Benchmarking Antibiogram Data

Hospitals within the county are required to annually provide their local antibiogram data to LACDPH for compilation into a regional multifacility antibiogram.

CLSI M39 provides extensive guidelines for antibiogram preparation.[1] LACDPH suggests that facilities prepare their local antibiogram by following recommendations in this guideline. See Table 1 below that lists the most important requirements.

Tables D1 and D2 in CLSI M39 provide suggestions for reviewing final %S data as a quality check before release of the antibiogram.[1] Here we provide a stepwise approach for using the LACDPH antibiogram dashboard to benchmark antibiogram data from your facility. We also provide six examples to highlight key points about data presented in the dashboard.

Stepwise Guide to Benchmarking Using the LACDPH Dashboard

Step 1

Review text on the LACDPH website that describes how the data are collected, compiled and presented in the antibiogram dashboard.

In brief, %S rates for each organism/antimicrobial agent combination are obtained by aggregating annual antibiogram data submitted from approximately 80 to 90 hospitals each year.

The first (Q1) and third (Q3) quartiles represent the spread of %S data submitted by all hospitals.

Step 2

Select a year and compare your antibiogram %S data for each organism/antimicrobial agent combination to the LACDPH %S, Q1, and Q3 published on the dashboard for that year. Please note:

If your %S compared to the Q1 and Q3 range is:	This means the susceptibility of your isolates compared to other facilities is:
Within the range	Similar
Below the range	More resistant
Above the range	More susceptible

Step 3

If your data are outside the range or close to Q1 or Q3, you may wish to explore further.

Some additional factors beyond those in Table 1 below that may impact %S data include:

Factor	Comments
Patient population served	The LACDPH data reflect isolates from inpatients and outpatients. Isolates from sicker hospitalized patients are more likely to be more resistant.
Culturing practices and isolates for which antimicrobial susceptibility testing (AST) is performed	Data reflect culturing practices and isolates specifically selected for AST; testing policies may differ among facilities. For example, if providers only order urine cultures on patients who have failed therapy, isolates recovered are likely to be more resistant.
Temporal outbreaks	An outbreak of MDRO occurring among more than a few patients, particularly for less commonly encountered species, may drive down %S data.
Breakpoints used to interpret AST results	CLSI has updated many breakpoints since 2010, and not all laboratories are using the most current breakpoints.[a] It is unknown what breakpoints were used by participants who submitted data for the LACDPH antibiogram dashboard. Use of updated breakpoints will usually result in a lower %S, since most breakpoint updates involved a lowering of the breakpoints.

[a] Current breakpoints are listed in "CLSI. Performance Standards for Antimicrobial Susceptibility Testing. 35th ed. CLSI supplement M100. Clinical and Laboratory Standards Institute; 2025."

All laboratories are encouraged to use current CLSI or FDA breakpoints. FDA breakpoints that are not aligned with CLSI breakpoints are listed on the FDA Susceptibility Test Interpretive Criteria website.

Step 4

If necessary, determine if adjustments to your protocols for antibiogram preparation are warranted for future analyses.

Step 5

You may wish to share your findings with your Antimicrobial Stewardship Team and:

- Discuss how your data compare to the LACDPH antibiogram.
- Explain any technical details identified that might have contributed to outliers in your data.

- Determine if any changes to your AST and reporting policies (e.g., changes in breakpoints; antimicrobial agents tested/reported) or antibiogram preparation protocols are warranted.
- Discuss if additional in-depth actions are needed to ensure data are accurate (e.g., check the technology used to collect and analyze data)

Examples from LACDPH Antibiogram Dashboard

Note: 2023 data were used for examples unless otherwise noted.

Example 1 - Basic comparison of your %S data to multifacility %S data

Antimicrobial Agent	Organism	Region	Isolates Tested[3]	Hospitals Reported	Susceptibility (%)[2] (Q1, Q3)	Change in Susceptibility (%)[5]
Ampicillin	Escherichia coli	County-Wide	195979	67	50 (39, 51)	-1

Of nearly 200,000 isolates of *E. coli* reported by 67 facilities, 50% were susceptible to ampicillin in 2023. There was only a 1% decrease in %S from 2022 (%S = 51%). If your %S is between 39% and 51%, your data are like those reported by other facilities. Again, %S values approaching the upper or lower limits of Q1 and Q3, respectively, suggest further examination of your data may be warranted.

Example 2 – Small number of "Isolates Tested"

Antimicrobial Agent	Organism	Region	Isolates Tested[3]	Hospitals Reported	Susceptibility (%)[2] (Q1, Q3)	Change in Susceptibility (%)[5]
Meropenem	Acinetobacter baumannii	County-Wide	1837	57	49 (25, 60)	7

Of 1837 isolates of *A. baumannii* reported, 49% were susceptible to meropenem in 2023. Red font indicates a %S value below 50%. There was a 7% increase in %S from 2022 (%S = 42%). The %S data for *A. baumannii* are more dynamic than for any other organism in part due to a relatively small number of strains tested that have a variety of susceptibility profiles, some very susceptible and some very resistant.

Example 3 – Antibiogram data from all facilities may not be based on the same breakpoints

Antimicrobial Agent	Organism	Region	Isolates Tested[3]	Hospitals Reported	Susceptibility (%)[2] (Q1, Q3)	Change in Susceptibility (%)[5]
Ciprofloxacin	Proteus mirabilis	County-Wide	23907	61	80 (54, 82)	1

Of nearly 24,000 isolates of *P. mirabilis* reported, 80% were susceptible to ciprofloxacin in 2023 and there was a 1% increase in susceptibility from 2022 (%S = 79%). The range between Q1 and Q3 is broad (54-82%) which may reflect some laboratories using outdated ciprofloxacin breakpoints which were updated in 2019. See above comment regarding breakpoint changes in CLSI M100.

Publication Dates for CLSI M100 Standards	Ciprofloxacin Breakpoints (µg/mL) Enterobacterales		
	Susceptible	Intermediate	Resistant
2019-present [a]	≤0.25	0.5	≥1
Before 2019	≤1	2	≥4

[a] Current breakpoints are located in "CLSI. Performance Standards for Antimicrobial Susceptibility Testing. 35th ed. CLSI supplement M100. Clinical and Laboratory Standards Institute; 2025."

Example 4 - Data from all facilities may not be based on the same breakpoints, but %S very high

Antimicrobial Agent	Organism	Region	Isolates Tested[3]	Hospitals Reported	Susceptibility (%)[2] (Q1, Q3)	Change in Susceptibility (%)[5]
Tobramycin	Pseudomonas aeruginosa	County-Wide	26529	71	97 (95, 98)	0

Of over 26,000 isolates of *P. aeruginosa* reported, 97% were susceptible to tobramycin in 2023 and there was no change in susceptibility from 2022. The range between Q1 and Q3 is very tight (95-98%) which relates to the very high %S. Tobramycin breakpoints were updated in March 2023, but it is unlikely laboratories used these for their complete 2023 antibiogram data.

Example 5 – Considerable variation in drugs reported by various facilities; drug/organism combinations for resistance has never been reported for vancomycin

Antimicrobial Agent	Organism	Region	Isolates Tested[3]	Hospitals Reported	Susceptibility (%)[2] (Q1, Q3)	Change in Susceptibility (%)[5]
Ampicillin	S. agalactiae (Group B Strep)	County-Wide	1101	37	100 (100, 100)	0
Ceftriaxone	S. agalactiae (Group B Strep)	County-Wide	759	28	100 (100, 100)	0
Clindamycin	S. agalactiae (Group B Strep)	County-Wide	6267	50	45 (10, 48)	-4
Erythromycin	S. agalactiae (Group B Strep)	County-Wide	809	32	39 (31, 49)	-4
Levofloxacin	S. agalactiae (Group B Strep)	County-Wide	1159	39	97 (97, 100)	-1
Linezolid	S. agalactiae (Group B Strep)	County-Wide	981	31	100 (100, 100)	0
Penicillin	S. agalactiae (Group B Strep)	County-Wide	5906	45	100 (100, 100)	0
Vancomycin	S. agalactiae (Group B Strep)	County-Wide	6408	54	100 (100, 100)	0

Looking at the highest number for "Isolates Tested" for any antimicrobial agent against *S. agalactiae*, 6408 isolates were tested and reported for vancomycin. In contrast, only 759 isolates were tested and reported for ceftriaxone. Five drugs show 100% S for *S. agalactiae* which is known to be very susceptible to many Gram-positive agents except for clindamycin and erythromycin. If %S data from your facility is less than 100% for the agents listed here with 100%, it would be useful for you to examine your data further.

Example 6 – Significance of %S statistic for guiding empiric therapy

Antimicrobial Agent	Organism	Region	Isolates Tested[3]	Hospitals Reported	Susceptibility (%)[2] (Q1, Q3)	Change in Susceptibility (%)[5]
Trimethoprim-sulfamethoxazole	Escherichia coli	County-Wide	191724	69	70 (62, 70)	-1
Trimethoprim-sulfamethoxazole	Klebsiella (Enterobacter) aerogenes	County-Wide	5359	63	97 (93, 100)	-1
Trimethoprim-sulfamethoxazole	Klebsiella oxytoca	County-Wide	4886	63	91 (83, 95)	-1
Trimethoprim-sulfamethoxazole	Klebsiella pneumoniae	County-Wide	38120	70	84 (76, 88)	-1

There are few data-driven guidelines that contain %S thresholds to suggest an antimicrobial agent may be a good choice for empiric therapy of initial infections. However, a %S rate ≥80% has been used for trimethoprim-sulfamethoxazole and the treatment of uncomplicated urinary tract infections.[2,3] This primarily relates to data from an individual facility. In the snapshot here for several species, the %S for trimethoprim-sulfamethoxazole varies considerably. It must be noted that the rule for trimethoprim-sulfamethoxazole and 80% was based on urine isolate data unlike here where the data here are from a variety of specimen sources. Regardless, when considering trimethoprim-sulfamethoxazole, these data suggest that it would be prudent to perform AST on *E. coli* isolates, even those from patients with uncomplicated urinary tract infections.

CLSI M39 Chapter 10 provides a few additional examples for using an individual facility's %S antibiogram data for guiding empiric therapy of initial infections.[1]

Quick Guide to Additional Features on the LACDPH Antibiogram Dashboard

- Notes about an organism or organism group in terms of intrinsic resistance and links to therapy guidelines. Find these on the dashboard's main page listed in a separate window under data for a specific organism/organism group.
- See snapshot below for location of links to:
- Gram-negative Composite Table
- Gram-positive Composite Table
- Graphs of Trends by Year

Table 1. CLSI M39 Key Recommendations for Routine Antibiogram Development [1]

- Antibiogram reports should be analyzed and presented at least annually.
- Only diagnostic (not surveillance) isolates should be included.
- Only final, verified test results should be included.
- Duplicates should be eliminated by including only the first isolate of a species, patient, and/or analysis period, regardless of specimen source or antimicrobial susceptibility profile.
- Only species with testing data for ≥ 30 isolates should be included.
- Only antimicrobial agents routinely tested against the population of isolates to be analyzed should be included, and the %S should be calculated from results reported, as well as those that may be suppressed on patient reports for which selective reporting rules have been applied.
- Laboratories should refrain from including results for supplemental antimicrobial agents selectively tested on resistant isolates only.
- Laboratories should report the %S but exclude the %I or %SDD in the %S statistic.

Abbreviations. %I, percent intermediate; %S, percent susceptible; %SDD, percent susceptible-dose dependent

References

1. Clinical and Laboratory Standards Institute. Analysis and Presentation of Cumulative Antimicrobial Susceptibility Test Data. M39, 5th edition, 2022.

2. Gupta K, Hooton TM, Naber KG, et al. International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women: A 2010 Update by the Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases. Clin Infect Dis. 2011;52(5):e103–e120.
3. Warren JW, Abrutyn E, Hebel JR, et al. Guidelines for Antimicrobial Treatment of Uncomplicated Acute Bacterial Cystitis and Acute Pyelonephritis in Women. Clin Infect Dis. 1999;29(4):745–758.