

Antimicrobial Resistance (AMR) Surveillance on Blood Culture Specimen in Public Hospitals and Clinics - Hospital Authority AMR Data (2022)

April 2024



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 - Overview on patients with blood culture
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- (Background, Data Scope, Definitions, Measurements, and Statistical Method remained unchanged compared to 2021, and can be referred in Supplementary slides)

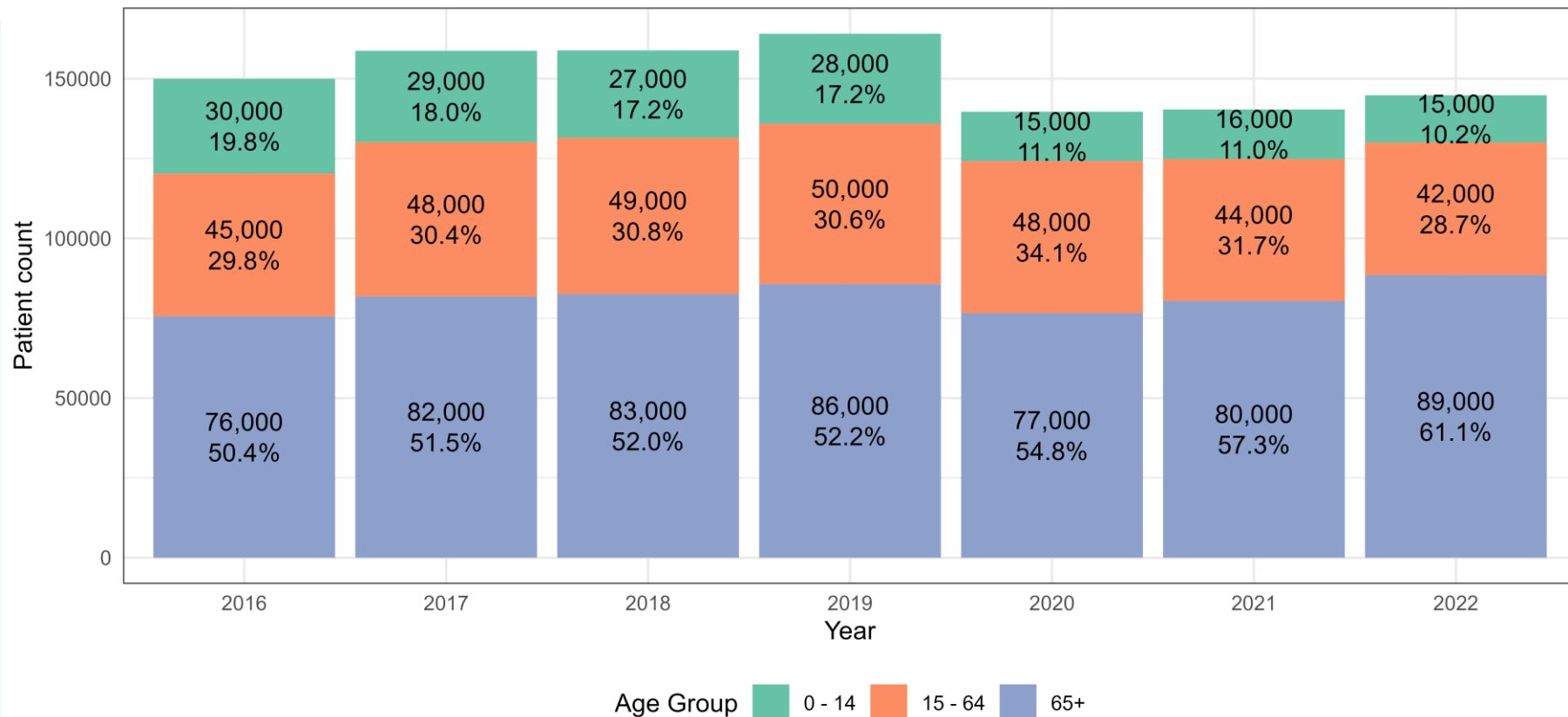


Results

Overview on patients with blood culture



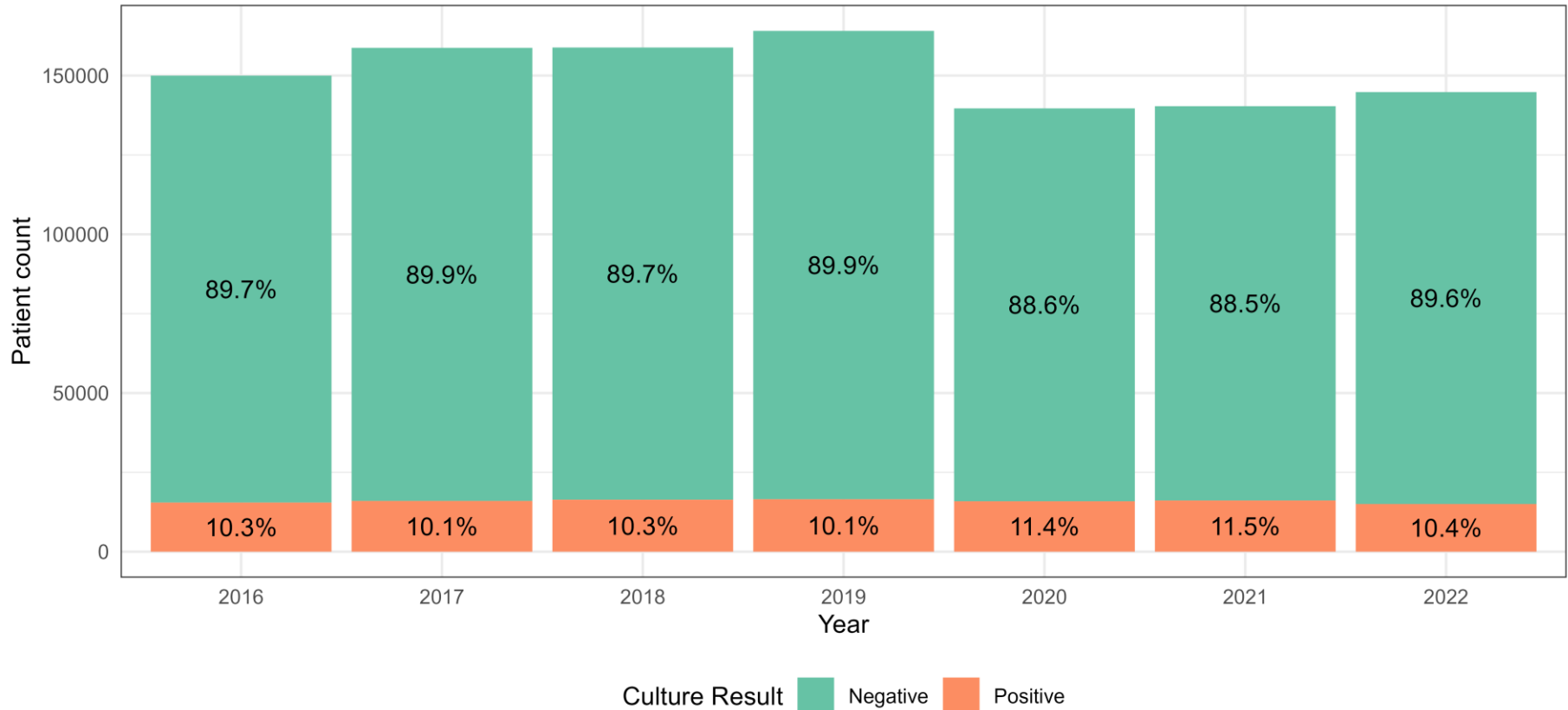
Age distribution of patients with blood culture



- No. of patients with blood culture slightly increased from 140,000 in 2021 to 145,000 in 2022.
- >50% patients aged 65 years or above from 2016 to 2022.



Percentage of patients with positive blood culture



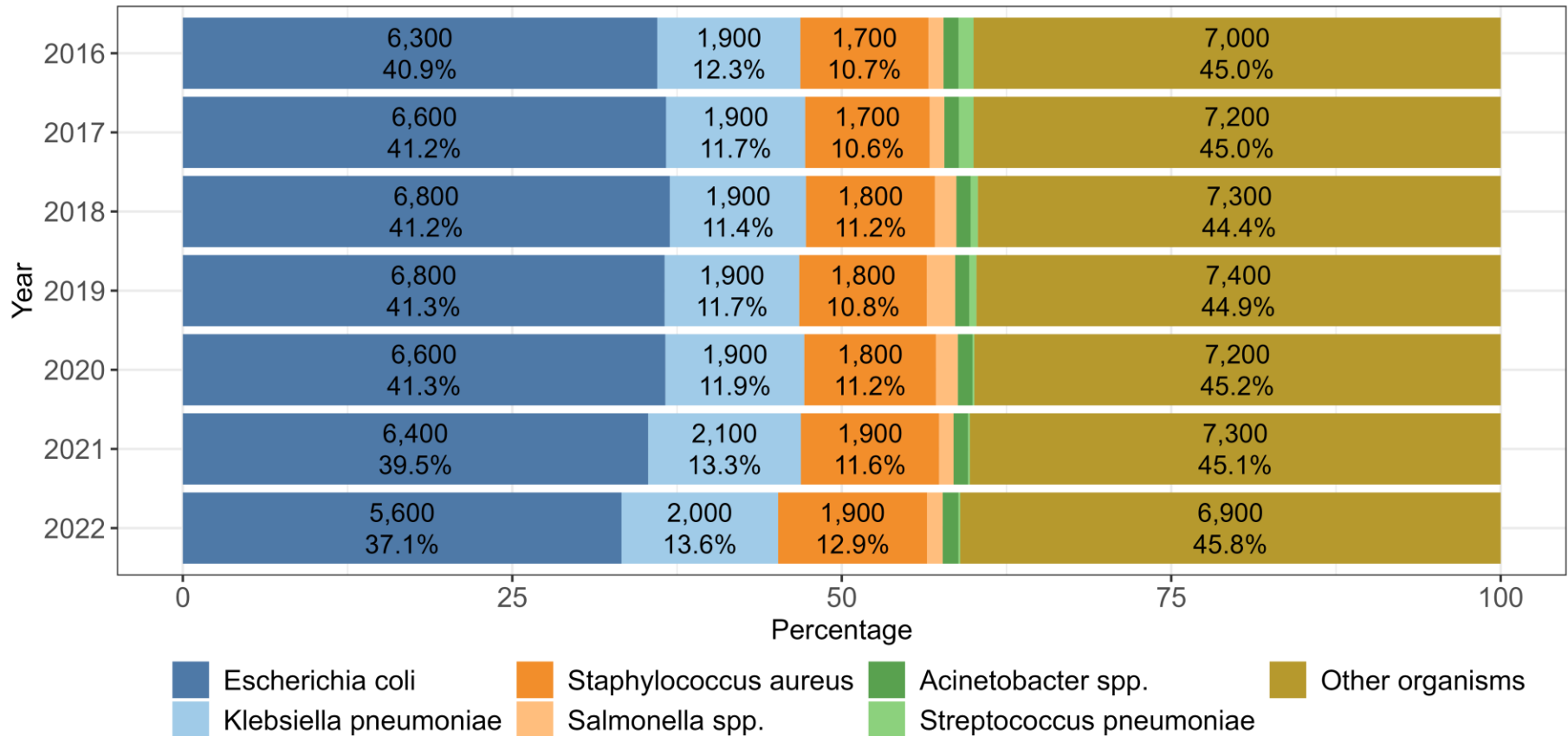
- % patients with positive blood culture remained stable over the past years at around 10-11%.

Results

Overview on WHO priority organisms isolated from blood



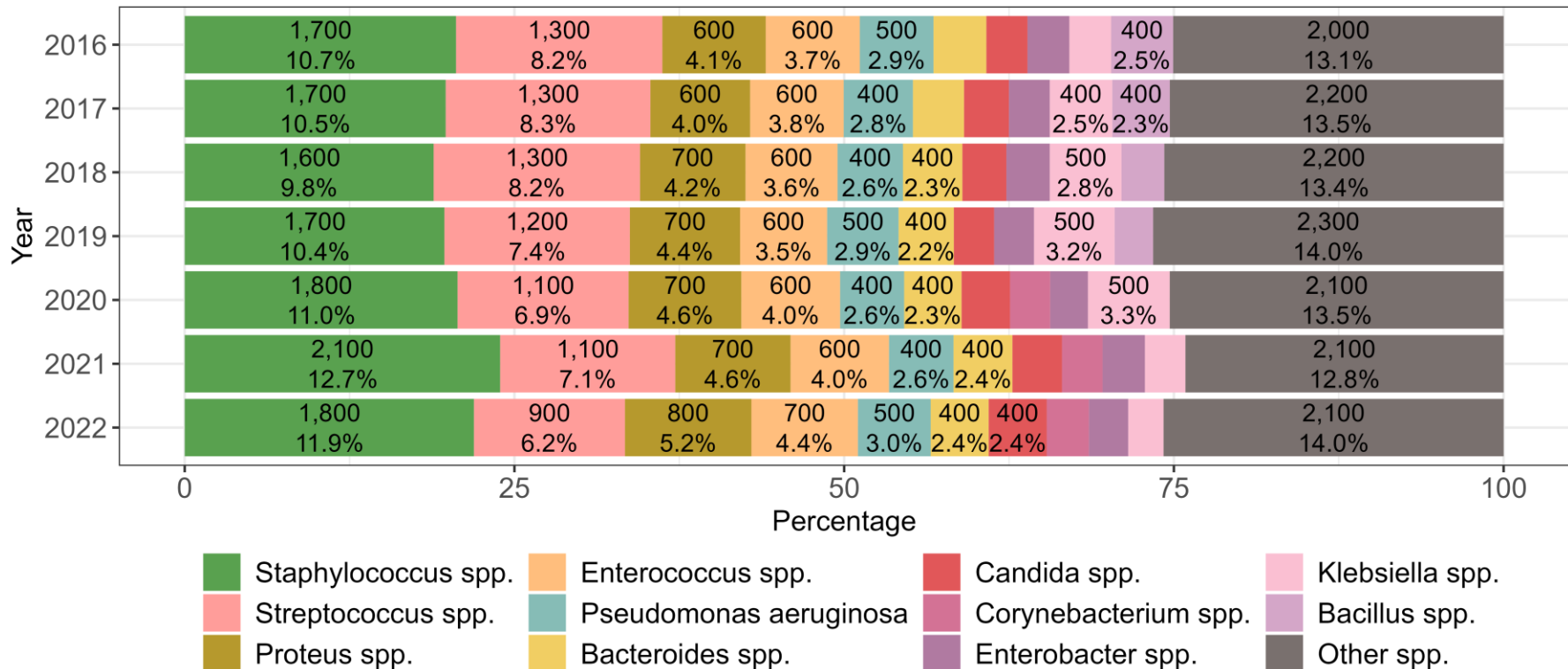
Distribution of organisms by year



- The three most common WHO priority organisms cultured from blood remained to be *E. coli*, *K. pneumoniae* and *S. aureus* from 2016 to 2022.
- *S. pneumoniae* (<50 cases), *Salmonella* spp. (200 cases) and *Acinetobacter* spp. (200 cases) case count remained low and stable.



Distribution of other organisms by year

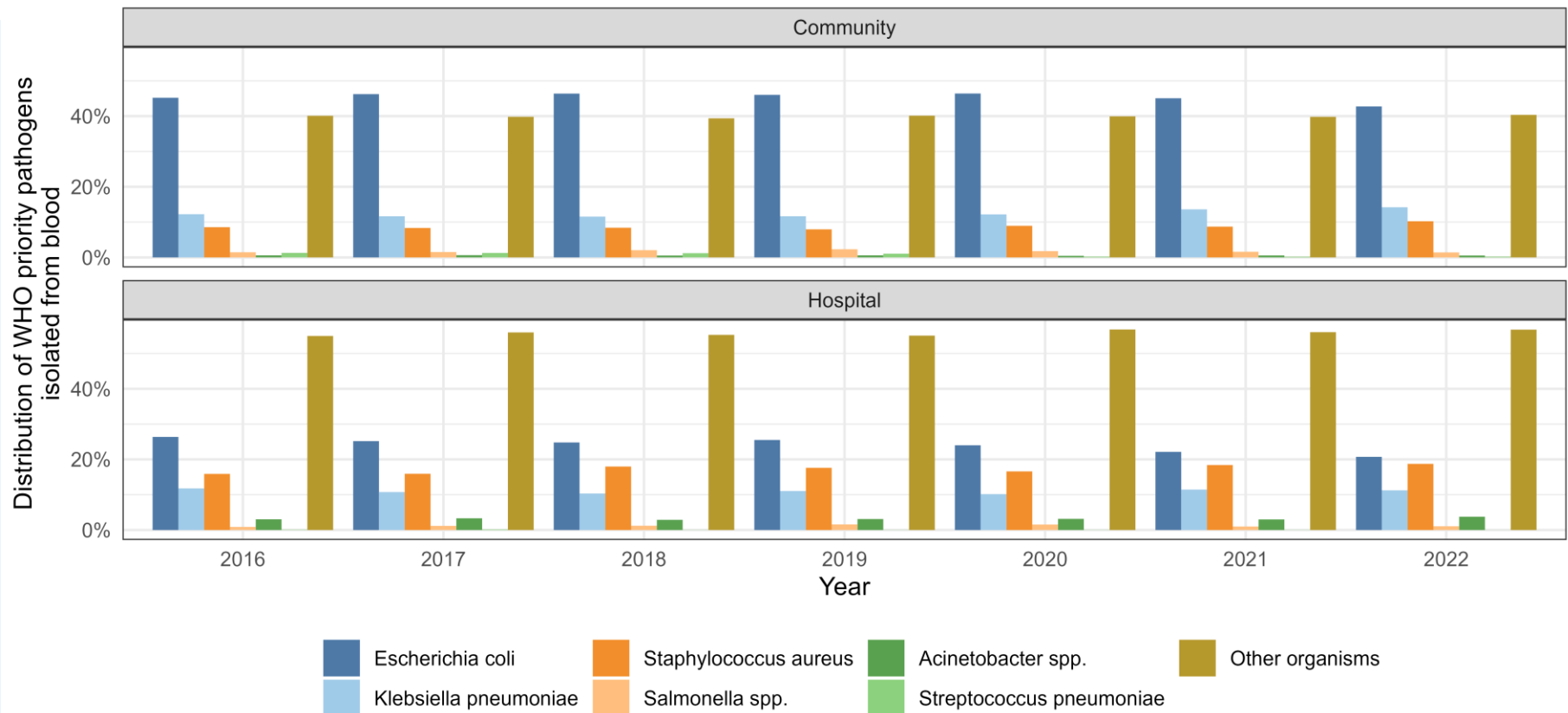


Note:
Each patient may have more than one kind of microorganism isolated from blood within the same surveillance year.

- Among the 40% of organisms isolated from blood being Other spp. each year, the most commonly seen organisms were *Staphylococcus* spp. (except *S. aureus*), *Streptococcus* spp. and *Proteus* spp.
- In 2022, *Enterococcus* spp., *Pseudomonas aeruginosa* and *Candida* spp. ranked 4, 5 and 7 respectively

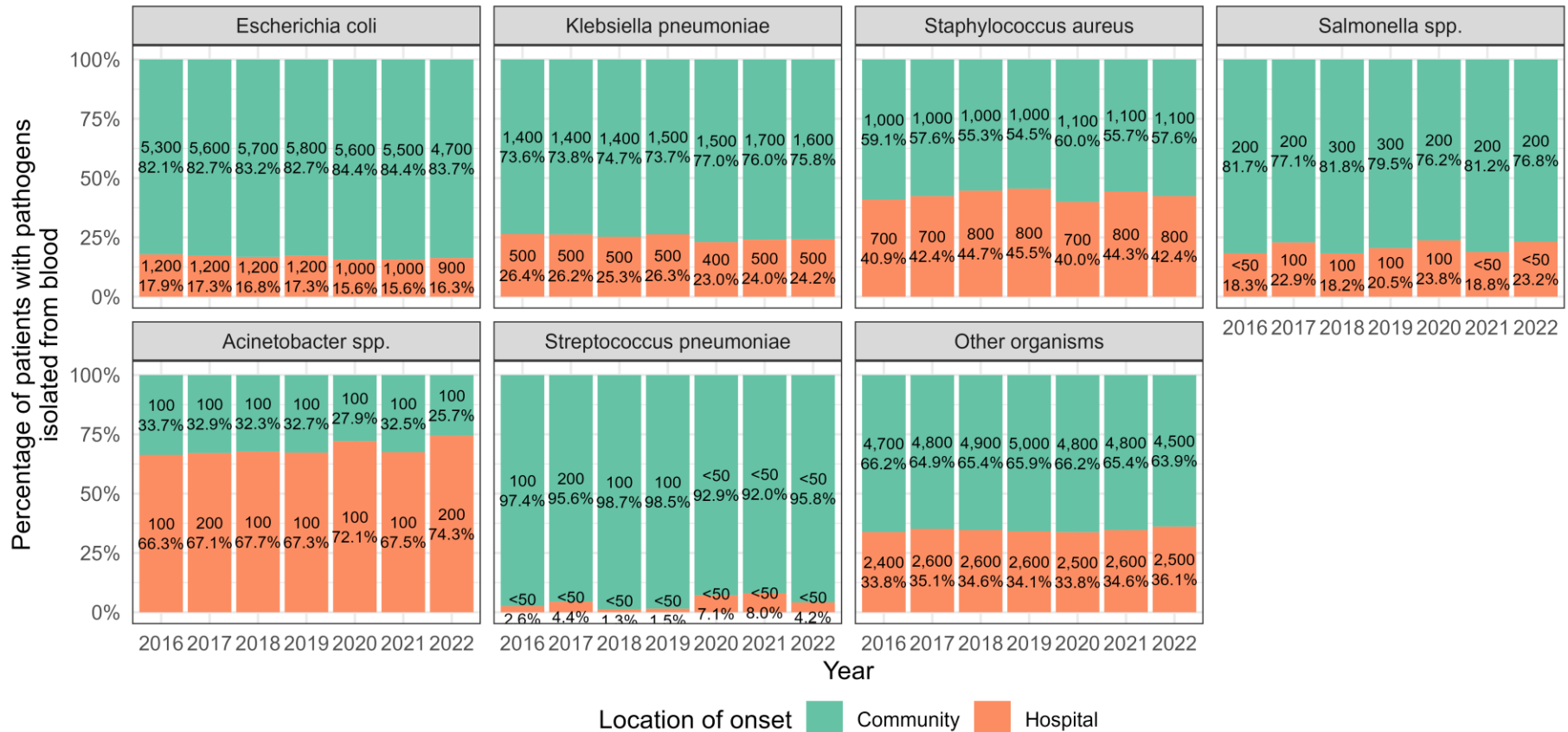


Distribution of organisms by location of onset



- Distribution of WHO priority organisms isolated from blood among patients remained stable for both community- and hospital-onset patients.

Distribution of organisms by location of onset



- *Escherichia coli*, *Klebsiella pneumoniae*, *Salmonella* spp. and *Streptococcus pneumoniae* were predominantly community-onset from 2016 to 2022.
- *Acinetobacter* spp. was predominantly hospital-onset.
- More than half of *Staphylococcus aureus* isolated were community-onset.



Results

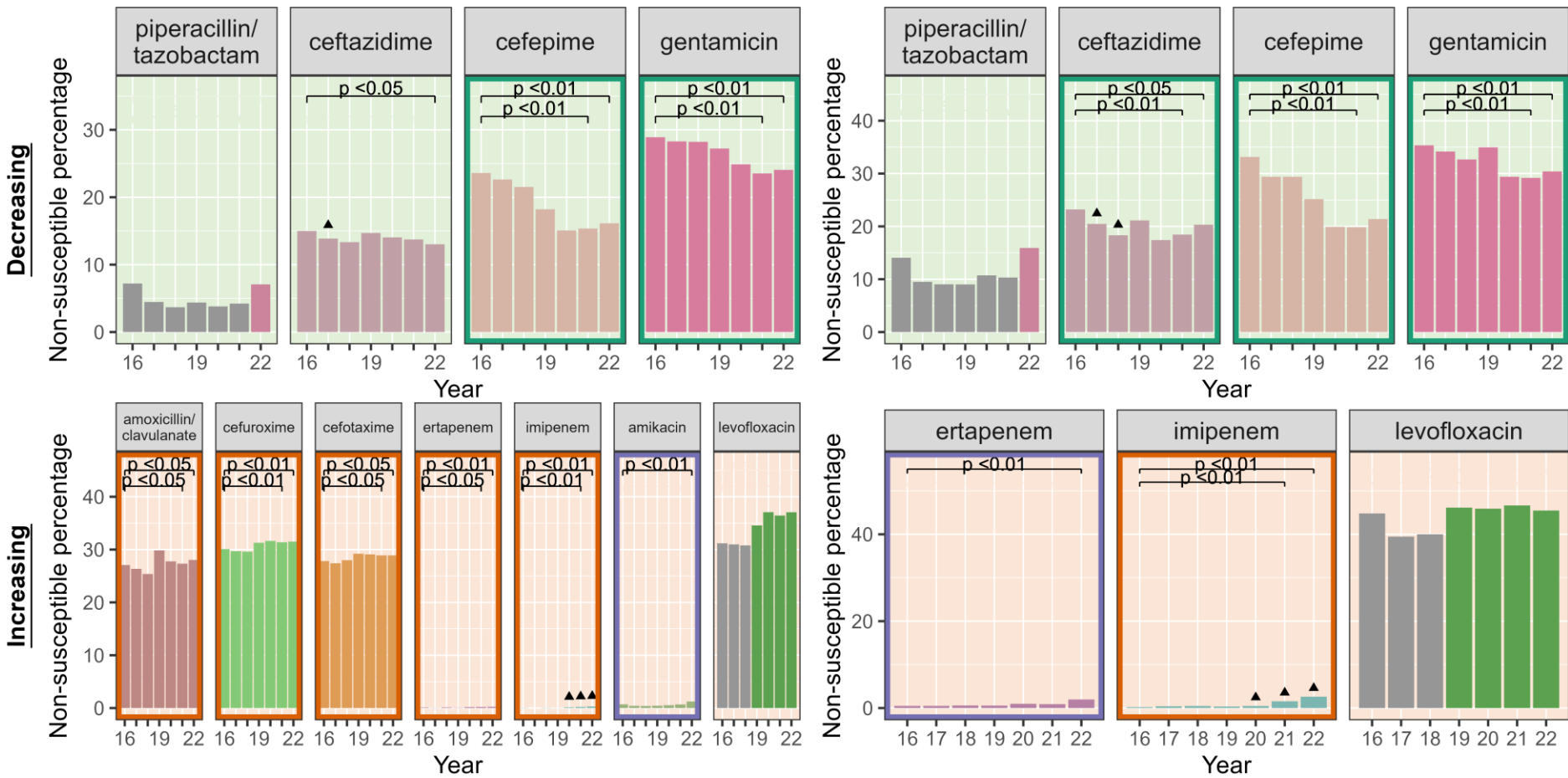
AST results for WHO priority organisms isolated from blood



AST results with significant trend for *E. coli* (16 to 22)

Community-onset

Hospital-onset



▲ <70% of isolates tested

Note: The CLSI released revised fluoroquinolones interpretive criteria for Enterobacteriaceae (excluding Salmonella spp.) in 2019, and revised piperacillin/tazobactam interpretive criteria for Enterobacteriaceae in 2022. These updates may have contributed to the observed increase in subsequent years compared to the years prior to the criteria changes.

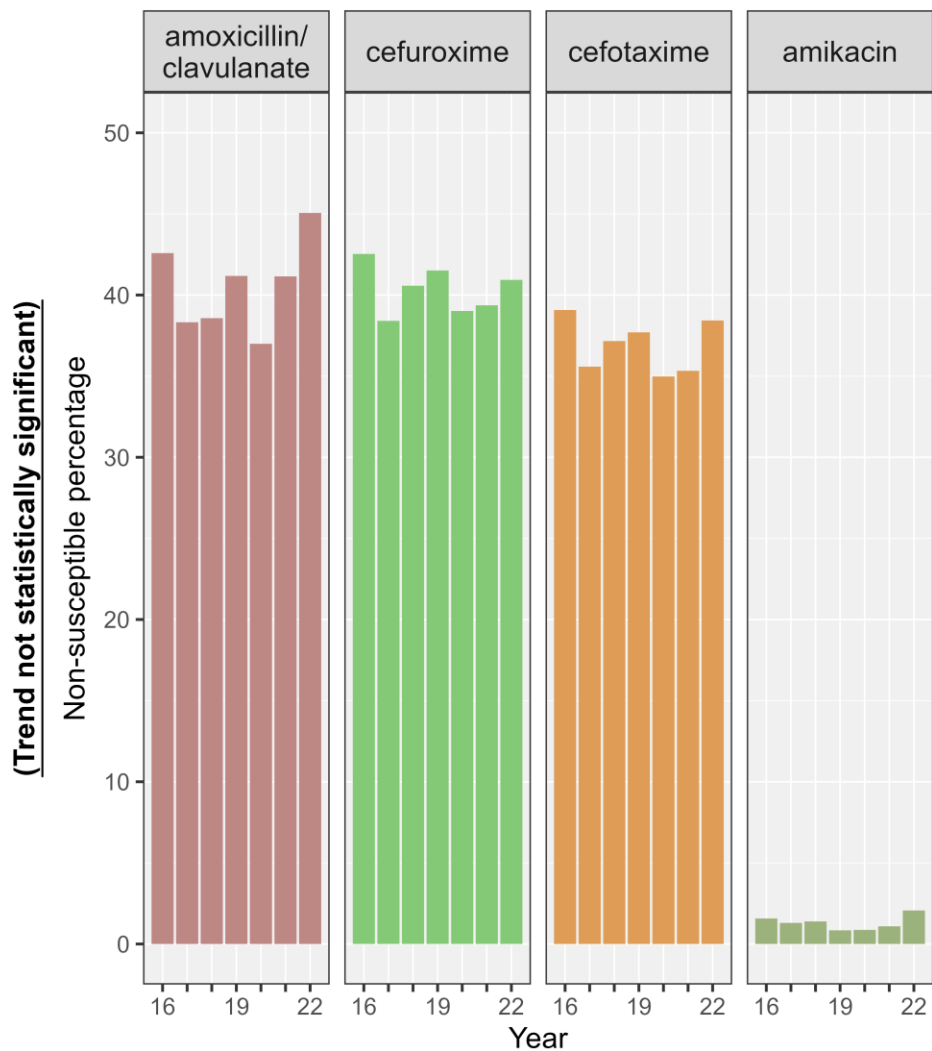
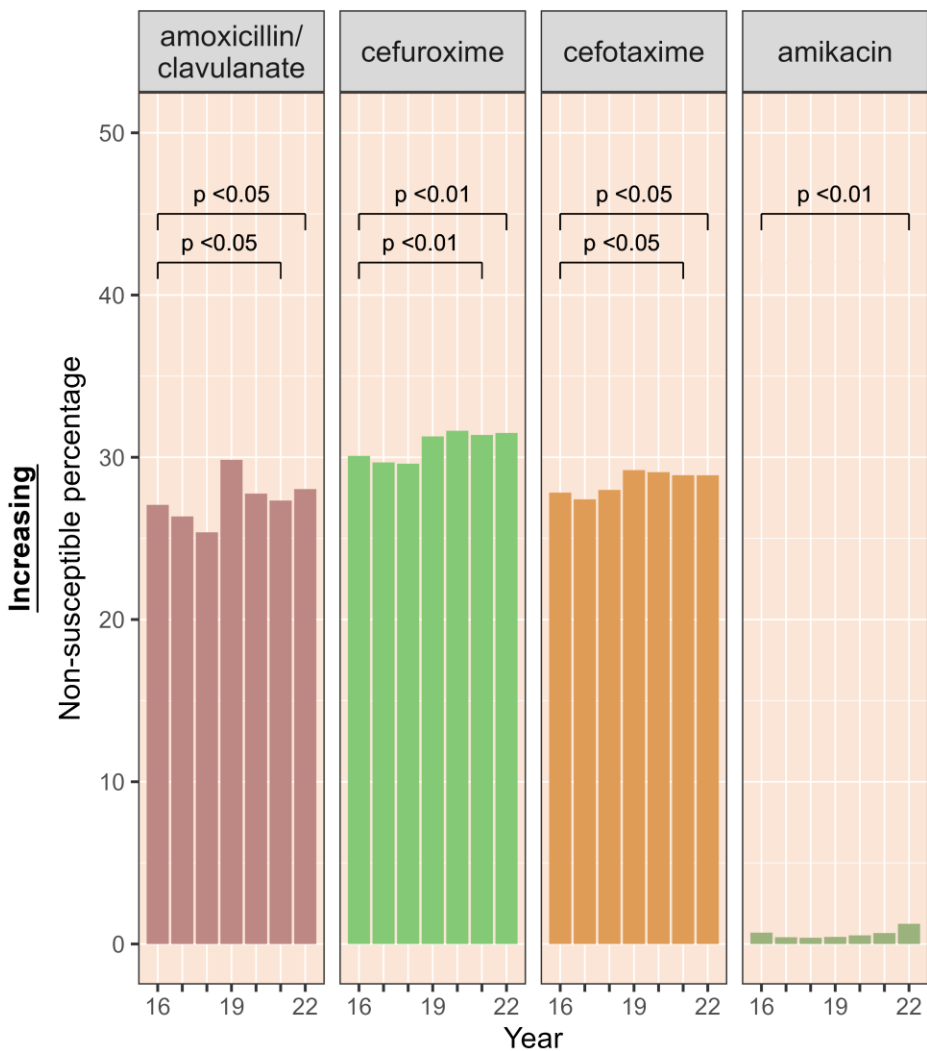
- (Green boxes) Continuous downward trends with mild increase in 2022 were observed for cefepime (community & hospital), gentamicin (community & hospital), and ceftazidime (hospital).
- (Orange boxes) For community-onset *E. coli* bacteraemia, although an increasing trend was still seen for several antimicrobials, steady state maintained for NS% of cefuroxime and cefotaxime.
- (Purple boxes) NS% for amikacin (community) and ertapenem (hospital) showed increasing trend for the first time since the beginning of surveillance (16-22).



AST results of amoxicillin/ clavulanate, cefuroxime, cefotaxime and amikacin for *E. coli* (16 to 22)

Community-onset

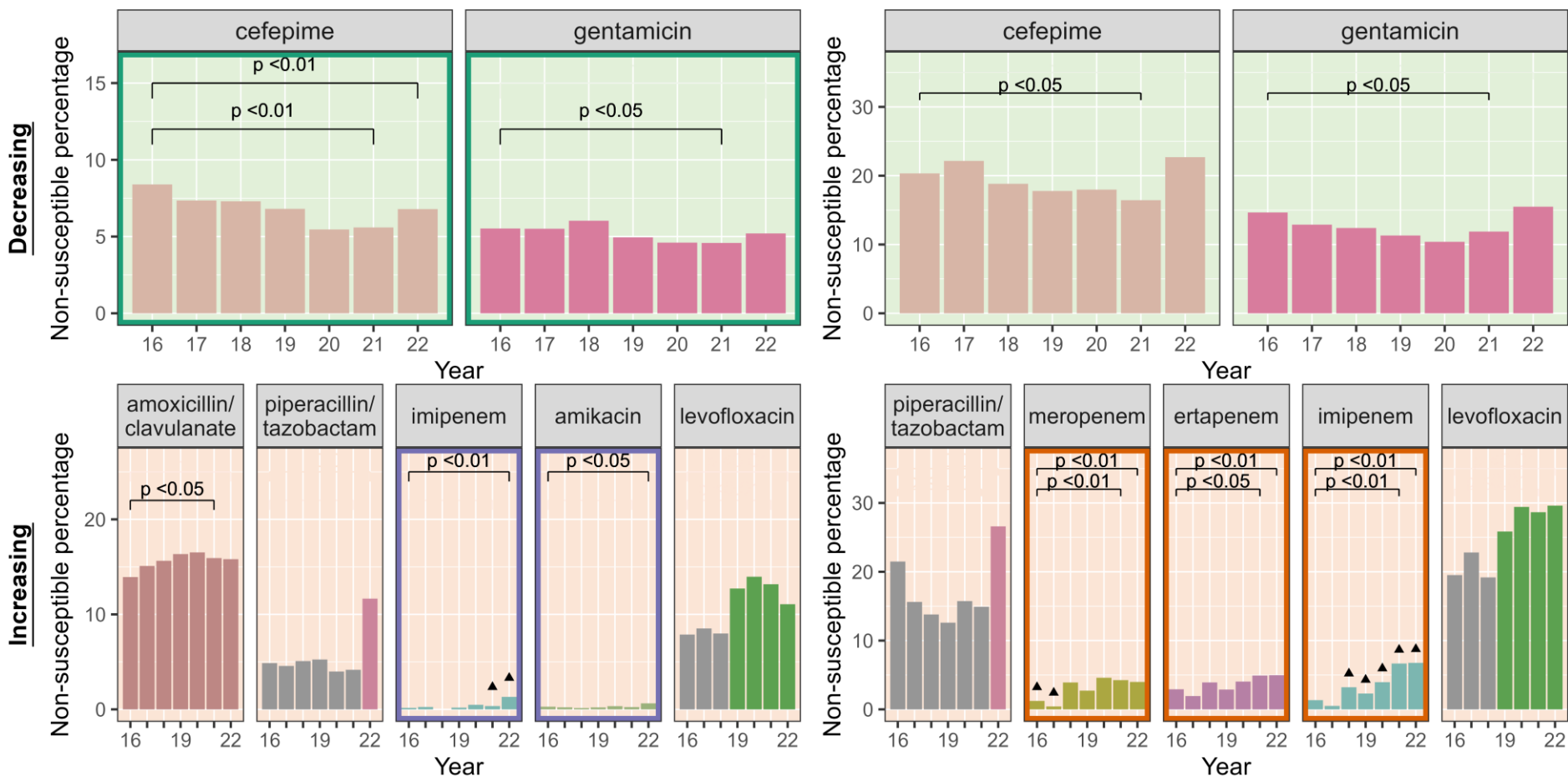
Hospital-onset



AST results with significant trend for *K. pneumoniae* (16 to 22)

Community-onset

Hospital-onset



▲ <70% of isolates tested

Note:

The CLSI released revised fluoroquinolones interpretive criteria for Enterobacteriaceae (excluding *Salmonella* spp.) in 2019, and revised piperacillin/tazobactam interpretive criteria for Enterobacteriaceae in 2022. These updates may have contributed to the observed increase in subsequent years compared to the years prior to the criteria changes.

- (Green boxes) Despite decreasing trend was observed for cefepime (community) during 16-20 and 16-21, a mild rebound in NS% was observed for cefepime (community & hospital). Rebound in NS% for gentamicin (community & hospital) was also observed.
- (Orange boxes) For hospital-onset cases, the increasing trends for meropenem, ertapenem and imipenem have plateaued since 2021.
- (Purple boxes) For community-onset case, NS% for imipenem and amikacin showed increasing trend for the first time since the beginning of surveillance (16-22).



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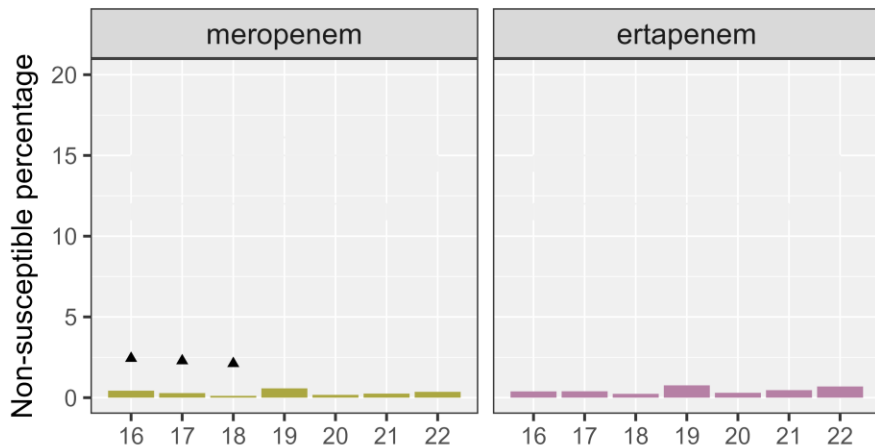
Department of Health

AST results of meropenem, ertapenem, amoxicillin/ clavulanate and amikacin for *K. pneumoniae* (16 to 22)

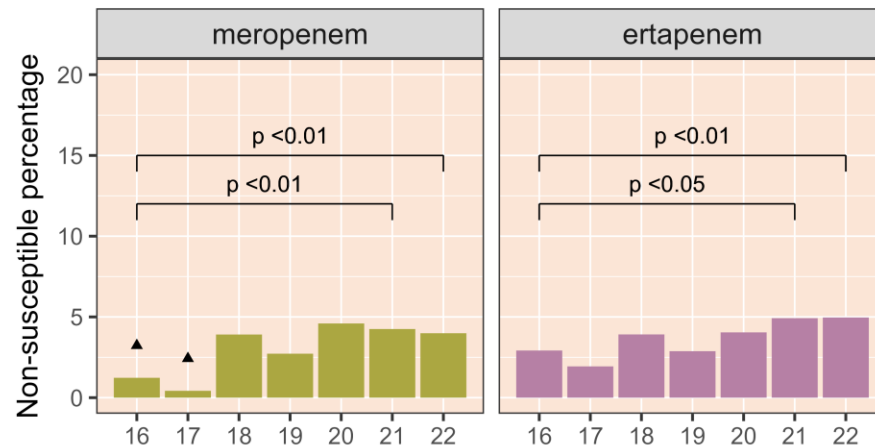
Community-onset

Hospital-onset

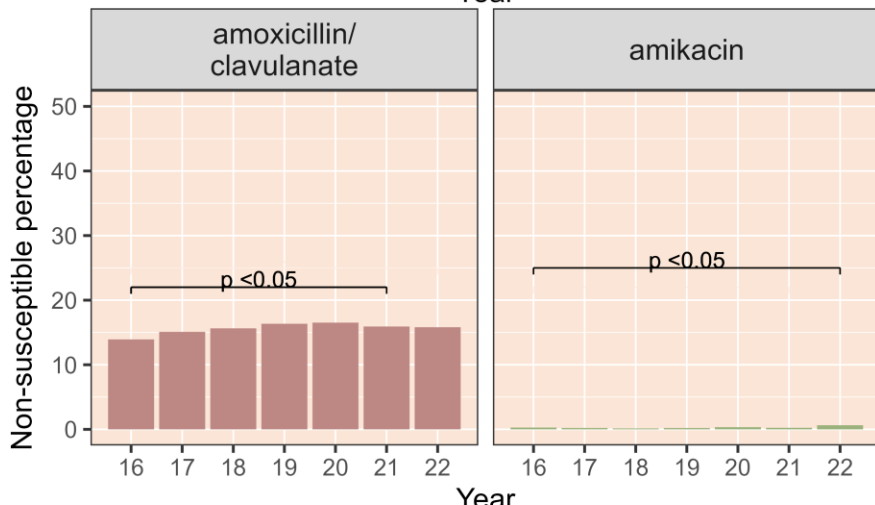
(Trend not statistically significant)



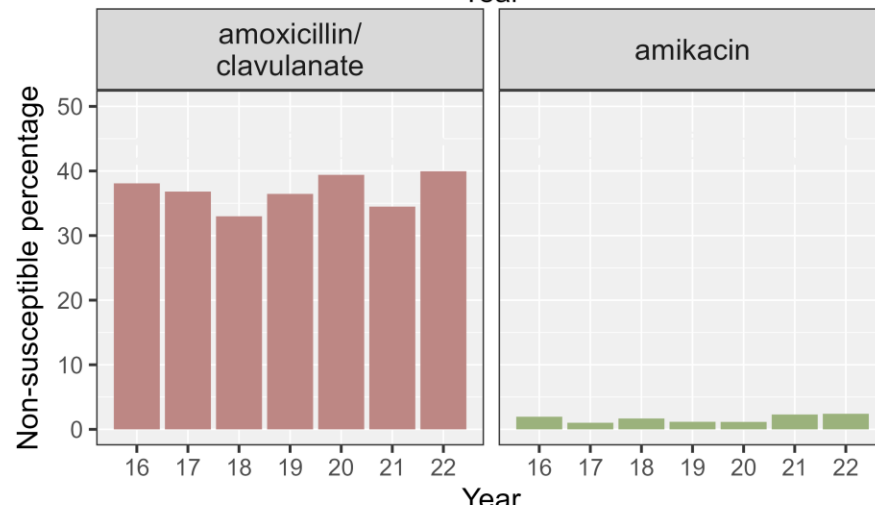
Increasing



Increasing



(Trend not statistically significant)

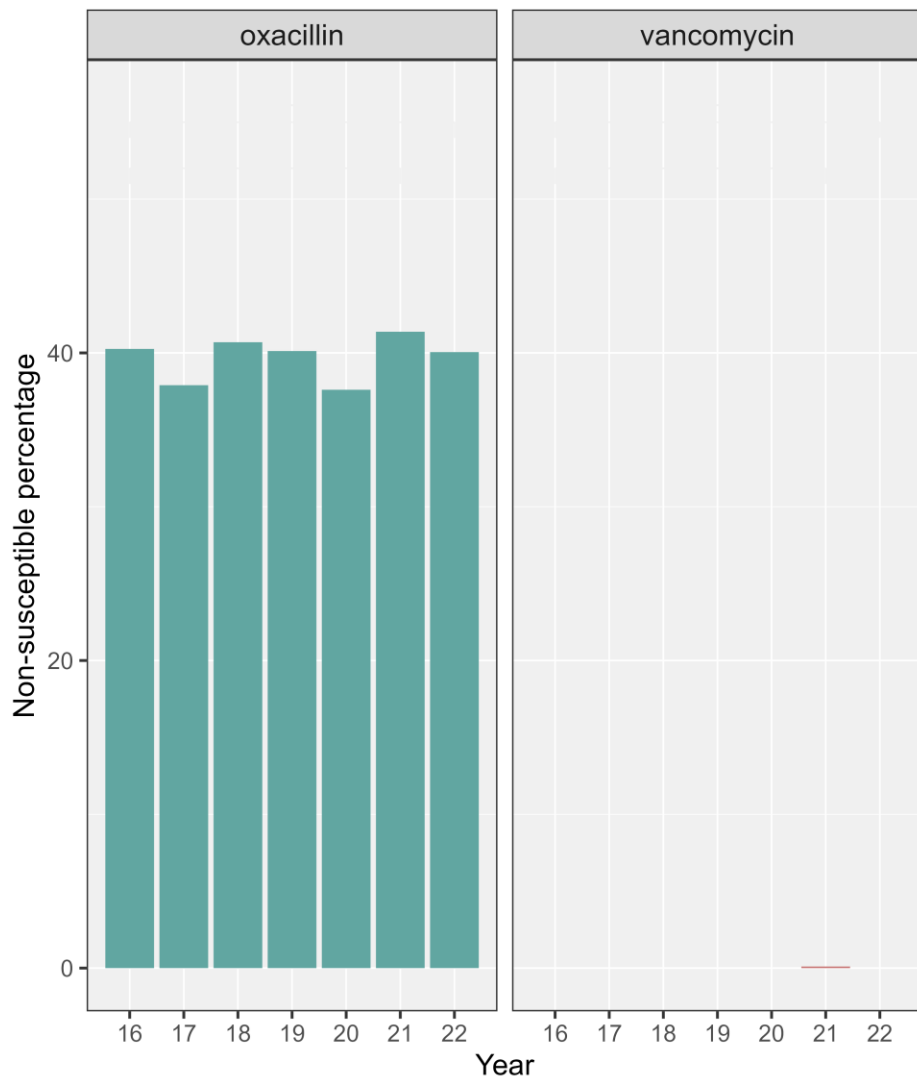


▲ <70% of isolates tested

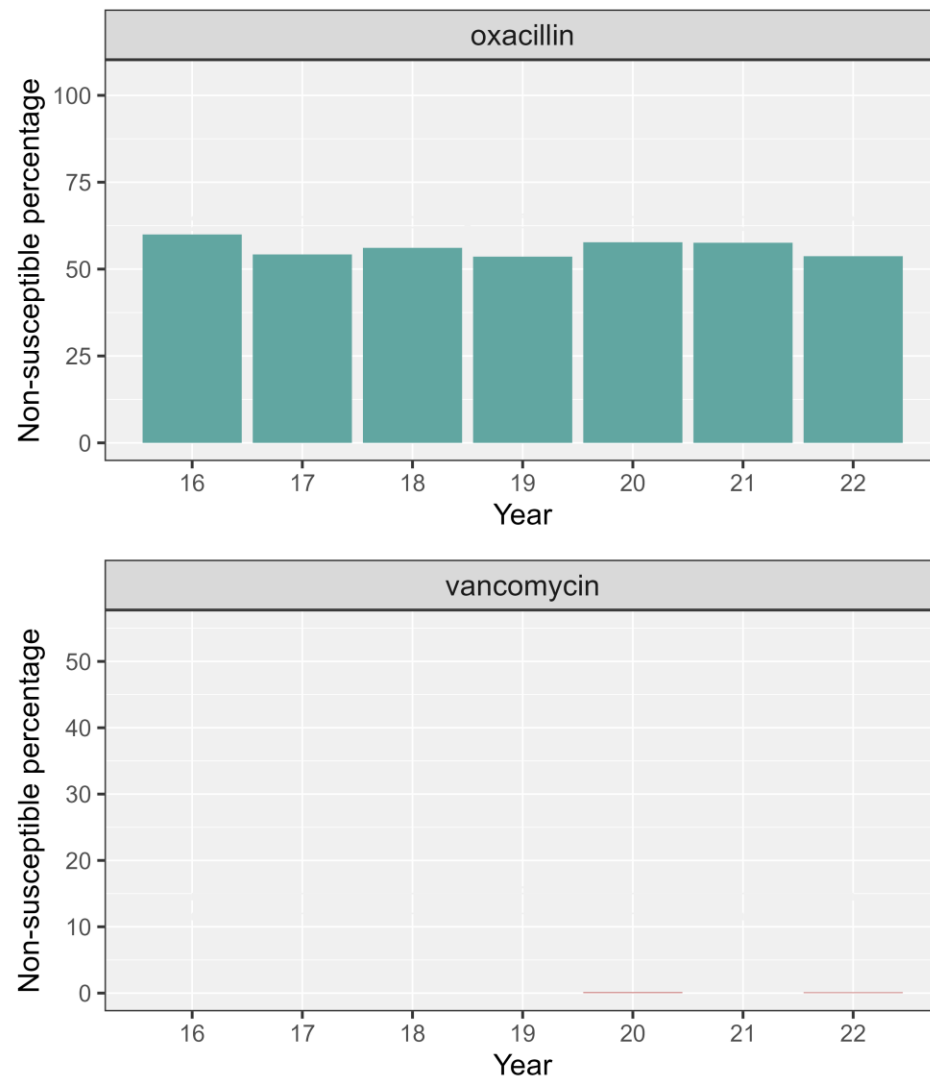


AST results for *S. aureus* (16 to 22)

Community-onset

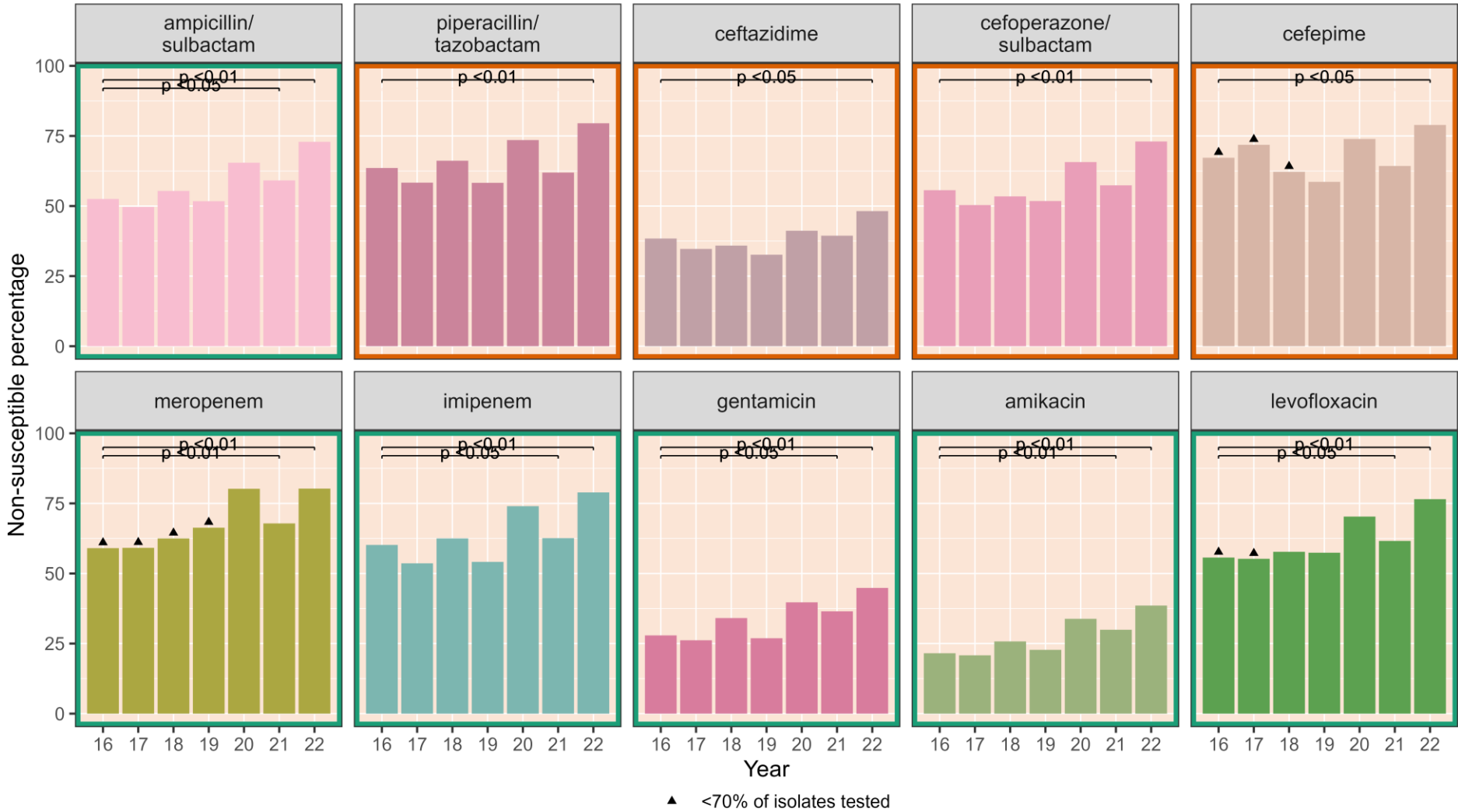


Hospital-onset



- NS% for oxacillin remained at an average of 40% for community-onset isolates and 56% for hospital-onset isolates from 2016 to 2022.

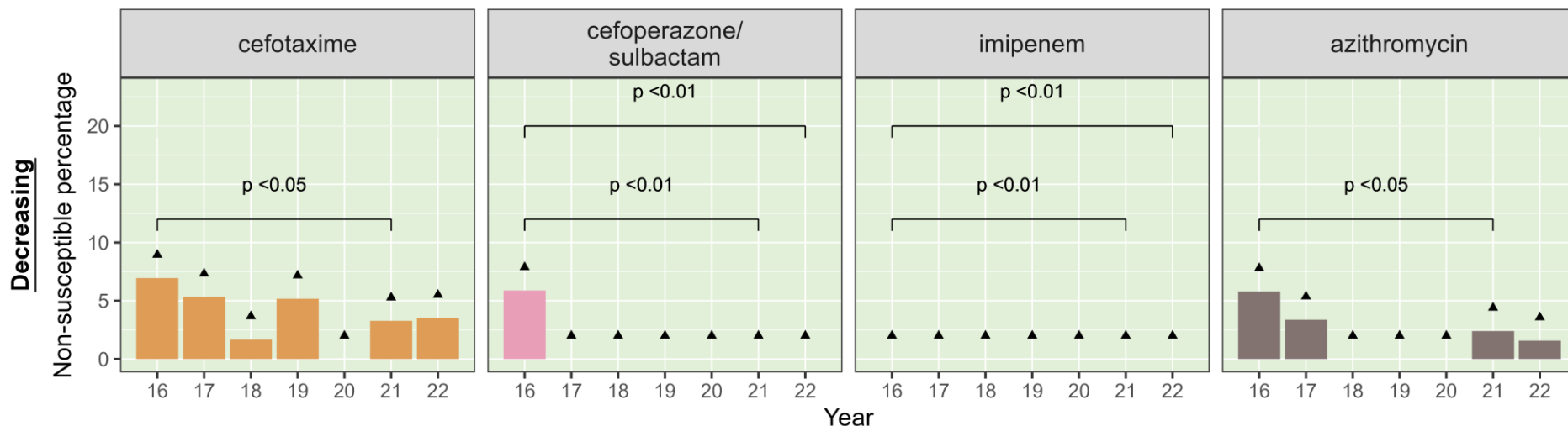
AST results with significant trend for *Acinetobacter* spp. (16 to 22)



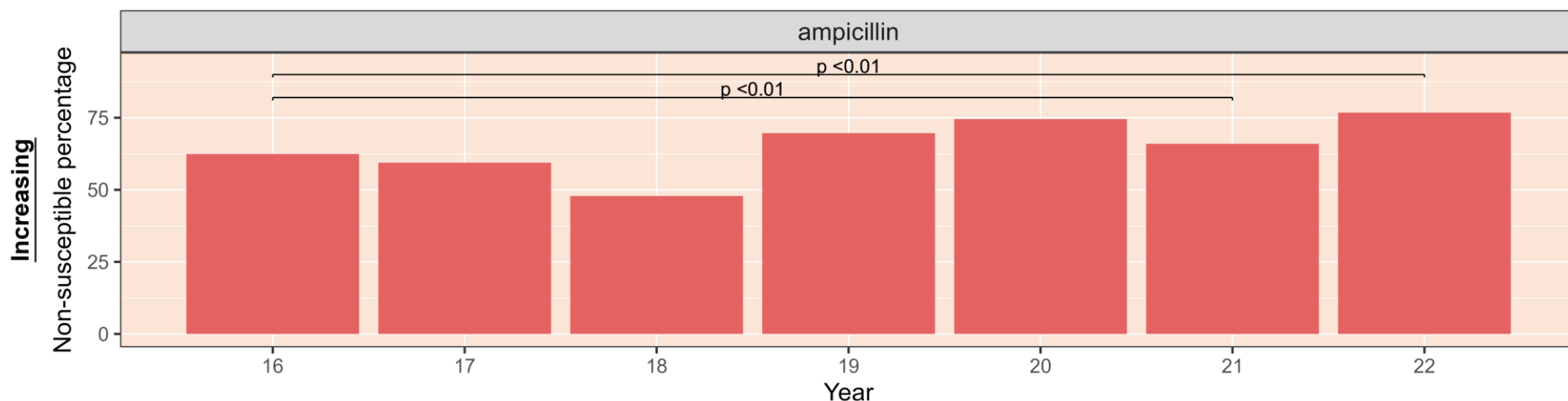
- (Green boxes) Increasing trend observed in 16-21 and 16-22 for ampicillin/ sulbactam, meropenem, imipenem, gentamicin, amikacin and levofloxacin.
- (Orange boxes) NS% for piperacillin/ tazobactam, ceftazidime, cefoperazone/ sulbactam and cefepime showed increasing trend for the first time since the beginning of surveillance (16-22).

AST results with significant trend for *Salmonella* spp. (16 to 22)

Community (Undifferentiated-onset)



Community (Undifferentiated-onset)

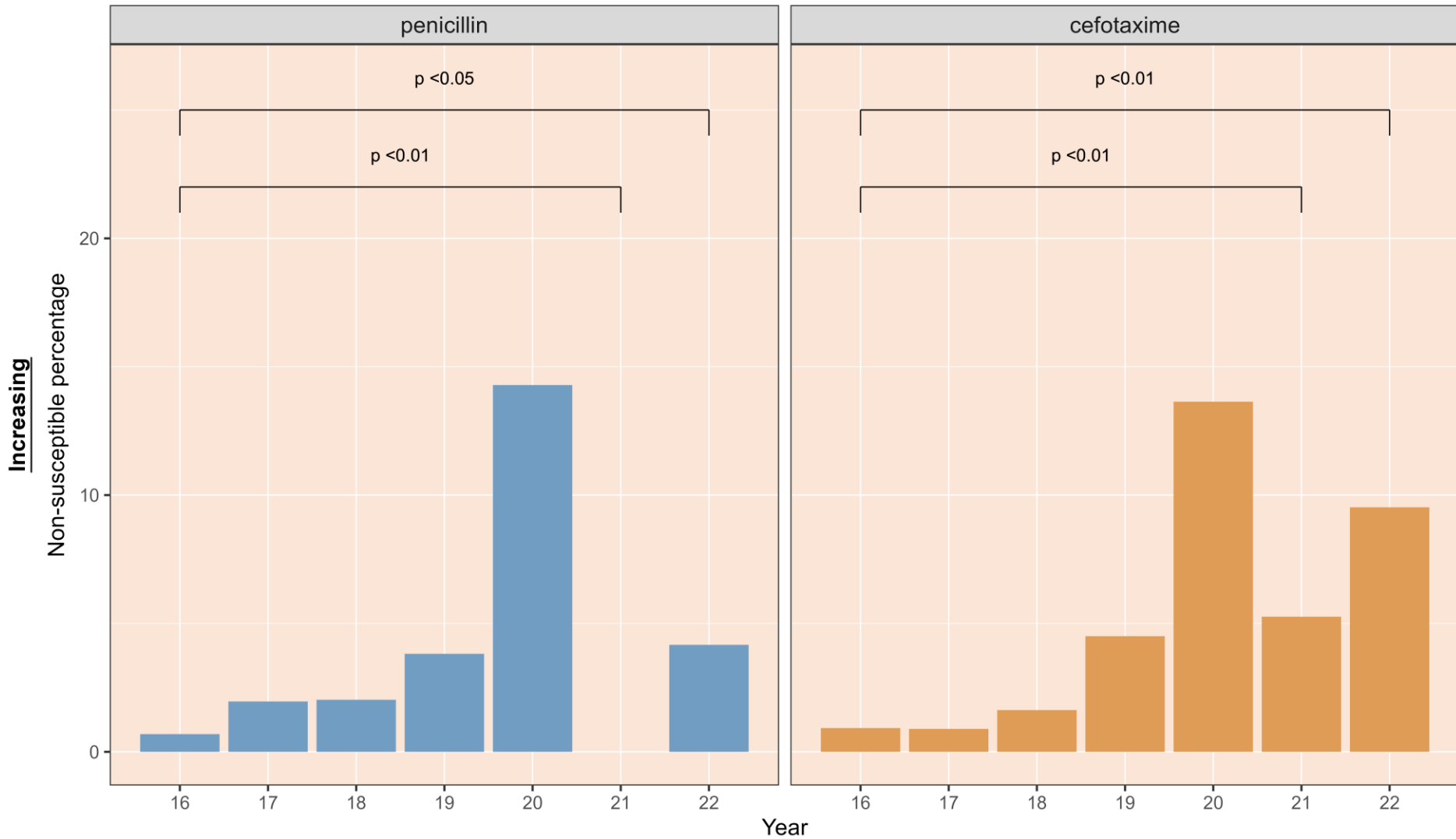


▲ <70% of isolates tested

- Increasing trend observed in 16-21 and 16-22 for ampicillin.
- NS% for cefotaxime, cefoperazone/sulbactam, imipenem and azithromycin remained <10% with decreasing trend observed from 16 to 21. However, these findings should be interpreted with caution as less than 70% of the isolates were tested.

AST results with significant trend for *Streptococcus pneumoniae* (16 to 22)

Community (Undifferentiated-onset)



- Increasing trend observed in 16-21 and 16-22 for penicillin and cefotaxime.

Summary Table on Key Findings

| WHO priority organism | Proportion of isolates being non-susceptible to antimicrobials, 2016 vs 2022 | |
|---------------------------|--|---|
| | Community-onset | Hospital-onset |
| <i>E. coli</i> | ↓ ceftazidime 15% → 13% ↓ cefepime 23.6% → 16.1% ↓ gentamicin 28.9% → 24.1% | ↓ ceftazidime 23.2% → 20.3% ↓ cefepime 33.1% → 21.4% ↓ gentamicin 35.3% → 30.4% |
| | ↑ amoxicillin/clavulanate 27.1% → 28% ↑ cefuroxime 30.1% → 31.5% ↑ cefotaxime 27.8% → 28.9% ↑ ertapenem 0.1% → 0.2% ↑ imipenem 0% → 0.3% ↑ amikacin 0.7% → 1.2% | ↑ ertapenem 0.5% → 2% ↑ imipenem 0.2% → 2.6% |
| <i>K. pneumoniae</i> | ↓ cefepime 8.4% → 6.8% | None observed |
| | ↑ imipenem 0.2% → 1.3% ↑ amikacin 0.3% → 0.6% | ↑ meropenem 1.2% → 4% ↑ ertapenem 2.9% → 5% ↑ imipenem 1.3% → 6.8% |
| <i>S. aureus</i> | oxacillin 40.3% → 40.1% | oxacillin 60% → 53.7% |
| <i>Acinetobacter</i> spp. | None observed | ↑ ampicillin/sulbactam 52.5% → 72.9% ↑ piperacillin/tazobactam 63.6% → 79.5% ↑ ceftazidime 38.4% → 48.2% ↑ cefoperazone/sulbactam 55.6% → 73% ↑ cefepime 67.2% → 78.9% ↑ meropenem 59% → 80.3% ↑ imipenem 60.2% → 78.9% ↑ gentamicin 27.9% → 44.8% ↑ amikacin 21.5% → 38.6% ↑ levofloxacin 55.7% → 76.5% |

Summary Table on Key Findings

| WHO priority organism | Proportion of isolates being non-susceptible to antimicrobials, 2016 vs 2022 |
|------------------------|--|
| | Community (Undifferentiated)-onset |
| <i>Salmonella spp.</i> | ↑ ampicillin 62.4% → 76.8% |
| <i>S. pneumoniae</i> | ↑ penicillin 0.7% → 4.2% ↑ cefotaxime 0.9% → 9.5% |





Summary on findings



Summary



Downward trends continued in 16-21 and 16-22:
E. coli – cefepime, gentamicin, ceftazidime
K. pneumoniae – cefepime (community)



Upward trend reversed in 16-22:
K. pneumoniae – amoxicillin/ clavulanate (hospital)



Upward trend continued in 16-22 but plateaued:
E. coli – amoxicillin/ clavulanate (community) , cefotaxime (community), cefuroxime (community)
K. pneumoniae – meropenem, ertapenem, imipenem (hospital)



Downward trend in 16-21 showed rebound in 2022:
K. pneumoniae – gentamicin, cefepime



Upward trend new seen in 16-22:
Acinetobacter spp. – piperacillin/ tazobactam (hospital), ceftazidime (hospital), cefoperazone/ sulbactam, cefepime



Recommendations

- Continue ASP in public hospitals
 - NS% on selected antimicrobials for *E. coli* and *K. pneumoniae* continued to decrease from 2021 to 2022
 - NS% on some drug-bug combinations were peaked in 2021 and reduced in 2022 (e.g. *K. pneumoniae* – amoxicillin/ clavulanate (Blood, Hospital-onset))
- Attention needed on emerging drug-bug combinations shows increasing resistance, e.g.
 - *Acinetobacter* spp. – piperacillin/ tazobactam, ceftazidime, cefoperazone/ sulbactam, cefepime (Blood, Hospital-onset)
 - Attention on these big gun antibiotics for ASP is warranted

