Kentucky Antimicrobial Stewardship Innovation Consortium

KASIC Advisory Board Combined Antibiogram

2021 Isolate Data

Background

An antibiogram is an aggregate of antimicrobial susceptibilities for different organisms to different antimicrobials over a certain period of time. Antibiograms present the total number of isolates in the period of review (e.g. past year) along with the percent of isolates that were susceptible to the corresponding antimicrobial. Prescribers may use an antibiogram to help select an empiric antimicrobial regimen to ensure the highest likelihood of activity against the likely causative pathogens. The Infectious Diseases Society of America Antimicrobial Stewardship guidelines recommend using an antibiogram to help develop empiric therapy guidelines. **Antibiograms do NOT take into consideration individual patient characteristics like past culture data and recent antibiotic exposure. Antibiograms should be used in addition to clinical judgement when selecting empiric antibiotics.**

Antimicrobial resistance rates on antibiogram vary by institution, population, age, and comorbidities. However, not all hospitals or long-term care facilities have access to an antibiogram and may benefit from referencing a regional antibiogram in the absence of a more specific option. Individual institutions may find benefit in comparing their antimicrobial resistance rates to rates of others. View the KASIC Pearl "Perfect your Pick: How to Use an Antibiogram" for more information.

Methods

Institutional antibiogram were requested from the KASIC advisory board. Twelve annual institutional antibiograms with microbiology data from 2021 were received. These data are included in this statewide report. These data are representative of the antibiotic susceptibility cultures performed on inpatients and outpatients at the reporting acute care hospitals. The reporting facilities primarily provide healthcare services for adults and therefore these data may not be suitable for application or comparison in pediatric populations. These data do not represent the full extent of antibiotic resistance in Kentucky.

Results

Data are displayed in two ways. The first is traditional antibiograms of gram-negative and gram-positive bacteria located on pages 3 and 4. Susceptibilities were estimated using the **weighted mean percent susceptibility** of bacterial isolates to relevant antibiotics. More detailed information can be found on the individual organism pages (pages 5-28). These figures were created using the **weighted mean percent susceptibility** (red dots) and the **standard deviation** of the susceptibilities (red bars). Total number of isolates for each bug-drug combination is available at the bottom of each individual organism page.

Document Navigation

There are hyperlinks throughout the document to assist in navigation. From the Table of Contents on page 2, clicking on the name of each page will take you directly to the respective page. To navigate back to full antibiograms on pages 3 and 4, click on the organism's name at the top of the individual organism page. Additional hyperlinks are included on some individual organism pages that link to additional clinical information.

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Gram-negative Bacteria Antibiogram

Gram-Negative Bacteria	Penicillins				Cephalosporins				Monobactam	Carbapenems		Aminoglycosides			Others			
	Ampicillin	Amoxicillin/Clavulanate	Ampicillin/Sulbactam	Piperacillin/Tazobactam	Cefazolin	Ceftriaxone	Ceftazidime	Cefepime	Aztreonam	Ertapenem	Meropenem	Amikacin	Gentamicin	Tobramycin	Ciprofloxacin	Levofloxacin	Nitrofurantoin	Trimeth/Sulfa
Acinetobacter baumannii			75				85	82			83	90	87	90	84	84		74
Citrobacter freundii				94		77	77	98	82	96	97	100	94	96	94	94	95	88
Citrobacter koseri		97	96		96	97	100	100	97	99	100	100	99	99				97
Enterobacter cloacae				84		65	75	93	78	86	99	100	97	97	93	95		90
Escherichia coli	52	85	64	97	86	89		95	93	99	99	100	92	92	82	82	97	79
Klebsiella aerogenes				83		75	80	99	85	98	99	100	100	100	98	97		98
Klebsiella oxytoca		93	72	95	27	94		98	95	100	100	100	98	97	97	97	86	94
Klebsiella pneumoniae		91	84	96	89	94		95	95	99	100	100	97	96	91	95		90
Morganella morganii				95		67	55	97	72	99	100	99	90	95	80	82		78
Proteus mirabilis	85	97	93	99	84	94		97	93	98	100	99	93	94	74	78		78
Pseudomonas aeruginosa				92			85	87	78		92	96		96	83	81		
Serratia marcescens				82		81	75	97	85	98	99	100	99	94	96	97		98
Stenotrophomonas maltophilia																82		90

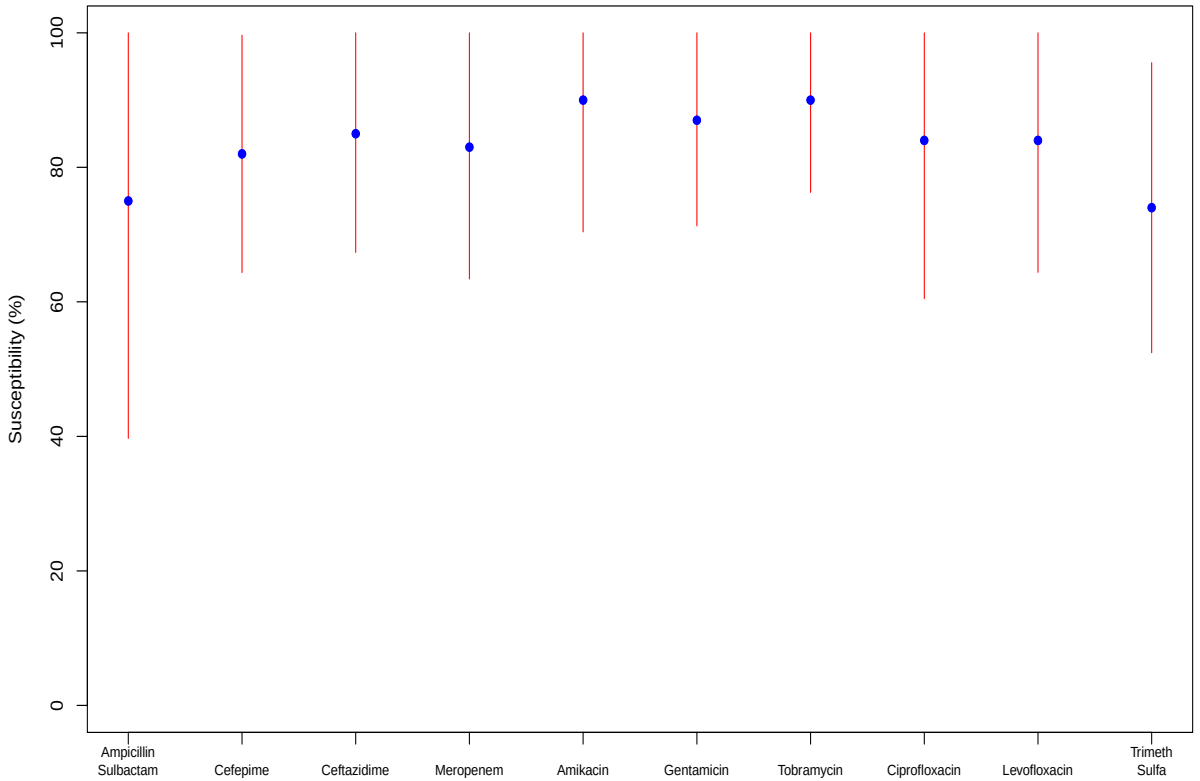
For antimicrobials listed, number shown is the weighted mean of percent susceptible reported on included antibiograms

Gram-positive Bacteria Antibiogram

Gram-Positive Bacteria	Penicillins				Cephalosporins	Other										
	Amoxicillin/Clavulanate	Ampicillin	Oxacillin	Penicillin	Ceftriaxone	Gent synergy	Clindamycin	Erythromycin	Vancomycin	Linezolid	Daptomycin	Tetracycline	Ciprofloxacin	Levofloxacin	TMP-SMX	Nitrofurantoin
Enterococcus faecalis		99		96		77			97	99	98		73	81		99
Enterococcus faecium		27		22		83			52	99	93		13	19		61
Streptococcus agalactiae		100		100	99		52	29	100					99		
Streptococcus anginosus		99		99	99		75	54	100			42		98		
Streptococcus pneumonia (non-CNS)	96			87	93		83	47	100			74		98		
Streptococcus pneumonia (CNS only)				68	90											
Viridans group Streptococci		79		72	95		77	44	100			64		93		
Coagulase negative Staphylococcus			47				56	34	100	99	99	82			69	
Staphylococcus aureus - MRSA							72	16	100	100	99	92			93	
Staphylococcus aureus - MSSA							80	60	100	100	100	93			98	
Staphylococcus lugdunensis			85				77	67	100	100	100	90			98	

For antimicrobials listed, number shown is the weighted mean of percent susceptible reported on included antibiograms

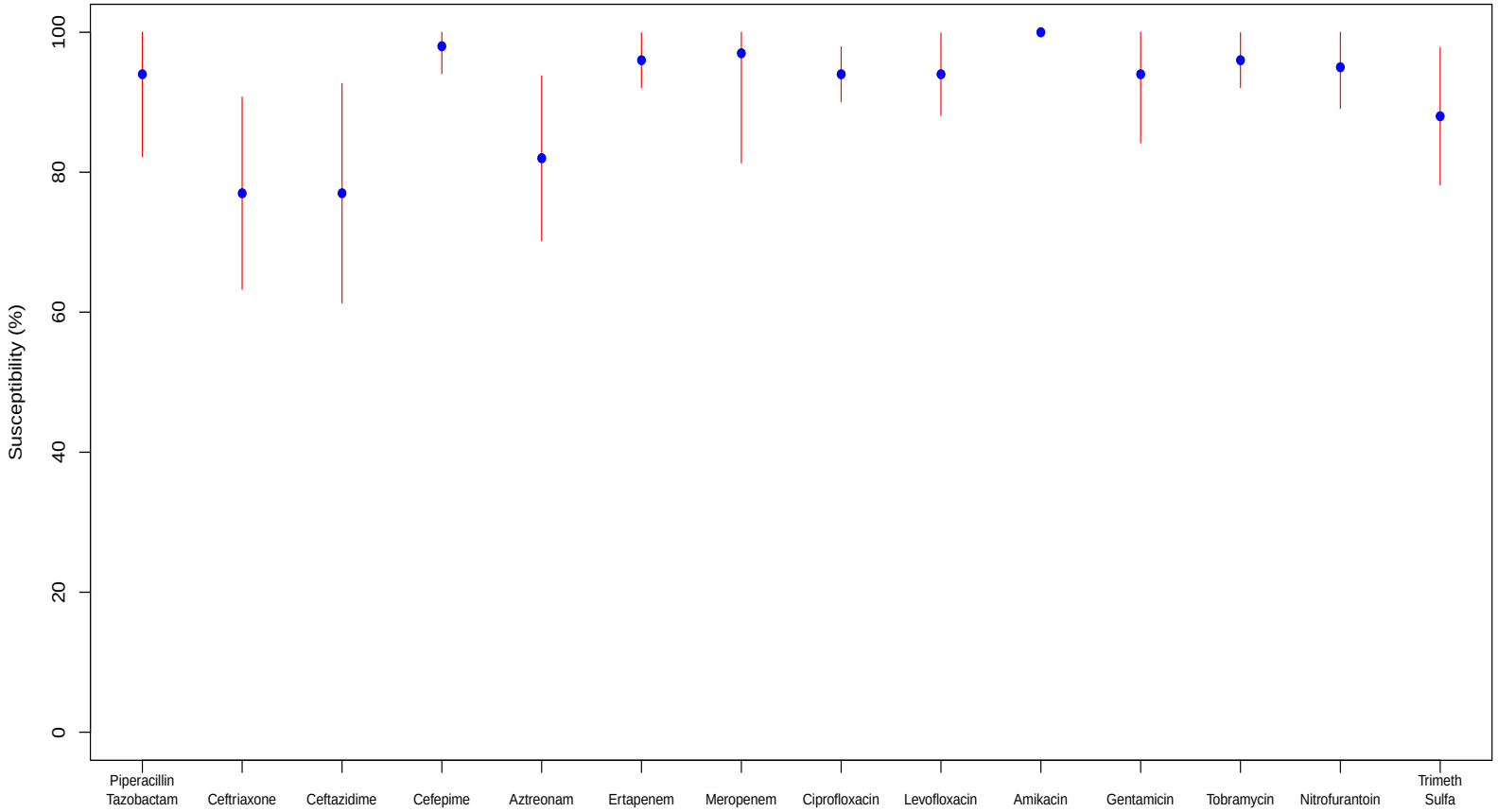
Acinetobacter baumannii



Acinetobacter baumannii	Amp/Sul	Cefepime	Ceftazidime	Meropenem	Amikacin	Gentamicin	Tobramycin	Ciprofloxacin	Levofloxacin	Trimeth/Sulfa
Weighted Mean	75*	82	85	83	90	87	90	84	84	74
Standard Deviation	18	9	9	10	10	8	7	12	10	11
Total N isolates	188	188	117	134	63	188	188	117	188	188

*Drug of choice of severe *A. baumannii* Infections is ampicillin-sulbactam, regardless of susceptibility. High doses may need to be utilized (e.g. 9 g Q8H or 27 g continuous infusion).

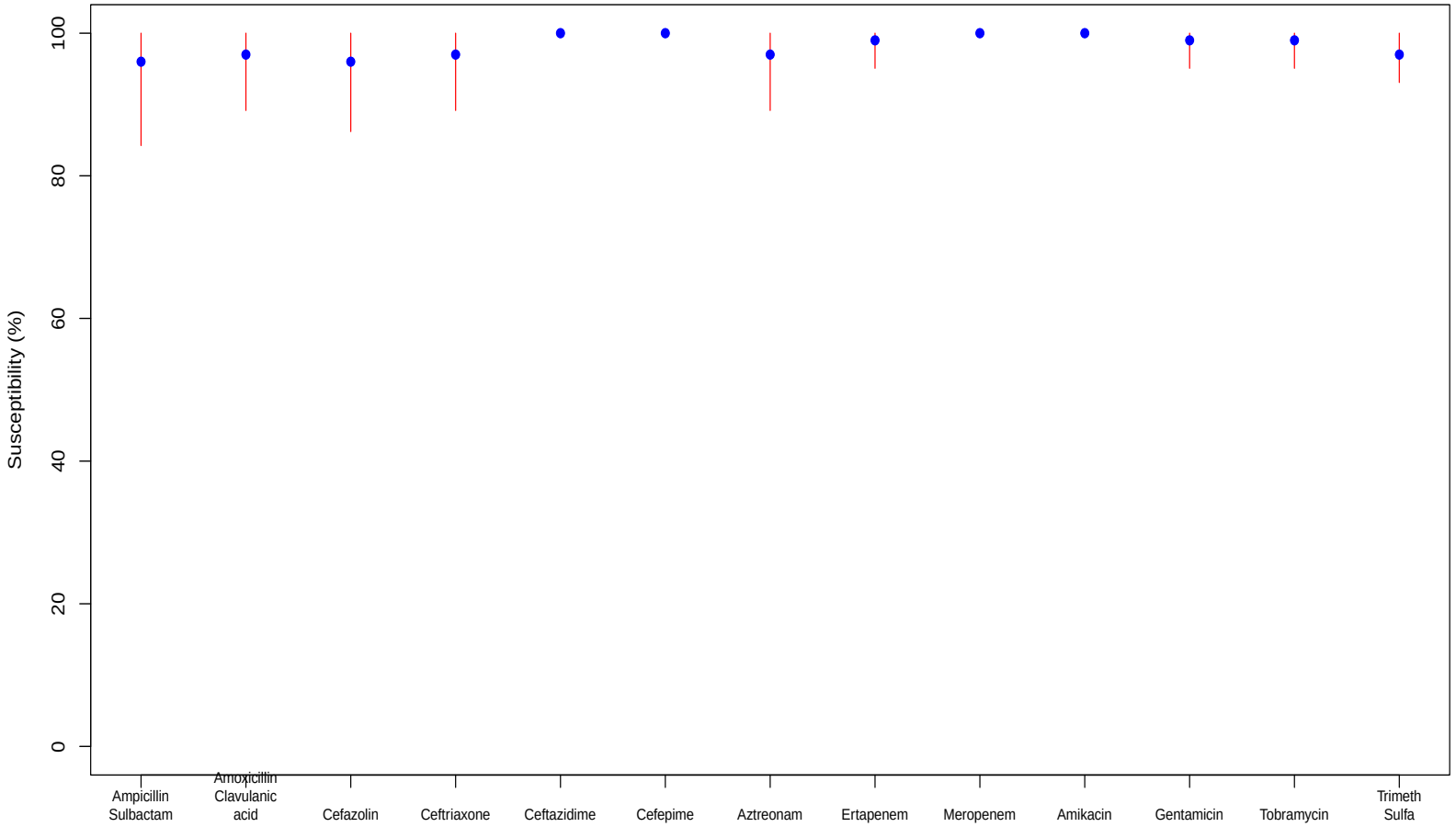
Citrobacter freundii



Citrobacter freundii	Pip/tazo	Ceftriax	Ceftaz	Cefep	Aztre	Erta	Mero	Cipro	Levo	Amik	Gent	Tobra	Nitro	Trim/Sulfa
Weighted Mean	94	77	77	98	82	96	97	94	94	100	94	96	95	88
Standard deviation	6	7	8	2	6	2	8	2	3	0	5	2	3	5
Total N Isolates	198	442	187	259	514	125	259	352	424	442	485	514	452	514

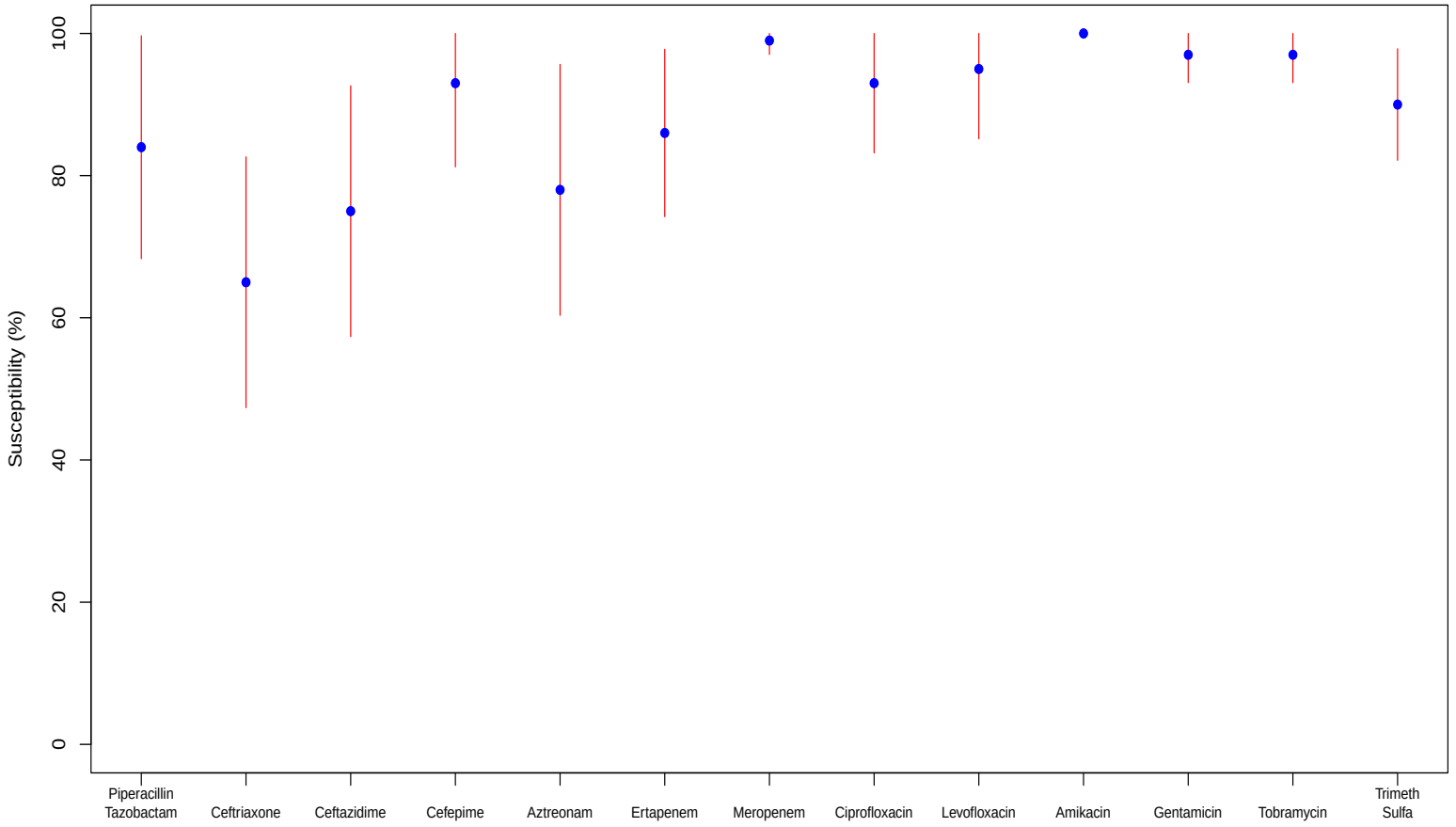
High-risk chromosomal AmpC beta-lactamase producing organism.

Citrobacter koseri



Citrobacter koseri	Amp/sul	Amox/clav	Cefaz	Ceftriax	Ceftaz	Cefep	Aztre	Ertap	Mero	Amik	Gent	Tob	Trim/Sulfa
Weighted Mean	96	97	96	97	100	100	97	99	100	100	99	99	97
Standard Deviation	6	4	5	4	0	0	4	2	0	0	2	2	2
Total N Isolates	97	97	97	97	78	97	97	97	97	55	97	97	97

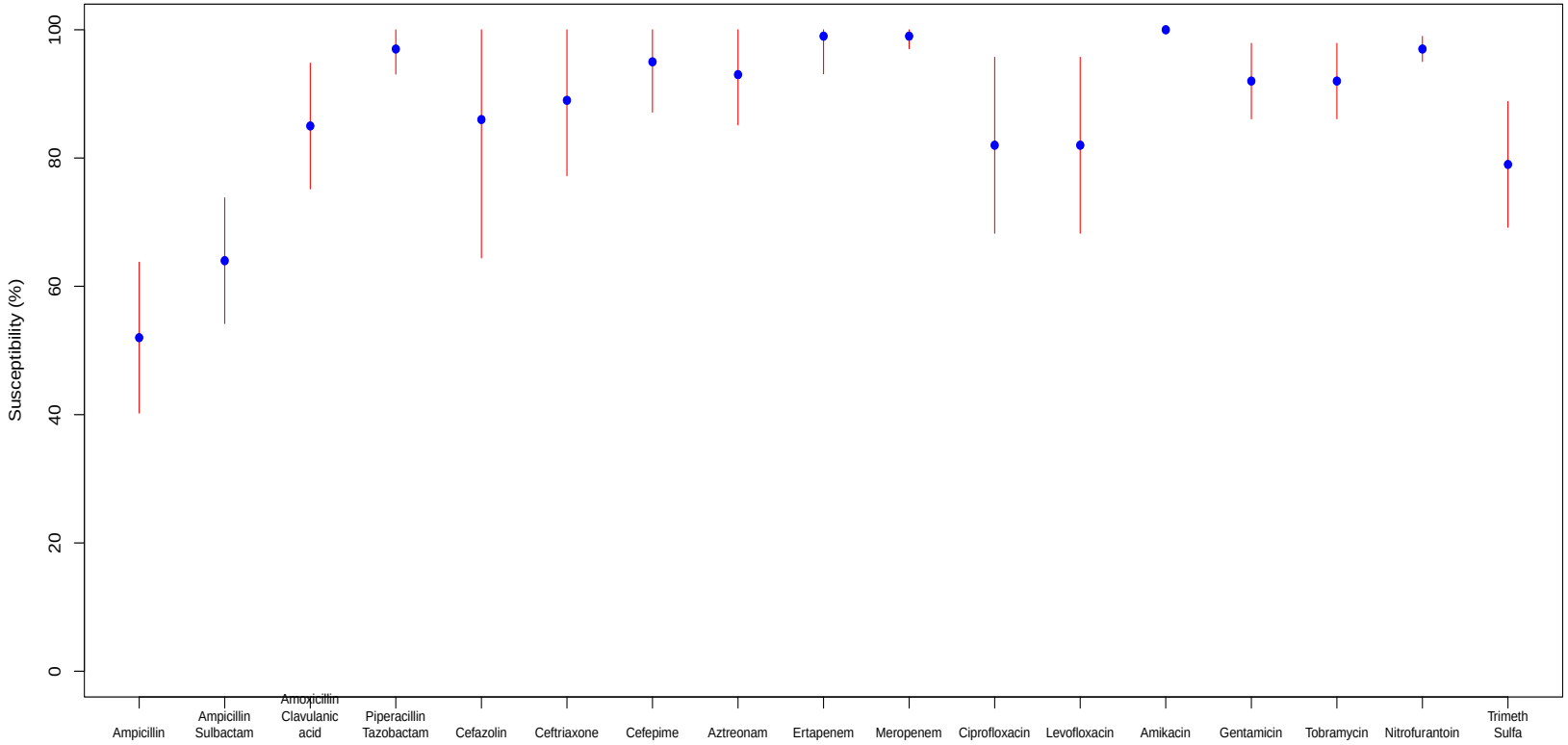
Enterobacter cloacae



Enterobacter cloacae	Pip/tazo	Ceftriax	Ceftaz	Cefep	Aztreo	Erta	Mero	Cipro	Levo	Amik	Gent	Tobra	Trim/Sulfa
Weighted Mean	84	65	75	93	78	86	99	93	95	100	97	97	90
Standard Deviation	8	9	9	6	9	6	1	5	5	0	2	2	4
Total N Isolates	1142	949	720	1142	1438	608	1142	1238	1423	1297	1482	1482	1482

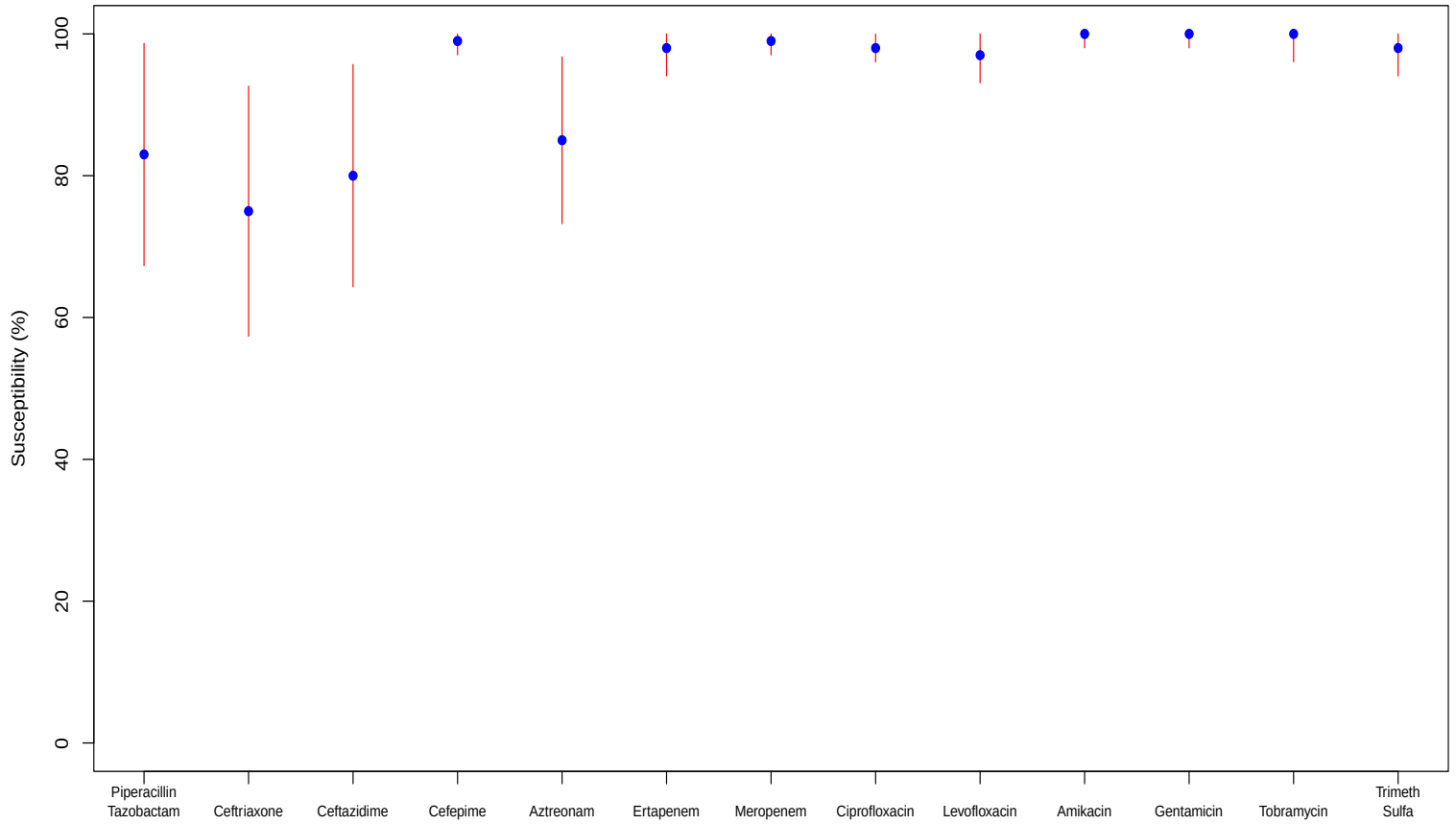
High-risk chromosomal AmpC beta-lactamase producing organism.

Escherichia coli



Escherichia coli	Amp	Amp/sul	Amox/clav	Pip/tazo	Cefaz	Ceftriax	Cefep	Aztre	Erta	Mero	Cipro	Levo	Amik	Gent	Tobra	Nitro	Trim/Sulfa
Weighted Mean	52	64	85	97	86	89	95	93	99	99	82	82	100	92	92	97	79
Standard Deviation	6	5	5	2	11	6	4	4	3	1	7	7	0	3	3	1	5
Total N Isolates	14015	30534	9867	14292	30580	30613	14488	30489	6952	14488	27822	30613	27743	30613	30613	24736	30613

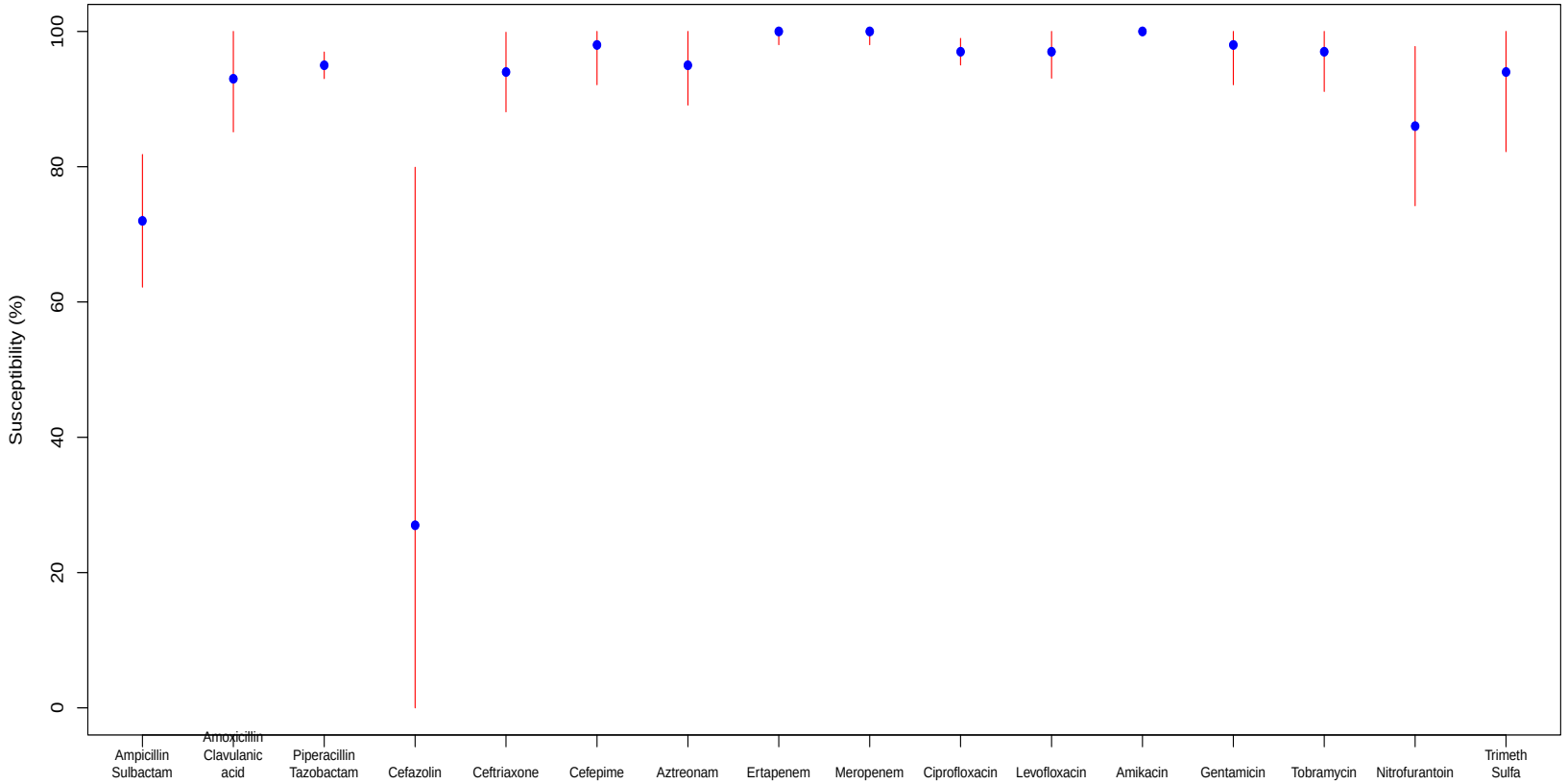
Klebsiella aerogenes



Klebsiella aerogenes	Pip/tazo	Ceftriax	Ceftaz	Cefep	Aztreo	Erta	Mero	Cipro	Levo	Amik	Gent	Tobra	Trim/Sulfa
Weighted Mean	83	75	80	99	85	98	99	98	97	100	100	100	98
Standard Deviation	8	9	8	1	6	2	1	1	2	1	1	2	2
Total N Isolates	251	416	309	309	511	214	309	453	453	511	511	511	511

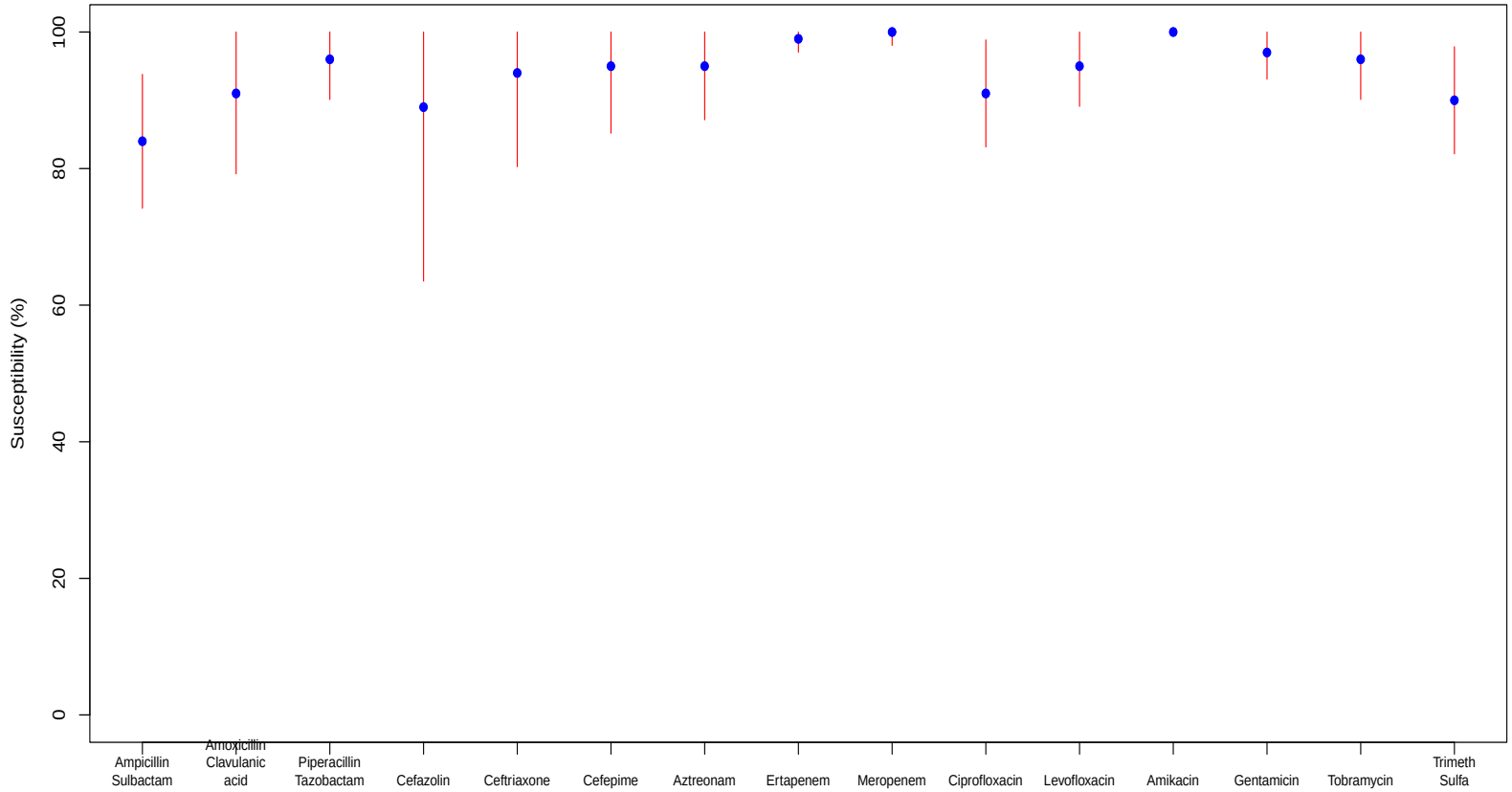
High-risk chromosomal AmpC beta-lactamase producing organism.

Klebsiella oxytoca



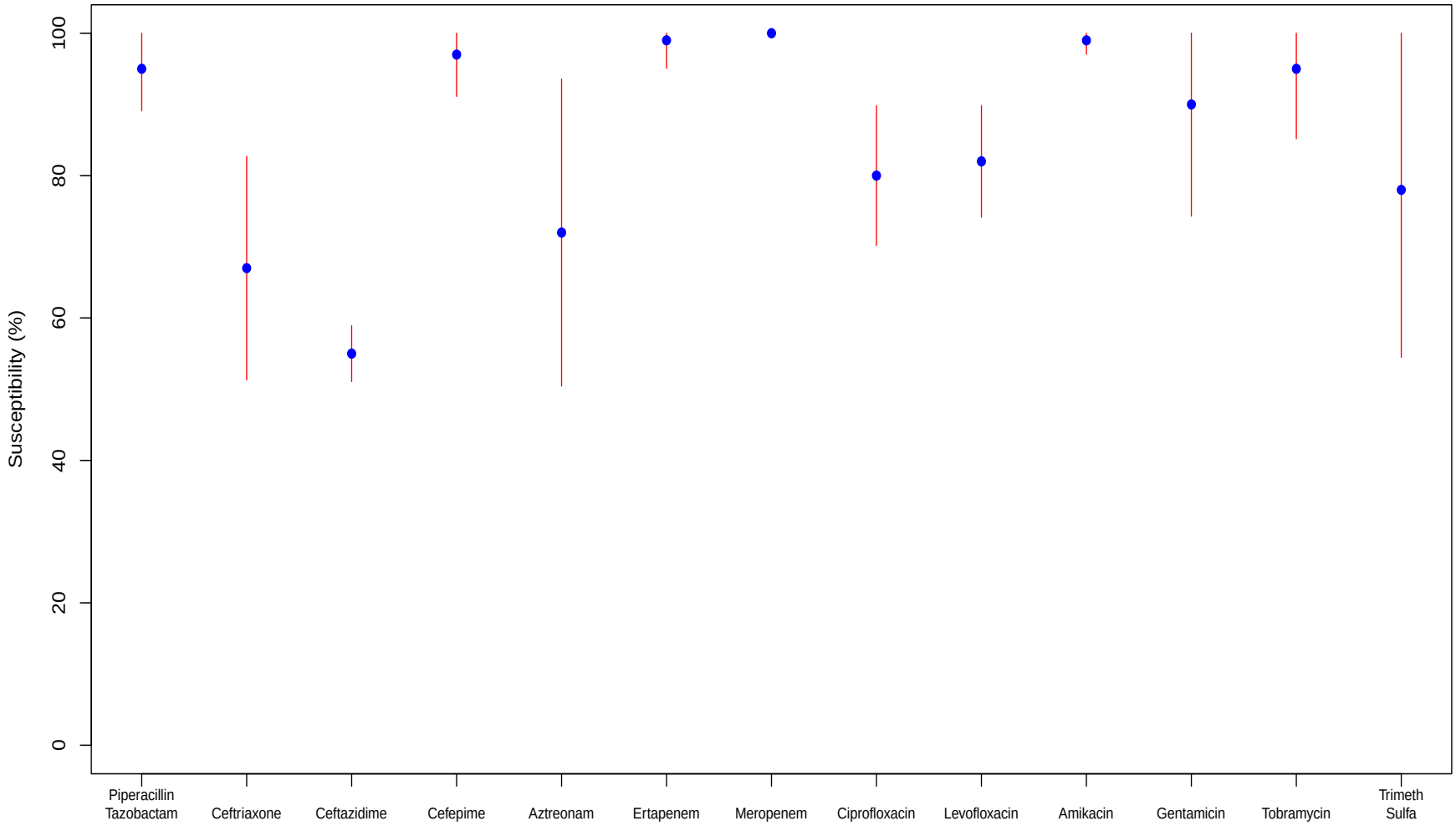
Klebsiella oxytoca	Amp/sul	Amox/clav	Pip/tazo	Cefaz	Ceftriax	Cefep	Aztre	Erta	Mero	Cipro	Levo	Amik	Gent	Tobra	Nitro	Trim/Sulfa
Weighted Mean	72	93	95	27	94	98	95	100	100	97	97	100	98	97	86	94
Standard Deviation	5	4	1	27	3	3	3	1	1	1	2	0	3	3	6	6
Total N Isolates	370	370	154	370	370	370	331	370	370	281	281	299	370	370	330	370

Klebsiella pneumoniae



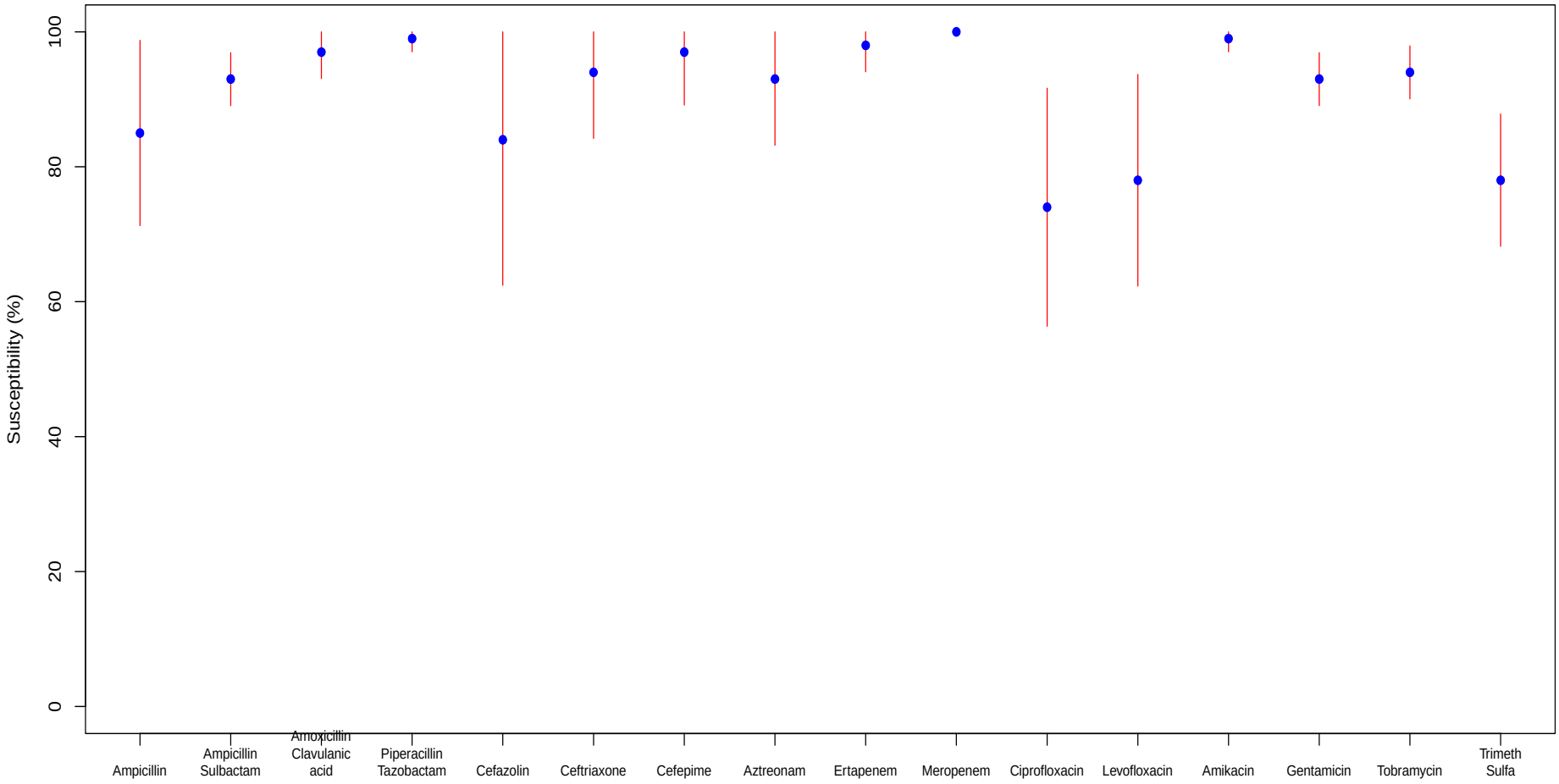
Klebsiella pneumoniae	Amp/sul	Amox/clav	Pip/tazo	Cefaz	Ceftriax	Cefep	Aztre	Erta	Mero	Cipro	Levo	Amik	Gent	Tobra	Trim/Sulfa
Weighted Mean	84	91	96	89	94	95	95	99	100	91	95	100	97	96	90
Standard Deviation	5	6	3	13	7	5	4	1	1	4	3	0	2	3	4
Total N Isolates	4842	2442	3519	4909	4981	3519	4802	1637	3519	4355	4981	4216	4981	4981	4981

Morganella morganii



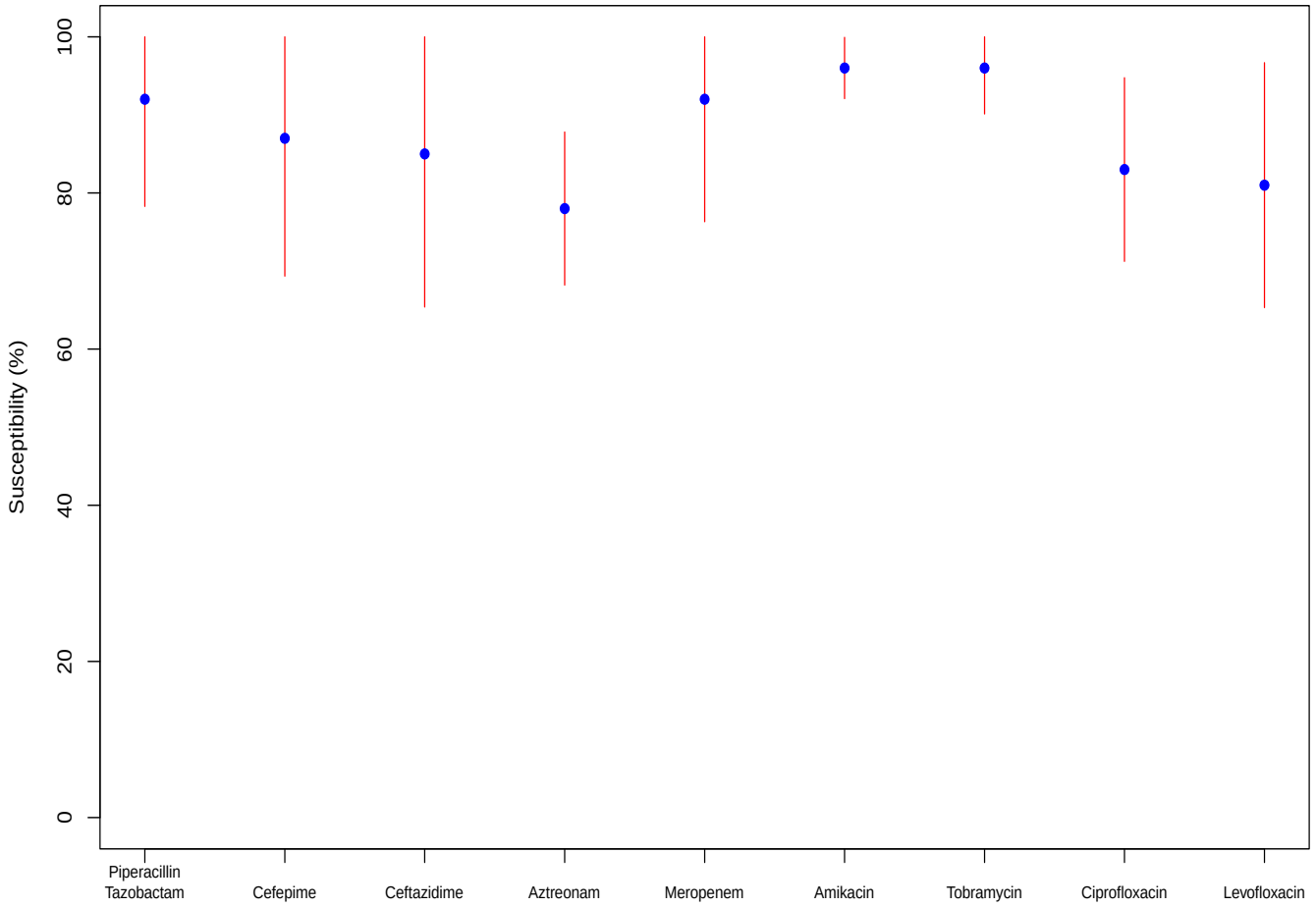
Morganella morganii	Pip/tazo	Ceftriax	Ceftaz	Cefep	Aztre	Erta	Mero	Cipro	Levo	Amik	Gent	Tobra	Trim/Sulfa
Weighted Mean	95	67	55	97	72	99	100	80	82	99	90	95	78
Standard Deviation	3	8	2	3	11	2	0	5	4	1	8	5	12
Total N Isolates	129	285	114	151	238	151	151	188	188	285	285	285	285

Proteus mirabilis



Proteus mirabilis	Amp	Amp/sul	Amox/clav	Pip/tazo	Cefaz	Ceftriax	Cefep	Aztre	Erta	Mero	Cipro	Levo	Amik	Gent	Tobra	Trim/Sulfa
Weighted Mean	85	93	97	99	84	94	97	93	98	100	74	78	99	93	94	78
Standard Deviation	7	2	2	1	11	5	4	5	2	0	9	8	1	2	2	5
Total N Isolates	1889	2906	1351	2025	2906	2959	2025	2906	920	2025	2559	2861	2506	2959	2959	2959

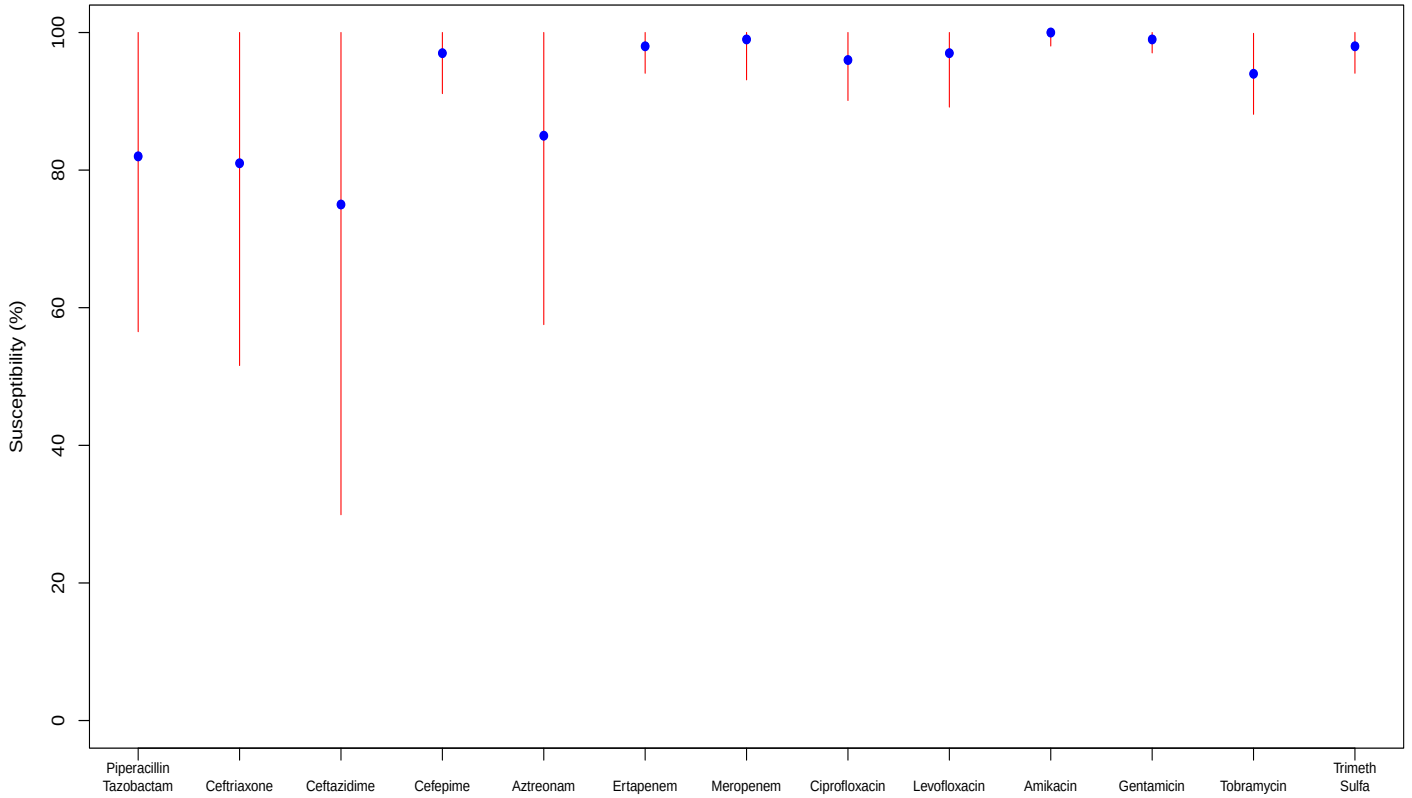
Pseudomonas aeruginosa



Pseudomonas aeruginosa	Pip/tazo	Cefep	Ceftaz	Aztre	Mero	Amik	Tobra	Cipro	Levo
Weighted Mean	92	87	85	78	92	96	96	83	81
Standard Deviation	7	9	10	5	8	2	3	6	8
Total N Isolates	2661	2661	1814	2147	2661	2893	3250	2893	3250

Pseudomonas aeruginosa is organism to target for antimicrobial stewardship due to limited options from intrinsic and acquired resistance and high frequency of isolation.

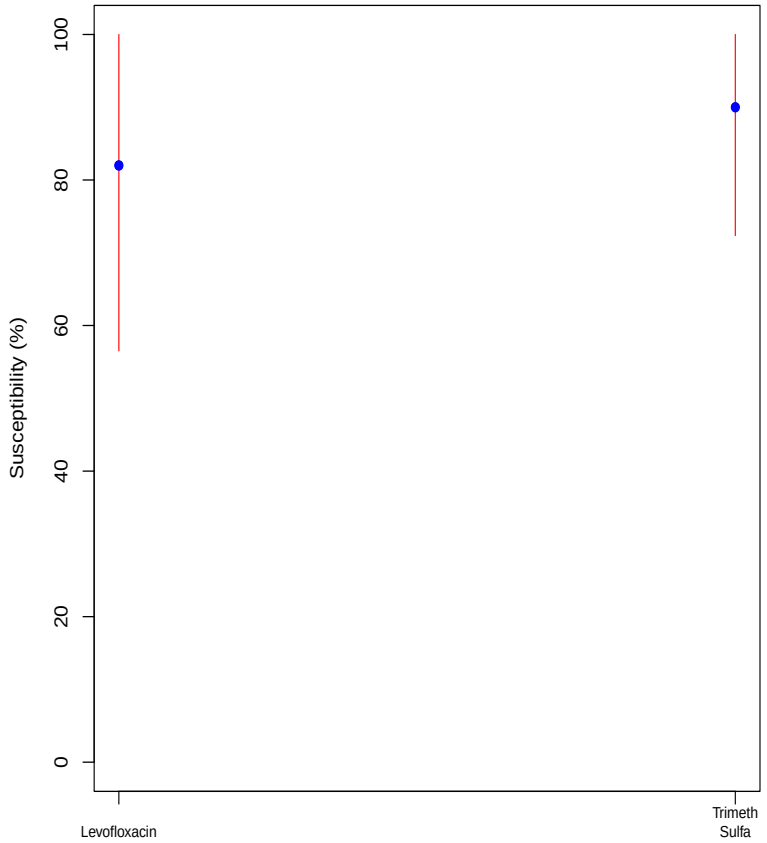
Serratia marcescens



Serratia marcescens	Pip/tazo	Ceftriax	Ceftaz	Cefep	Aztre	Erta	Mero	Cipro	Levo	Amik	Gent	Tobra	Trim/Sulfa
Weighted Mean	82	81	75	97	85	98	99	96	97	100	99	94	98
Standard Deviation	13	15	23	3	14	2	3	3	4	1	1	3	2
Total N Isolates	360	617	349	632	606	304	632	538	622	569	701	701	701

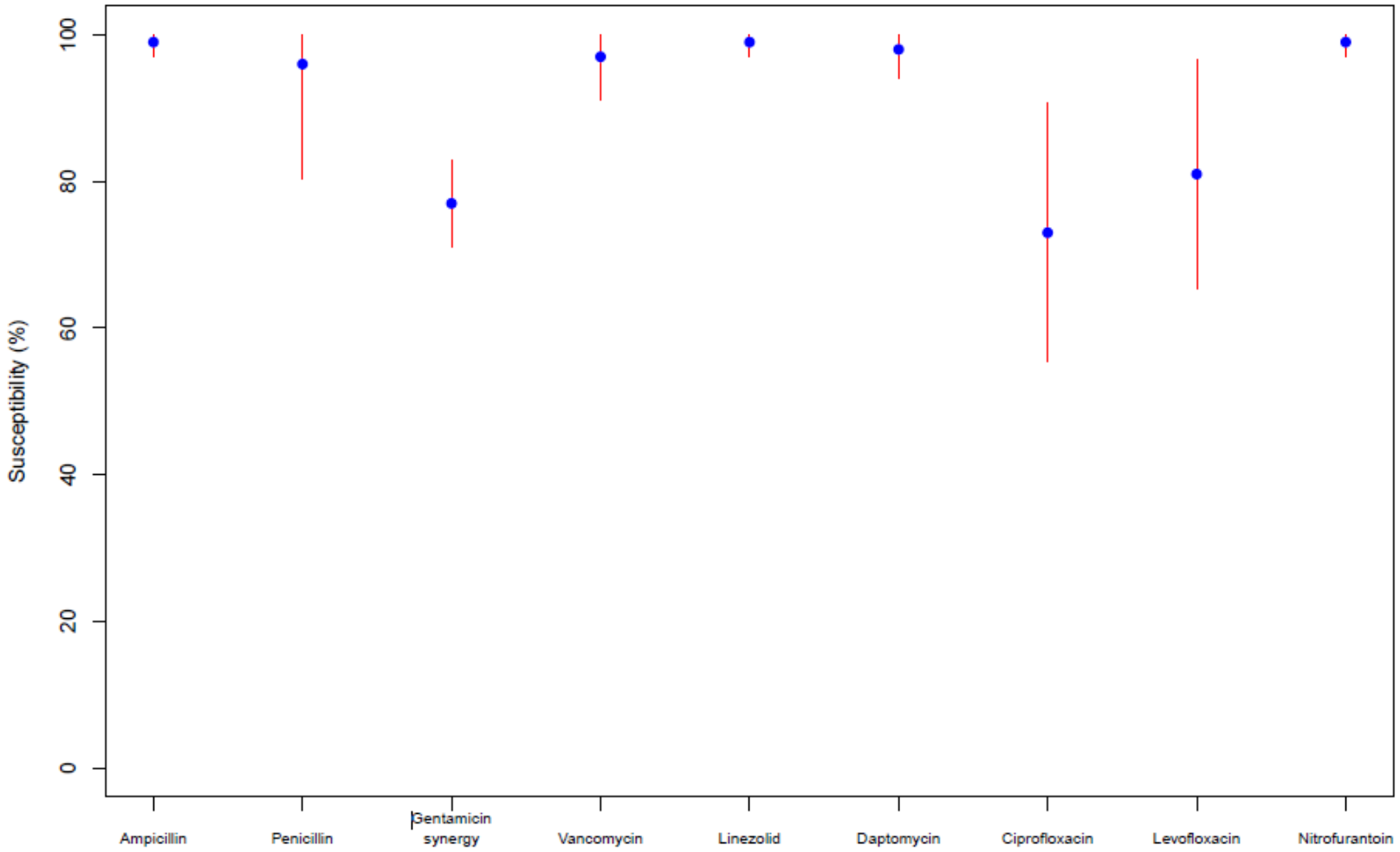
Moderate-risk chromosomal AmpC beta-lactamase producing organism.

Stenotrophomonas maltophilia



Stenotrophomonas maltophilia	Levofloxacin	Trimeth/Sulfa
Weighted Mean	82	90
Standard Deviation	13	9
Total N Isolates	173	173

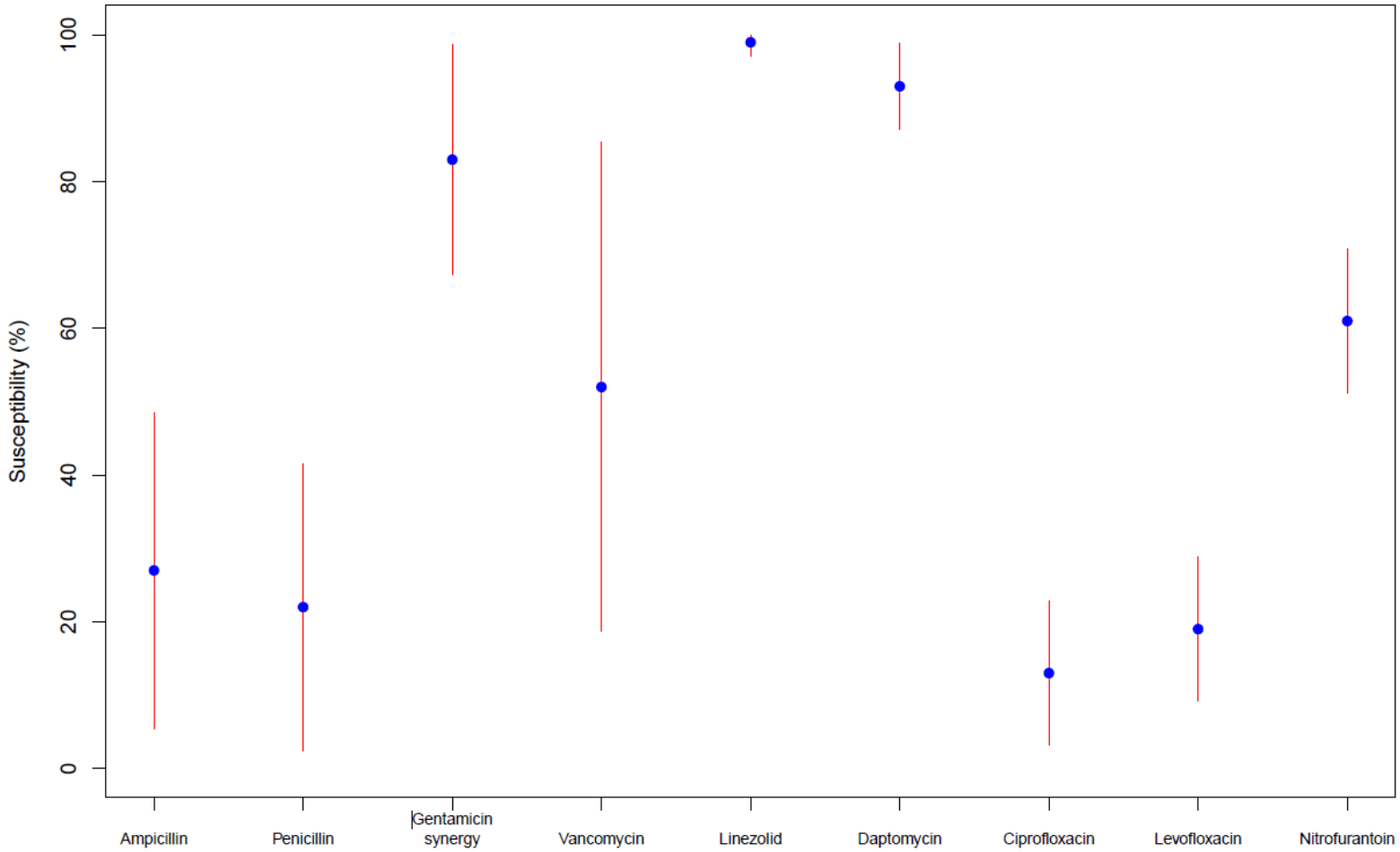
Enterococcus faecalis



Enterococcus faecalis	Ampicillin	Penicillin	Gent synergy	Vancomycin	Linezolid	Daptomycin	Ciprofloxacin	Levofloxacin	Nitrofurantoin
Weighted Mean	99	96	77	97	99	98	73	81	99
Standard Deviation	1	8	3	3	1	2	9	8	1
Total N Isolates	2173	1564	893	2173	1484	1032	542	1691	841

Enterococcus spp. possess intrinsic resistance to many common antibiotics (e.g. cephalosporins)

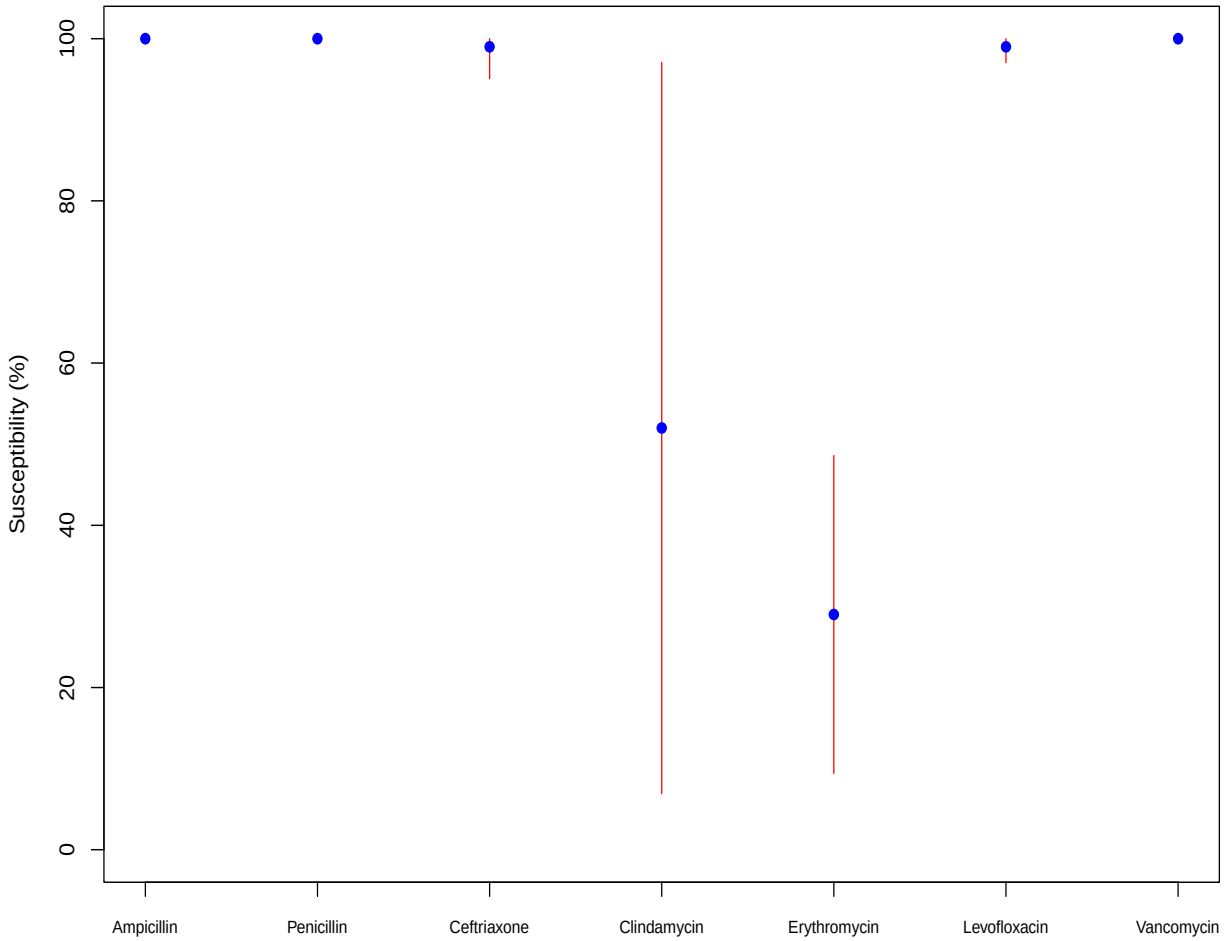
Enterococcus faecium



Enterococcus faecium	Ampicillin	Penicillin	Gent synergy	Vancomycin	Linezolid	Daptomycin	Ciprofloxacin	Levofloxacin	Nitrofurantoin
Weighted Mean	27	22	83	52	99	93	13	19	61
Standard Deviation	11	10	8	17	1	3	5	5	5
Total N Isolates	570	244	115	570	529	249	365	417	344

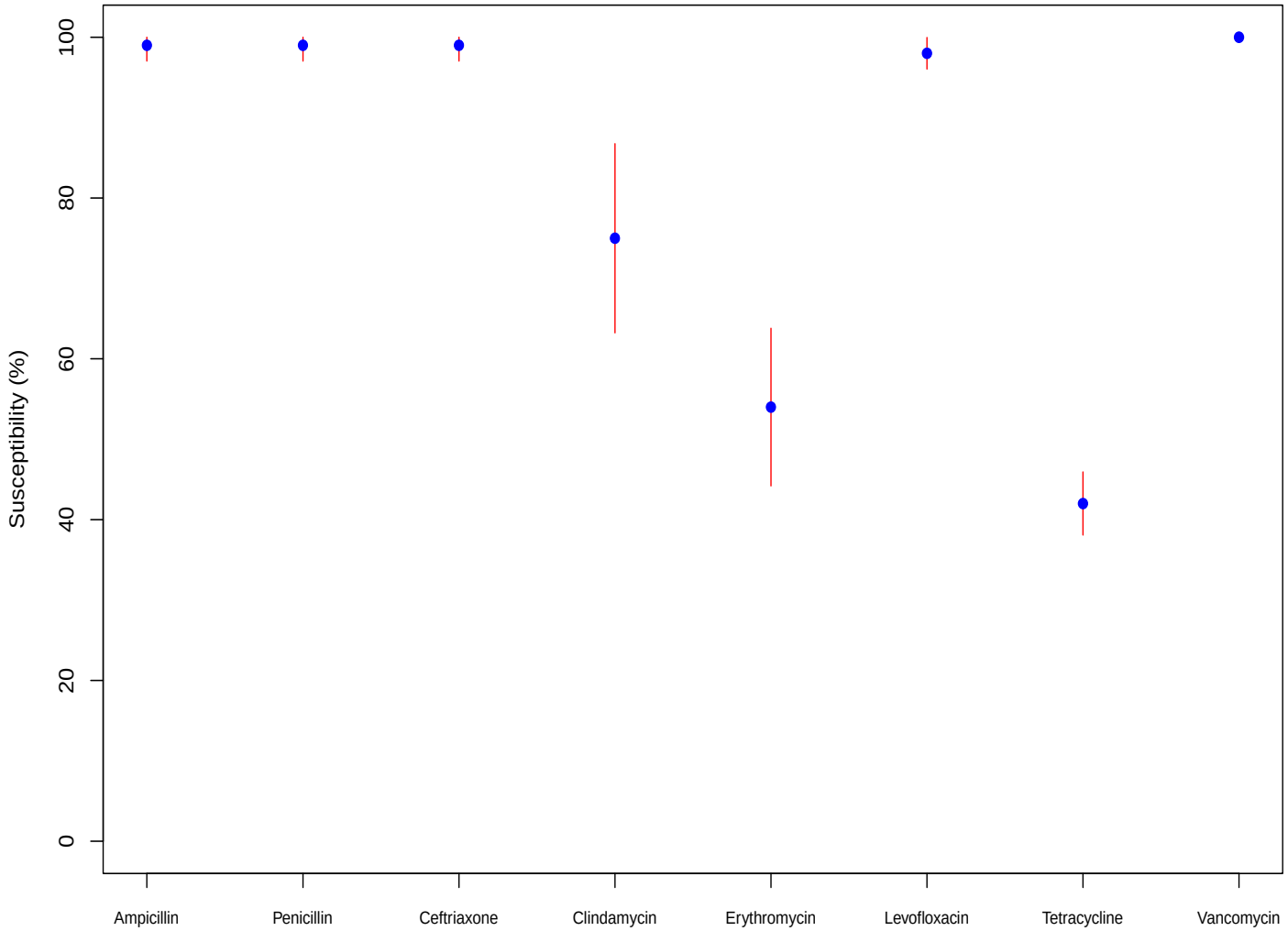
Enterococcus spp. possess intrinsic resistance to many common antibiotics (e.g. cephalosporins)

Streptococcus agalactiae



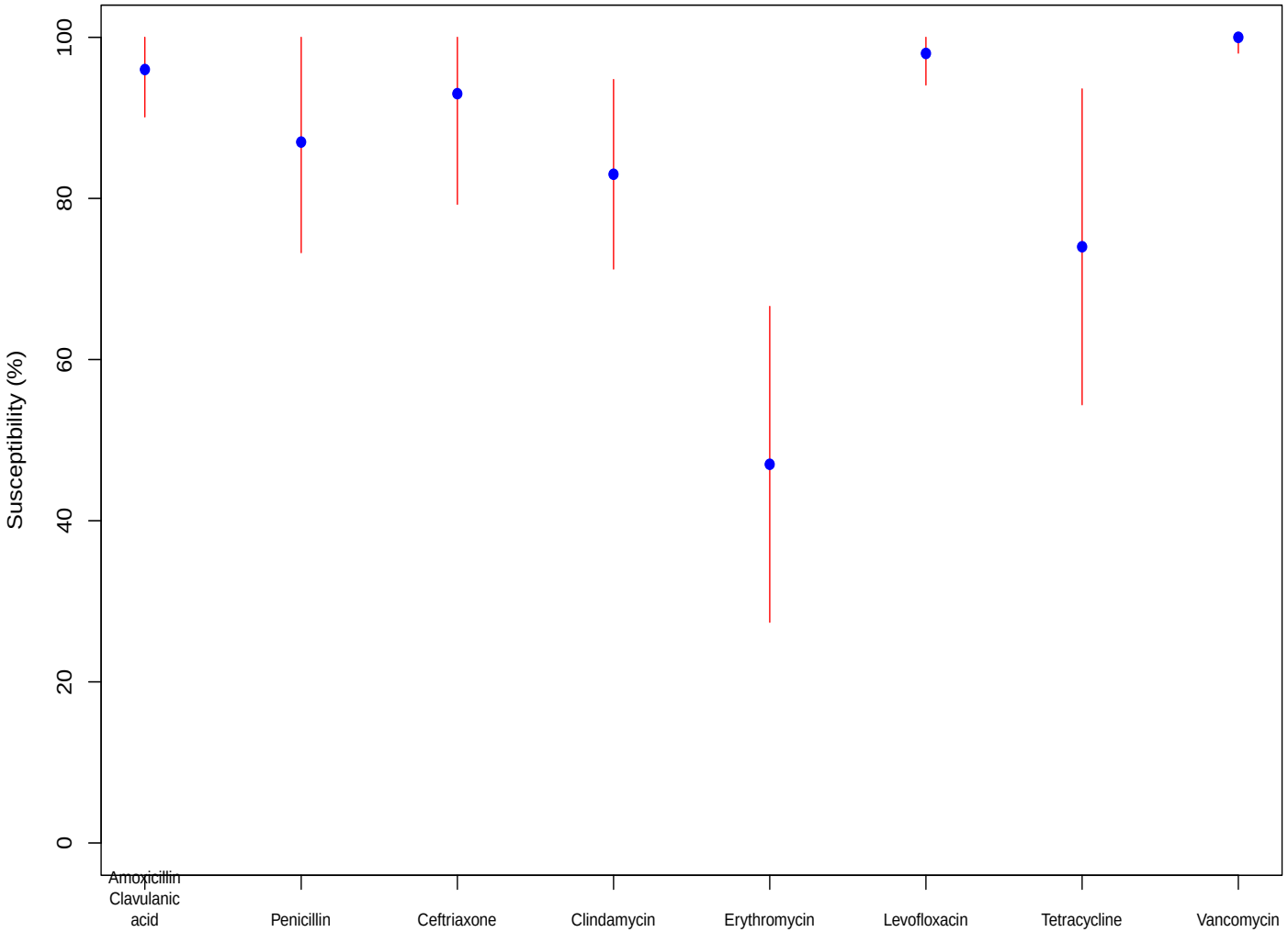
Streptococcus agalactiae	Ampicillin	Penicillin	Ceftriaxone	Clindamycin	Erythromycin	Levofloxacin	Vancomycin
Weighted Mean	100	100	99	52	29	99	100
Standard Deviation	0	0	2	23	10	1	0
Total N Isolates	138	138	138	138	114	138	138

Streptococcus anginosus



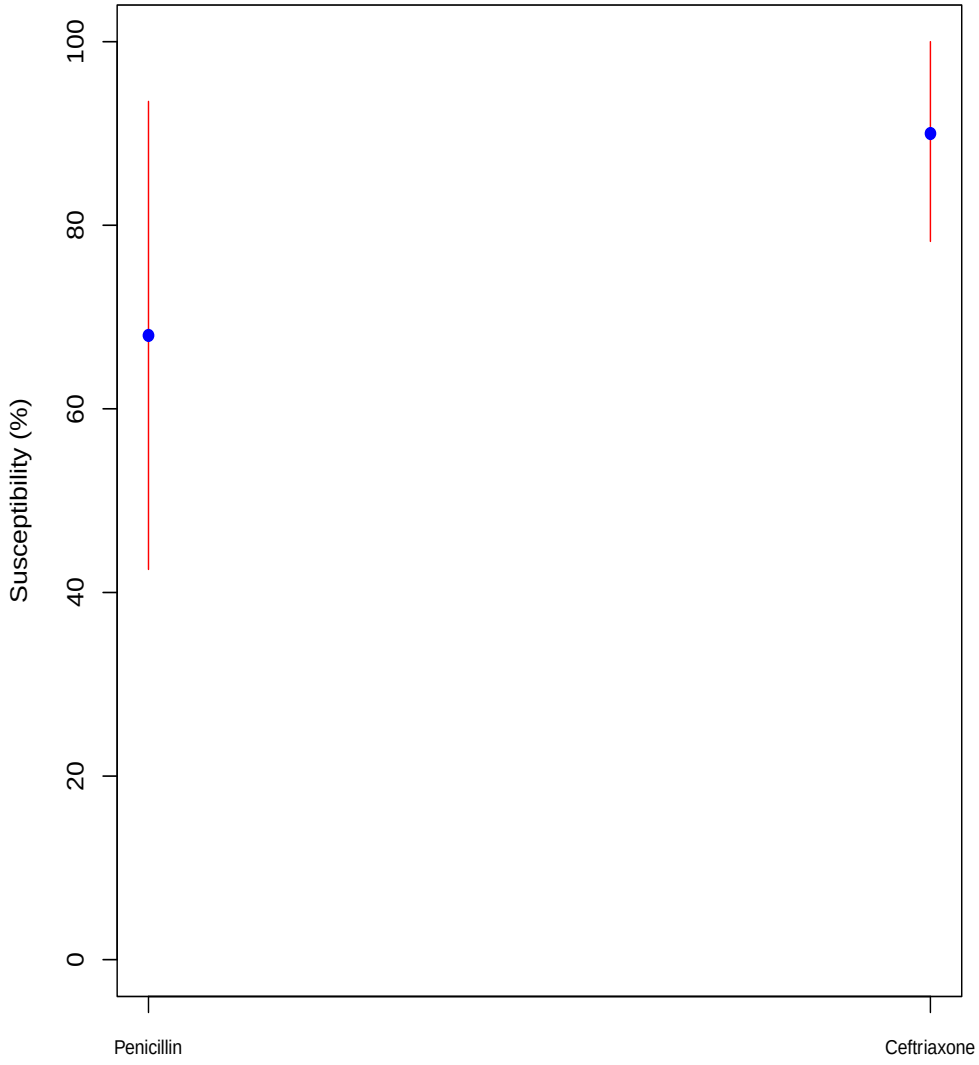
Streptococcus anginosus	Ampicillin	Penicillin	Ceftriaxone	Clindamycin	Erythromycin	Levofloxacin	Tetracycline	Vancomycin
Weighted Mean	99	99	99	75	54	98	42	100
Standard Deviation	1	1	1	6	5	1	2	0
Total N Isolates	172	172	172	172	172	172	172	172

Streptococcus pneumoniae (non-CNS isolates)



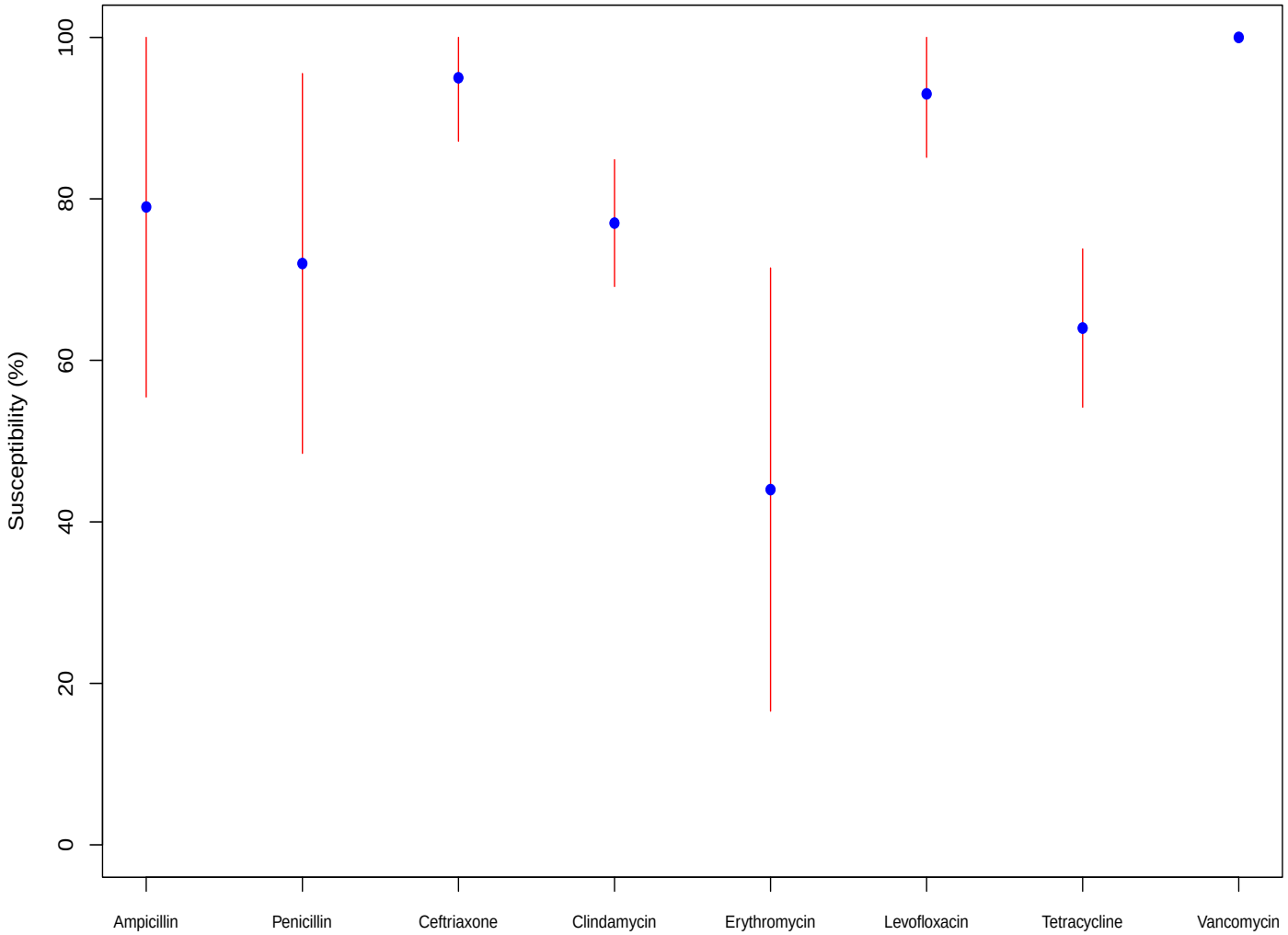
Streptococcus pneumoniae	Amox/clav	Penicillin	Ceftriaxone	Clindamycin	Erythromycin	Levofloxacin	Tetracycline	Vancomycin
Weighted Mean	96	87	93	83	47	98	74	100
Standard Deviation	3	7	7	6	10	2	10	1
Total N Isolates	322	358	403	342	331	403	374	403

Streptococcus pneumoniae (CNS isolates)



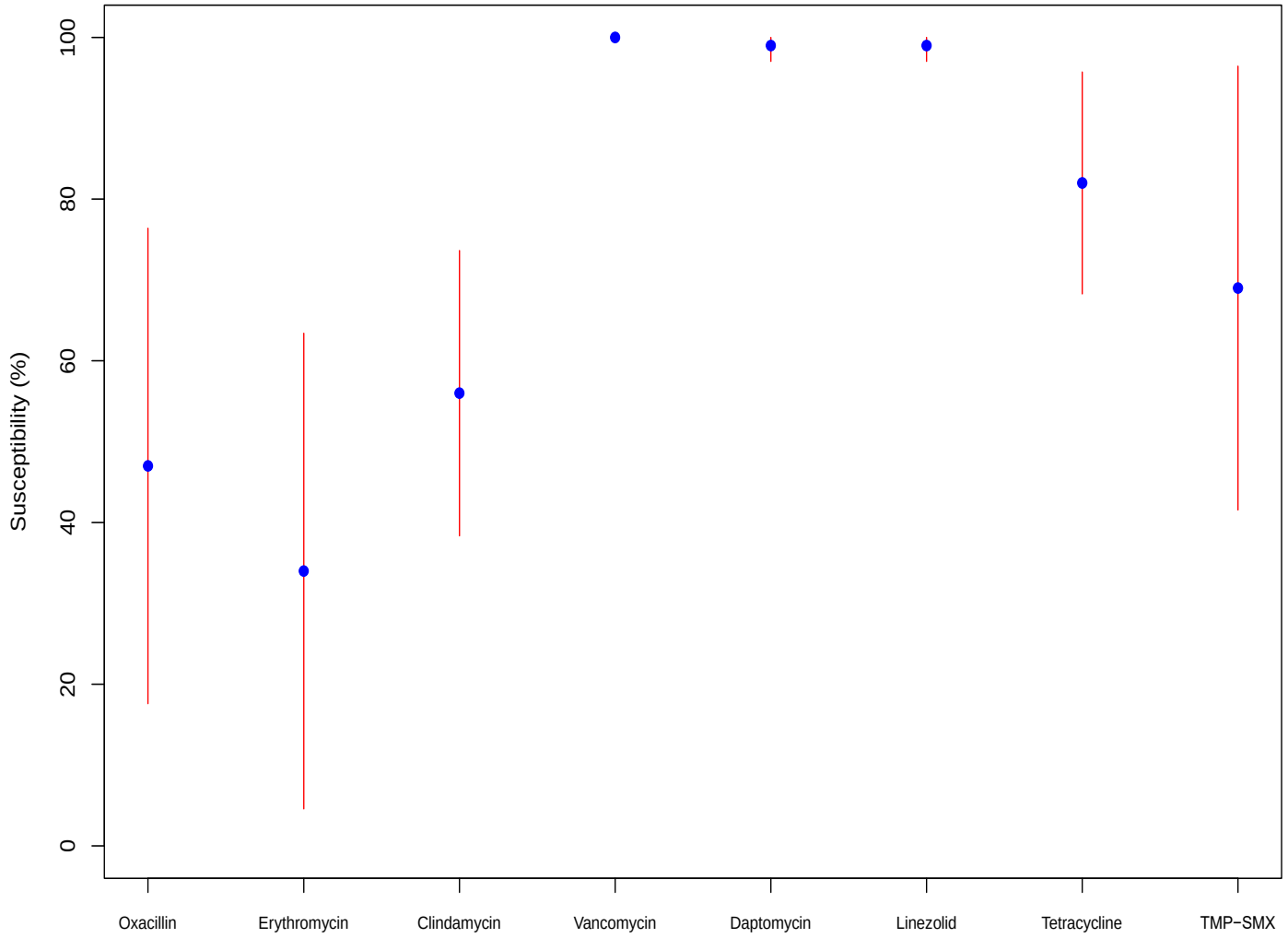
Streptococcus pneumoniae	Penicillin	Ceftriaxone
Weighted Mean	68	90
Standard Deviation	13	6
Total N Isolates	167	167

Viridans Group Streptococci



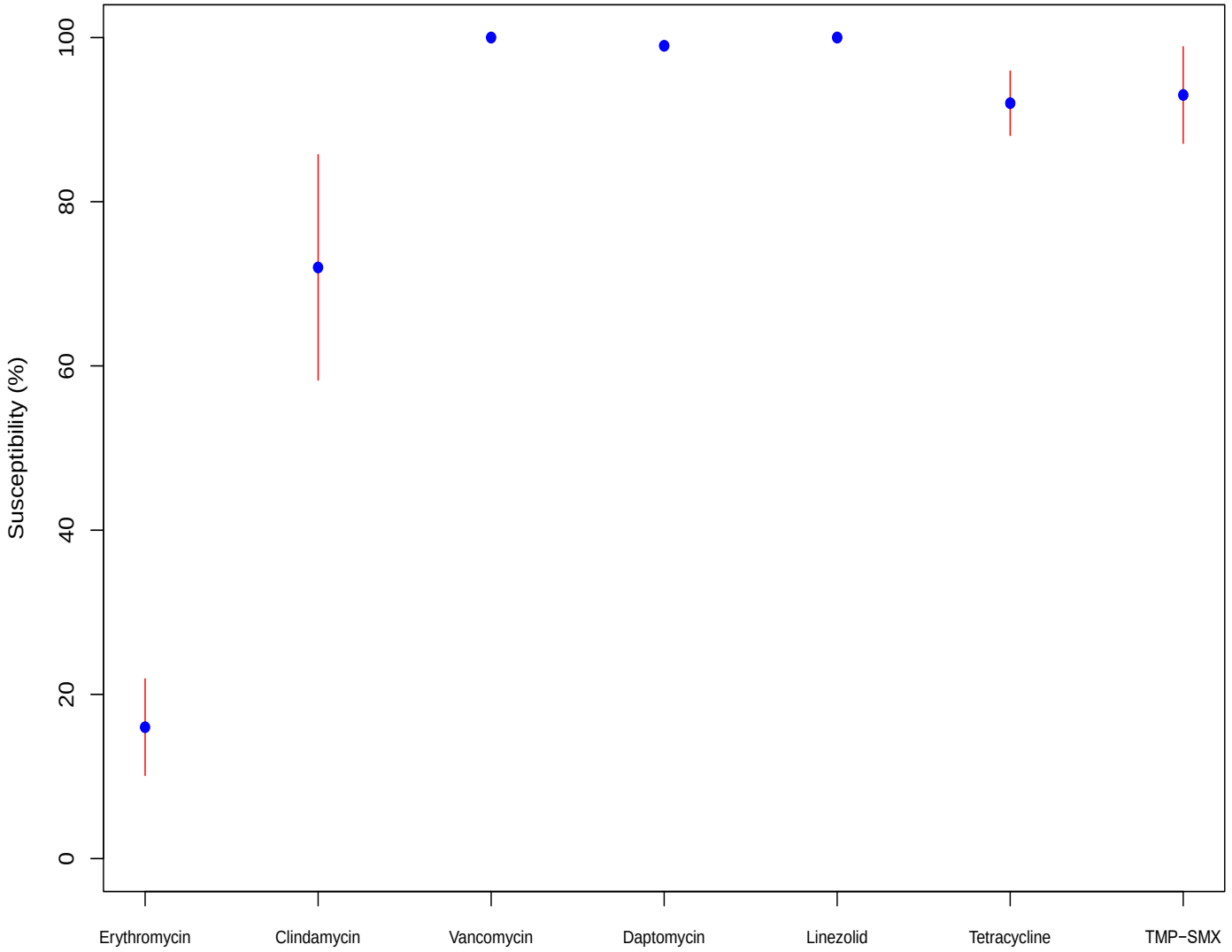
Viridans group Streptococci	Ampicillin	Penicillin	Ceftriaxone	Clindamycin	Erythromycin	Levofloxacin	Tetracycline	Vancomycin
Weighted Mean	79	72	95	77	44	93	64	100
Standard Deviation	12	12	4	4	14	4	5	0
Total N Isolates	433	498	498	498	432	433	433	498

Coagulase negative Staphylococcus



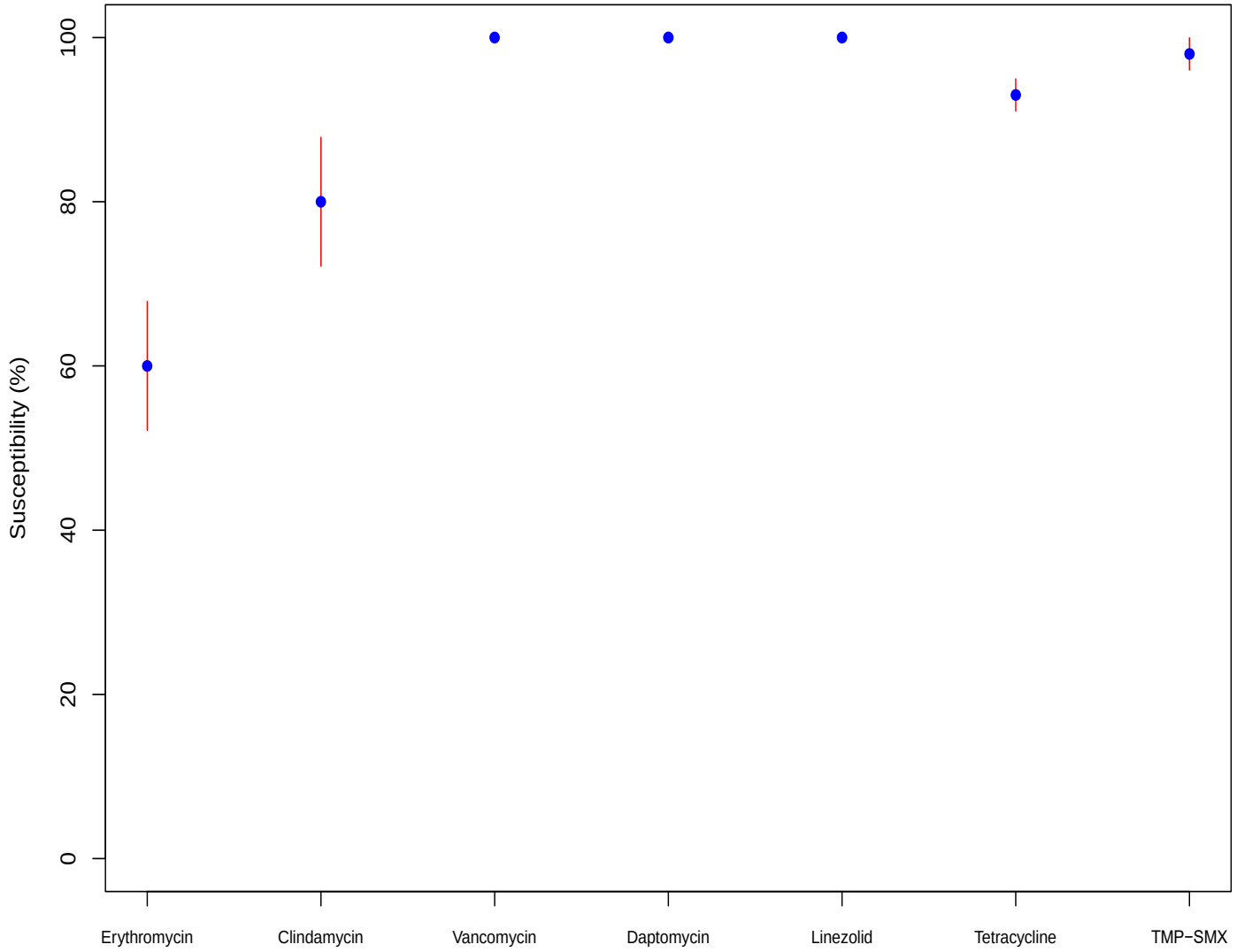
Coagulase negative staphylococci	Oxacillin	Erythromycin	Clindamycin	Vancomycin	Daptomycin	Linezolid	Tetracycline	TMP-SMX
Weighted Mean	47	34	56	100	99	99	82	69
Standard Deviation	15	15	9	0	1	1	7	14
Total N Isolates	1783	1240	1550	2171	1128	1870	2171	1750

Methicillin Resistant *Staphylococcus aureus*



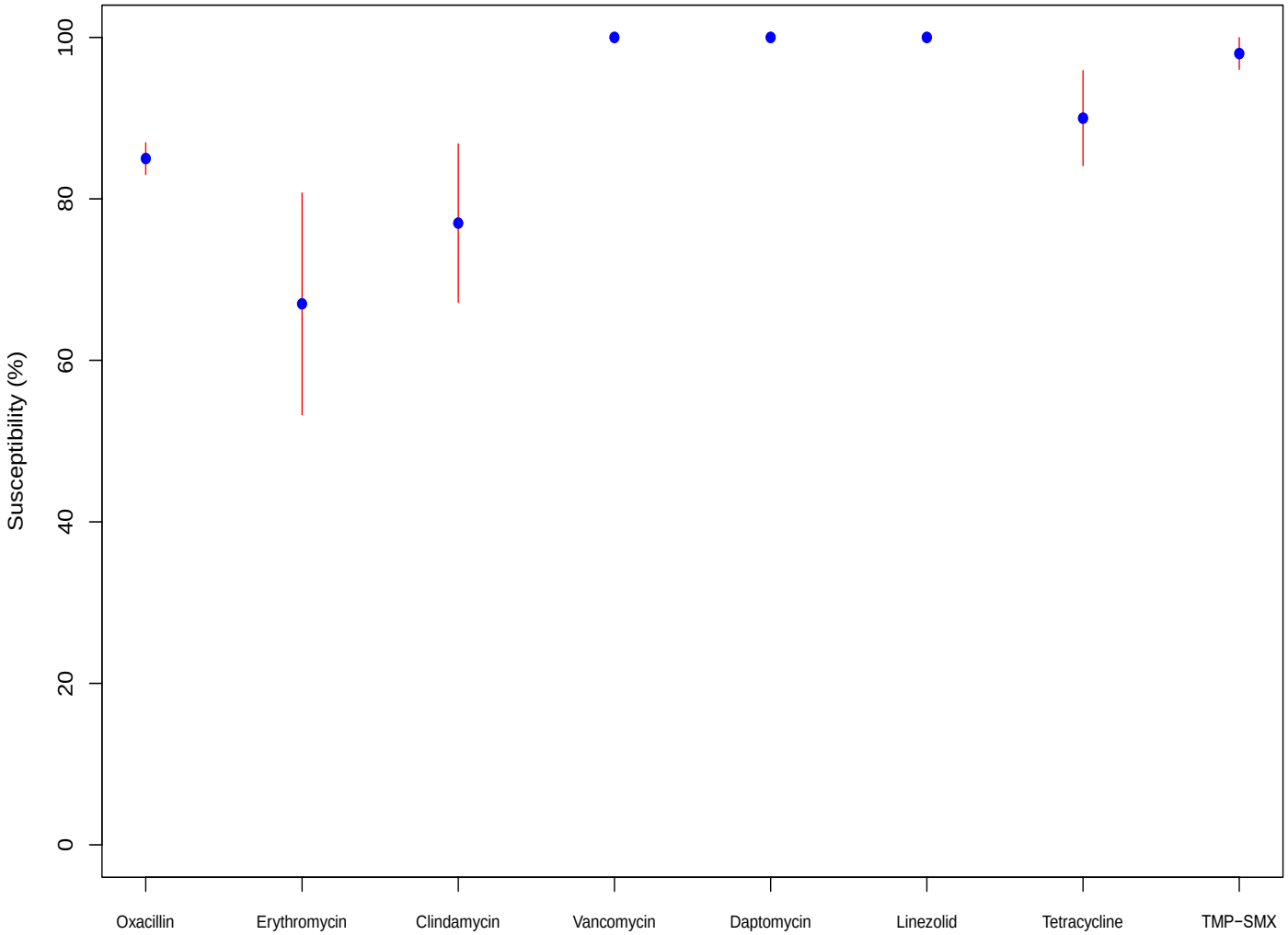
Staphylococcus aureus - MRSA	Erythromycin	Clindamycin	Vancomycin	Daptomycin	Linezolid	Tetracycline	TMP-SMX
Weighted Mean	16	72	100	99	100	92	93
Standard Deviation	3	7	0	0	0	2	3
Total N Isolates	3264	4303	4402	1965	3578	4402	4402

Methicillin Susceptible *Staphylococcus aureus*



Staphylococcus aureus - MSSA	Erythromycin	Clindamycin	Vancomycin	Daptomycin	Linezolid	Tetracycline	TMP-SMX
Weighted Mean	60	80	100	100	100	93	98
Standard Deviation	4	4	0	0	0	1	1
Total N Isolates	3998	4664	4829	1931	3940	4874	4628

Staphylococcus lugdunensis



Staphylococcus lugdunensis	Oxacillin	Erythromycin	Clindamycin	Vancomycin	Daptomycin	Linezolid	Tetracycline	TMP-SMX
Weighted Mean	85	67	77	100	100	100	90	98
Standard Deviation	1	7	5	0	0	0	3	1
Total N Isolates	164	130	164	164	164	164	164	164