

Background

Bloodstream infection (BSI) is one of the leading causes of morbidity and mortality worldwide. Estimating the disease burden of BSIs is important to identify at-risk patients and to inform clinical decisions in treatment and prevention.

Objectives

To assess temporal patterns of the incidence and mortality in inpatients with BSI by causative pathogen and patients' characteristic in Hong Kong in 2012–2021.

Methods

Individual electronic medical records for patients admitted into public hospitals between January 1, 2012 and December 31, 2021 provided by the Hospital Authority (HA) were utilized to identify BSI episodes, including patient demographics, time of admission to and discharge from hospital, clinical outcome at discharge from hospital, all discharge diagnoses, type of specimen for microbiological tests, time of specimen collection, microbiological diagnoses on identified bacteria and the antibiogram of the identified bacteria from the antibiotic susceptibility test, etc. The BSI episode was defined as a positive blood culture with at least one pathogen identified (excluding potential contaminants). Two consecutive blood cultures conducted within 14 days with the same bacterial spp. identified would be treated as one BSI episode, otherwise two different episodes. Occurrence of BSIs and in-hospital mortality was analyzed in relation to patients' characteristics, bacterial pathogens and clinical conditions. Age-standardized incidence rates were estimated using the direct standardization method and the 2000 World standard population.

Results

In total, **2,973,545** blood culture records were identified and extracted from HA database, yielding an overall culture rate of **4,042** samples per 100,000 person-years. Of these, **253,838 (8.5%)** were positive for at least one bacterial pathogen, and the annual positivity rate remained stable over time in 2012-2021 (Table 1). We identified 180,437 blood culture records of BSI during the study period (Figure 1). Among these records, **162,778 BSI episodes** were defined from **116,500 patients**. The crude 30-day all-cause mortality was **20.3%** among these patients, and the median delay from identification of BSI to death was **6 days** (interquartile range (IQR): 1-15), with 27.7% of them died within two days.

Table 1. Detection of bacterial pathogens from blood culture in patients admitted into public hospitals in Hong Kong during 2012-2021.

Year	Positive blood cultures	All blood cultures	Positive culture rate (%)
2012	19333	218153	8.9
2013	19407	221428	8.8
2014	20746	238120	8.7
2015	22593	250722	9.0
2016	23377	275892	8.5
2017	24422	295991	8.3
2018	25188	303380	8.3
2019	25464	314079	8.1
2020	24420	276751	8.8
2021	24882	288632	8.6
Not within our study period	24006	165833	14.5
All	253838	2973545	8.5

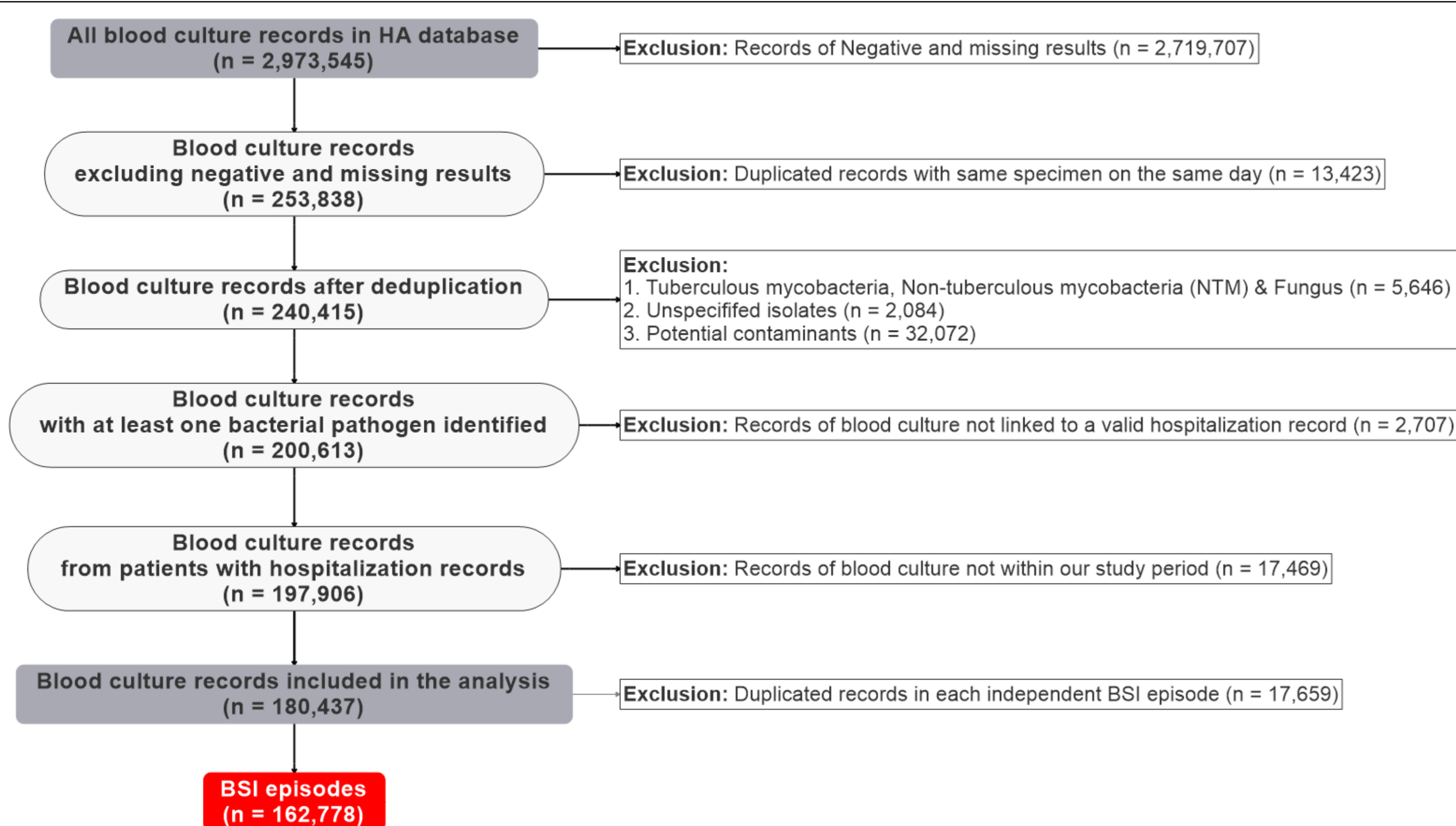


Figure 1. Flow chart of identifying BSI records and episodes for patients admitted into public hospitals in Hong Kong during 2012-2021.

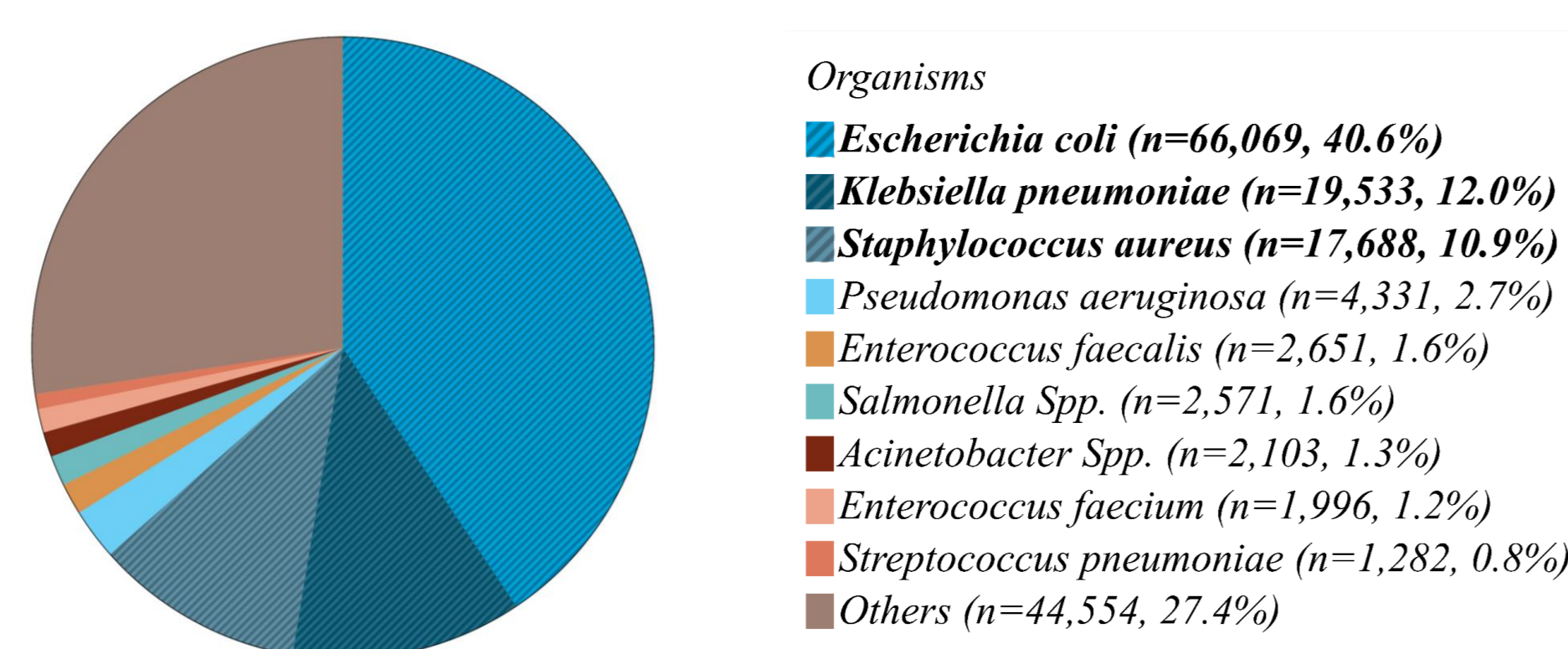


Figure 2. Distributions of bacterial pathogens identified from blood samples collected from inpatients admitted into public hospitals in Hong Kong during 2012-2021.

Figure 2 showed that the top 3 most frequently identified bacterial pathogens identified from blood samples were ***Escherichia coli* (40.6%)**, ***Klebsiella pneumoniae* (12.0%)** and ***Staphylococcus aureus* (10.9%)**. The crude BSI incidence was **220 episodes per 100,000 person-years** (95% CI: 219 to 221), varied from 187 to 244 episodes per 100,000 person-years from 2012 to 2021. The **age-standardized BSI incidence rate was 118 episodes per 100,000 person-years** (95% CI: 117 to 119), ranged from **112 to 125 episode per 100,000 person-years** (Figure 3A). Crude incidence rates stratified by age and sex are shown in Figure 3B. A notable increase in the incidence rate of BSIs over time was observed among persons **≥80 years** of age. **Male** has a higher incidence rate than female in each age group. Figure 4 reports the temporal trends in the annual BSI incidence by type of bacterial species.

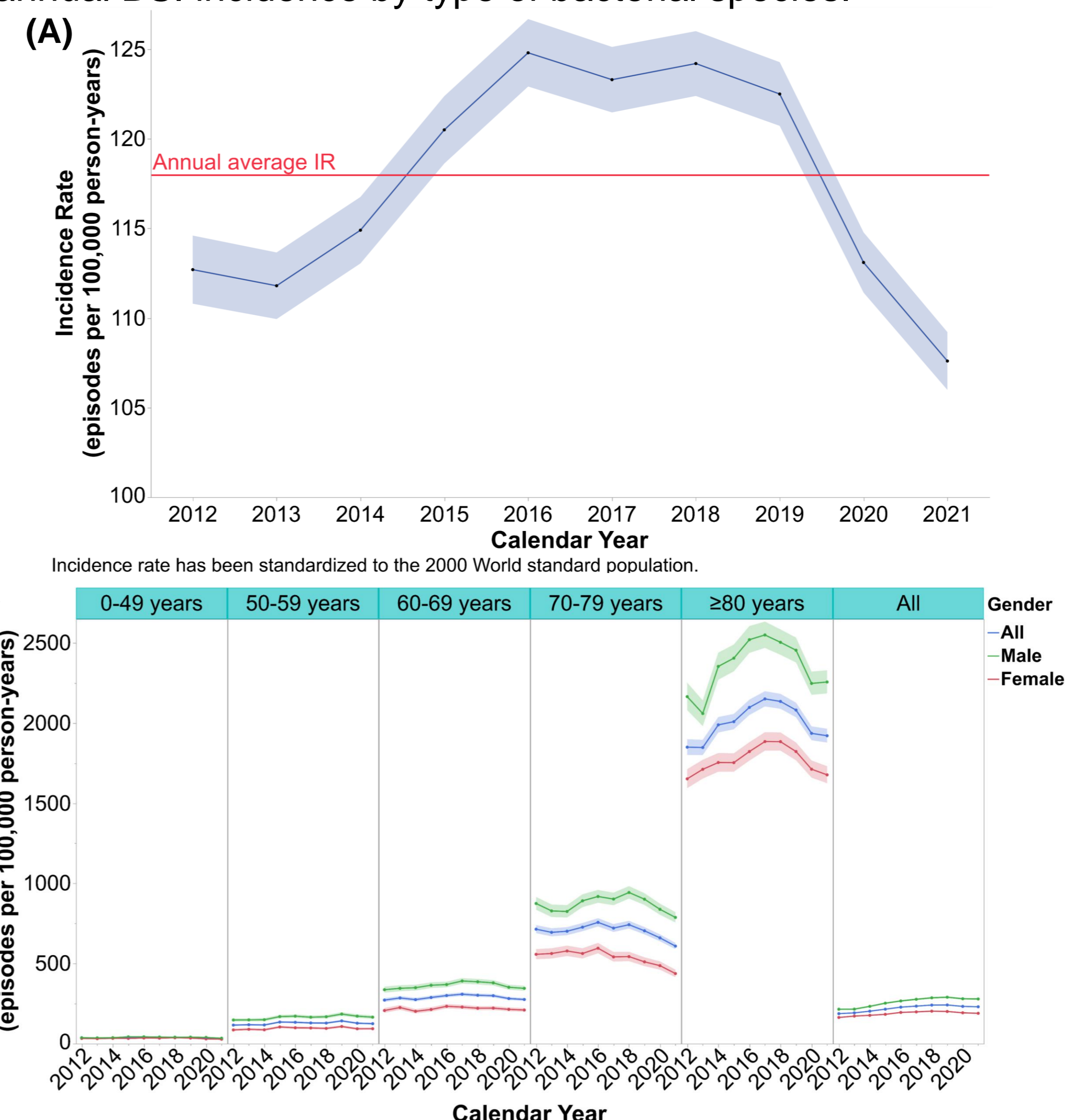


Figure 3. (A) Age-standardized annual BSI incidence in Hong Kong during 2012-2021. (B) Crude BSI incidence rate by age, sex and calendar year in Hong Kong during 2012-2021.

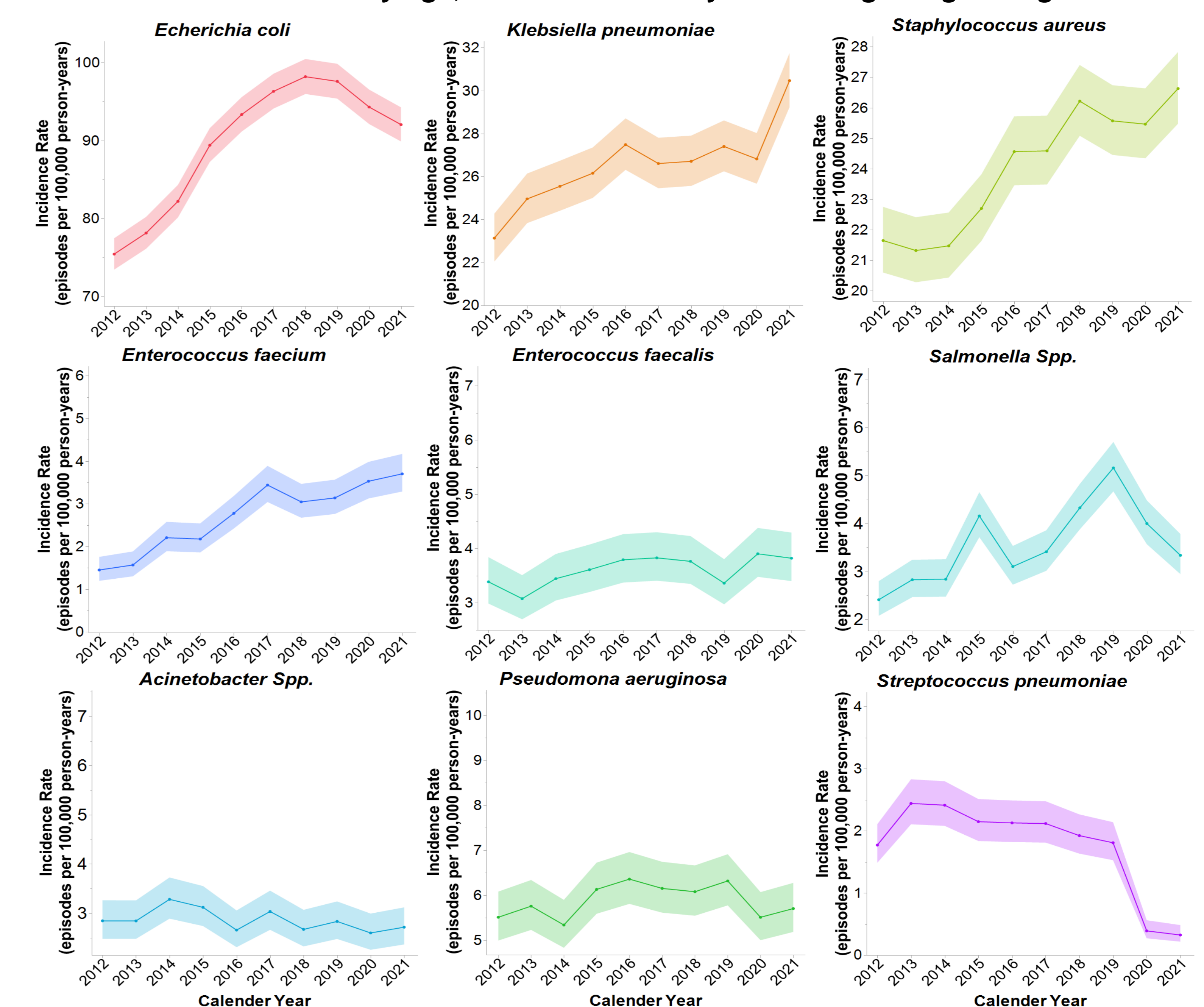


Figure 4. Annual BSI incidence by bacterial species among patients admitted into public hospitals in Hong Kong during 2012-2021.

Conclusions

Our study illustrated the disease burden associated with BSIs in the Hong Kong population. The temporal patterns in the BSI incidence by type of pathogen in different patient groups warrant further studies to improve inpatient care including through the design of antimicrobial stewardship program.

Acknowledgements

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