

Temporal and regional incidence of carbapenemase-producing Enterobacterales in Switzerland from 2013 to 2018

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Background

Increasing rates of carbapenemase-producing Enterobacterales (CPE) have been observed in Europe and all over the world resulting in increased mortality, morbidity and healthcare costs. In Switzerland, several individual CPE cases and local outbreaks were reported since 2009, and CPE were defined as notifiable pathogens by the Swiss Federal Office of Public Health in 2016. However, no systematically collected epidemiological Swiss data has been published until now.

Aims

The aims of this study were i) to describe CPE distributions and trends of different genera and genotypes in Switzerland from 2013 to 2018 on a national, regional and hospital level, including the characterization of individual outbreak clusters and ii) to identify epidemiological factors associated with changes in case incidence.

Methods

Data on human CPE isolates were collected by the Swiss Antibiogramm Committee (SAC) (2013-2015) and the Swiss Federal Office of Public Health (SFPOH) and then collated and analysed for temporal and regional trends by the Swiss Centre for Antibiotic Resistance (ANRESIS). Analyses and visualizations were performed with the R software environment. A statistical detection of regional clusters was performed with the SaTScan software embedded in WHONET.

Results

- A total of 731 CPE isolates were reported in Switzerland from 2013 to 2018.

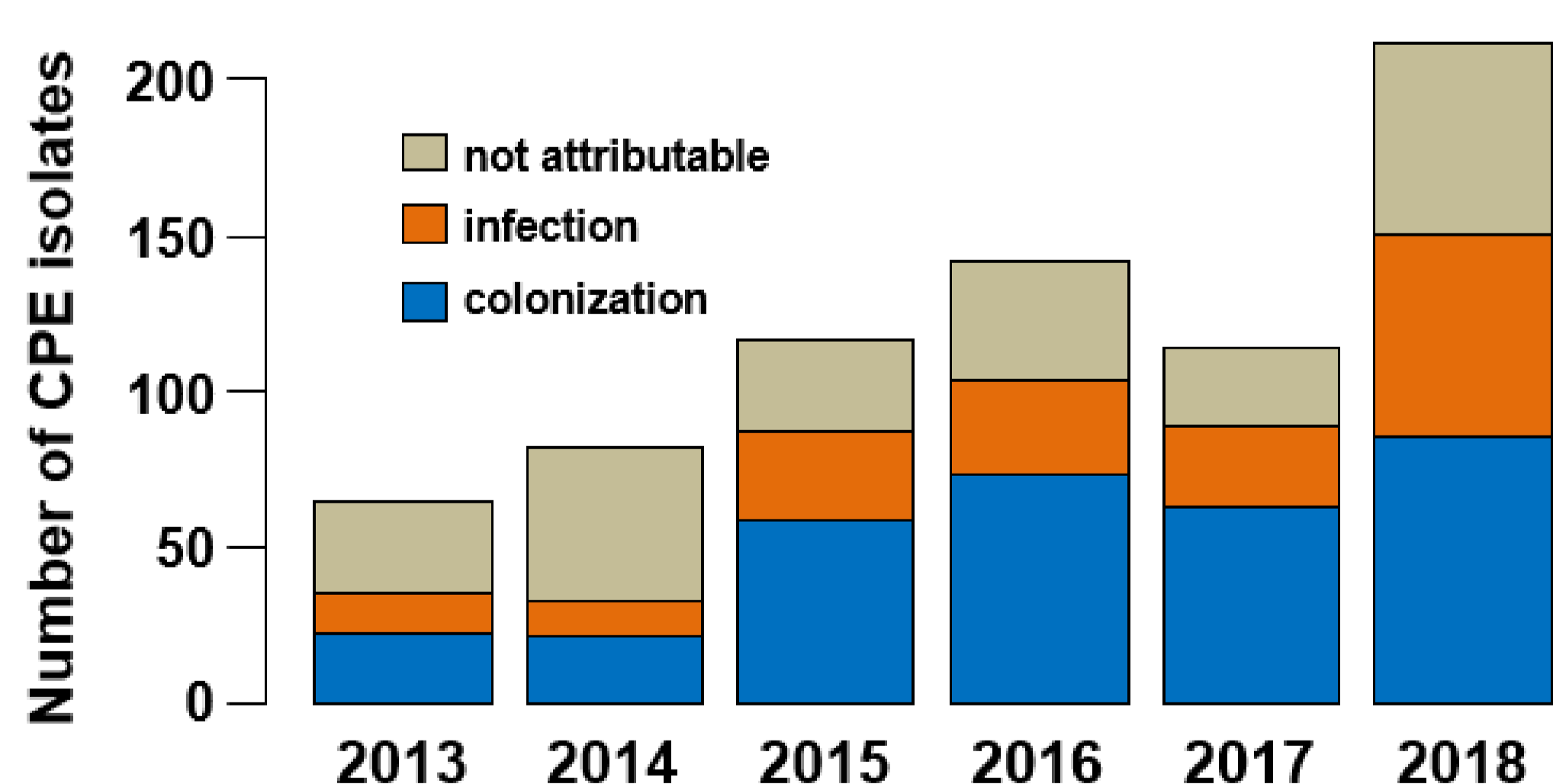


Figure 1: Total number of CPE cases related to colonization and infection from 2013-2018 in Switzerland.

- Yearly detection of CPE isolates has increased considerably from 65 in 2013 to 212 in 2018 (Figure 1). The most frequently isolated species were *Klebsiella pneumoniae* (54% of the cases), followed by 28% *Escherichia coli* (Figure 2).
- The most frequent carbapenemase genotypes were OXA-48-types (43%), followed by 21% KPC and 14% NDM (Figure 3).

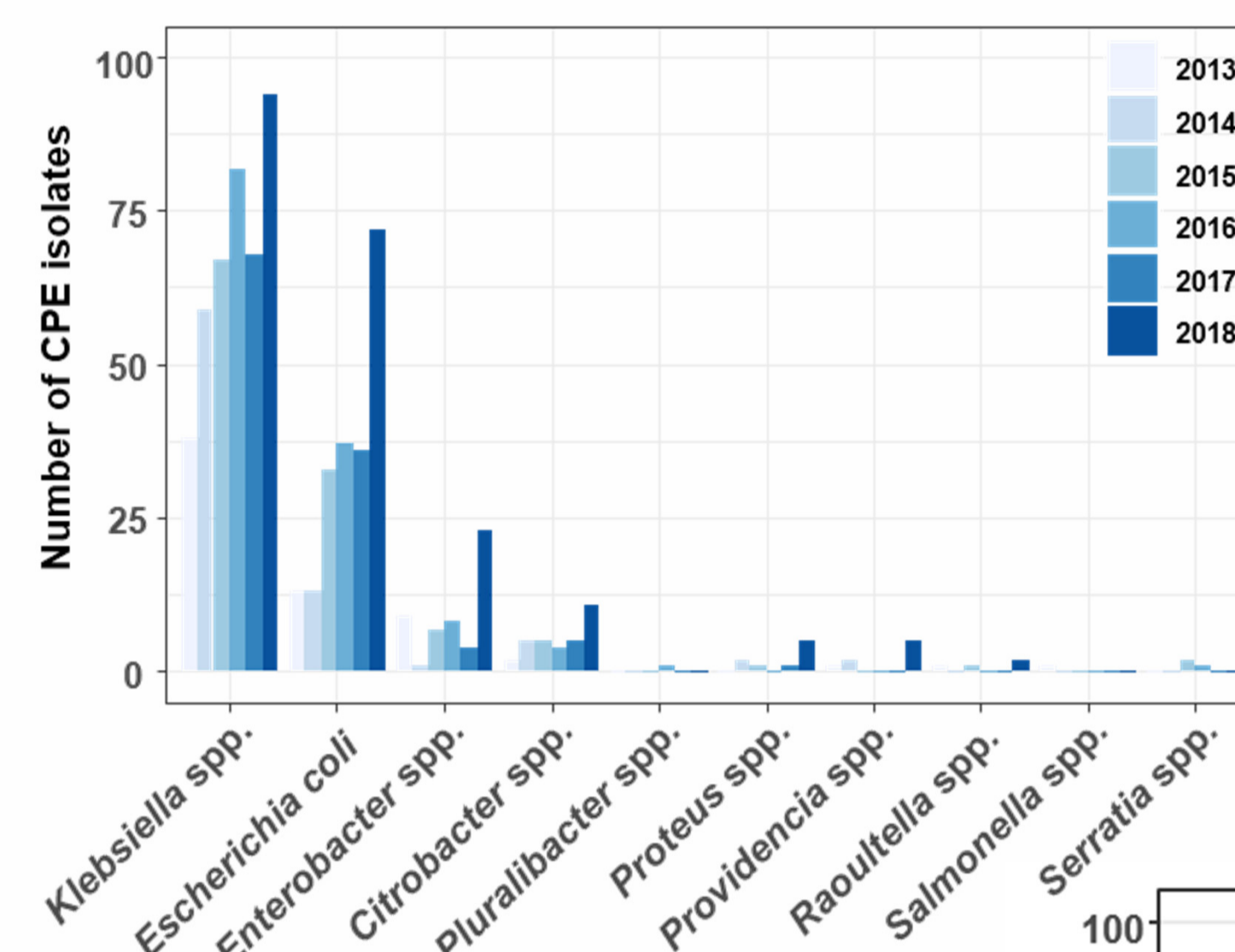


Figure 2. Numbers of CPE isolates by genus (2013-2018).

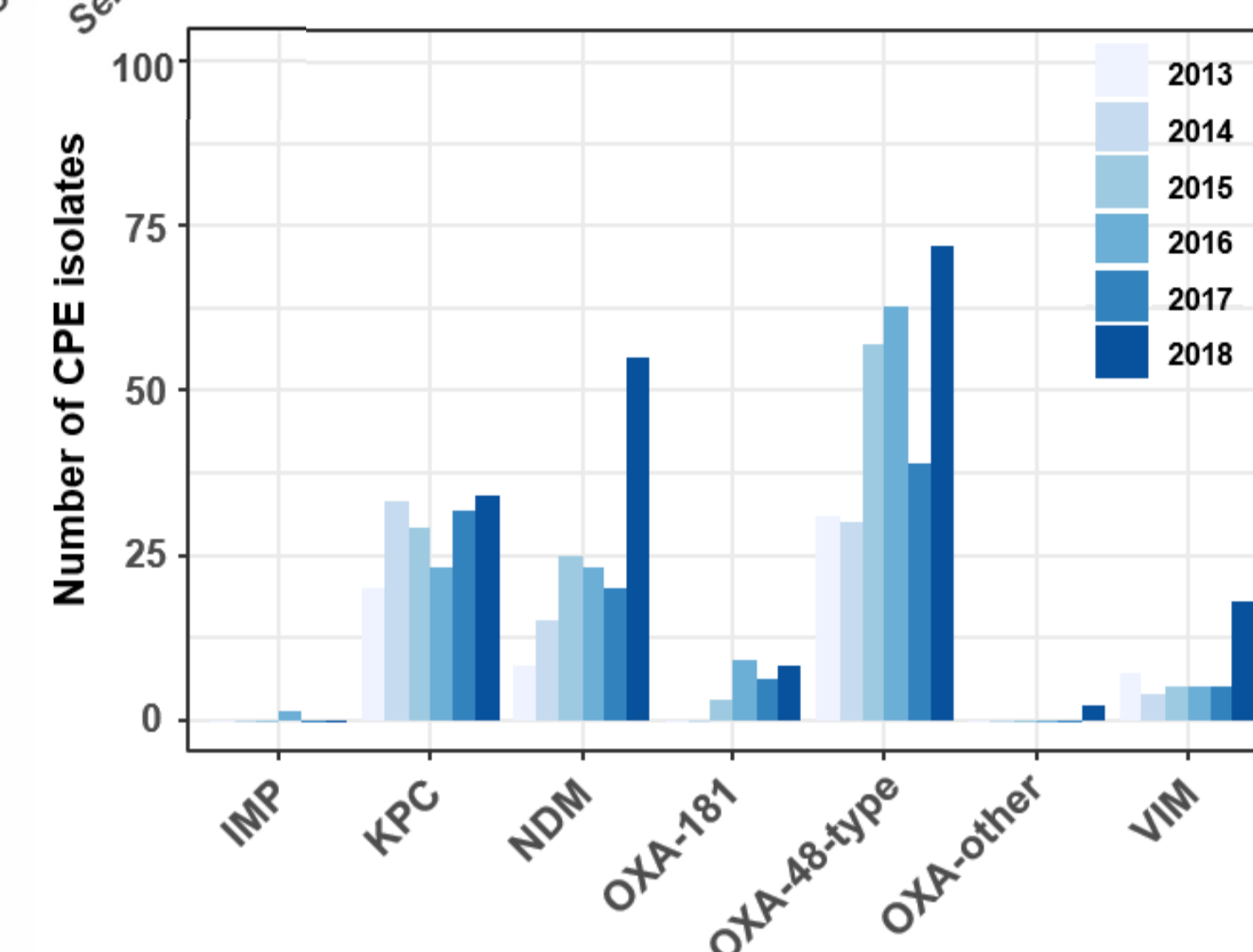


Figure 3. Numbers of CPE isolates by genotype (2013-2018).

- At the regional level, highest numbers of CPE isolates per 100'000 inhabitants were identified in Geneva (predominantly OXA-48-type) bordering France and Ticino (predominantly KPC) bordering Italy (Figure 4).
- A multivariable analysis showed that the incidence was significantly higher for the male gender ($p < 0.01$) and the Geneva region ($p < 0.05$).
- Seven significant local clusters were identified in the WHONET-SaTScan cluster analysis. All of these clusters were identified by the responsible hospital infectiologists already immediately after their occurrence. Three were confirmed as locally detected outbreaks by genetic analyses.

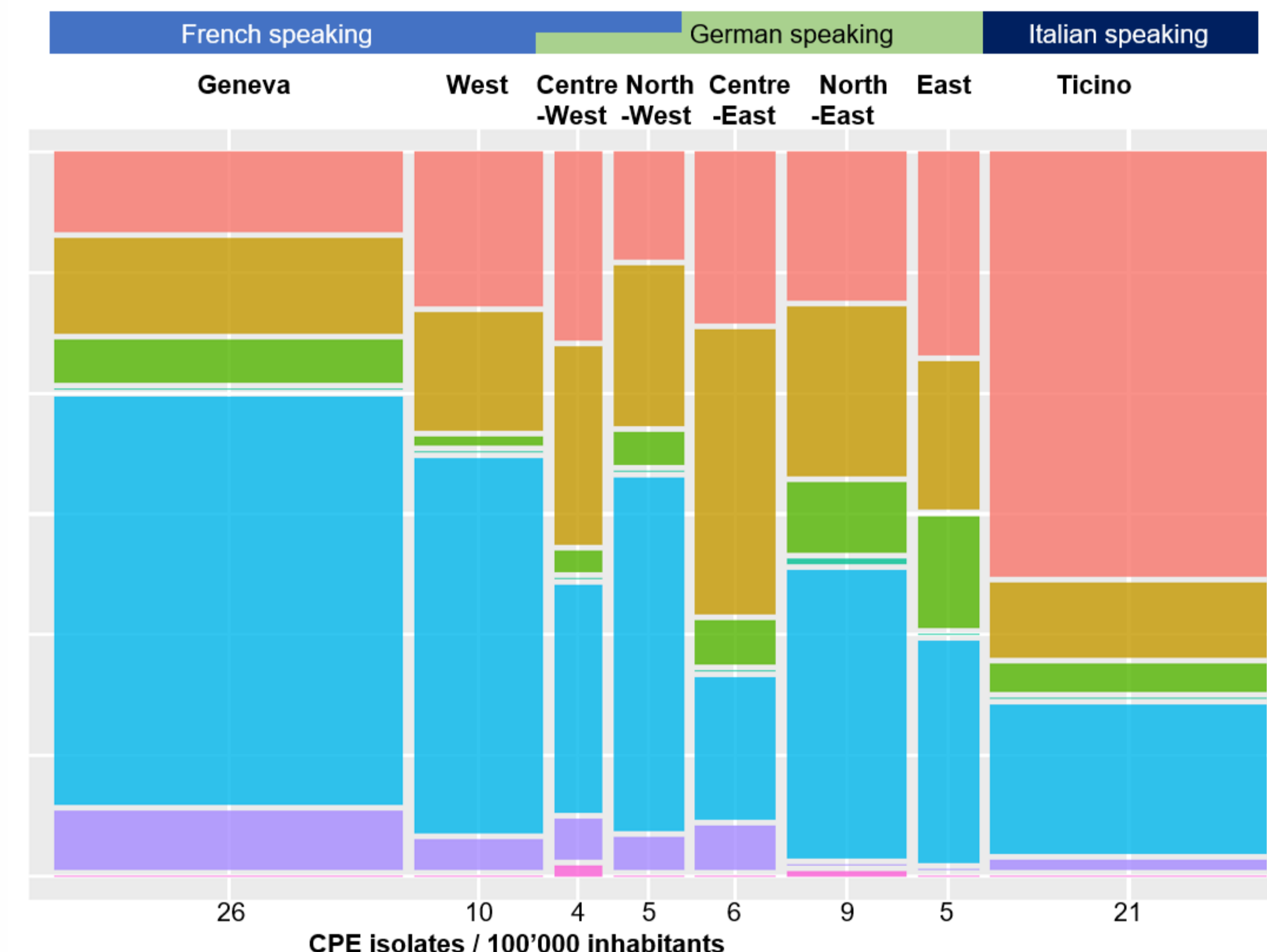


Figure 4. Geographic distribution of CPE genotypes per 100'000 inhabitants 2013-2018. The mean for Switzerland was 8 isolates /100'000 inhabitants.

Conclusion and Outlook

In a first continuous surveillance of CPE in Switzerland a several-fold increase in incidence of all major genotypes was observed from 2013 to 2018. With OXA-48-type predominantly in the western parts (bordering France), and KPC in the southern part (bordering Italy), the genotype distribution within Switzerland mirrors the situation in central Europe. Important future improvements in CPE surveillance are the implementation of national screening guidelines and a more systematic integration of epidemiological and molecular typing data.