

Background

- Approximately 3 million cases of complicated urinary tract infections (cUTI) occur annually in the U.S. with over 80% being diagnosed in the community setting.¹
- ESBL-producing Enterobacterales infections alone increased by 53% from 2012-2017, with community-onset cases largely driving this finding (64% increase in community-onset ESBL infections).²
- Antimicrobial resistance (AMR) and multidrug resistance (MDR) are a growing threat and can complicate effective management of urinary tract infections.
- cUTIs are typically treated with initial empiric therapy, however agents commonly used to treat urinary tract infections caused by Enterobacterales are becoming ineffective due to higher circulating baseline antibiotic resistance, resulting in treatment failures and unnecessary hospitalizations.³⁻⁷
- We aimed to improve our understanding of current nationwide resistance patterns in the outpatient setting to help inform empiric treatment and antimicrobial stewardship efforts.

Methods

- We conducted a retrospective study of AMR in Enterobacterales (ENT: *E. coli*, *K. pneumoniae*, *K. oxytoca*, *P. mirabilis*) urine isolates for 2019 across 295 outpatient US facilities utilizing BD Insights Research Database (Franklin Lakes, NJ USA)
- Isolates were non duplicate (first isolate of a species within 30 days), noncontaminant and collected from adult outpatients with antimicrobial susceptibility done by each facility's reference lab
- Analyses were based on culture results patients were not required to have a urinary tract infection UTI diagnosis or symptoms
- ENT urine isolates were evaluated for the following AMR categories: extended spectrum beta lactamase producing phenotype (ESBL + by confirmatory test or non-susceptible (NS) to ceftriaxone, cefotaxime, ceftazidime or ceftazidime + ceftazidime), trimethoprim/sulfamethoxazole (TMP/ SMX) NS, fluoroquinolone NS, nitrofurantoin NS, and MDR defined as resistance to 3 antibiotic classes
- We evaluated the percentage of resistant isolates overall based on the geographic region (based on US census regions and zip code tabulation) and report at county level. Counties without susceptibility results were populated to the nearest county either within or across state lines
- Only counties with ≥ 30 tested isolates were reported and those with < 30 isolates tested were indicated as $< 1\%$ NS (e.g., insufficient isolates tested).

Results

- In total, 669,664 (*E. coli*, *K. pneumoniae*, *K. oxytoca*, *P. mirabilis*) urine isolates were collected and tested.
- High rates of resistance to oral UTI therapies were observed in the ambulatory setting.
- A total of 14 states (28%) had county resistance rates $\geq 20\%$ for ESBL-producing Enterobacterales from urine collection: **(Figure 1 and Figure 3)**
 - Missouri had the highest rate (28.6%), followed by Kentucky, North Carolina, Tennessee, Virginia, and West Virginia each at 24.7%.
 - Georgia, Arizona, New Mexico, Texas and Florida all were observed to have $>20\%$ ESBL-phenotype rates.
 - Delaware, Maryland, and New Jersey all reported 20% ESBL-phenotype rates.
- MDR (≥ 3 drug NS) rates $\geq 10\%$ were noted within 9 states (18%). **(Figure 2 and Figure 3)**
 - States in rank order included: Missouri (20%), Kentucky, North Carolina, Tennessee, Virginia, and West Virginia with areas observing 14.7% MDR rates.
 - Georgia, Alabama, and Florida also had counties with MDR rates $>10\%$.
 - Counties within California, Hawaii, Texas, and Ohio observed rates of MDR Enterobacterales which ranged from 9.3%-9.5%.
- Across all states, the mean highest reported resistance rates among counties was 14% for ESBL-producing phenotypes and 7.1% for MDR Enterobacterales isolates **(Figure 3)**.

Figure 1. Rate of non-duplicate outpatient ESBL phenotype per total isolates tested in 2019

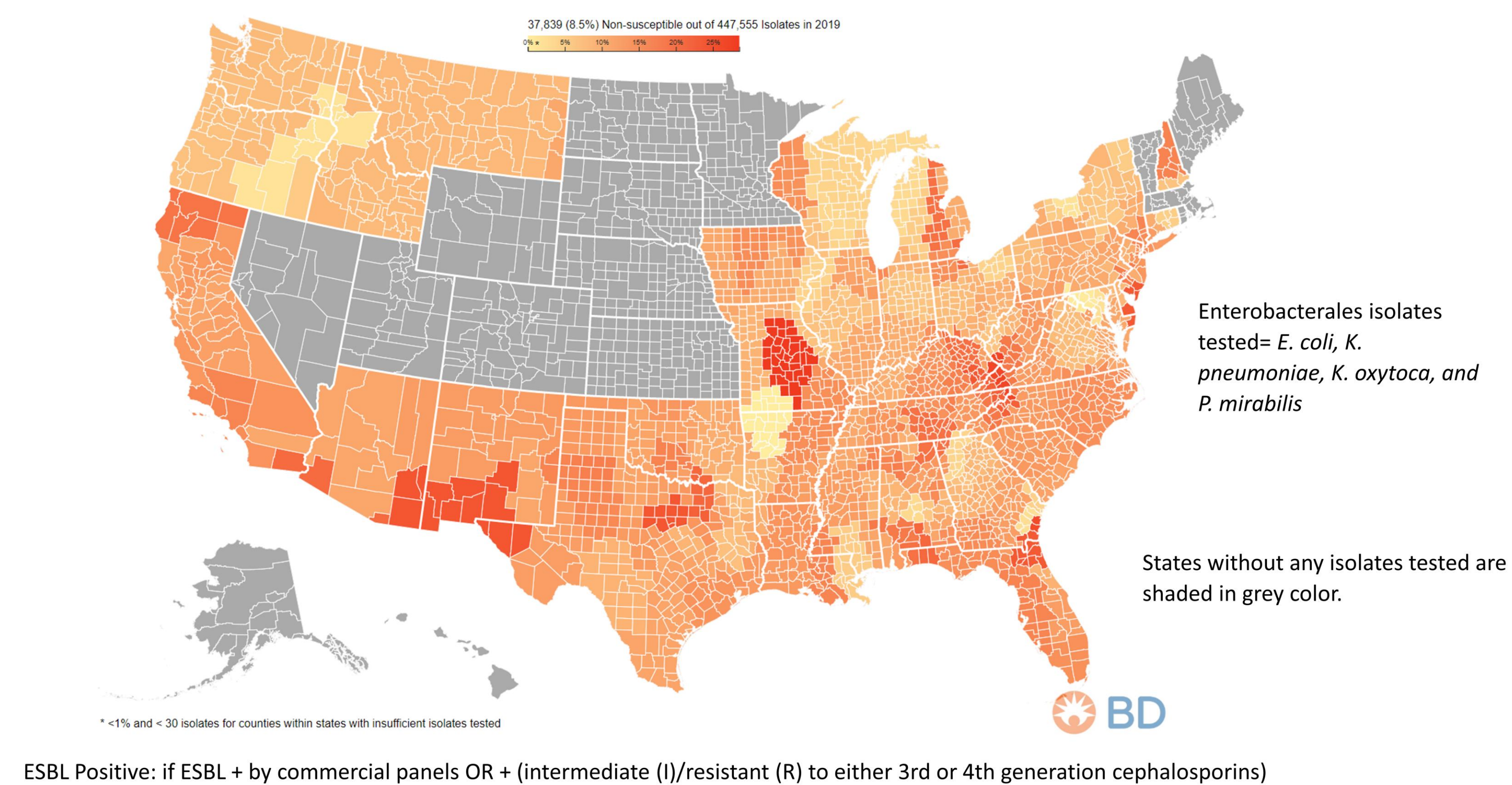


Figure 2. Rate of non-duplicate outpatient MDR (≥ 3 drug NS) per total isolates tested in 2019

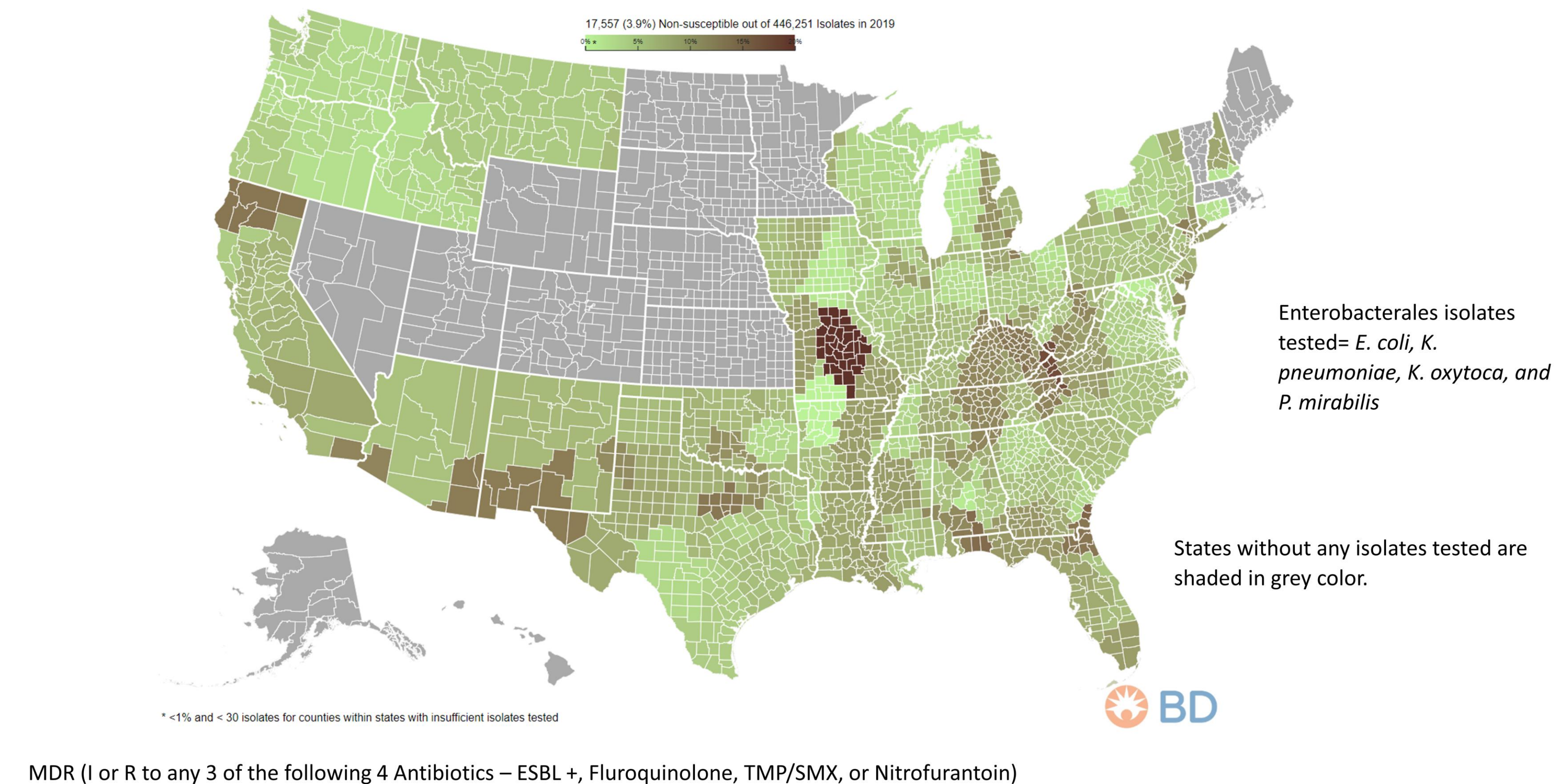
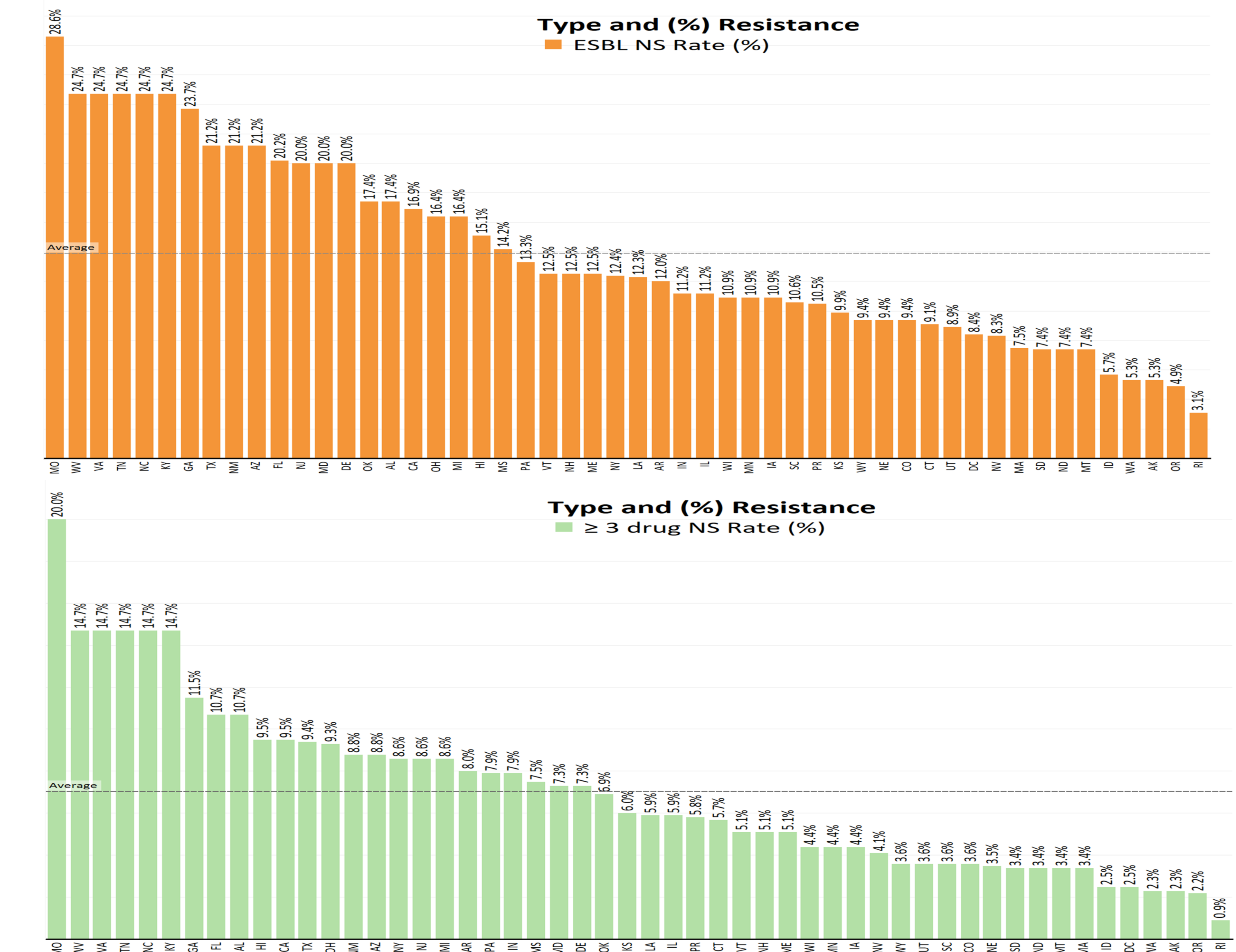


Figure 3. Highest county rates of ESBL and MDR phenotype per total isolates tested in 2019 in each state



Summary and Conclusions

- Although, there were geographic variations, across all regions, important differences were noted for ESBL-producing phenotypes and MDR resistance rates in the ambulatory setting.
- Alarmingly, many states harbored resistance rates $\geq 20\%$ for ESBLs-producing phenotypes and MDR $\geq 10\%$.
- These geographical resistance rates are concerning, given the lack of viable oral treatment options for patients with UTIs in the outpatient setting.
- Higher resistance may lead to negative patient outcomes and unnecessary ED visits or inpatient admissions.³
- Antimicrobial stewardship and educational efforts on the selection of appropriate empiric antibiotics may be worthwhile additional efforts in these endemic geographical areas.
- The approval of newer oral agents that overcome AMR are warranted and offer an alternative to limited existing oral therapy.

References

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