



Trends in antimicrobial use and antimicrobial resistance in 2020 in the United States: has the COVID-19 pandemic had an impact on AMR?

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Disclosures

- I have no financial relationships with the commercial entities producing healthcare related products and/or services
- The findings and conclusions in this presentation are those of the authors and do not necessarily represent the official positions of the Centers for Disease Control and Prevention (CDC)

Objectives

- Describe the changes in antibiotic use in 2020 compared to 2019 in a large cohort of hospitals in the United States
- Describe the burden of secondary infections and common antibiotic resistant infections typically associated with healthcare exposures among patients diagnosed with COVID-19 compared to historical controls diagnosed with influenza like illness (ILI)

Data Source

- Premier Healthcare Database¹
 - U.S. hospital-based all payor database from geographically diverse, non-governmental community and teaching hospitals
 - Newly developed special use dataset updated every two weeks
 - Includes data from 2019 through 2020
- Convenience sample of over 800 acute care hospitals in the United States
 - Represents >20% of inpatient visits annually
 - 31% Rural, 29% Teaching, 33% Large (>300 hospital beds)
- Contains de-identified data on all patients regardless of age or payer

Types of data in Premier Healthcare Database

- ICD-9/10-CM diagnostic and procedure codes and other clinical data
- Patient demographics
- Hospital characteristics
 - Rural v. urban, Teaching status, Bed size group, Census division
- Hospital charge data
 - Used to determine antibiotic use
- Microbiology data
 - Used for secondary infections and antibiotic resistant infections

Antibiotic Use

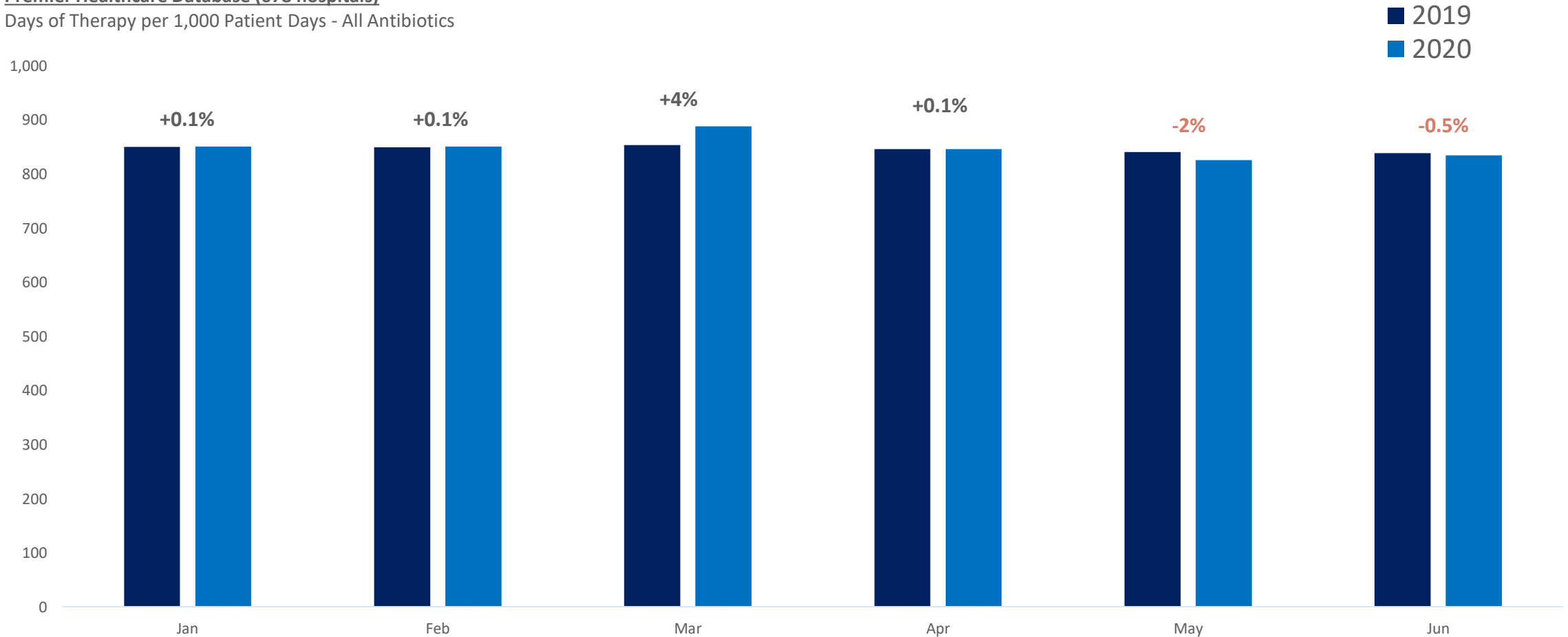
Use of antibiotics: Facility trends 2019-2020

- Methods
 - Cohort of hospitals reporting antibiotic use every month from Jan 2019 through June 2020
 - Inpatient visits only
 - Antibiotic usage data derived from the billing data
 - Calculated days of therapy (DOT) per 1,000 patient days
 - One DOT represents the use of a single antibiotic on a given day regardless of the number of doses administered or dosage strength
 - Pairwise comparison of antibiotic use for each month, Jan – June

Hospital Antibiotic Use: All Antibiotics

Premier Healthcare Database (678 hospitals)

Days of Therapy per 1,000 Patient Days - All Antibiotics



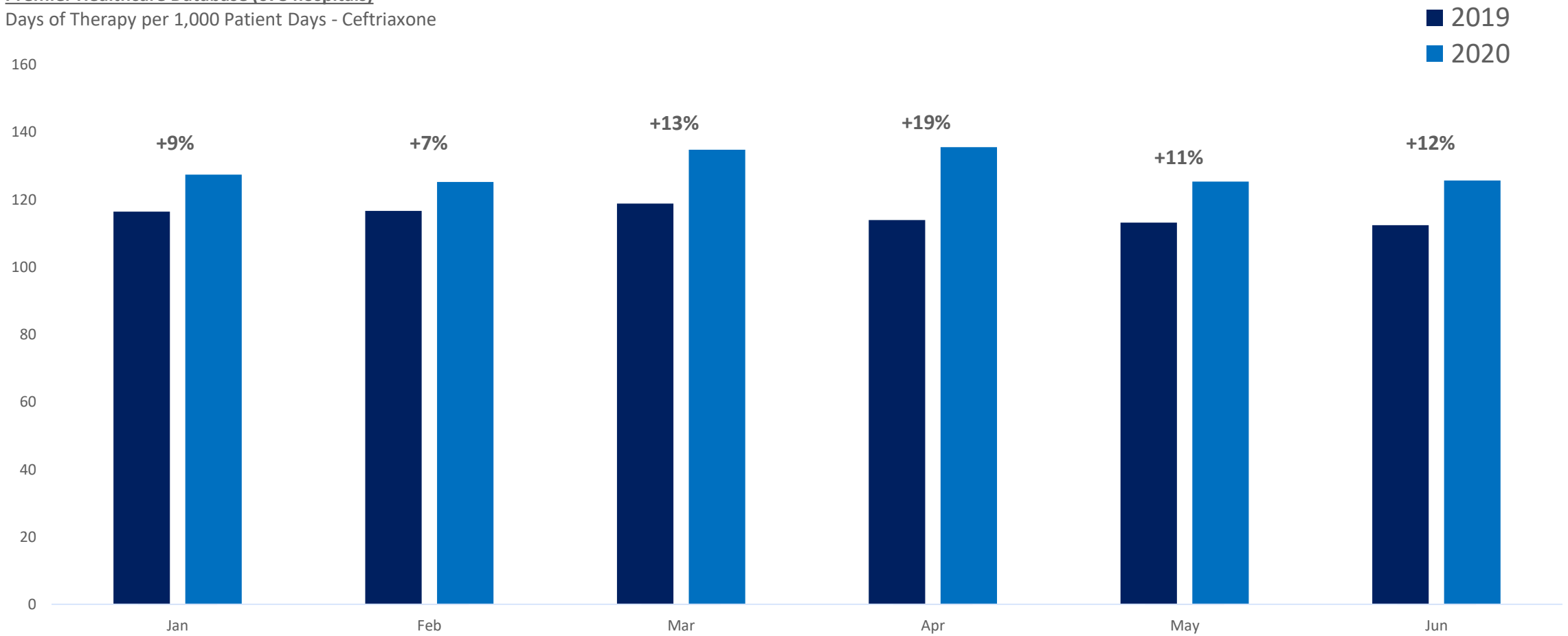
Preliminary unpublished analysis, please do not reproduce.

Note: 20% drop in hospitalizations for March-June of 2020 vs 2019

Hospital Antibiotic Use: Ceftriaxone

Premier Healthcare Database (678 hospitals)

Days of Therapy per 1,000 Patient Days - Ceftriaxone



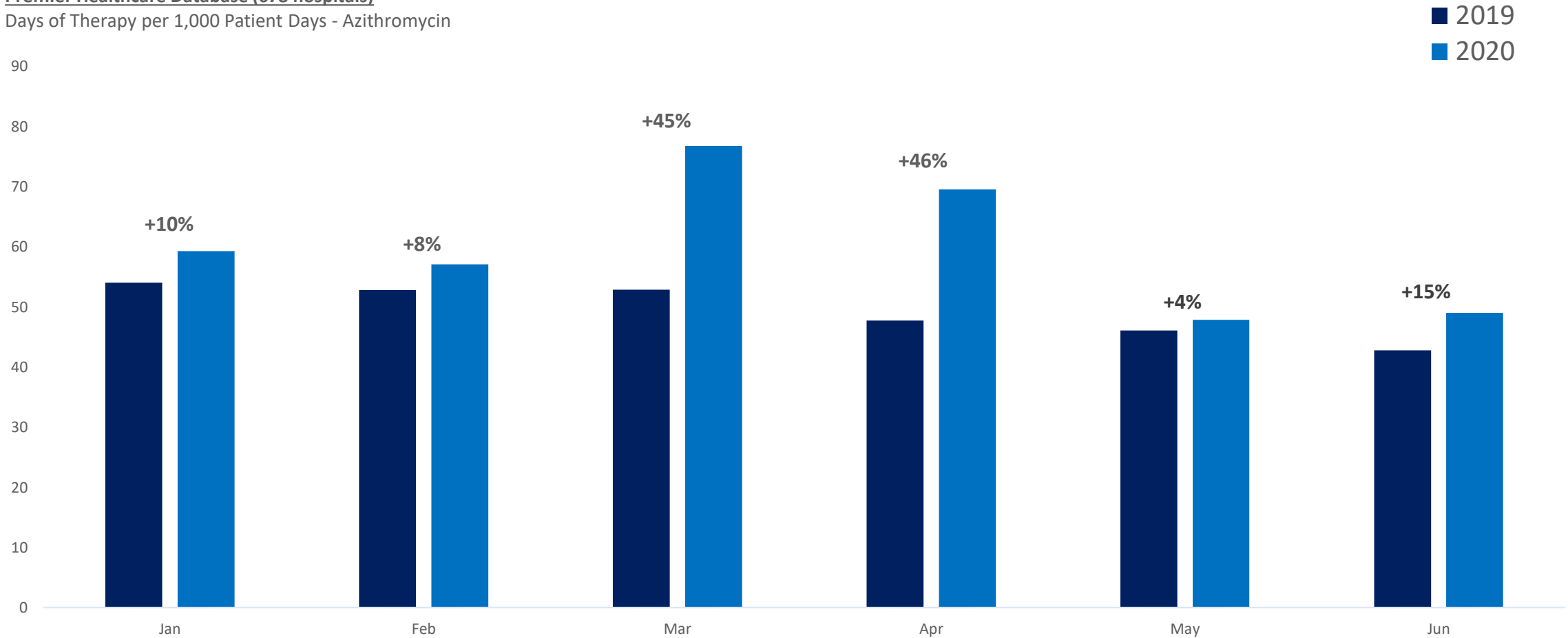
Preliminary unpublished analysis, please do not reproduce.

Note: 20% drop in hospitalizations for March-June of 2020 vs 2019

Hospital Antibiotic Use: Azithromycin

Premier Healthcare Database (678 hospitals)

Days of Therapy per 1,000 Patient Days - Azithromycin



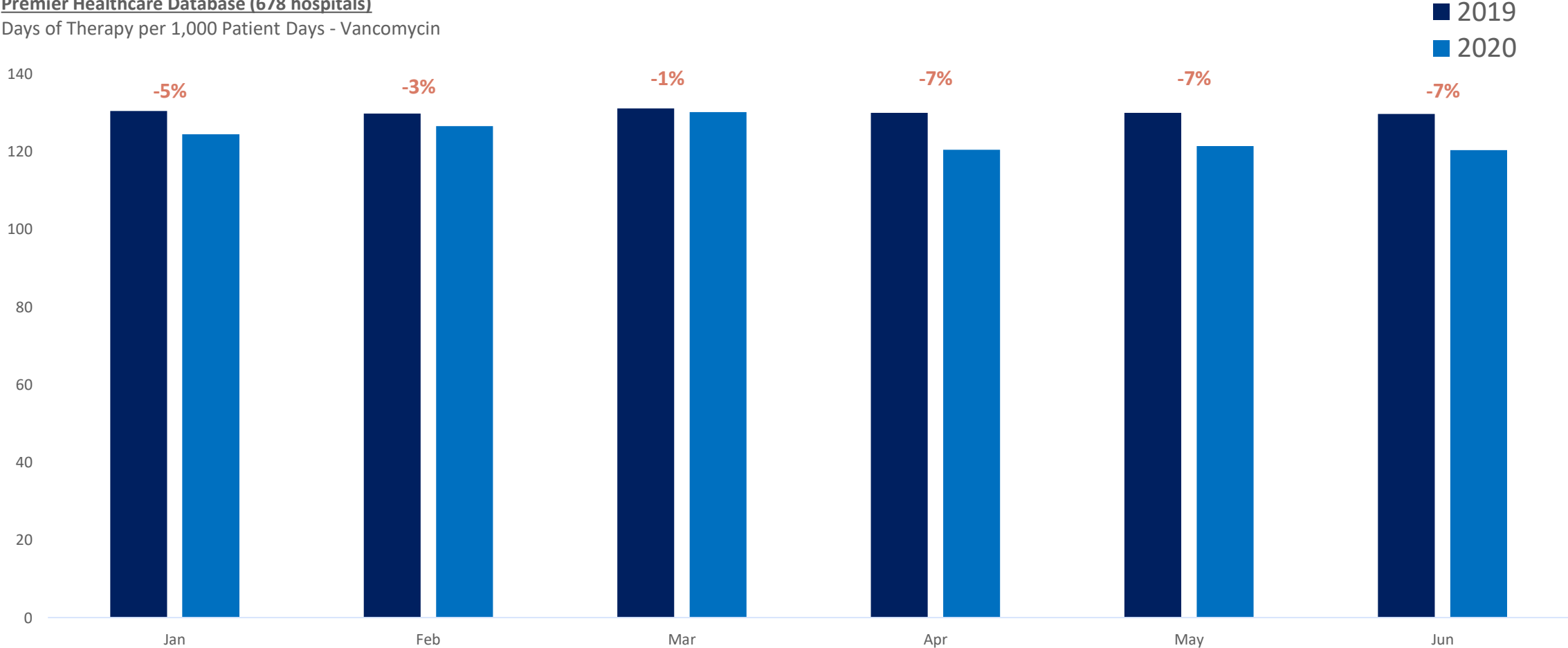
Preliminary unpublished analysis, please do not reproduce.

Note: 20% drop in hospitalizations for March-June of 2020 vs 2019

Hospital Antibiotic Use: Vancomycin

Premier Healthcare Database (678 hospitals)

Days of Therapy per 1,000 Patient Days - Vancomycin



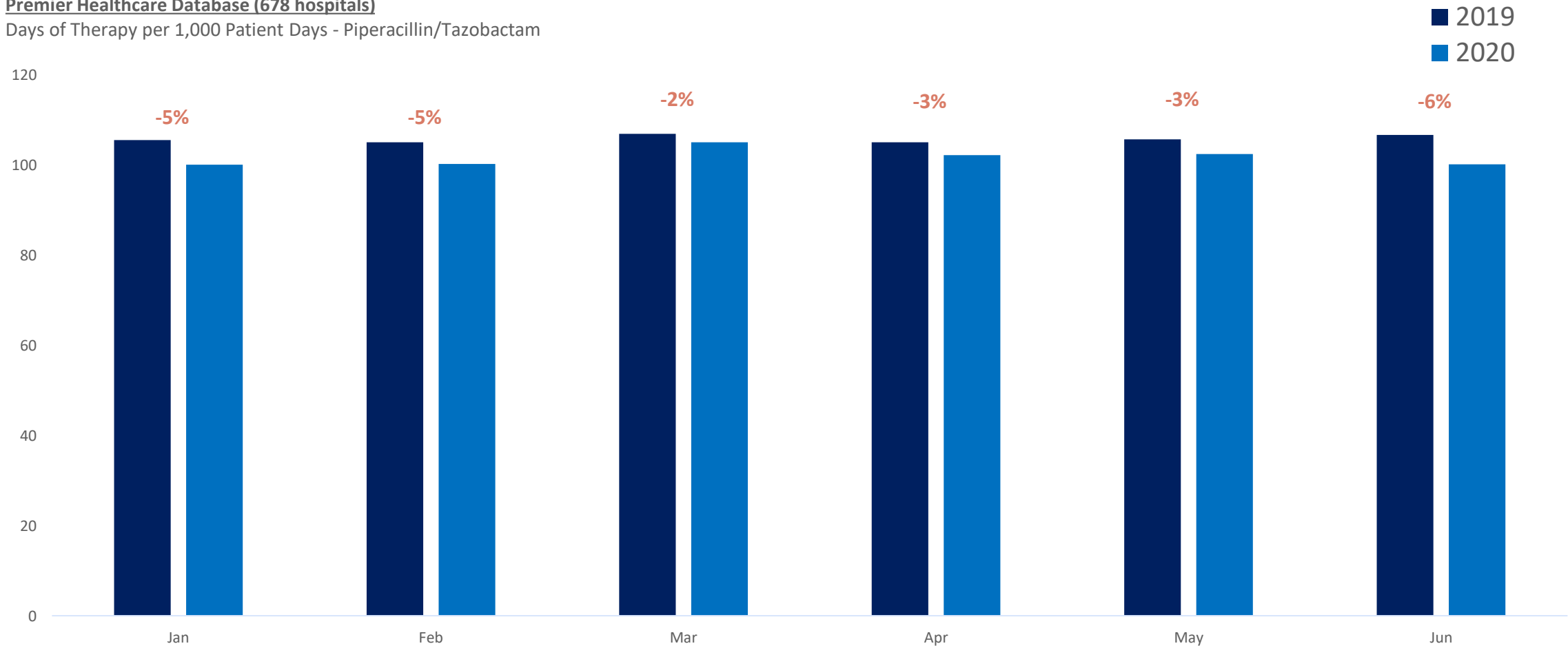
Preliminary unpublished analysis, please do not reproduce.

Note: 20% drop in hospitalizations for March-June of 2020 vs 2019

Hospital Antibiotic Use: Piperacillin/Tazobactam

Premier Healthcare Database (678 hospitals)

Days of Therapy per 1,000 Patient Days - Piperacillin/Tazobactam



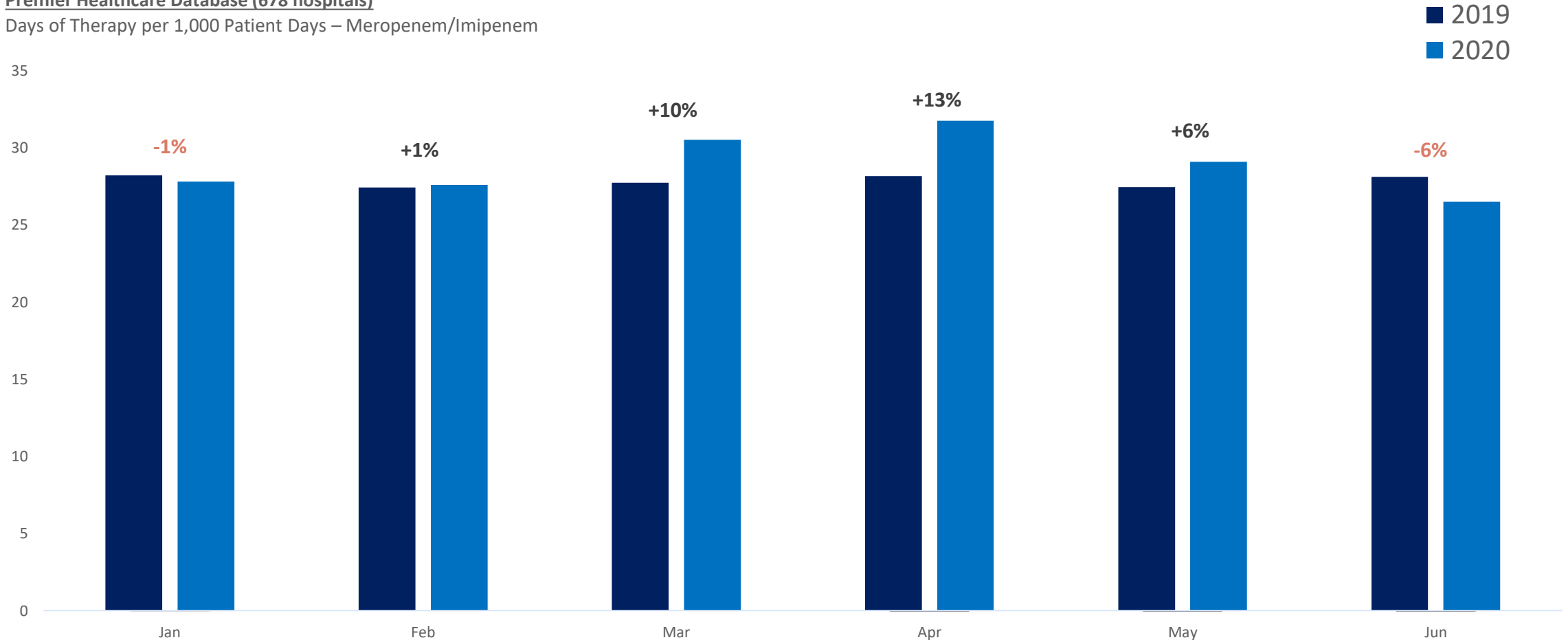
Preliminary unpublished analysis, please do not reproduce.

Note: 20% drop in hospitalizations for March-June of 2020 vs 2019

Hospital Antibiotic Use: Meropenem/Imipenem

Premier Healthcare Database (678 hospitals)

Days of Therapy per 1,000 Patient Days – Meropenem/Imipenem



Preliminary unpublished analysis, please do not reproduce.

Note: 20% drop in hospitalizations for March-June of 2020 vs 2019

Secondary Infections

Secondary Infection Estimates: Methods

- Searched **inpatient discharges** from participating hospitals
 - Identified COVID-19 as
 - Hospitalized patients with confirmed SARS-CoV-2 diagnosis code (U07.1)
 - Discharged Apr to Jul 2020
 - Hospitalized patients with suspected SARS-CoV-2 diagnosis code
 - B97.29 discharged Mar to Apr 2020, admissions from Feb to Apr 2020
 - Identified Influenza Like Illness (ILI)
 - Used ILI codes previously established
 - Discharged from Jan to Mar 2019
 - Limited to months in which influenza is normally transmitted in the U.S.

Secondary Infection Estimates: Methods

- Used microbiology data to create estimates of bacterial infections
 - Established cohort of hospitals reporting microbiology data each month (For COVID, N=156; For ILI, N=165)
 - Determined the proportion of discharges with a bacterial or fungal culture
 - Used the sensitivity data to determine the proportion of discharges with a positive culture as a surrogate for infection
 - Determined the proportion of discharges with certain antibiotic resistant infections
 - MRSA, ESBL, CRE, VRE, CRPA, CRAB
 - Defined by organisms and medication sensitivities²
 - Stratified by community-onset (within the first 3 days of admission) and hospital-onset (day 4 or later after admission)

Comparison of Flu & COVID-19 Discharges

	Patients with Influenza-Like Illness (Jan-March 2019)	Patients with COVID-19 (Jan-July 2020)
Mean length of stay	5.88 days	8.33 days
Discharges with bacterial/fungal culture	55.8%	58.0%
Discharges with a positive culture with a susceptibility result	12.4%	9.6%

Influenza-Like Illness Definition: A hospitalization with a discharge during January 1, 2019-March 30, 2019, and any of the following ICD-10-CM codes: B97.89, H66.9, H66.90, H66.91, H66.92, H66.93, J00, J01.9, J01.90, J06.9, J09.X, J10.X, J11.X, J12.89, J12.9, J18, J18.1, J18.8, J18.9, J20.9, J40, R05, R50.9

COVID-19 Definition: An ICD-10-CM code of U07.1 (confirmed) with a discharge date April–July 2020 or ICD-10-CM code of B97.29 (suspected) with a discharge date March–April, 2020, and admission dates February–April 2020

Data collected November 4, 2020

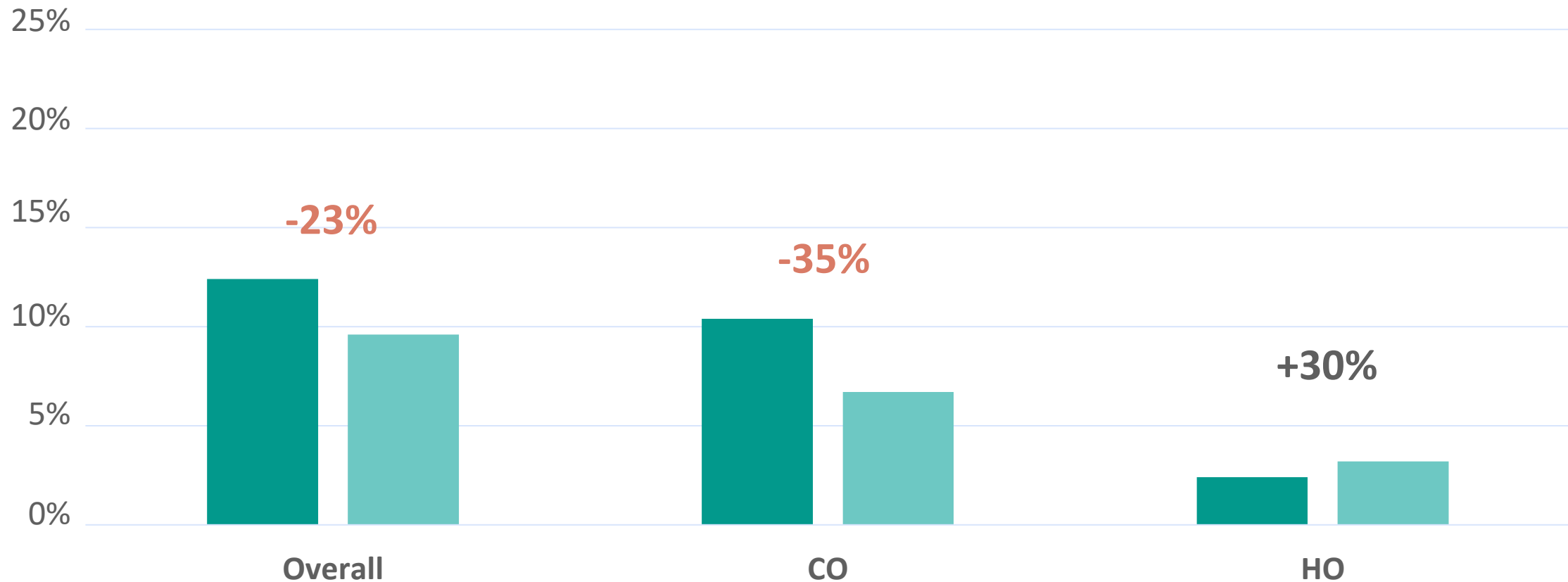
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Cultures from Patients with COVID-19 and ILI Grew Organisms at Similar Frequency

Proportion of discharges with a positive culture

■ Influenza-Like Illness (2019)

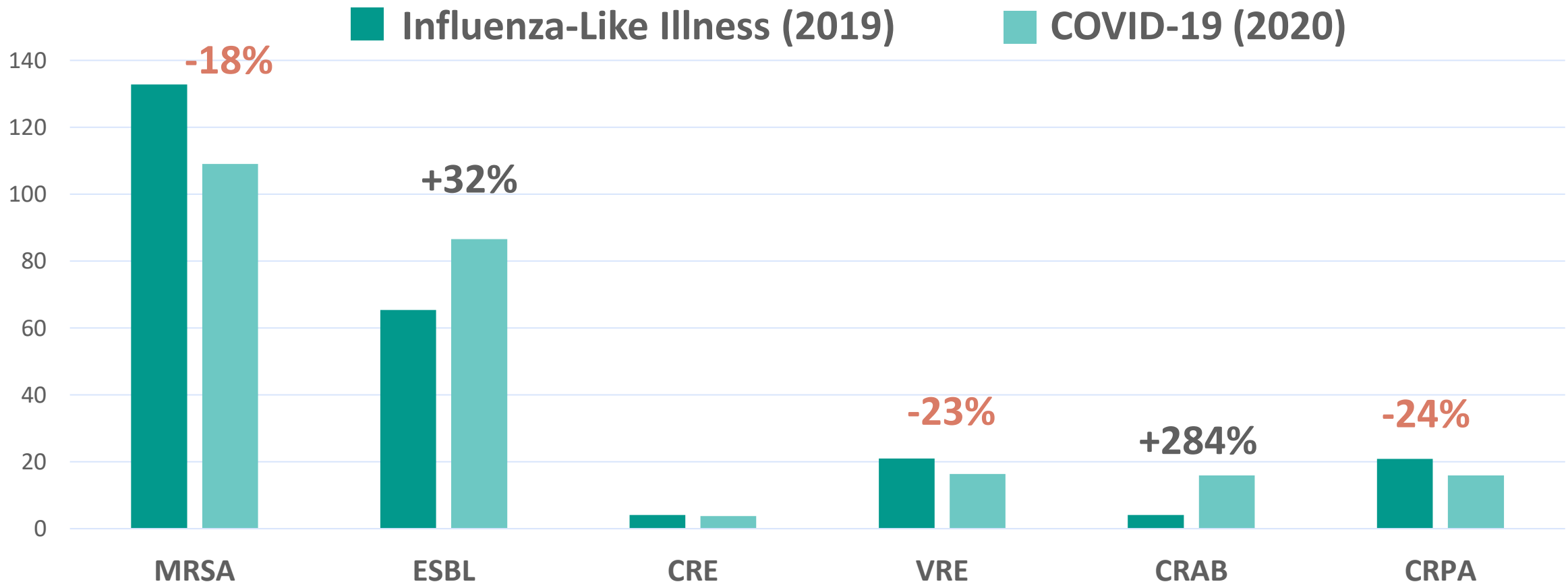
■ COVID-19 (2020)



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Antibiotic-Resistant Pathogens in Hospitalized Patients: Overall

Rate of resistant organisms per 10,000 discharges



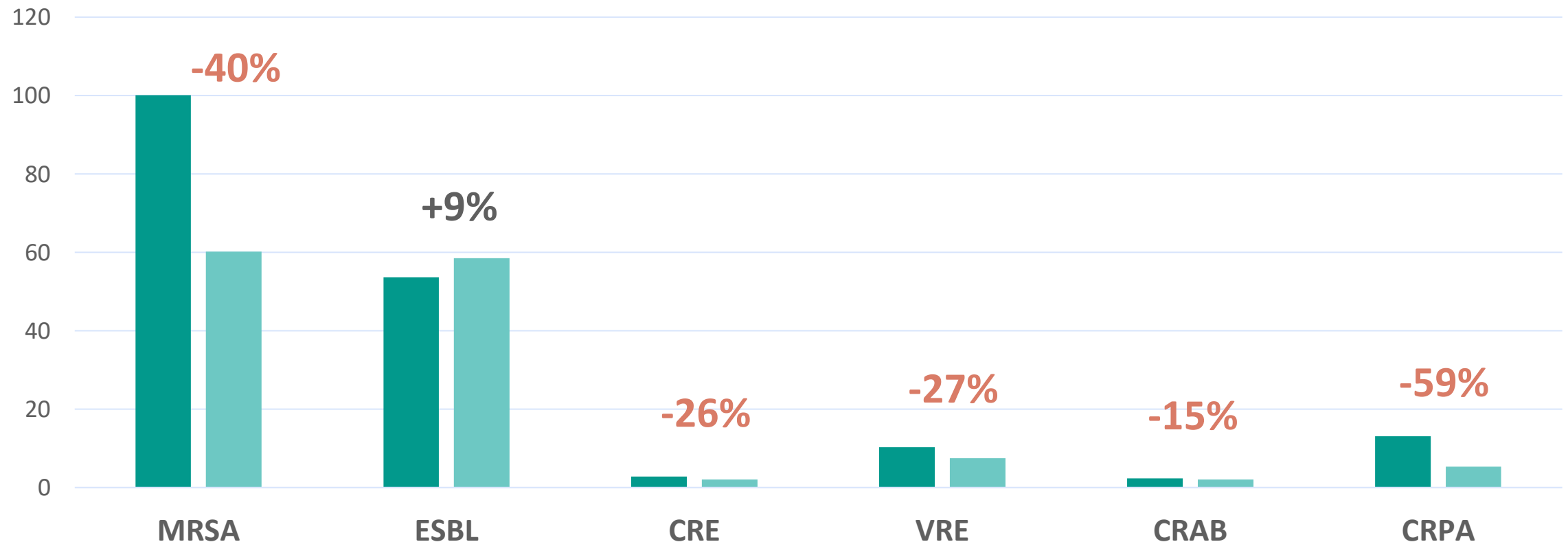
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Antibiotic-Resistant Pathogens in Hospitalized Patients: Community-onset

Rate of community-onset resistant organisms per 10,000 discharges

Influenza-Like Illness (2019)

COVID-19 (2020)

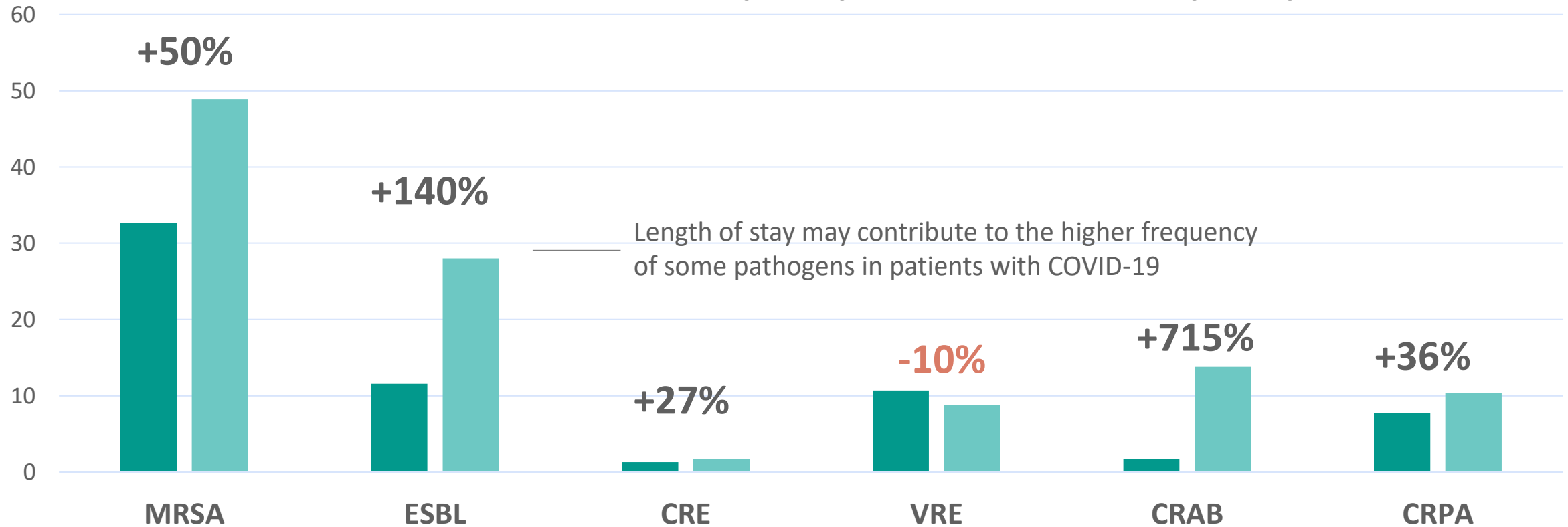


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Antibiotic-Resistant Pathogens in Hospitalized Patients: Hospital-onset

Rate of hospital-onset resistant organisms per 10,000 discharges

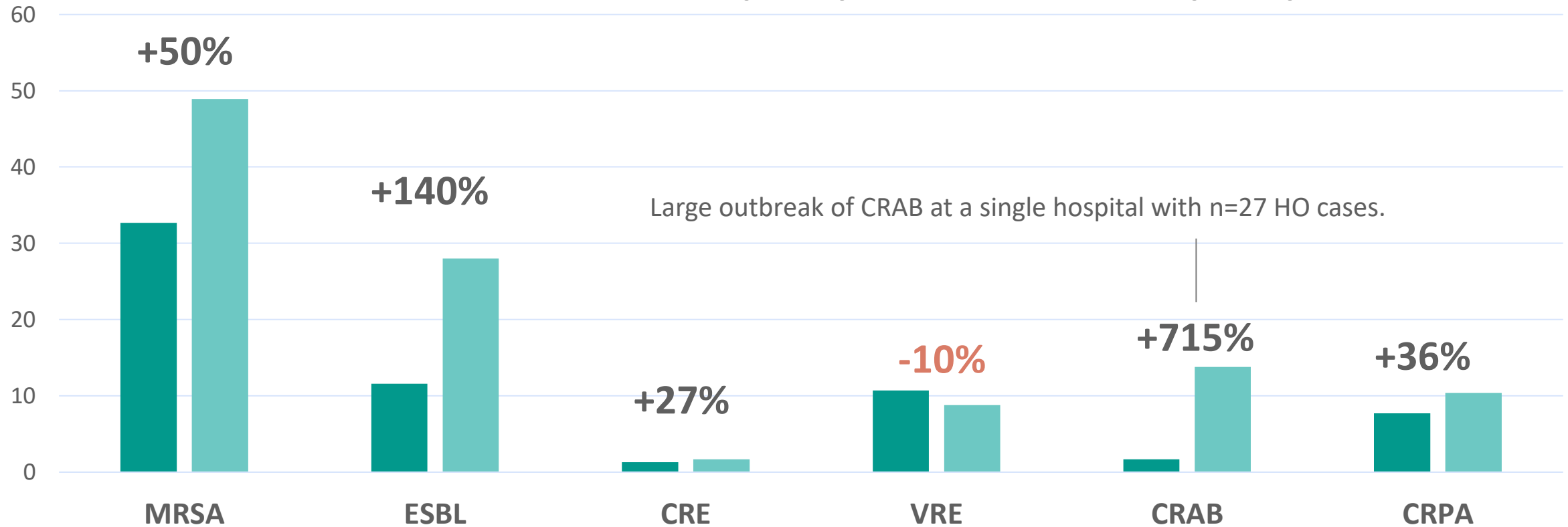
Influenza-Like Illness (2019) COVID-19 (2020)



Antibiotic-Resistant Pathogens in Hospitalized Patients: Hospital-onset

Rate of hospital-onset resistant organisms per 10,000 discharges

Influenza-Like Illness (2019) COVID-19 (2020)

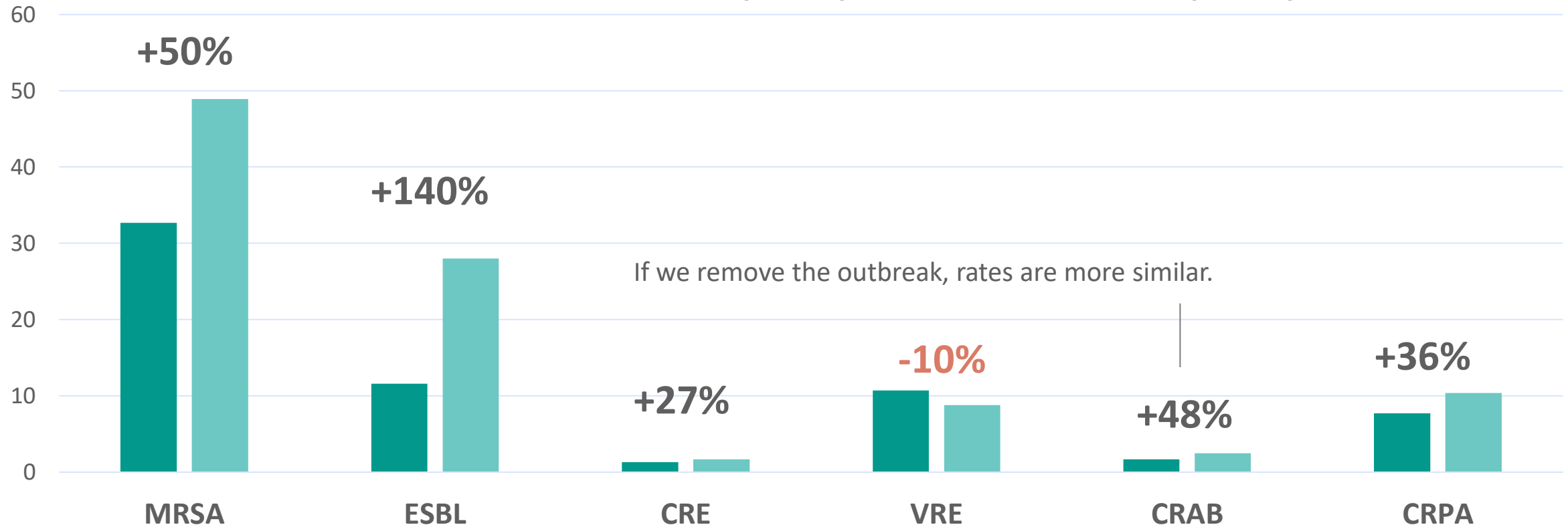


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Antibiotic-Resistant Pathogens in Hospitalized Patients: Hospital-onset

Rate of hospital-onset resistant organisms per 10,000 discharges

Influenza-Like Illness (2019) COVID-19 (2020)



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Summary

- Antibiotic use fluctuated, appears stable but remains too high
 - Hospitals spiked in early 2020 but flattened as the pandemic continued
- Healthcare infection control is critical to fighting AR and SARS-CoV-2 infections
 - No clear evidence that COVID-19 patients are more susceptible to bacterial/fungal infections; similar frequency as patients with influenza-like-illness (ILI). However, we are seeing sporadic outbreaks of AR infections in COVID units & higher rates of hospital-onset infections
 - COVID-19 creates a perfect storm for AR in healthcare settings: length of stay, crowding, sick patients, antibiotic use, infection control issues

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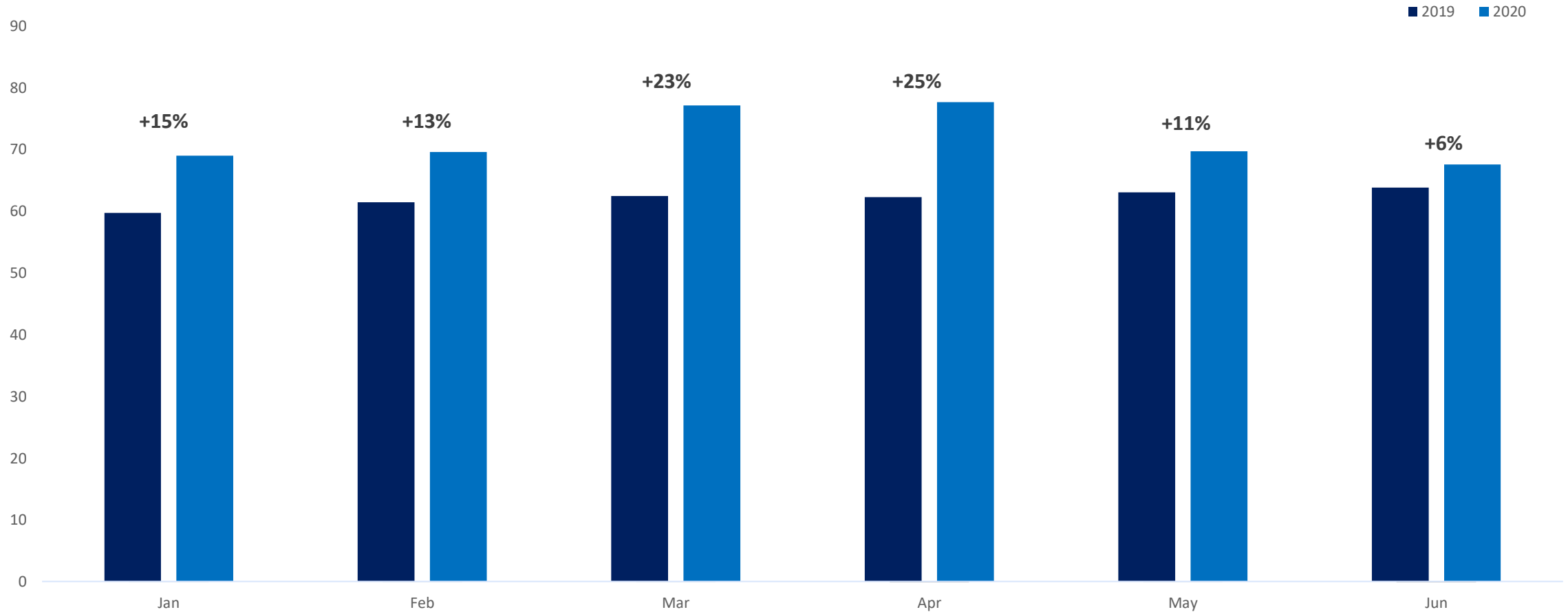
References

- 1. Premier Healthcare Database: Data that informs and performs. March 2, 2020 (<https://learn.premierinc.com/white-papers/premier-healthcare-database-whitepaper>).
- 2. John A. Jernigan, M.D., Kelly M. Hatfield, M.S.P.H., Hannah Wolford, M.S.P.H., et al. Multidrug-Resistant Bacterial Infections in U.S. Hospitalized Patients, 2012-2017. *N Engl J Med.* 2020;382:1309-1319.

Hospital Antibiotic Use: Cefepime/Ceftazidime

Premier Healthcare Database (678 hospitals)

Days of Therapy per 1,000 Patient Days – Cefepime/Ceftazidime



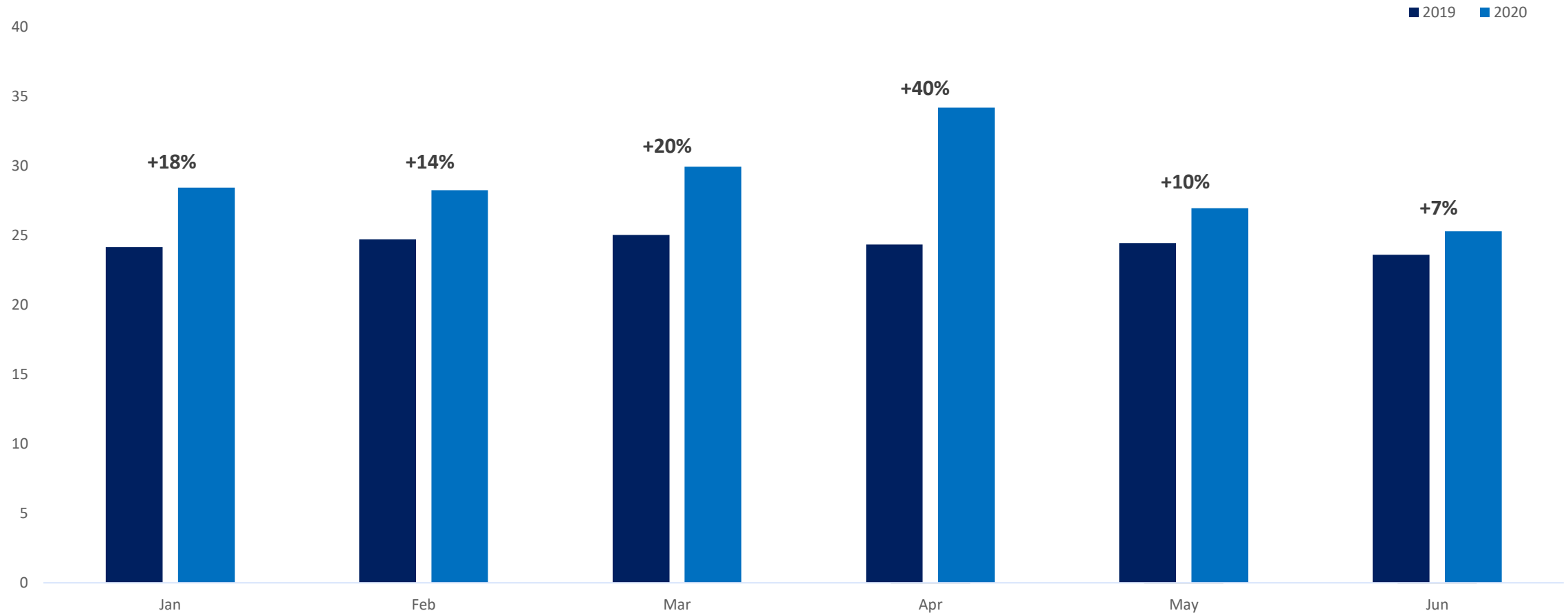
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Hospital Antibiotic Use: Doxycycline

Premier Healthcare Database (678 hospitals)

Days of Therapy per 1,000 Patient Days - Doxycycline



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