

Antimicrobial resistance trends in *Escherichia coli* and *Klebsiella pneumoniae* urinary isolates from Switzerland over a 5-year period (2009-2014)

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Background: Urinary tract infections (UTI) are among the most frequent infections in the community and in the hospital setting and are most often treated empirically without knowledge of individual microbiology and susceptibility results. Comprehensive resistance surveillance data on a national level are therefore important to guide empiric antibiotic regimens for UTI.

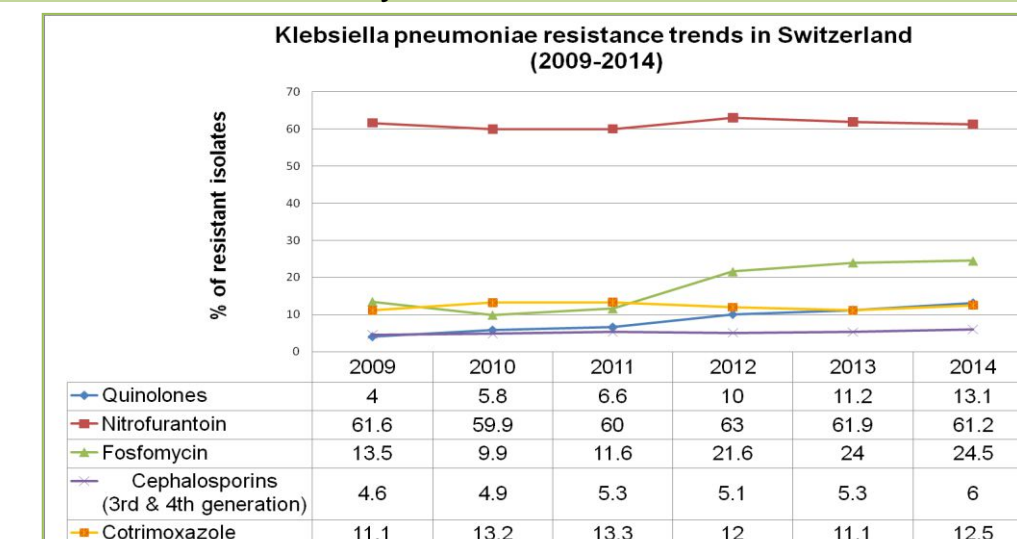
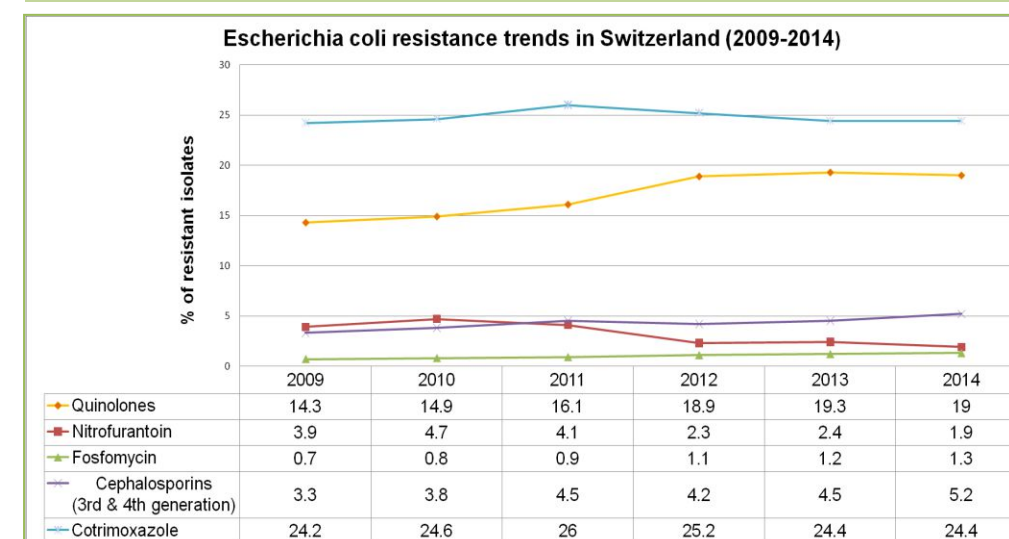
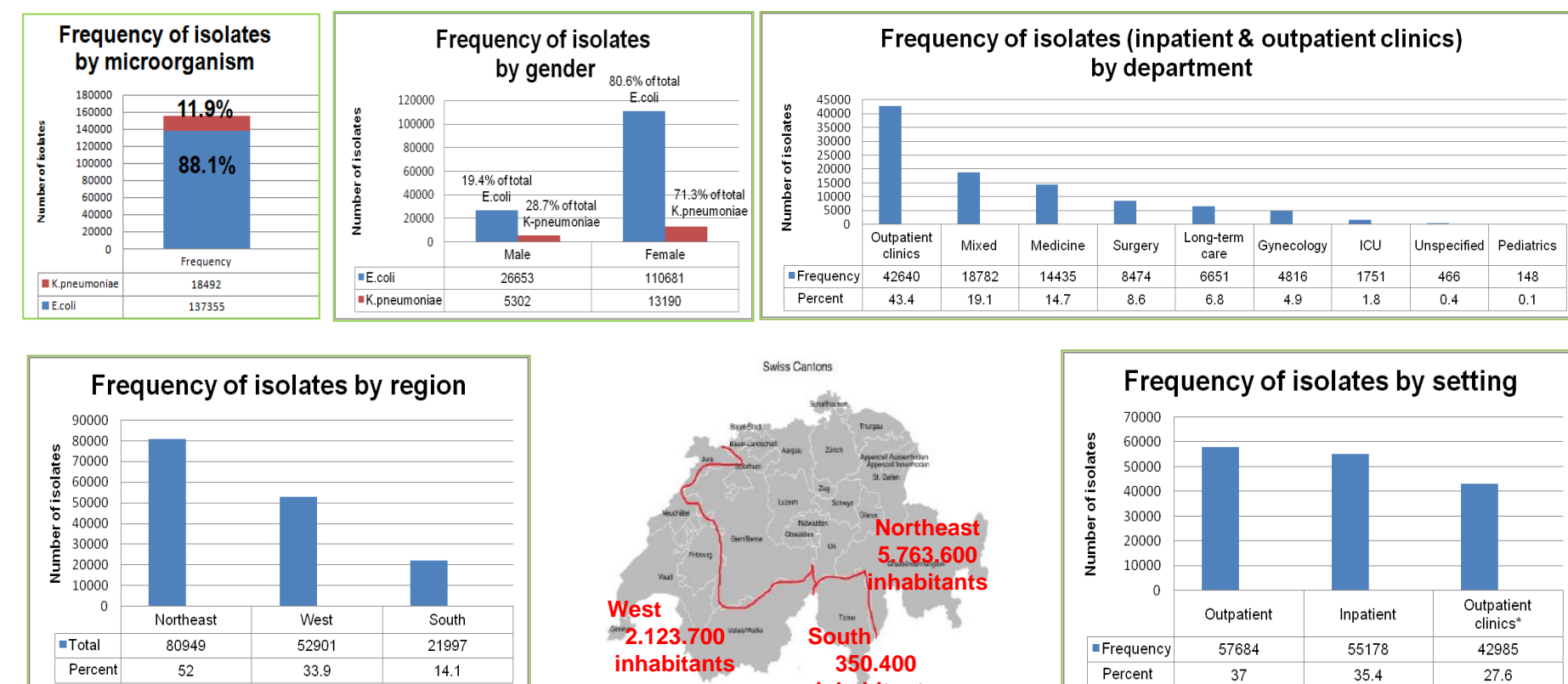
Methods:

- The data were collected by ANRESIS, a laboratory-based antimicrobial resistance surveillance system, and included data from 12 laboratories homogeneously distributed across Switzerland.
- We analyzed data for routinely collected *Escherichia coli* and *Klebsiella pneumoniae* urinary samples from the community and hospital setting between 2009 and 2014.
- Isolates were considered resistant as reported by the laboratories providing the data. Intermediate isolates were considered resistant.
- Our analyses focused on resistance to antibiotics commonly prescribed for UTI
 - cotrimoxazole, fluoroquinolones, nitrofurantoin, fosfomycin and third or fourth generation cephalosporins (as a surrogate of extended spectrum beta-lactamase production (ESBL))
- Only the first isolate per patient per year was included for all age groups
- Annual increase rates were calculated comparing 2009 and 2014 rates

Results:

- In total, **155 847** urinary isolates were included, of which 137,355 (88.1%) were *E. coli* isolates.
- The prevalence of **quinolone** resistance increased from 14.3 to 19.0% ($p < 0.001$) for *E. coli* and from 4.0 to 13.1% ($p < 0.001$) for *K. pneumoniae*.
 - For *E. coli* the increase was more pronounced among inpatient isolates, on average +1.0% per year versus +0.25% for community isolates
 - For *K. pneumoniae* trends in both settings were similar (+2.0% versus +1.7%).
- A higher average yearly increase was described in isolates obtained from males +1.4% for *E. coli* and +2.4% for *K. pneumoniae* (females showed a yearly increase of +0.5% and +1.6% respectively. The increase was statistically significant for both pathogens both in males and in females ($p < 0.001$).
- Cotrimoxazole** resistance rates remained stable over time for in- and outpatients
 - 24.2 vs. 24.4% for *E. coli* and 11.1 vs. 12.5% for *K. pneumoniae*, respectively
- Resistance to **third and fourth generation cephalosporins** remained low but has been increasing over the study period
 - from 3.3 to 5.2% for *E. coli* ($p < 0.001$) and from 4.6 to 6.0% for *K. pneumoniae* in 2014 with yearly increases $< 0.5\%$
- For **fosfomycin**, resistance rates for *E. coli* were below 1.5% over the whole study period
 - with yearly increases $< 1\%$ for in- and outpatients.
- For **nitrofurantoin** the prevalence of resistant isolates was below 5% and decreased over the study period
 - 0.4% for *E. coli*
- K. pneumoniae* showed high resistance rates to both drugs
 - 61.2% for nitrofurantoin and 24.5% for fosfomycin in 2014
 - with an increase of +2.2% between 2009 and 2014 for fosfomycin.

Characteristics of included samples (2009-2014):



Conclusions:

- National surveillance data confirm that nitrofurantoin and fosfomycin remain good options for the empiric treatment of uncomplicated lower UTI in Switzerland.
- Quinolones should be used with caution, as *E. coli* resistance proportions are high for this compound and rates are increasing.
- Resistance to third/fourth generation cephalosporins remains low but has been increasing.
- The unavailability of antibiotic consumption data is an intrinsic limitation to the interpretation of the results.