

Trends in Hospital-onset Escherichia coli Infections Resistant to Fluoroquinolones and Extended-spectrum Cephalosporins, 2012-2020

Nicole Hood^{1,2}, MPH, Hannah M. Wolford¹, MSPH, Babatunde Olubajo¹, PHD, MPH, Ashley Rose¹, MPH, James Baggs¹, PHD, Sujan C. Reddy¹, MD

¹Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, Atlanta, GA

²Epidemiology Department, Rollins School of Public Health, Emory University, Atlanta, GA

CONTACT INFO

Nicole Hood, MPH
rnu6@cdc.gov

BACKGROUND

Inpatient and outpatient fluoroquinolone (FQ) use has decreased substantially in the last decade; however, the impact of this trend on FQ resistance is less clear. During this period, extended-spectrum β -lactamase-producing (ESBL) Enterobacteriales infections increased. We examined hospital-onset (HO) *E. coli* clinical culture trends and resistance patterns among hospitalized adult patients in the United States.

METHODS

- We measured prevalence of positive clinical cultures from inpatient encounters in a cohort of hospitals submitting data to PINC AI Healthcare Database from 2012-2020.
- We included *E. coli* cultures with susceptibility testing to FQs and extended-spectrum cephalosporins (ESC)
- Hospital onset** was defined as cultures obtained ≥ 4 days into hospitalization
- FQ resistance** was defined as non-susceptibility to:
 - ciprofloxacin, levofloxacin, or moxifloxacin
- ESC resistance** was defined as non-susceptibility to:
 - cefotaxime, ceftriaxone, ceftazidime, or cefepime
- Co-resistance** was defined as non-susceptibility to:
 - both ESC and FQ resistance in the same *E. coli* isolate
- Isolates were classified as FQ resistant only (and not ESC), ESC resistant only (and not FQ), co-resistant, or neither FQ nor ESC resistant.**
- As few as 190 hospitals (in 2012) and as many as 247 hospitals (in 2017) contributed data within a given year
- A total of 706,595 isolates tested positive for *E. coli*

While overall hospital-onset fluoroquinolone (FQ) resistant *E. coli* infections declined by 12% from 2012-2020, co-resistance with extended-spectrum cephalosporins and FQs increased by 75% during the same period.

Figure 1. Annual Proportion of Hospital-onset *E. coli* Infections with Selected Antibiotic Resistance Patterns, 2012-2020

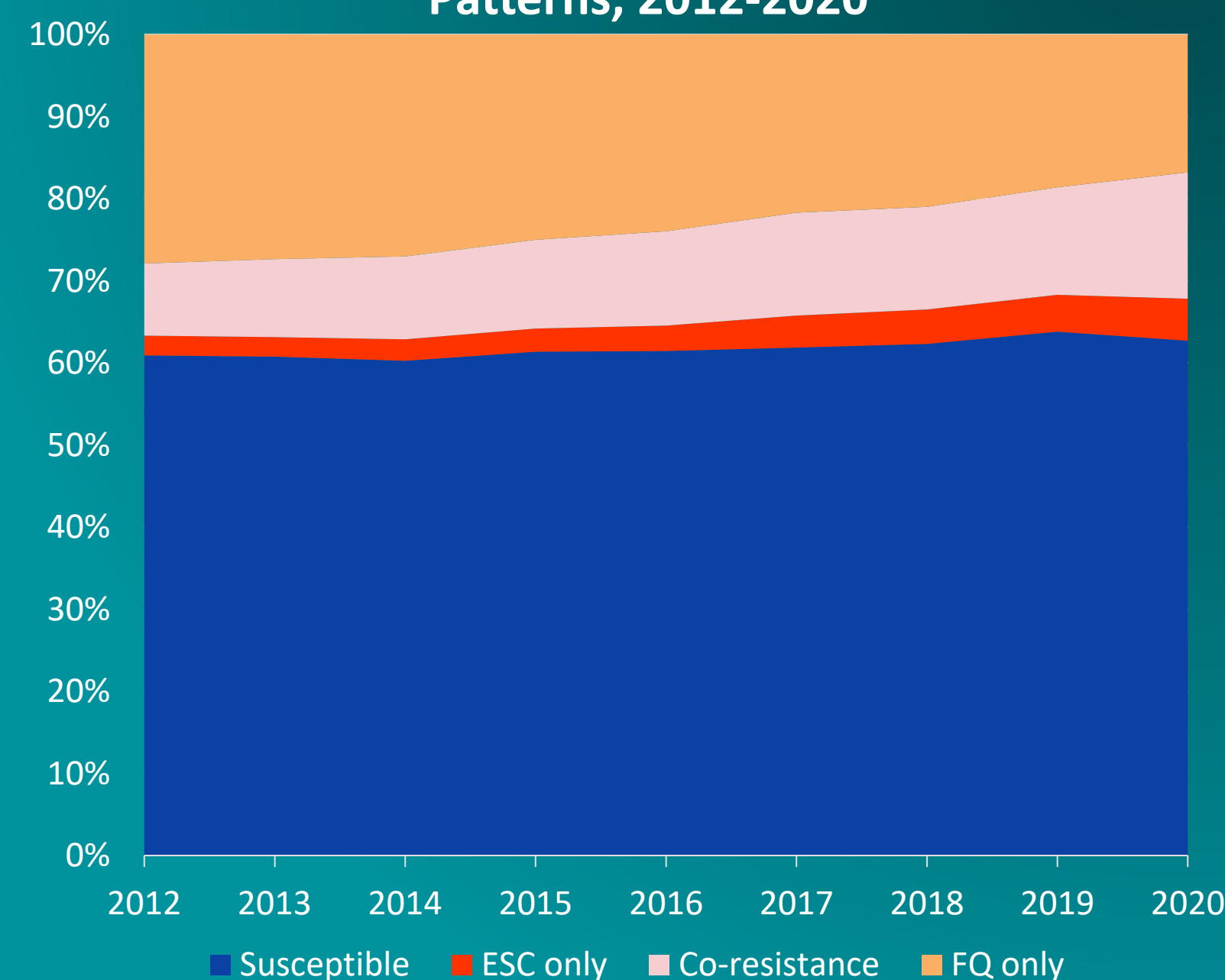
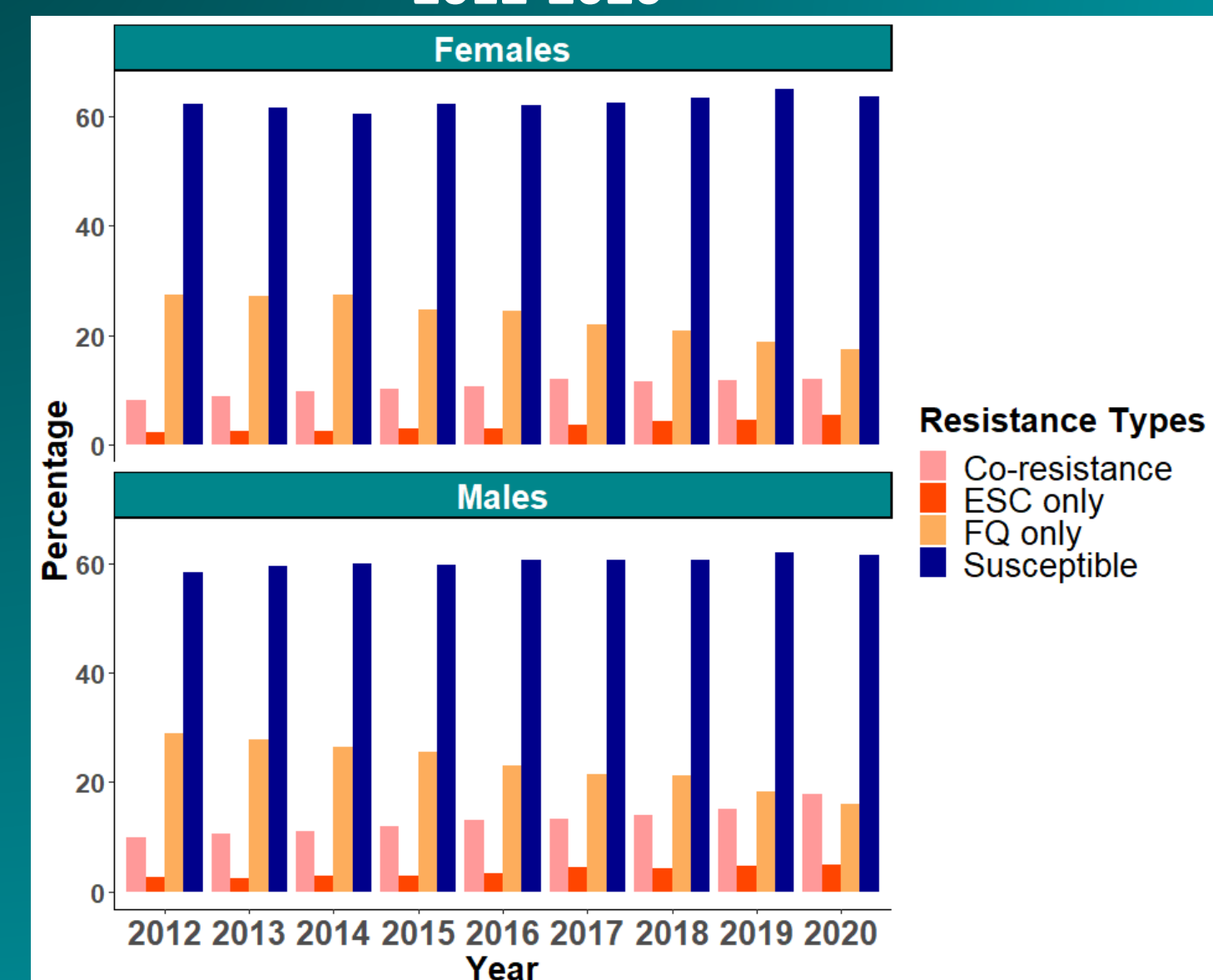


Figure 2. Annual Proportion of Selected Antibiotic Resistance Patterns by Gender, 2012-2020



RESULTS

- Overall FQ resistance decreased by 12.3% (from 36.7% in 2012 to 32.2% in 2020) (Figure 1)
- The proportion of HO *E. coli* with only FQ resistance decreased by 39.8%
- However, the overall proportion of HO *E. coli* infections with co-resistance increased by 75.0% (from 8.8% in 2012 to 15.4% in 2020)
- In 2020, about half of FQ-resistant *E. coli* infections had co-resistance with ESC
- The overall proportion of HO *E. coli* infections with only ESC resistance increased by 112.5% (from 2.4% in 2012 to 5.1% in 2020)
- Males had a greater increase from 2012 to 2020 in co-resistant *E. coli* infections compared to the increase seen in females

CONCLUSIONS

These results suggest that declining FQ use has been accompanied by a decrease in overall FQ resistance, but an increase in co-resistant *E. coli*. Increases in FQ and ESC co-resistance may be due to factors including increases in the use of non-FQ antibiotics such as cephalosporins and increased transmission of *E. coli* strains such as ST131 in which co-resistance is prevalent. Antibiotic stewardship across multiple antibiotic classes combined with infection control measures are likely necessary to reduce multidrug resistant *E. coli* infections.

