Incidence and resistance rates of *Pseudomonas aeruginosa* bloodstream infections in Switzerland: a nationwide surveillance study (2010 – 2022)

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Background

Bloodstream infections (BSI) cause significant morbidity and mortality worldwide (1). *Pseudomonas aeruginosa* is an important microorganism of nosocomial BSI, yet so far, no population-based epidemiological study exists on the incidence of *P. aeruginosa* BSI in Switzerland.

Objective

The aim of this study was to analyse recent trends in the incidence of *P. aeruginosa* BSI and the percentage of resistant isolates in Switzerland and its different linguistic regions.

Methods

A retrospective, nationwide observational study was conducted on *P. aeruginosa* BSI reported from 78 acute care hospitals over a period of 13 years (2010 – 2022). With an overall coverage of 58.1 % of yearly bed-days, the number of BSI was extrapolated to calculate the annual incidence of *P. aeruginosa* BSI for Switzerland and its three main linguistic regions (coverage in the French-speaking region 74.2 %, Italian-speaking region 71.3 %, German-speaking region 52.1 %). A Poisson regression model was used to analyse incidence trends over time.

In addition, the resistance rates were calculated for aminoglycosides, carbapenems, ceftazidime, cefepime, ciprofloxacin and piperacillin-tazobactam, as well as for multidrug-resistant (MDR) *P. aeruginosa,* and the trends were assessed using a logistic regression model. Further stratified analyses by sex and age groups were performed.

Results

The incidence of *P. aeruginosa* BSI in Switzerland increased significantly (p < 0.001) from 5.5/100'000 inhabitants in 2010 to 7.6/100'000 in 2022 (Fig. 1). The incidence was lower in the German-speaking region compared to the French-speaking region (p < 0.001), but there was a higher increase in incidence in the German-speaking region (p < 0.001, Fig. 1). The incidence was higher in males than females in every year (7.9/100'000 *vs.* 3.2/100'000 in 2010 and 10.7/100'000 *vs.* 4.6/100'000 in 2022) and highest in patients aged ≥ 80 years (24.0/100'000 in 2010 and 41.5/100'000 in 2022, Fig. 2a).

Figure 2a: Incidence of *P. aeruginosa* BSI in different age groups 2010 – 2022.

Figure 2b: Pooled resistance rates of *P. aeruginosa* in different age groups.

The resistance rates increased for cefepime (2.4 % in 2010, 8.8 % in 2022, p < 0.001), ceftazidime (5.6 % in 2010, 9.4 % in 2022, p = 0.014), ciprofloxacin (3.3 % in 2010, 6.5 % in 2022, p = 0.014) and piperacillin-tazobactam (6.4 % in 2010, 11.2 % in 2022, p = 0.002). There was no significant upward trend for carbapenems (9.2 % in 2010, 9.1 % in 2022), aminoglycosides (1.5 % in 2010, 2.0 % in 2022), and MDR *P. aeruginosa* (2.5 % in 2010, 3.5 % in 2022, Fig. 3). Regarding the different age groups, the pooled resistance rates were highest in patients aged 2 – 24 years for every antibiotic but ceftazidime (Fig. 2b).

Figure 3: Resistance rates of *P. aeruginosa* for different antibiotics in Switzerland 2010 – 2022.
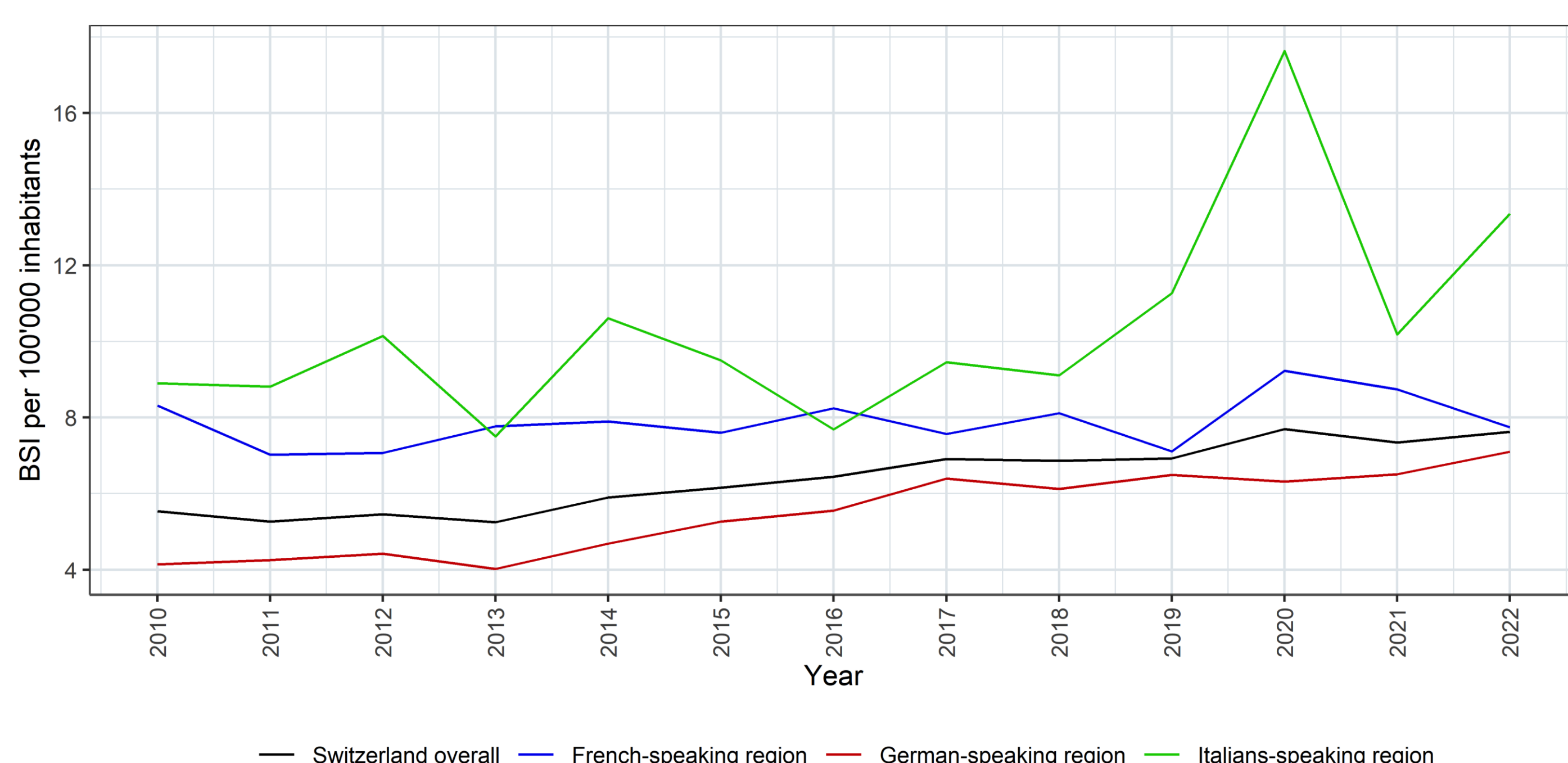

Figure 1: Incidence of *P. aeruginosa* BSI in Switzerland and its different linguistic regions 2010 – 2022. The large variance in the Italian-speaking region might be explained by small sample sizes.
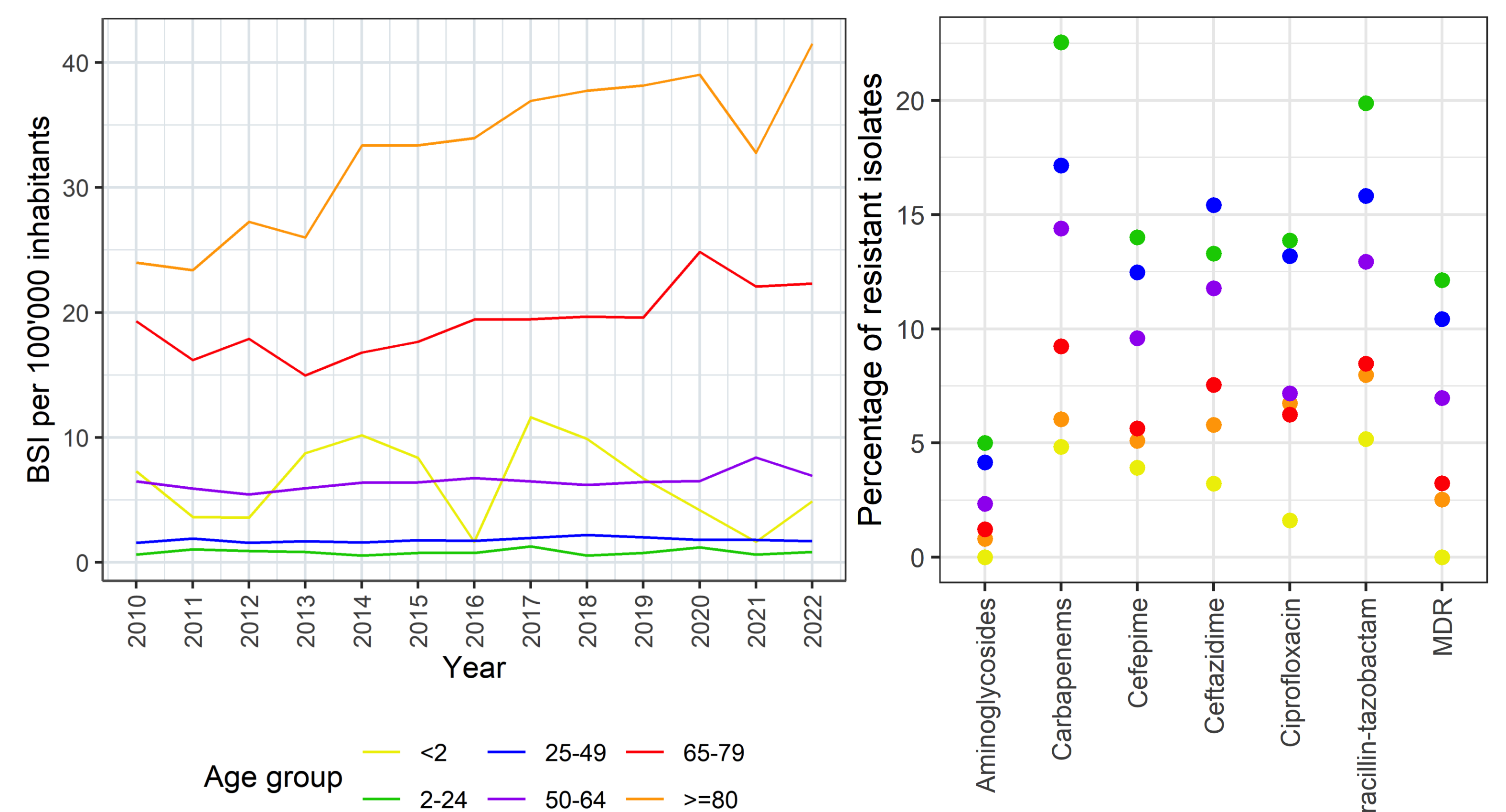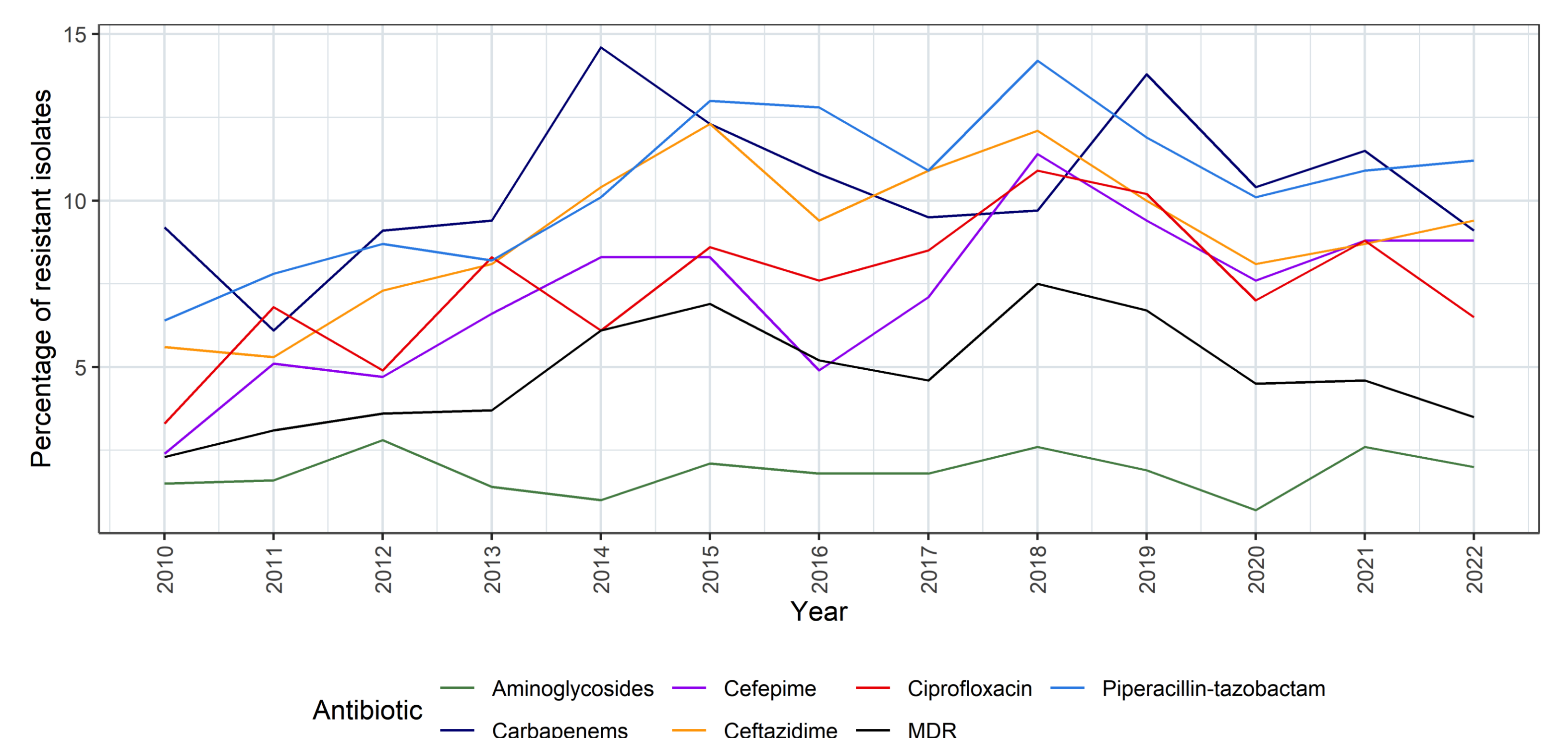
Discussion and Conclusion

The overall incidence of *P. aeruginosa* BSI in Switzerland increased from 2010 to 2022. The incidence in the German-speaking region was approaching the higher incidences in the French- and Italian-speaking regions.

Resistance rates increased for most antibiotics except for aminoglycosides, carbapenems and MDR *P. aeruginosa.* The resistance rates were generally lower compared to the EU/EAA population-weighted mean resistance rates in 2021 (2). Since 2018, a decrease in resistance rates has been observed for most antibiotics.

The high resistance rates in patients aged 2 - 24 years – although having a low incidence – require further investigation on comorbidities (e.g., cystic fibrosis).

References
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