

Antimicrobial Resistance (AMR) Surveillance on Urine Culture Specimen in Public Hospitals and Clinics - Hospital Authority AMR Data (2021)

February 2023



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Background



Background

- The second Hong Kong Strategy and Action Plan 2023-2027 was issued in November 2022
- Activity 1.2.1 suggests continuing AMR surveillance based on the Global Antimicrobial Resistance Surveillance System (GLASS), developed by the World Health Organization (WHO)
- This presentation briefly accounts the surveillance findings of urine specimens from 2016 to 2021





Method



WHO GLASS Recommendations (1)

- Based on *WHO GLASS Manual for Early Implementation (2015)*:
 - WHO Priority Organisms captured:
 - *Escherichia coli*
 - *Klebsiella pneumoniae*
 - Organisms other than the above were grouped as “Other spp.”
 - Location of onset
 - Community-onset organisms isolated from urine specimen collected in non-inpatient settings or within 48 hours after hospital admission
 - Hospital-onset organisms isolated from urine specimen collected more than 48 hours after hospital admission
 - Using 48 hours instead of 2 calendar days of WHO as agreed by HA



WHO GLASS Recommendations (2)

- Based on *WHO GLASS Manual for Early Implementation (2015)*:
 - Removal of duplicate results (deduplication)
 - For each surveillance period (one calendar year), only the first result would be reported for each patient per specimen type per organism for the same location of onset
 - Antimicrobial susceptibility test (AST) result being “Intermediate” or “Resistant” was considered as “non-susceptible”
 - AST results derived from < 10 isolates per calendar year were excluded from analysis



Scope of Data

- The following information was collected from patients who had urine culture:
 - Demographic data
 - Microbiology data
 - Organisms cultured
 - AST results
 - Susceptible (sensitive)
 - Non-susceptible (intermediate or resistant)



Broad-spectrum Antimicrobials (Big Guns)

- Where appropriate, AST results of the following broad-spectrum antimicrobials identified by experts in HA were examined because of their importance on treating resistant infections
 - Piperacillin/tazobactam
 - Ceftazidime
 - Cefoperazone/sulbactam
 - Cefepime
 - Ceftaroline fosamil
 - Ceftolozane/tazobactam
 - Ceftazidime/avibactam
 - Meropenem
 - Ertapenem
 - Imipenem/cilastatin
 - Vancomycin
 - Linezolid
 - Daptomycin
 - Colistin
 - Teicoplanin



Scope of Reporting

- Overview on patients with urine culture
 - Number of patients from whom a urine culture was taken
- Overview on WHO priority organisms isolated from urine
 - Number of patients with positive and negative culture results
 - Distribution of organisms by location of onset
- AST results on WHO priority organisms
 - Number and % of patients with non-susceptibility results
 - Trend of antimicrobial non-susceptibility
 - 2016 - 2021 trend



Statistical Analysis on AST Results

- 2016 – 2021 trend analysis
 - Year 2016 was chosen as the baseline for comparison as the Hong Kong Strategy and Action Plan on AMR was issued in 2017 and such decision was endorsed by the High Level Steering Committee
 - One-way Cochran-Armitage test was used to look for trend
 - $P < 0.05$ was considered statistically significant
 - $P < 0.01$ was considered statistically highly significant

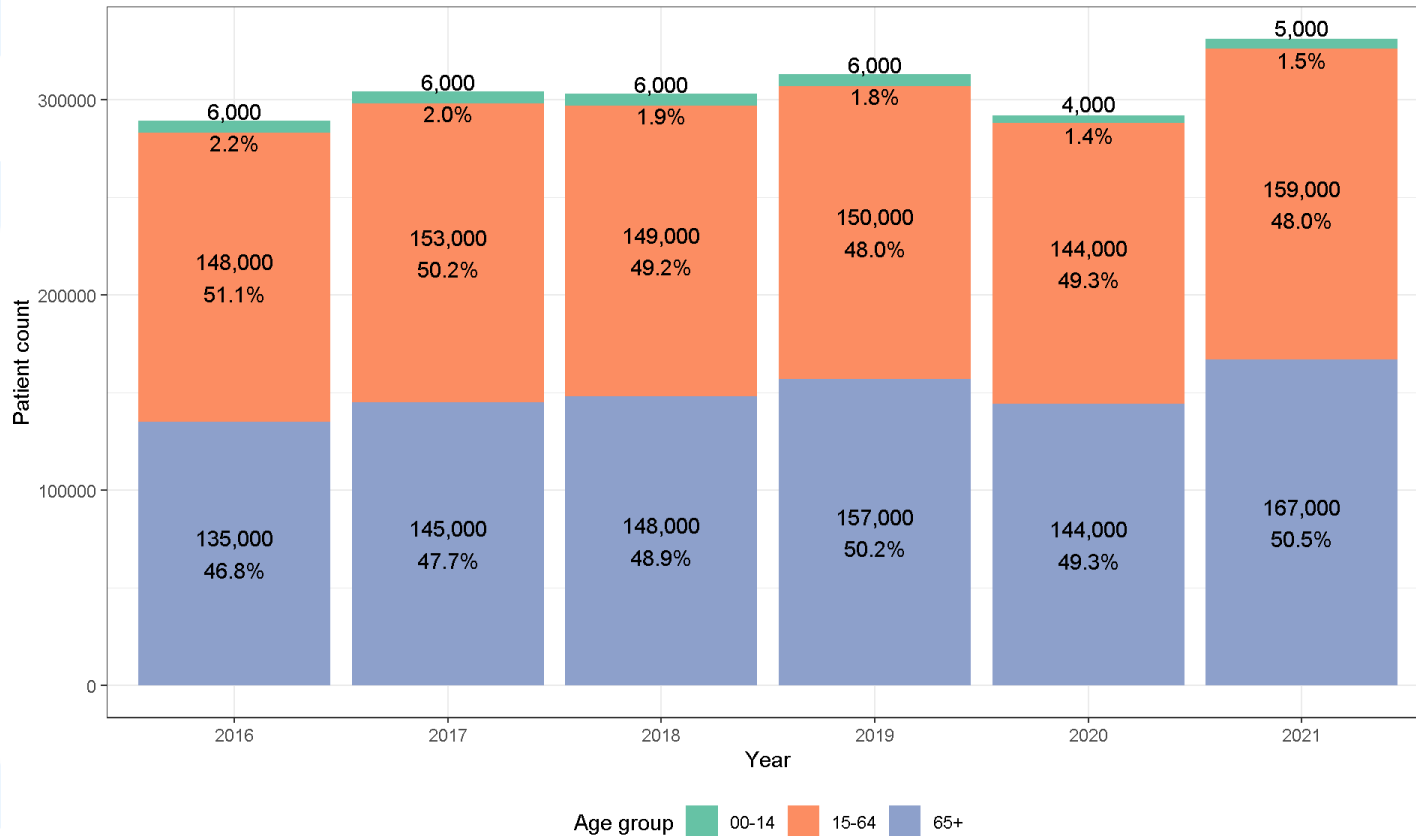


Results

1. Overview on patients with urine culture



Age distribution of patients with urine culture

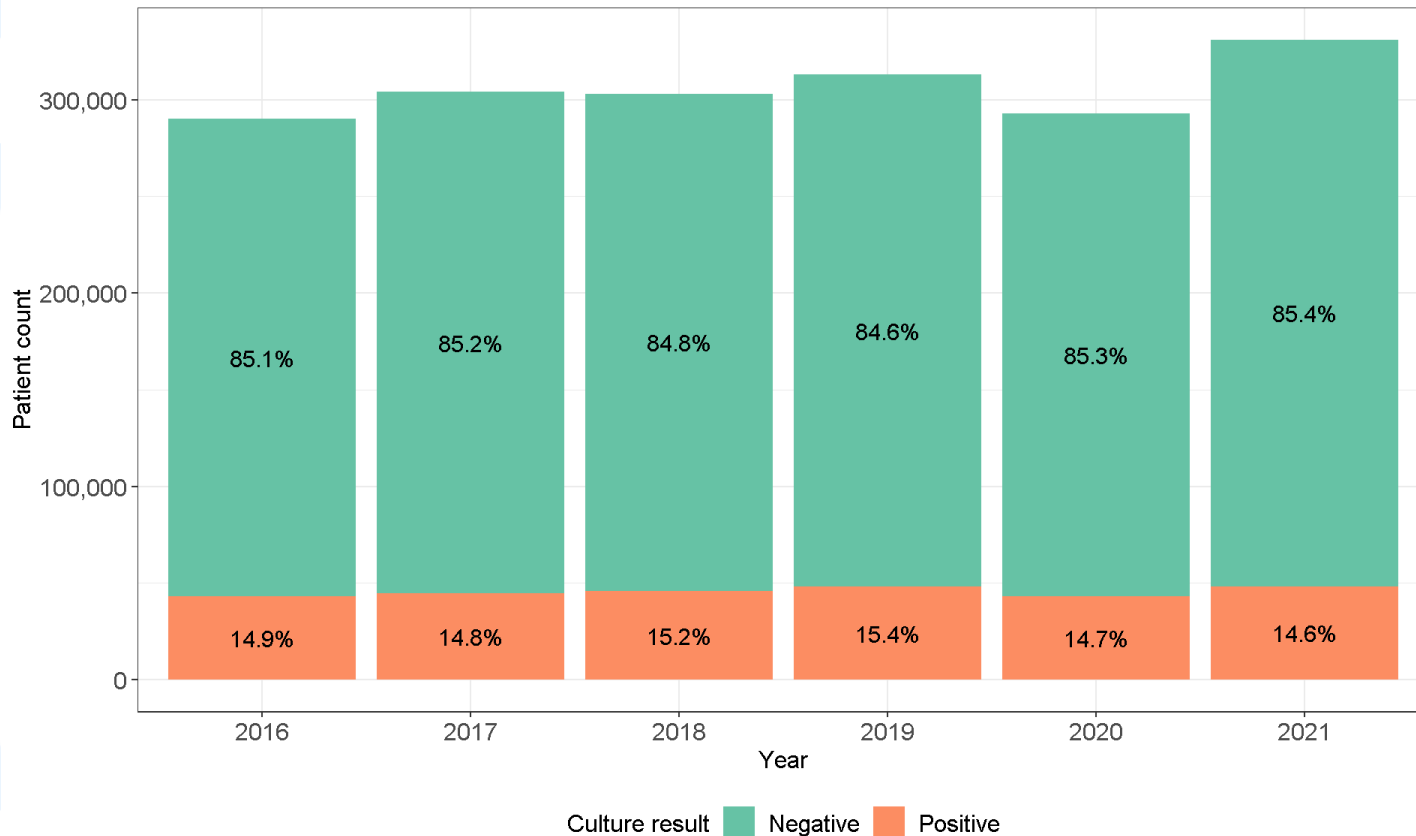


- No. of patient with urine culture increased from 293,000 in 2020 to 331,000 in 2021 (13% increase)

(Patient count rounded to nearest thousand)



Percentage of Patients with Positive Urine Culture



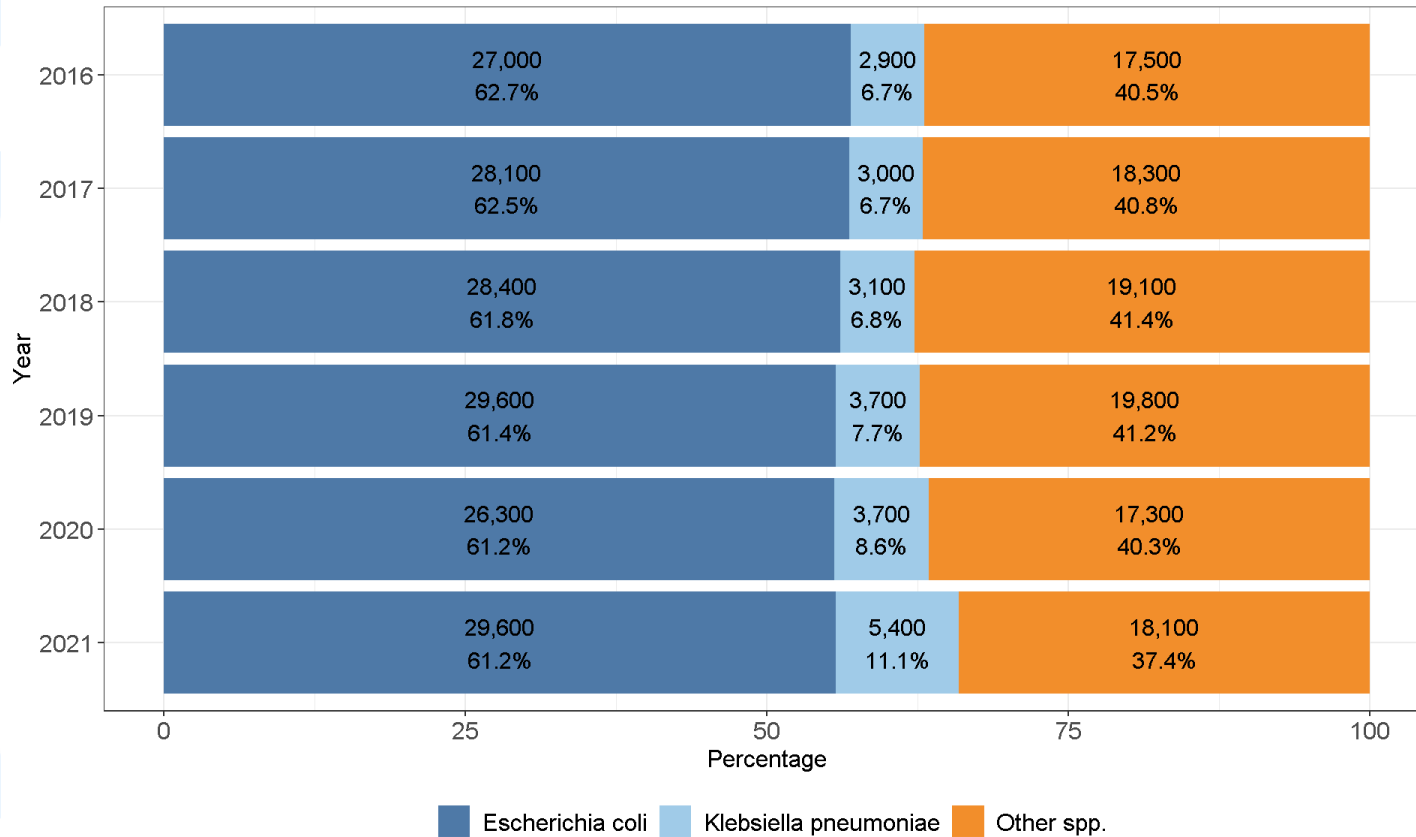
- % patients with positive urine culture remained stable over the past years at around 14 – 15%

Results – Urine Culture

2. Overview on WHO priority organisms isolated from urine



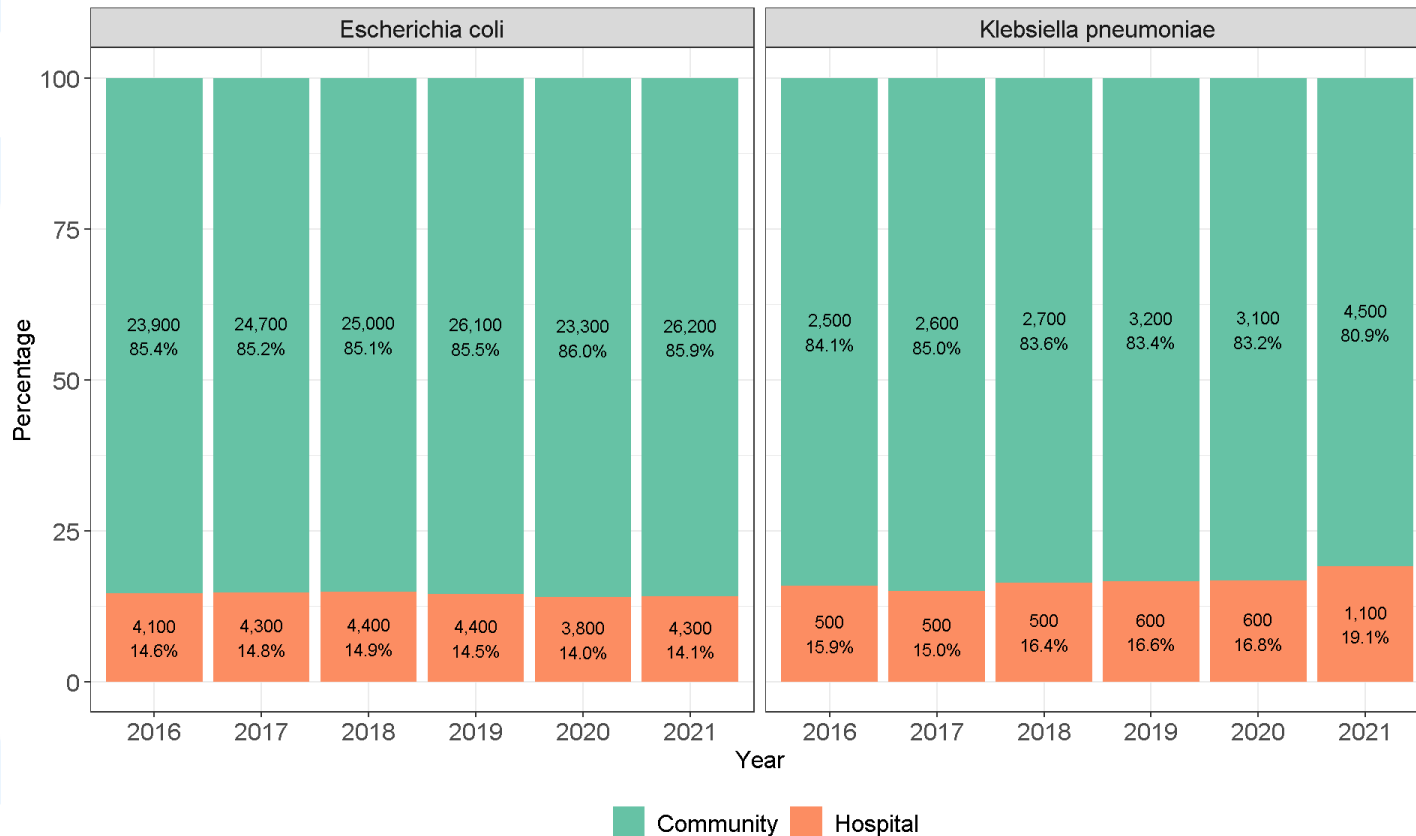
Distribution of Organisms by Year



- The most common WHO priority organism cultured from urine remained to be *E. coli* from 2016 to 2021



Distribution of Organisms by Location of Onset



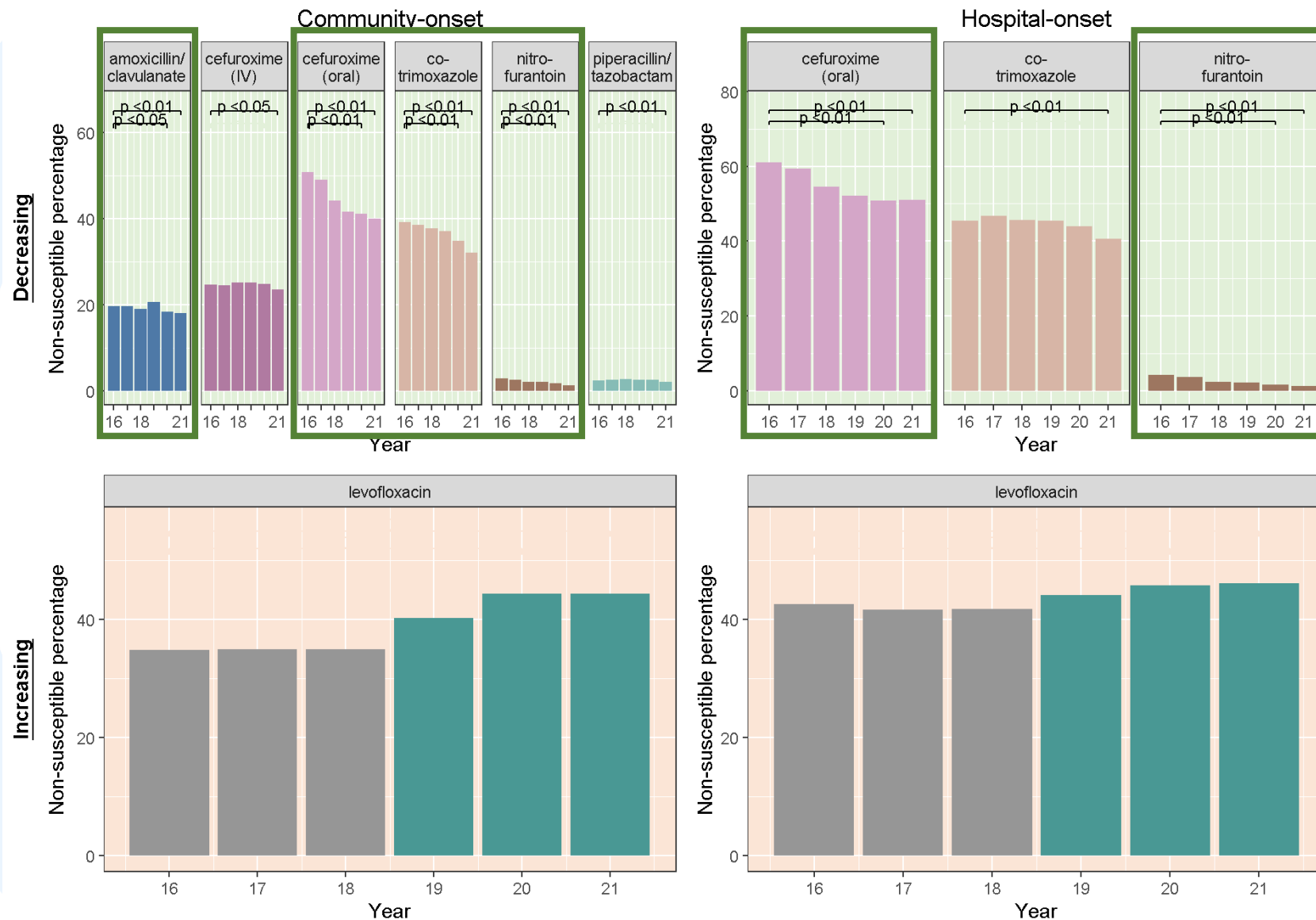
- Both *Escherichia coli* and *Klebsiella pneumoniae* were predominantly community-onset from 2016 to 2021

Results – Urine Culture

3. AST results for WHO priority organisms isolated from urine



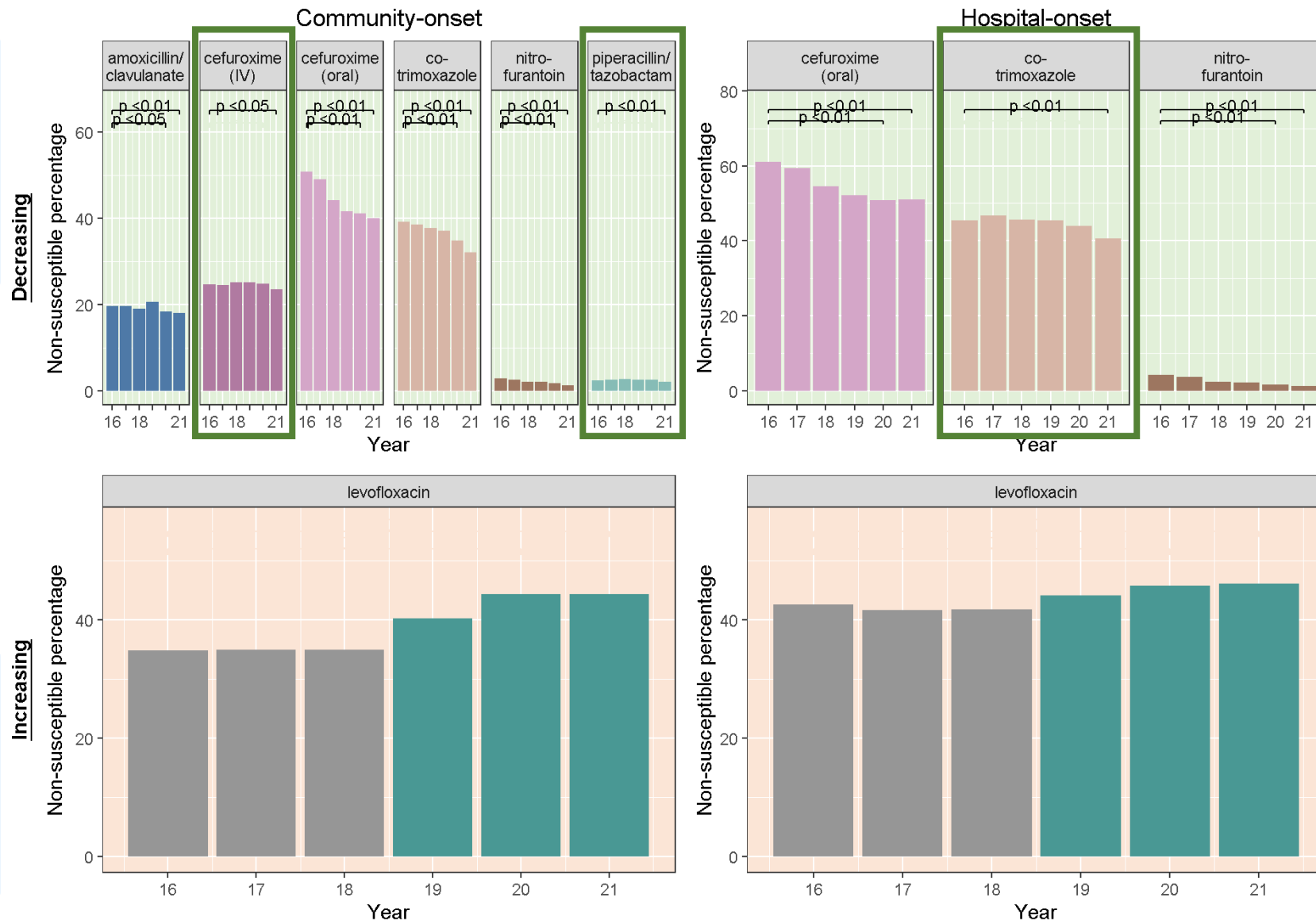
Significant change in trend for *E. coli* (16 to 21)



‡ Revised fluoroquinolones interpretive criteria for Enterobacteriaceae (except *Salmonella* spp.) was released by CLSI in 2019. The increase in 2019 and thereafter compared with 2018 and before may be contributed by a change in CLSI criteria.

- Decreasing trend for amoxicillin/ clavulanate (community), cefuroxime (oral) (community & hospital), co-trimoxazole (community) and nitrofurantoin (community & hospital) were observed in 16-20 and 16-21

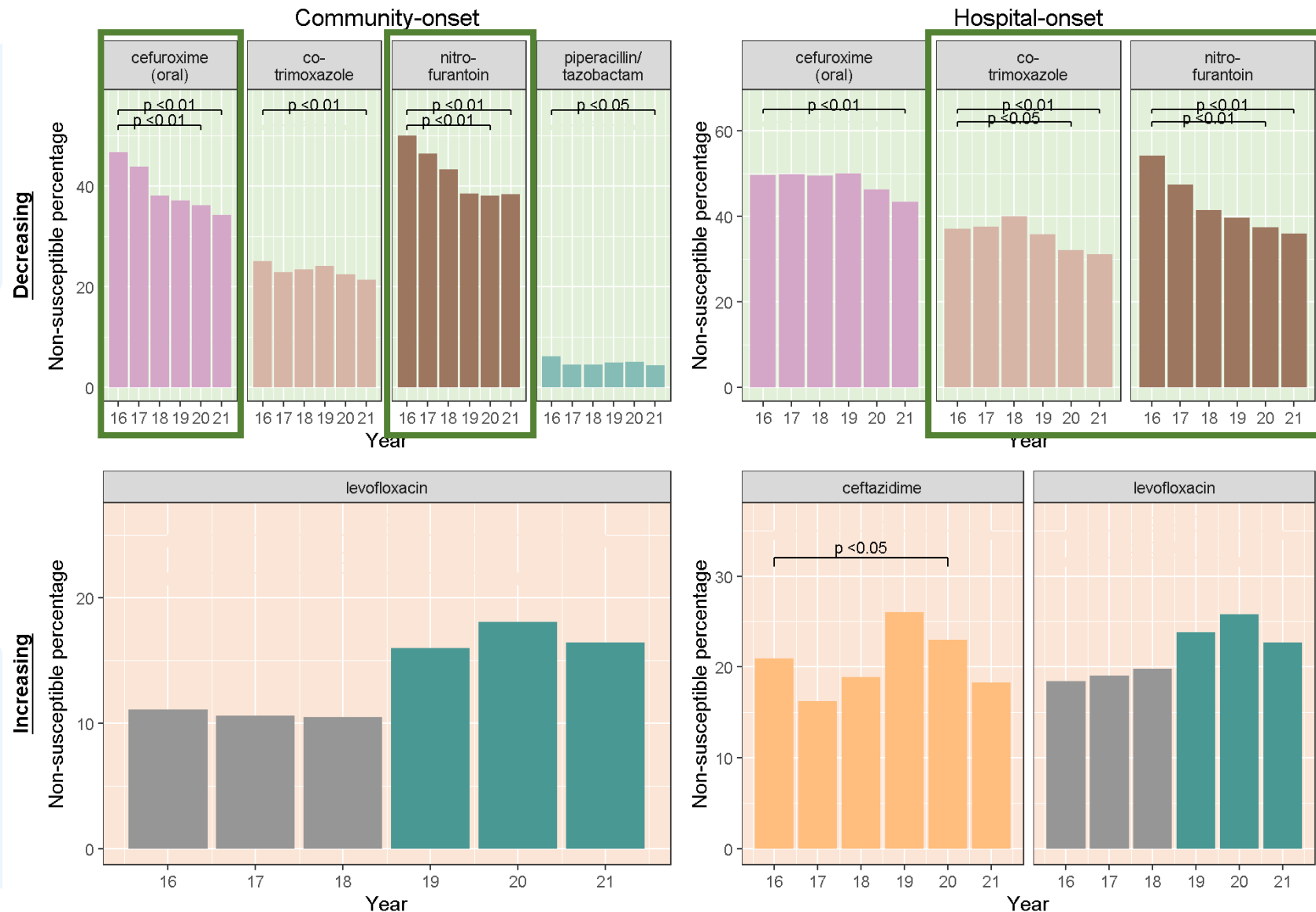
Significant change in trend for *E. coli* (16 to 21)



‡ Revised fluoroquinolones interpretive criteria for Enterobacteriaceae (except *Salmonella* spp.) was released by CLSI in 2019. The increase in 2019 and thereafter compared with 2018 and before may be contributed by a change in CLSI criteria.

- Decreasing trend for cefuroxime (IV) (community), piperacillin/ tazobactam (community) and co-trimoxazole (hospital) were newly seen in 16-21

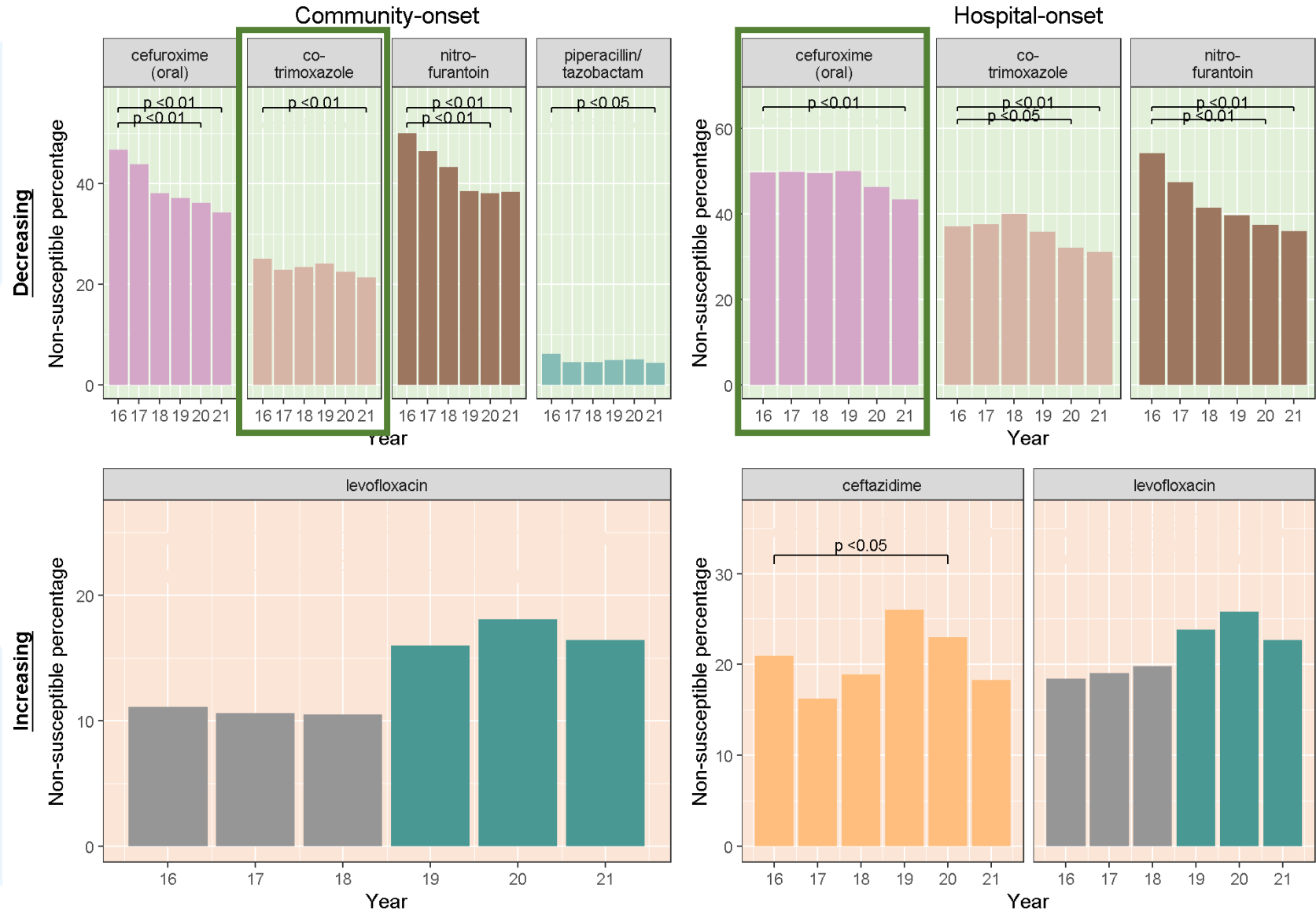
Significant change in trend for *K. pneumoniae* (16 to 21)



‡ Revised fluoroquinolones interpretive criteria for Enterobacteriaceae (except *Salmonella* spp.) was released by CLSI in 2019. The increase in 2019 and thereafter compared with 2018 and before may be contributed by a change in CLSI criteria.

1. Downward trends were observed for cefuroxime (oral) (community), co-trimoxazole (hospital) and nitrofurantoin (community & hospital) from 16-20 and 16-21

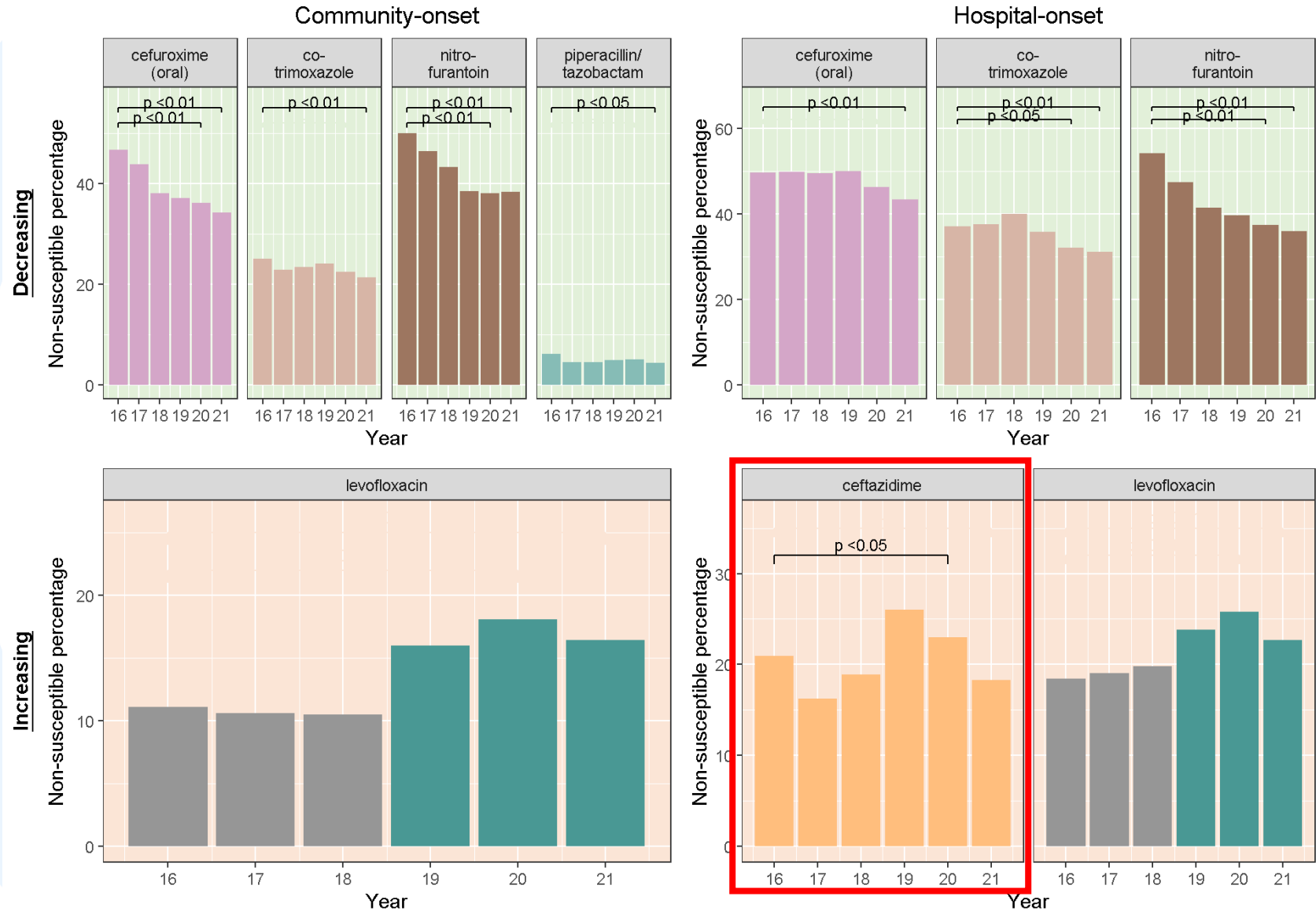
Significant change in trend for *K. pneumoniae* (16 to 21)



‡ Revised fluoroquinolones interpretive criteria for Enterobacteriaceae (except *Salmonella* spp.) was released by CLSI in 2019. The increase in 2019 and thereafter compared with 2018 and before may be contributed by a change in CLSI criteria.

2. Downward trends were newly observed for co-trimoxazole (community) and cefuroxime (oral) (hospital) for 16-21

Significant change in trend for *K. pneumoniae* (16 to 21)



‡ Revised fluoroquinolones interpretive criteria for Enterobacteriaceae (except *Salmonella* spp.) was released by CLSI in 2019. The increase in 2019 and thereafter compared with 2018 and before may be contributed by a change in CLSI criteria.

Remarks on Interpretation of Results

- CLSI guidelines for sensitivity testing involving levofloxacin interpretive criteria for Enterobacteriaceae (except *Salmonella* spp.) has been updated in 2019. In case laboratories in HA chose to apply the criteria for reporting in 2019, some *E. coli* and *K. pneumoniae* isolates previously categorised as sensitive to levofloxacin / ciprofloxacin using the old criteria would become non-susceptible following a change in zone size requirement under the 2019 criteria.
- Laboratories of different hospitals might use different panels for AST. This could result in bias of results toward those laboratories performing a major proportion of a particular AST especially if number of isolates tested is small.
 - In the report, the issue of small number of isolates is partially addressed, in accordance of recommendation by WHO GLASS, that non-susceptibility results derived from <10 isolates were not included for analysis.



Summary Table on Key Findings (Urine)

WHO priority organism	Proportion of isolates being non-susceptible to antimicrobials, 2016 vs 2021	
	Community-onset	Hospital-onset
<i>E. coli</i>	↓ Amoxicillin/clavulanate (19.6% → 18.0%) ↓ Piperacillin/tazobactam (2.4% → 2.1%) ↓ Cefuroxime (IV) (24.7% → 23.6%) ↓ Cefuroxime (Oral) (50.7% → 39.9%) ↓ Co-trimoxazole (39.2% → 32.0%) ↓ Nitrofurantoin (2.9% → 1.2%)	↓ Cefuroxime (Oral) (61.0% → 51.0%) ↓ Co-trimoxazole (45.4% → 40.6%) ↓ Nitrofurantoin (4.3% → 1.3%)
<i>K. pneumoniae</i>	↓ Piperacillin/tazobactam (6.2% → 4.3%) ↓ Cefuroxime (oral) (46.6% → 34.2%) ↓ Co-trimoxazole (25.1% → 21.4%) ↓ Nitrofurantoin (49.9% → 38.3%)	↓ Cefuroxime (oral) (49.6% → 43.3%) ↓ Co-trimoxazole (37.0% → 31.1%) ↓ Nitrofurantoin (54.2% → 35.9%)





Summary



Summary



Downward trends of non-susceptibility (NS) continued in 16-20 and 16-21:

E. coli – amoxicillin/ clavulanate, cefuroxime (oral), co-trimoxazole, nitrofurantoin

K. pneumoniae – cefuroxime (oral), co-trimoxazole, nitrofurantoin



New downward trend of NS observed in 16-21:

E. coli – co-trimoxazole, cefuroxime (IV), piperacillin/ tazobactam

K. pneumoniae – co-trimoxazole, cefuroxime (oral)



Recommendations

- Decreasing trends of non-susceptibility could maintain for both *Escherichia coli* and *Klebsiella pneumoniae* towards most antimicrobials
- New decreasing trend was also observed
- Further monitoring would be continued

