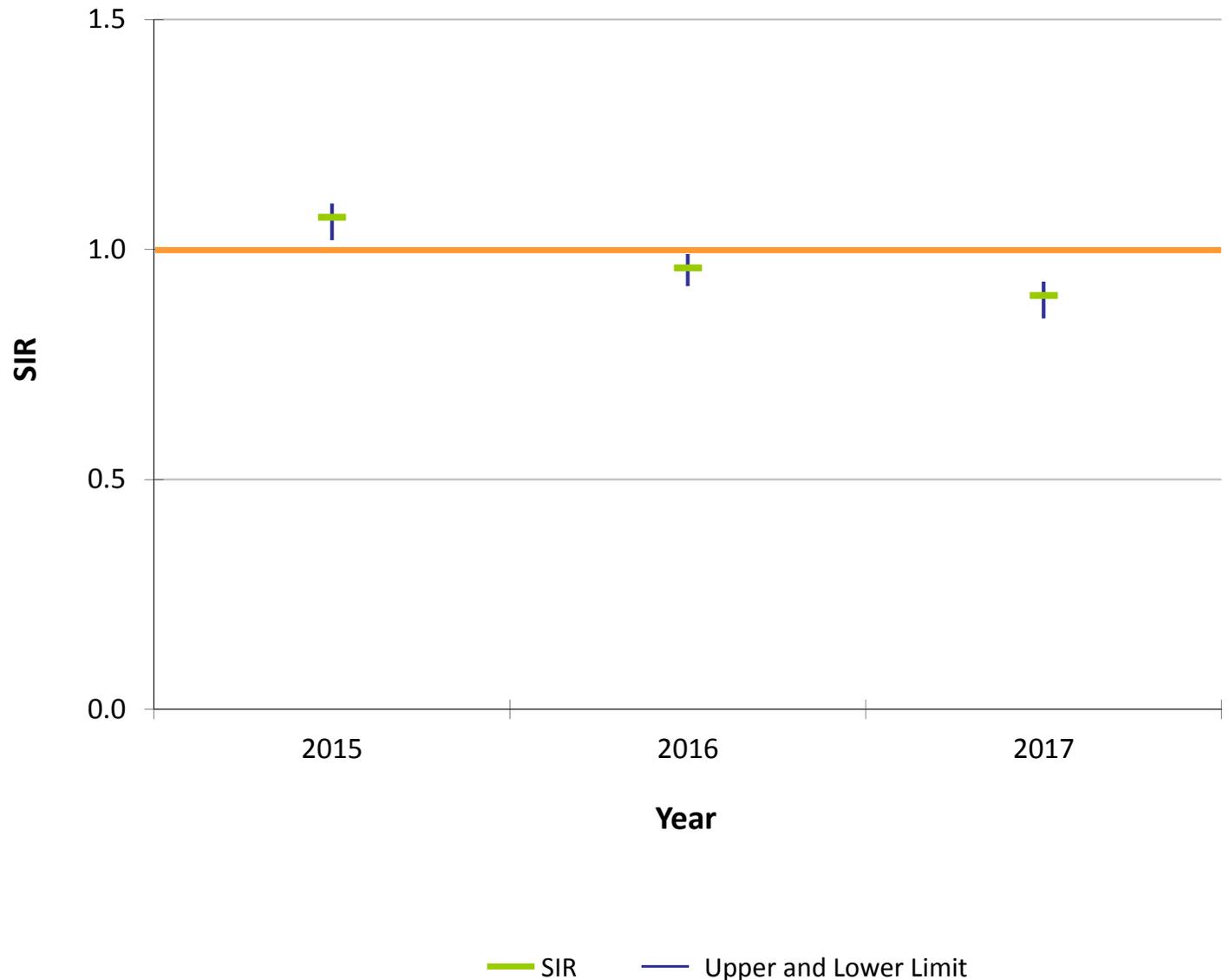The number of infections reported is lower than the number of predicted infections.

Key Findings

For the past two years, Massachusetts hospitals reporting CDI events experienced significantly lower number of infections than predicted, based on 2015 national aggregate data.
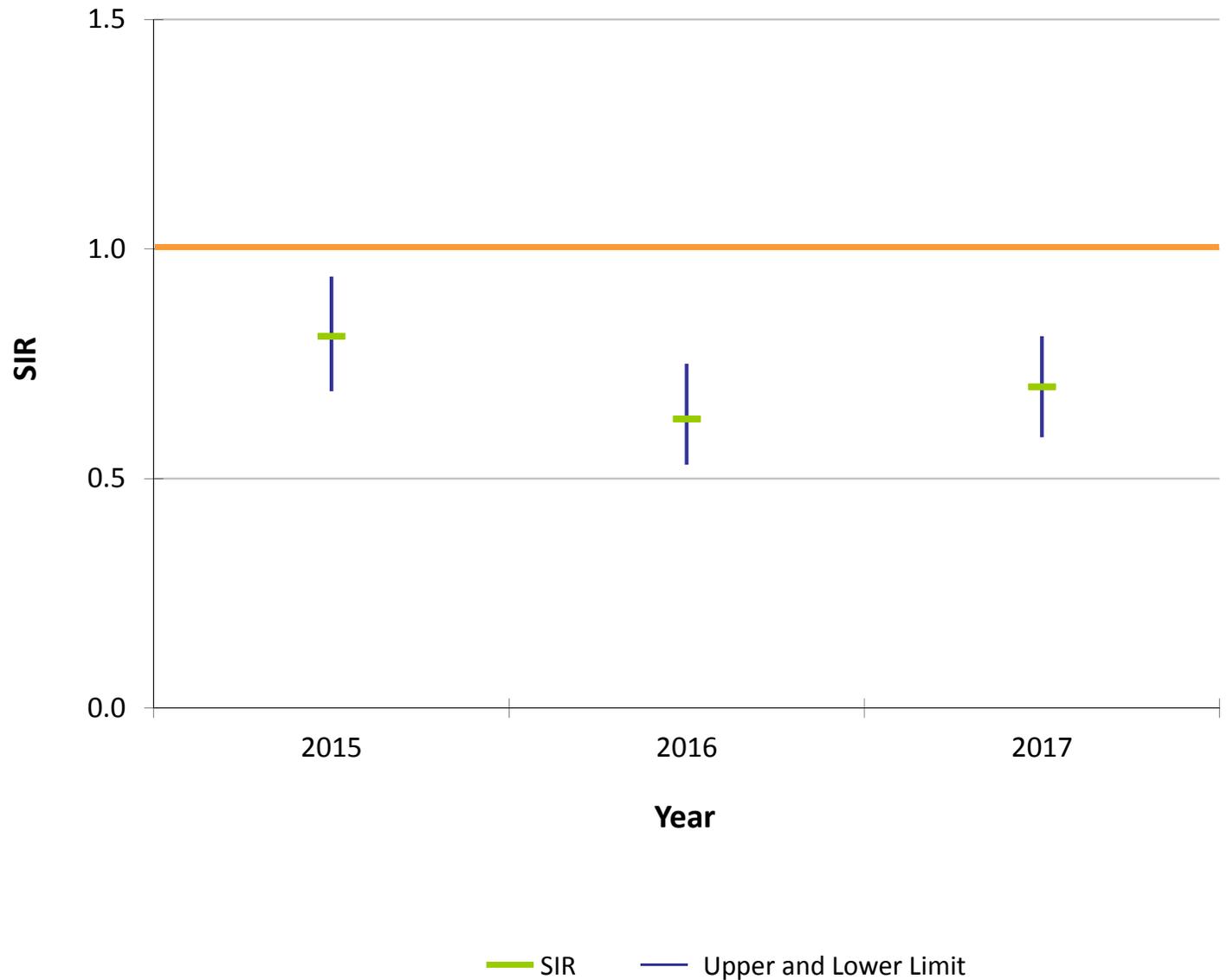
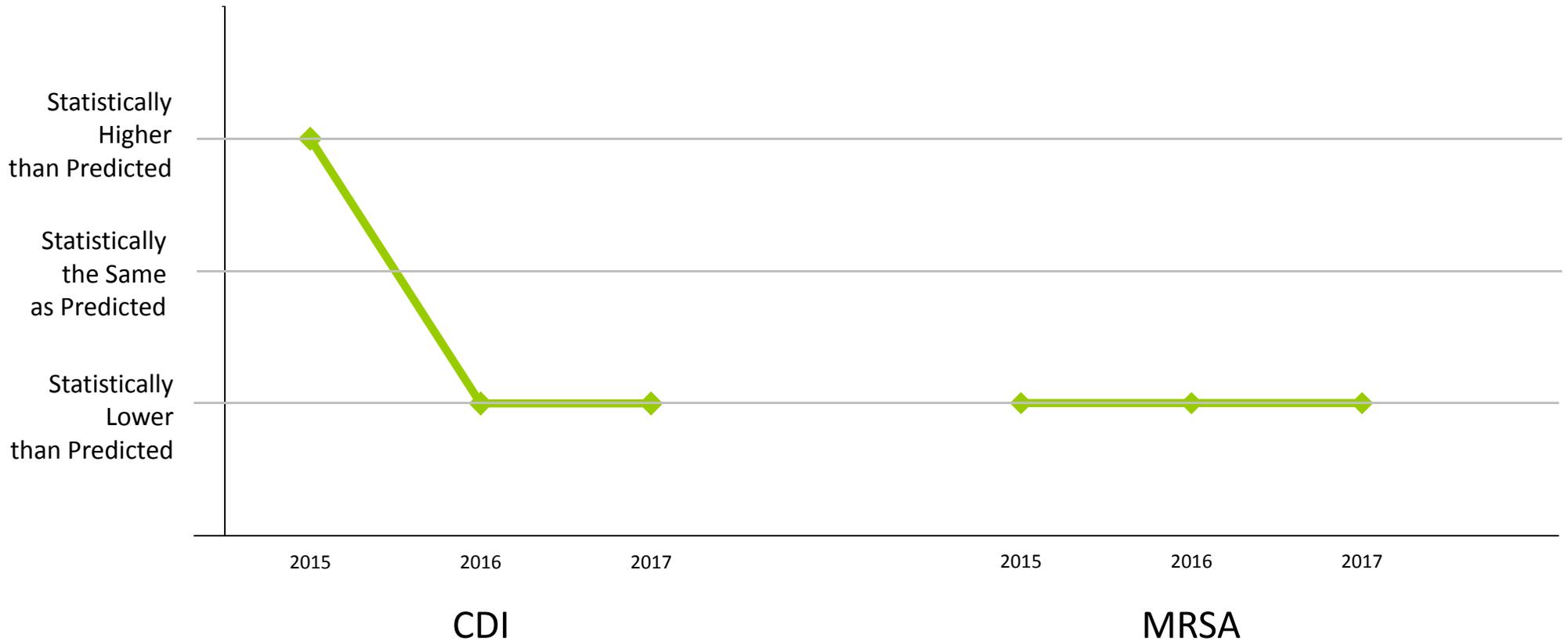There were 2,186 CDI events reported in 2017.

Key Findings

For the past three years, Massachusetts acute care hospitals reporting MRSA events experienced significantly lower number of infections than predicted, based on 2015 national aggregate data.
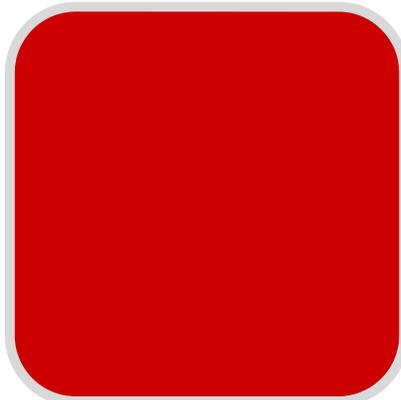
There were 150 MRSA events reported in 2017.

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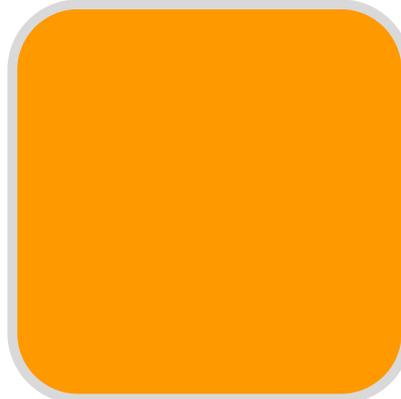**Significantly Higher than Predicted**

The number of infections reported is higher than the number of predicted infections.

Same as Predicted

The number of infections reported is the same as the number of predicted infections.

**CDI
MRSA**

Significantly Lower than Predicted

The number of infections reported is lower than the number of predicted infections.

- External data validation of *Clostridium difficile* infections conducted at 20 acute care hospitals and 10 long-term care facilities in the fall of 2017 and spring of 2018. DPH plans to conduct data validation of specific NHSN measures to ensure completeness and accuracy of reported data.

- Continued enrollment of long-term care facilities into NHSN for *Clostridium difficile* infection reporting.

- Ongoing data sharing with the Neonatal Quality Improvement Collaborative (NeoQIC) to address opportunities for improvement.

- Five hemodialysis infection prevention simulation trainings were held for hemodialysis nurses and technicians.

- On-site Infection Control Assessment and Response (ICAR) visits expanding from nursing homes to long-term acute care facilities.

- DPH monitors progress by providing quarterly Data Cleaning Reports and Targeted Assessment for Prevention (TAP) Reports for all hospitals to identify areas where focused infection prevention efforts are needed.

- Outreach to hospitals with higher than expected SIRs to ensure the need for improvement has been addressed.

- Antibiotic or antimicrobial resistance occurs when organisms are able to resist the effects of drugs. Bacteria are not killed by the antibiotic and continue to grow.

- Some individuals may be at a greater risk for acquiring a drug resistant infection (individuals with co-morbidities, previous hospitalizations, antibiotic exposures, etc.). However, drug-resistant infections can affect anyone.

- Infections with resistant organisms can be difficult to treat, are expensive and can have adverse effects.

- Inevitably, bacteria are able to adapt to newly developed antibiotics and become resistant.

- It is imperative to respond aggressively to prevent resistance and prevent the spread of existing resistant bacteria.

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MDRO Type	2016	2017	2018*	Total
Enterobacter cloacae	22	88	71	181
Klebsiella oxytoca and pneumoniae	15	78	33	126
Escherichia coli	5	32	40	77
Enterobacter aerogenes	8	17	5	30
Candida auris	0	7	0	7
Other	0	0	1	1
Total	50	222	150	422

*Data are current as of June 30, 2018 and are subject to change.

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DPH provides epidemiologic investigation support and guidance when specific MDROs are suspected to mitigate any exposure.

Activities include:
- Provide detailed infection control recommendations;
- Recommend retrospective and prospective laboratory surveillance
- Coordinates colonization screening of close contacts in collaboration with regional laboratory.

	2017	2018*
Confirmed	7	0
Contact	75	10
Suspect	0	1

* Data are current as of June 30, 2018 and are subject to change.

Candida auris:
A drug-resistant germ that spreads in healthcare facilities

Candida auris (also called *C. auris*) is a fungus that causes serious infections. Patients with *C. auris* infection, their family members and other close contacts, public health officials, laboratory staff, and healthcare workers can all help stop it from spreading.

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- Studies indicate that between 30-50% of antibiotics prescribed in hospitals and between 40-75% of antibiotics prescribed in nursing homes is unnecessary*.

- Improved prescribing practices can help reduce rates of *Clostridium difficile* and antibiotic resistance.

- Appropriate antibiotic prescribing can improve patient outcomes and reduce healthcare costs.

*https://www.cdc.gov/antibiotic-use/healthcare/
https://www.cdc.gov/longtermcare/prevention/antibiotic-stewardship.html

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- Electronic laboratory reporting (ELR) of mandatory MDROs of concern into the Massachusetts Virtual Epidemiologic Network (MAVEN).

- Mandatory submission of MDRO isolates to the Massachusetts State Public Health Laboratory for advanced testing;
 - Identify novel resistance mechanisms;
  - Identify *Candida auris.*

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- *NEW* - Nine part webinar series for long-term care and long-term acute care facilities, "*Navigating Infection Control and Antibiotic Stewardship in Long-term Care*" with three "ask the experts" calls.

- *NEW* - Collection, monitoring and reporting of facility-level antibiotic use data in long-term care facilities (n=45).

- *NEW* - "Bug of the Month" webinar series targeting MDROs of concern for all facility types.

- Publication of annual statewide antibiogram.

  – Provides bug-drug combinations of interest for benchmarking purposes (https://www.mass.gov/service-details/massachusetts-antibiograms)

- Engagement with subject matter experts and stakeholders during quarterly statewide HAI/AR Technical Advisory Group (TAG) meetings.

Staphylococcus aureus Susceptibility Rates – 2017

Statewide
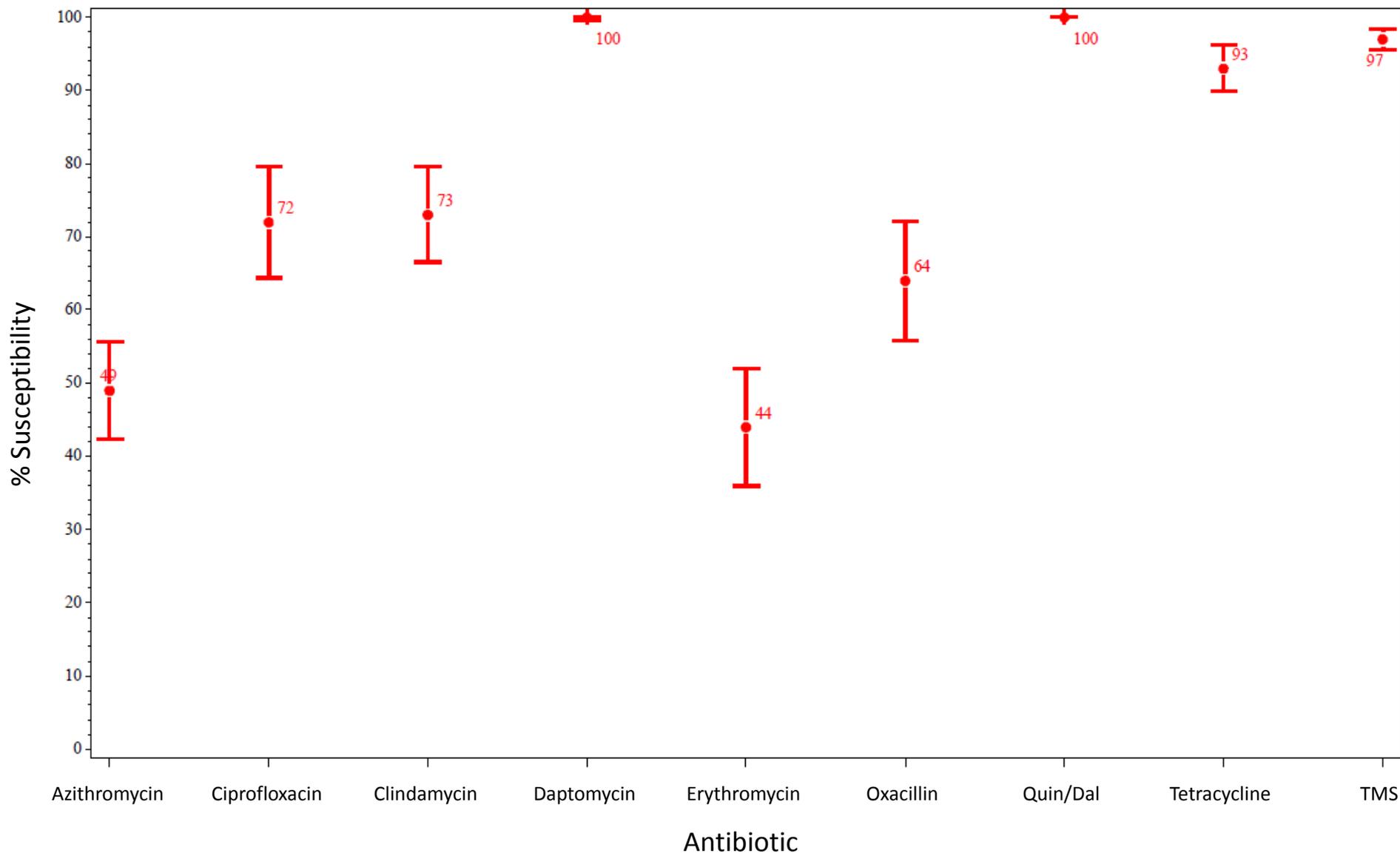
- Awarded competitive funding from the Council of State and Territorial Epidemiologists (CSTE) to modify the infection control assessment and response (ICAR) tool for use in long-term acute care hospitals (LTACHs) and to conduct enhanced education for managing and containing MDROs.

- Plan to collect and analyze NHSN antibiotic use (AU) data from a sample of acute care facilities to better understand trends in antibiotic use and monitor stewardship activities.

- Support and collaborate with two national Leadership in Epidemiology, Antimicrobial Stewardship and Public Health (LEAP) fellows, selected to improve the utility of the statewide antibiogram data and to enhance AS activities in long-term care facilities.

- Engage additional infection preventionists in use of MAVEN system for ease in response and containment of MDROs.

Thank you for the opportunity to present this information today.

Please direct any questions to:

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