

Temporal and structural patterns of third-generation cephalosporin resistant *Klebsiella pneumoniae* incidence in Swiss hospitals

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BACKGROUND / AIM

Routine surveillance data revealed increasing extended spectrum cephalosporin resistance rates in invasive *Klebsiella pneumoniae* (ESCR-KP) in Switzerland, from 1.3% in 2004 up to 8.5% in 2019.¹

The aim of this study was to identify underlying predictors for changing incidence of invasive ESCR-KP infections in Swiss hospitals such as antibiotic consumption, hospital type (university vs. non-university), linguistic region and time. Further it was aimed to compare the approach of considering overall ESCR-KP incidence (clinical and screening isolates) and invasively infected patients only.

METHODS

A retrospective observational multi-centre study was conducted in 21 Swiss hospitals over a period of 11 years (2009 – 2019).

Yearly ESCR-KP incidence as well as consumption data of 3rd and 4th generation cephalosporins, fluoroquinolones, aminoglycosides and sulfamethoxazole-trimethoprim were aggregated per hospital and stratified per hospital type and linguistic region.

A multiple linear regression model was developed in order to identify predictor variables for incidence of invasive ESCR-KP infections. For infection control purposes, overall ESCR-KP incidence (clinical and screening isolates) was analyzed in a second model. Samples which were labelled by the hospitals as screening sample, faeces, intact skin or anal swab were considered as screening isolates. Samples from other sites were summarized as clinical isolates.

RESULTS

► An increase in incidence of invasive ESCR-KP infections from 0.01 to 0.04 patients/1000 bed-days (Figure 1) was observed between 2009 and 2019 in Switzerland and confirmed by the multiple linear regression model ($P < 0.01$).

► Incidence of invasive ESCR-KP infections was higher in university hospitals ($P < 0.01$) and higher in the French-speaking region compared to the German-speaking region ($P < 0.01$).

► There was no association observed between incidence of invasive ESCR-KP infections and consumption of 3rd and 4th generation cephalosporins, fluoroquinolones, aminoglycosides or sulfamethoxazole-trimethoprim.

RESULTS

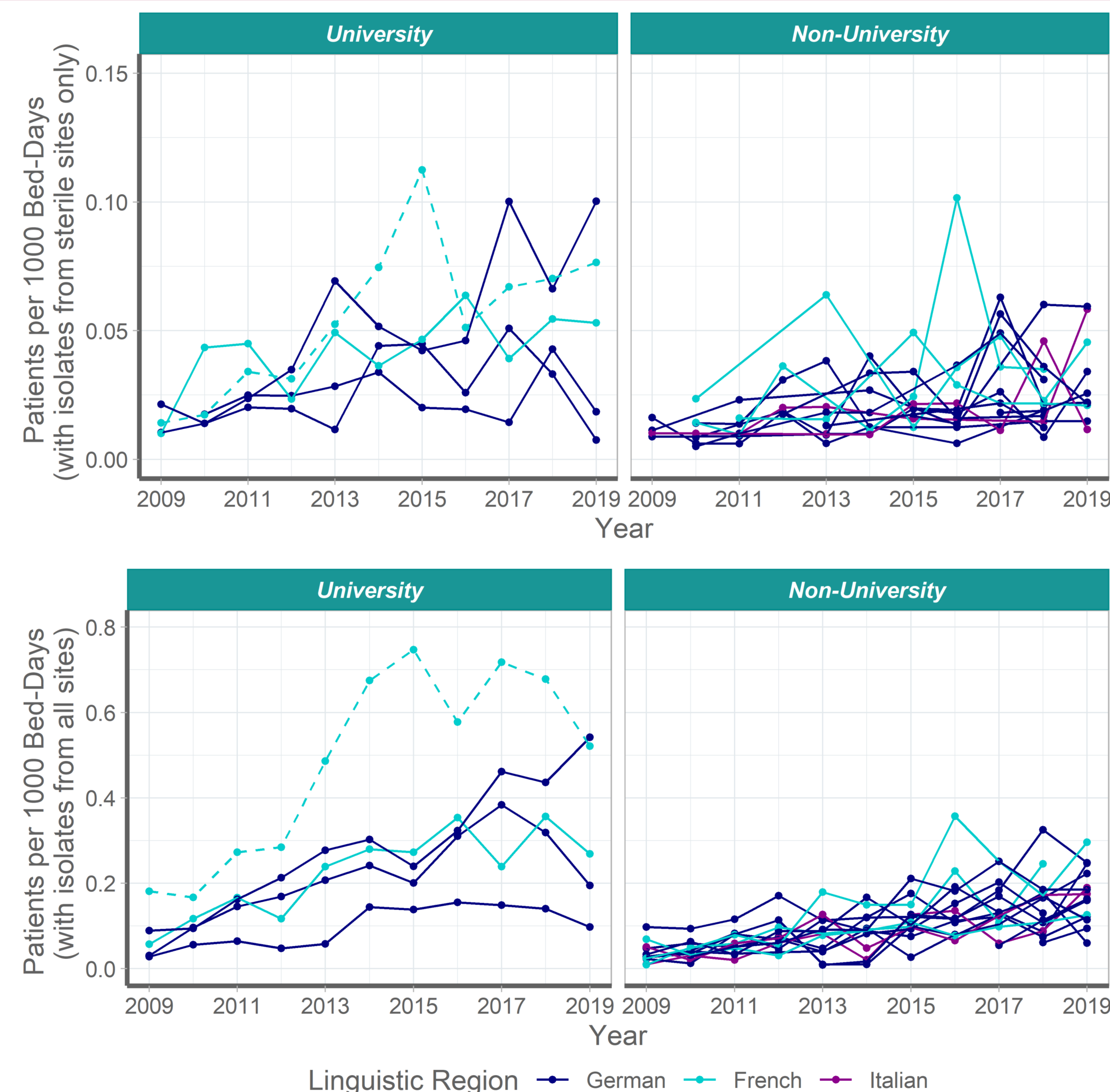


Figure 1: Incidence of invasive ESCR-KP infections (*upper panels*) and overall ESCR-KP incidence (clinical and screening isolates, *lower panels*) in university hospitals (*left panels*) including Geneva (*dashed line*) and non-university hospitals (*right panels*) depicted per linguistic region and year. Consider different y-scales.

► Variability between university hospitals increased, when samples from all sites were considered (Figure 1), mainly due to high incidence of patients with screening isolates at the Geneva university hospital.

RESULTS

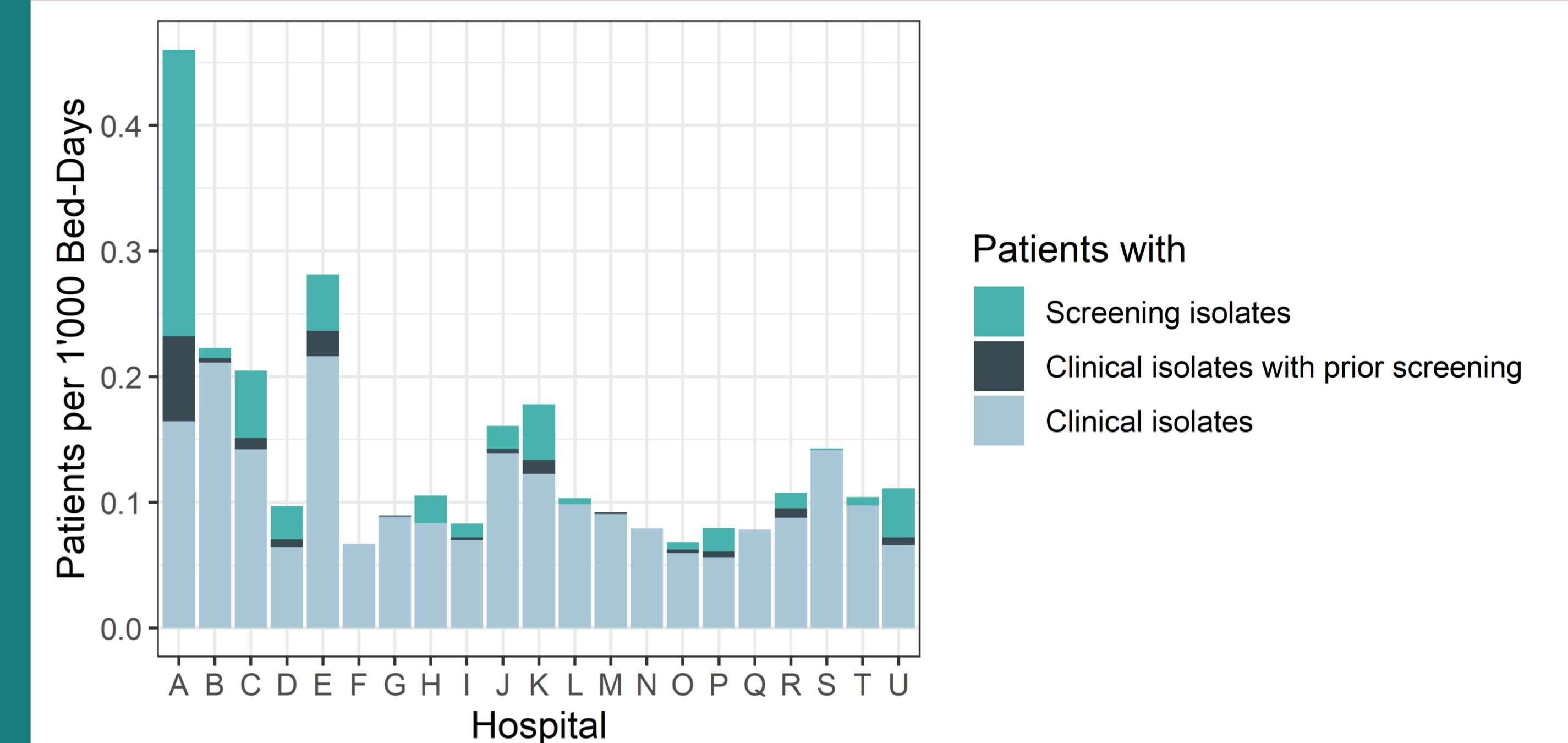


Figure 2: Comparing sample sites of patients with ESCR-KP in university hospitals (A to E) including Geneva (A) and non-university hospitals (F to U) from 2009-2019.

► 50% of all patients with ESCR-KP at the Geneva university hospital had a screening isolate only and 15% had a screening isolate with prior screening (Figure 2).

CONCLUSION / OUTLOOK

Incidence of invasive ESCR-KP infections increased in Switzerland between 2009 and 2019 and was not associated with antibiotic consumption. Further analysis using patient-specific data are needed to investigate this relationship.

Analysing overall ESCR-KP incidence (clinical and screening isolates) revealed a bias caused by different screening activities. Possible approaches to avoid such a bias in future and to improve ESCR-KP surveillance are a more rigorous labelling of screening samples, measuring the screening activity and a nationwide implementation of screening guidelines.

REFERENCES

¹ Federal Office of Public Health and Federal Food Safety and Veterinary Office. Swiss Antibiotic Resistance Report 2020. Usage of Antibiotics and Occurrence of Antibiotic Resistance in Switzerland. November 2020. FOPH publication number: 2020-OEG-64.