Nationales Zentrum für Infektionsprävention
Centre national de prévention des infections
Centro nazionale per la prevenzione delle infezioni
National Center for Infection Control

# Point prevalence survey 2023 of healthcare-associated infections and antimicrobial use in Swiss acute care hospitals

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## Abbreviations

| | |
|---|---|
| ANRESIS | Swiss Centre for Antibiotic Resistance |
| AU | Antimicrobial use |
| BSI | Bloodstream infection |
| CABSI | Catheter-associated bloodstream infection |
| CAUTI | Catheter-associated urinary tract infection |
| CDI | *Clostridioides difficile* infection |
| COVID | Coronavirus disease |
| CH | Switzerland |
| CI | Confidence interval |
| CLABSI | Central line-associated bloodstream infection |
| CVC | Central venous catheter |
| FOPH | Federal Office of Public Health |
| HAI | Healthcare-associated infection |
| ICU | Intensive care unit |
| IPC | Infection Prevention and Control |
| IPCAF | Infection Prevention and Control Assessment Framework at the Facility Level |
| IQR | Interquartile range |
| LRTI | Lower respiratory tract infection |
| NEO | Neonatal infection |
| PPS | Point Prevalence Survey |
| PRIM | Primary care |
| PRIVFP | Private ownership, for-profit |
| PRIVNFP | Private ownership, not-for-profit |
| PUB | Public hospitals |
| PVC | Peripheral venous catheter |
| SEC | Secondary care |
| SPEC | Specialised care |
| SSI | Surgical site infection |
| SYS | Systemic infection |
| TERT | Tertiary care |
| UTI | Urinary tract infection |
| VAP | Ventilator-associated pneumonia |
| 95%CI | 95% confidence interval |



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## Executive Summary

The year 2023 was marked as a period of early recovery from the COVID-19 pandemic. Although COVID-19 still affected health services, hospitals were transitioning to pre-pandemic functioning and many routine activities had resumed, including surveillance of healthcare-associated infections (HAI) and antimicrobial use (AU).

Point prevalence surveys (PPS) have been conducted annually since 2017, with the exception of 2020. The second national survey was successfully done in 2022, with 108 Swiss acute care hospitals submitting data on HAI and AU. In the beginning of 2023, Swissnoso called for voluntary participation in the yearly PPS, which remained free of charge thanks to financial support from the Federal Office of Public Health. Participation was significantly higher compared to previous years between the two national surveys (2018, 2019 and 2021). Seventy-six hospitals provided data on 10,236 patients.

### HAI

In 2023, the overall HAI prevalence was 5.9% (95%CI: 5.4-6.4%) and 5.7% (95%CI: 4.8-6.6%) when only hospitals that participated in all surveys from 2017 to 2023 were included. The result was comparable to both national surveys in 2017 (5.9%) and 2022 (6.0%). No statistically significant trends were identified during the years, neither in the overall cohorts nor in the subset of hospitals participating in all surveys.

### Antimicrobial use (AU)

One in three patients received at least one antimicrobial on the day of survey in 2023 (32.6%; 95%CI: 31.7-33.6%). This is consistent with previous years. Antimicrobial use in the subset of hospitals participating in all surveys however, was significantly higher both in 2022 and 2023 compared to previous years.

Over the years, no significant change was detected on the overall prevalence of HAI and AU. Stable proportions mean that the methodology is robust, and that the impact of COVID-19 on HAI was limited. However, they also mean that no improvement in HAI prevention or antimicrobial stewardship has been achieved. Two years ago, structural minimum requirements in the control and prevention of healthcare-associated infections in acute hospitals have been launched by the office of public health and Swissnoso. These requirements aim to standardise and improve the performance of infection prevention and control (IPC) in acute care hospitals. Since 2016, two national strategies on antimicrobial resistance have been conducted. StAR-1 aimed to produce treatment guidelines, to set the stage for antimicrobial stewardship and to produce guidelines on the prevention of multidrug-resistant microorganisms. StAR-2 expanded on the treatment guidelines and facilitated access to data on antimicrobial resistance. StAR-3 is the third national strategy on antimicrobial resistance. It started in 2023 and aims to implement antimicrobial stewardship in the hospitals. Future surveys will show whether minimal requirements on HAI-prevention combined with antimicrobial stewardship will result in a measurable decrease of HAI-prevalence and antimicrobial use.



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# 1 Introduction

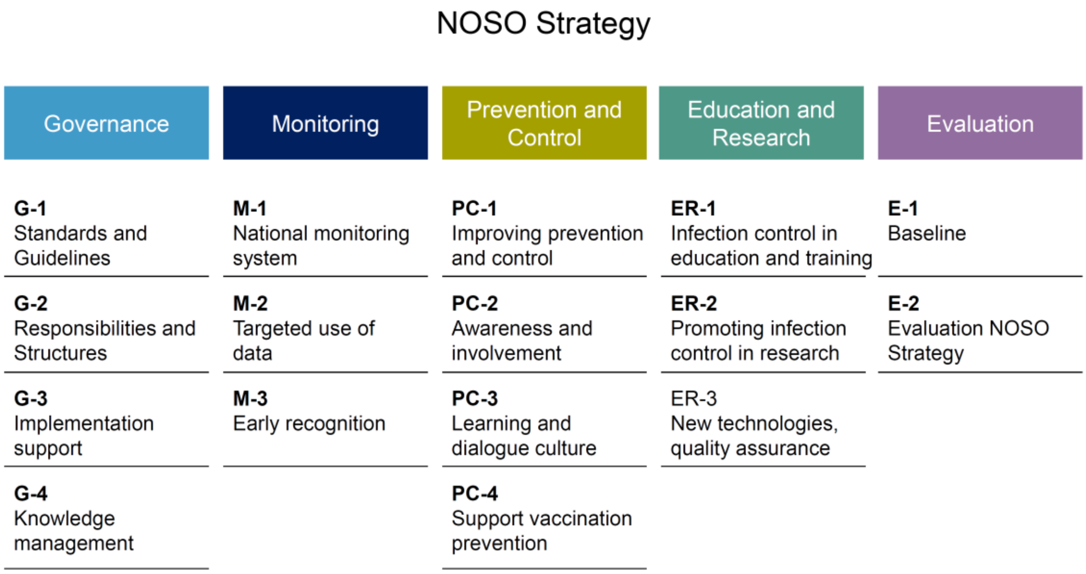
## 1.1 NOSO Strategy

NOSO strategy is the Swiss national programme for the surveillance, prevention and control of healthcare-associated infections. [1] It is based on the federal law on epidemics and contributes to the Federal Council's health policy strategy *Health2030*. The strategy has five fields of action: governance, monitoring, prevention and control, education and research, and evaluation (Fig. 1). With the aim to provide baseline data and to evaluate progress of the NOSO strategy, PPS belongs to the action field *Evaluation*.

## 1.2 Minimum requirements and PPS: milestones of the NOSO strategy

While PPS is part of the *Evaluation* action field of the NOSO strategy, the minimum requirements belong to the *Governance* action field (G-1: Standards and Guidelines). [2] These requirements are national recommendations, developed by a working group of Swissnoso and endorsed by relevant professional and political stakeholders. Since they were issued in January 2021, they were largely communicated to acute care hospitals though different channels, including a number of stakeholder workshops in which hospitals could verbalize their status of implementation. The WHO IPCAF survey 2022 revealed that Swiss hospitals do not outperform hospitals in other European countries. It can be concluded that the minimum requirements may not be fully implemented in all acute care hospitals, despite the fact that most cantons made them mandatory by service contracts. Swissnoso has finalized a self-assessment questionnaire on the Swiss structural minimum requirements in February 2024. This questionnaire allows IPC professionals to continuously evaluate of their IPC programme. [3]

**Figure 1: NOSO strategy with the 5 action fields**



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# 2 PPS methodology and organisation

## 2.1 Objectives and methods

The objectives and methods the survey have remained the same as in the previous year without significant changes of the protocol. [4]

## 2.2 Material and train-the-trainer courses

Two training courses were organized online in German and French. All materials were available on the Swissnoso website and protocol changes were highlighted during the training sessions.

## 2.3 Data management

Data were collected from 1 April to 30 June 2023. Hospitals could choose to enter data into the database either manually or automatically using specifications provided by the coordinating centre. As in the previous year, automatic import was facilitated by a direct upload option in the database. Hospitals could download their data (without benchmarking) in different formats (HTML, CSV, pdf). Once completed, the national data were summarized and analysed using STATA version 13 (STATA Corporation), R and R studio. Hospitals received a set of slides with benchmarks to their relevant peers.


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# 3 Implementation

## 3.1 List of participating hospitals

Seventy-six hospitals participated in the survey. The hospitals represented distinct hospital sites or hospital groups (Table 1).

**Table 1: Participating hospitals by canton in alphabetic order**

| | |
|---|---|
| **AG** | Kantonsspital Baden AG |
| | Spital Muri |
| | Hirslanden Klinik Aarau |
| **BE** | Insel Gruppe AG - Inselspital |
| | Regionalspital Emmental AG – Spital Burgdorf |
| | Spital Region Oberaargau – Spital Langenthal |
| | Spitäler fmi AG - Unterseen |
| | Spitäler fmi AG – Frutigen |
| | Hôpital du Jura bernois SA – St-Imier |
| | Hôpital du Jura bernois SA - Moutier |
| | Hirslanden Bern AG, Beau-Site |
| | Hirslanden Bern AG, Salem Spital |
| | Hirslanden Bern AG, Klinik Permanence |
| | Privatklinik Linde AG - Biel |
| **BL** | Klinik Arlesheim AG |
| **BS** | Universitätsspital Basel |
| | St. Claraspital |
| | Universitäts-Kinderspital beider Basel UKBB |
| | Bethesda Spital AG |
| | Felix Platter-Spital |
| | Merian Iselin Klinik |
| | REHAB Basel |
| | Adullam Spital/Pflegezentrum Basel |
| | Adullam Spital/Pflegezentren Riehen |
| **FR** | Hôpital Daler – Daler Spital |
| **GE** | Hôpitaux universitaires de Genève |
| | Hôpital de La Tour |
| | Clinique Générale-Beaulieu |
| | Clinique de la Plaine |
| **GR** | Spital Oberengadin |
| **LU** | Luzerner Kantonsspital |
| **NE** | Clinique Montbrillant |
| **SH** | Hirslanden- Klinik Belair Schaffhausen |
| **SO** | Solothurner Spitäler AG – Bürgerspital Solothurn |
| | Solothurner Spitäler AG – Spital Olten |
| | Solothurner Spitäler AG – Spital Dornach |
| **SZ** | Spital Lachen AG |



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| | |
|---|---|
| | Spital Schwyz |
| **TG** | Klinik Seeschau |
| **TI** | EOC - Ospedale Regionale di Lugano Civico |
| | EOC - Ospedale Regionale Bellinzona e Valli |
| | EOC - Ospedale Regionale di Locarno |
| | EOC - Ospedeale Regionale di Mendrisio |
| | EOC - Ospedale Regionale di Lugano Italiano |
| | EOC - Istituto Cardio Centro Ticino |
| | Clinica Luganese SA |
| | Clinica Santa Chiara SA |
| **UR** | Kantonsspital Uri |
| **VD** | CHUV |
| | Etablissements Hospitaliers du Nord Vaudois – Site Yverdon-les-Bains |
| | Etablissements Hospitaliers du Nord Vaudois – Site St-Loup |
| | Ensemble Hospitalier de la Côte – Hôpital de Morges |
| | Hôpital Riviera-Chablais Rennaz |
| | Groupement Hospitalier de l'Ouest Lémanique – Hôpital de Nyon |
| | Hôpital intercantonal de La Broye HIB - Payerne |
| | Hôpital du Pays-d'Enhaut – Château D'Oex |
| | Réseau Santé Balcon du Jura.vd – Sainte Croix |
| | Groupement Hospitalier de l'Ouest Lémanique – Hôpital de Rolle |
| | Clinique Bois-Cerf |
| | Clinique de La Source |
| | Clinique Cecil SA |
| | Clinique de Genolier |
| | Clinique CIC Riviera SA - Clarens |
| | Pôle Santé Vallée de Joux – Le Chênit |
| **VS** | Hôpital du Valais – Site de Sion |
| | Clinique médico-chirurgicale de Valère |
| | Clinique CIC Valais SA - Saxon |
| **ZH** | UniversitätsSpital Zürich |
| | Kantonsspital Winterthur |
| | Spitalverband Limmattal |
| | GZO AG - Wetzikon |
| | Spital Bülach AG |
| | Universitätskinderspital Zürich - Eleonorenstiftung |
| | Spital Männedorf AG |
| | Privatklinik Bethanien |
| | Privatklinik Lindberg |



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# 4 Results

## 4.1 Hospital characteristics and most relevant indicators

Fifty-seven of the 76 participating hospitals were small size hospitals, 13 medium-size, and six large-size hospitals. All adult, mixed and children university hospitals participated. Table 2 summarizes details of the participating hospitals.

**Table 2: Hospital characteristics**

| | Hospitals, N | Patients, N |
|---|---|---|
| Total | 76 | 10,263 |
| Large hospitals (>650 beds) | 6 | 4,195 |
| Medium size hospitals (200-650 beds) | 13 | 2,664 |
| Small size hospitals (<200 beds) | 57 | 3,404 |
| Adult/mixed University hospitals | 5 | 3,780 |
| Paediatric University hospitals | 2 | 178 |
| Primary care hospitals | 36 | 2,350 |
| Secondary care hospitals | 23 | 2,855 |
| Tertiary care hospitals | 9 | 4,554 |
| Specialized hospitals | 6 | 326 |
| Free-standing Paediatric hospitals | 2 | 178 |
| Public hospitals | 36 | 7,729 |
| Private non-for-profit hospitals | 22 | 1,626 |
| Private for-profit hospitals | 17 | 817 |



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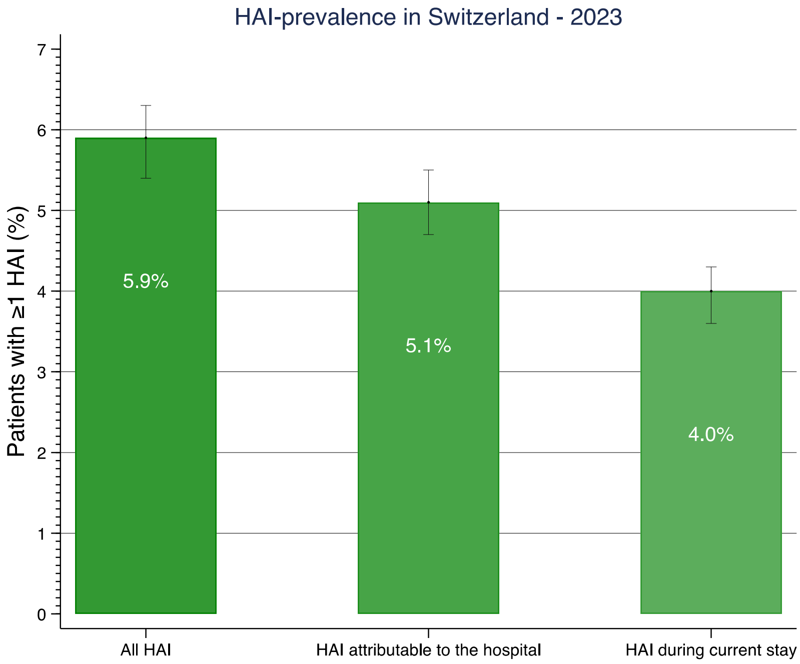
## 4.2 Healthcare-associated infections

The overall HAI-prevalence in Swiss acute care hospitals was 5.9% (95%CI: 5.4-6.4) (**Fig. 2**), of which 5.1% (4.7-5.5%) were attributable to the hospital, and 4.0% (3.6-4.4%) occurred during current hospital stay.

**Figure 2: 2023 HAI-prevalence in all participating hospitals by attribution and current hospital stay**



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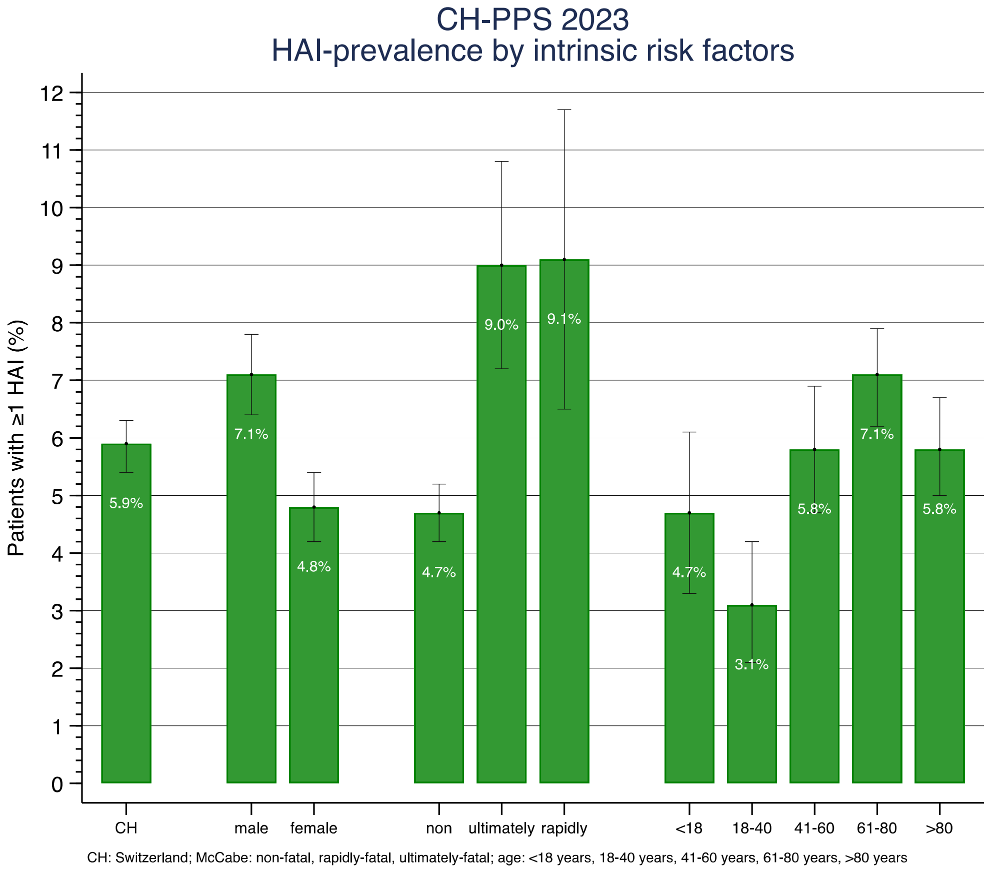
HAI-prevalence depends on intrinsic (patient-related) risk factors. Higher risk factors are identified for male gender, poorer prognosis (ultimately and rapidly fatal outcome) and age (**Fig. 3**).

**Figure 3: HAI-prevalence by intrinsic risk factors**



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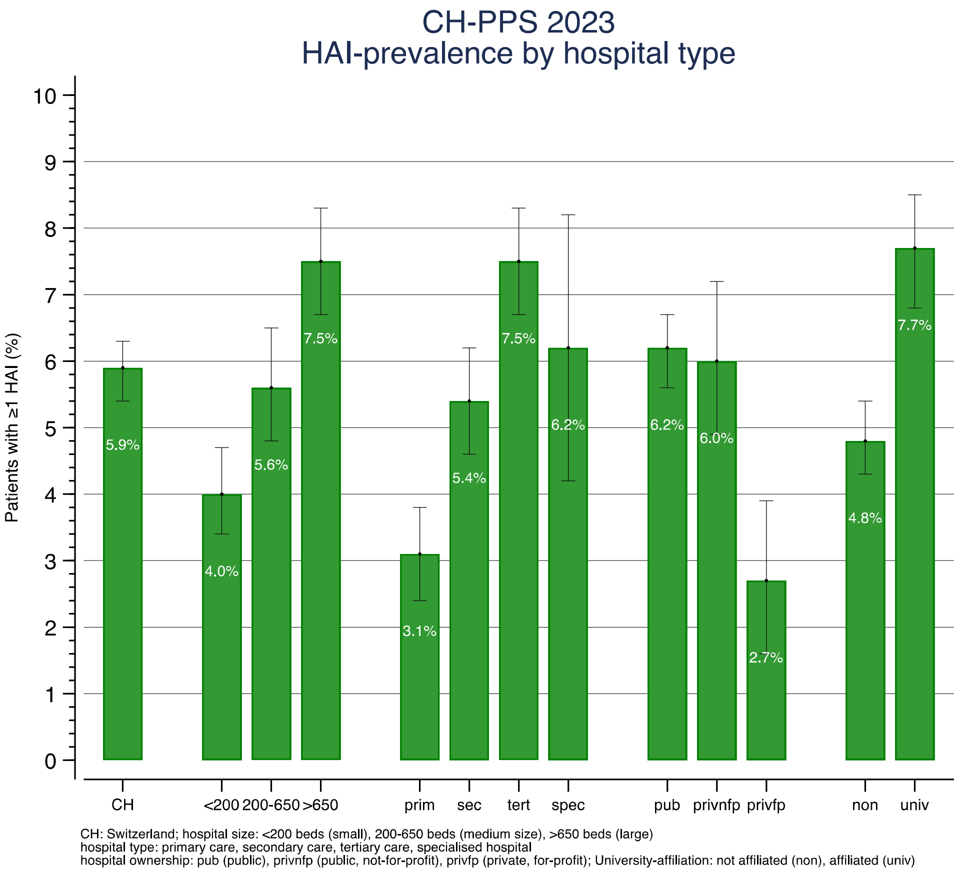
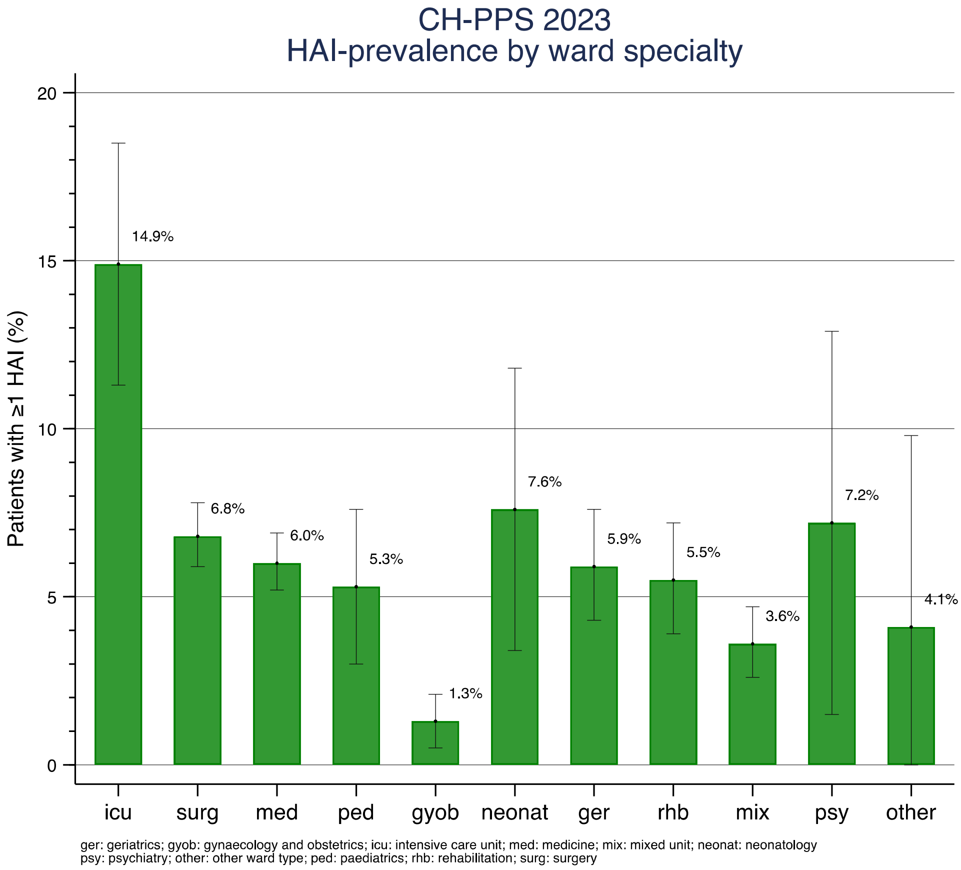
HAI-prevalence depends on hospital size, hospital type, ownership and whether a hospital is University-affiliated (**Fig. 4**). Risk are mainly explained by differences in patient case mix and the provision of care. Larger tertiary care hospitals have a higher case-mix, offer more intensive care capacity and perform more complex interventions. This is particularly true for University-affiliated hospitals.

**Figure 4: HAI prevalence by hospital size, hospital type, ownership and University-affiliation**



Intensive care has the highest and gynaecology/obstetrics has the lowest HAI-prevalence (**Fig. 5**). Reasons for the extremes are a high case-mix and complexity of care in intensive care on one side, and younger, generally healthy women with a short hospital stay time on the other hand.

**Figure 5: HAI prevalence by ward specialty**



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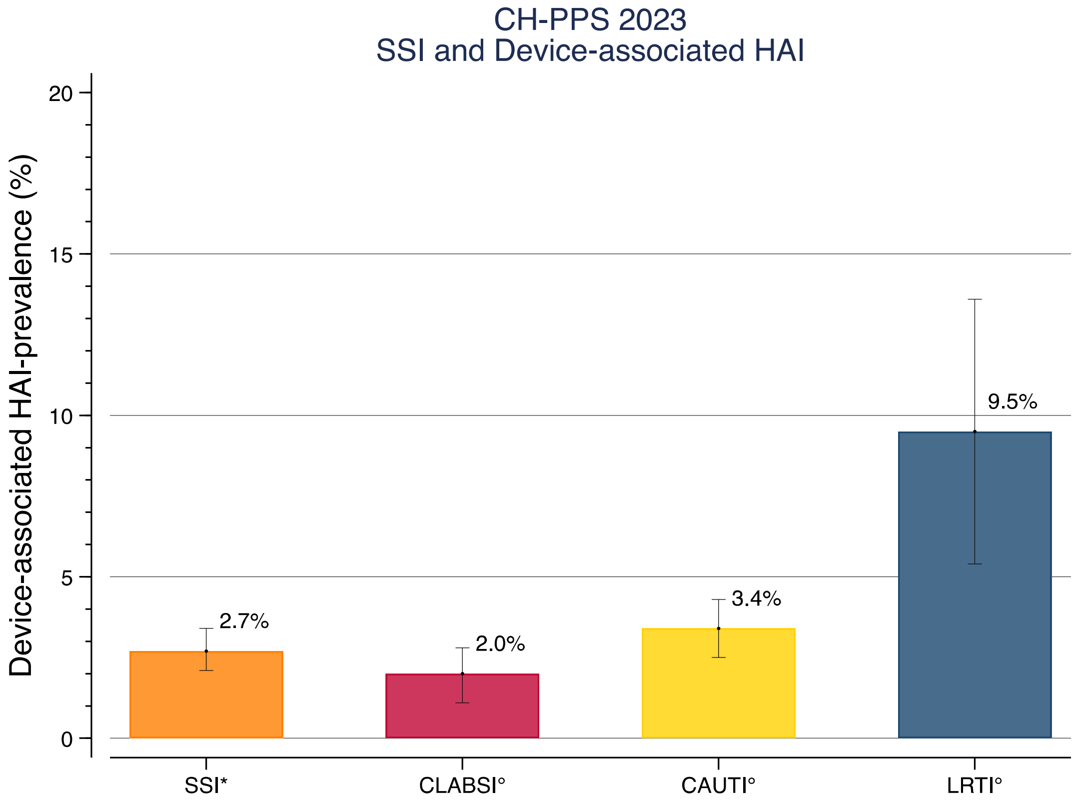
Interventions such as surgery and the use of invasive medical devices are a risk factor for HAI. Figure 6 summarises the prevalence of HAIs associated with surgery (SSIs) or the use of medical devices such as intravascular catheters, urinary catheters and mechanical ventilation.

**Figure 6: SSI-prevalence in patients undergoing surgery and device-associated HAI-prevalence in patients with medical devices during current stay**




* Number of surgical site infections occurring during present hospital stay as per NHSN (national healthcare safety network) surgeries during current hospital stay
° Number of infections as per patients having a relevant medical device in place at survey
CAUTI: catheter-associated urinary tract infection; CLABSI: central line-associated (bloodstream) infection;
LRTI: lower-respiratory tract infection; SSI: surgical site infection



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**Figure 7** summarises the trend of HAI-prevalence since 2017 in all participating hospitals. No significant trend was identified.

**Figure 7: HAI prevalence in all participating hospitals over time**

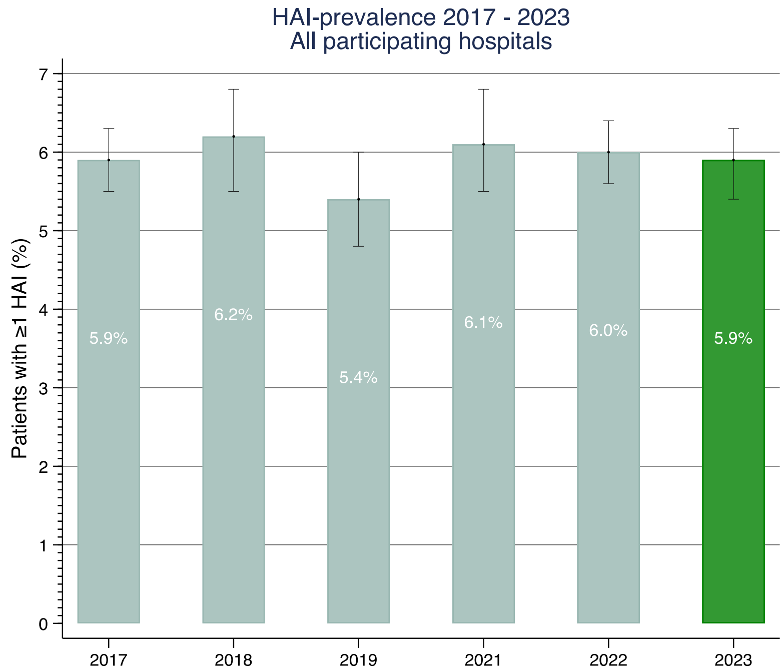




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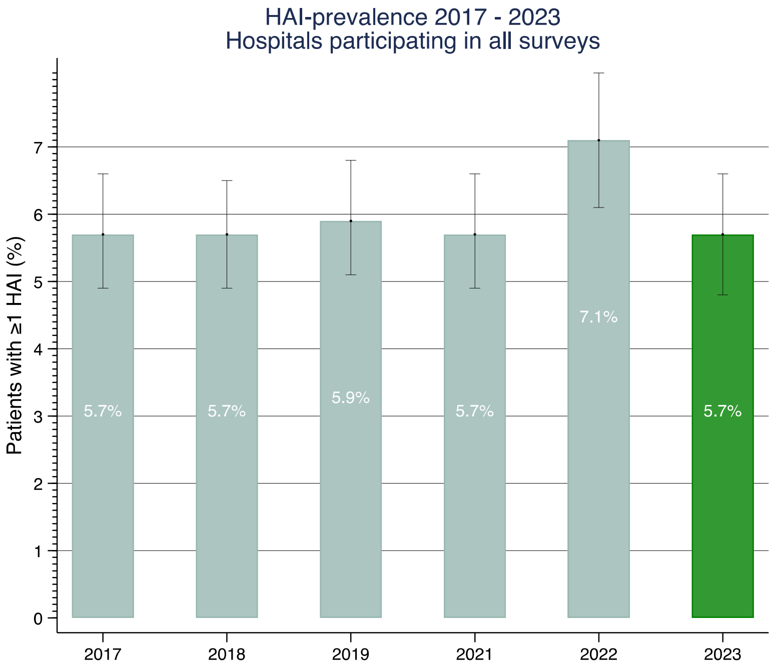
**Figure 8** summarises the trend of HAI-prevalence since 2017 in the subset of hospitals (N=9) participating in all surveys. No significant trend was identified despite an outlier in 2022.

**Figure 8: HAI prevalence over time in the subset of hospitals participating in all surveys**



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**Figures 9 and 10** summarise the trends of HAI-types (as distributions) over time; the most common infection types were surgical site Infections (SSI) and lower respiratory tract infections (LRTI), followed by urinary tract infections (UTI) and bloodstream infections (BSI).

**Figure 9: HAI types (distribution) in all participating hospitals over time**

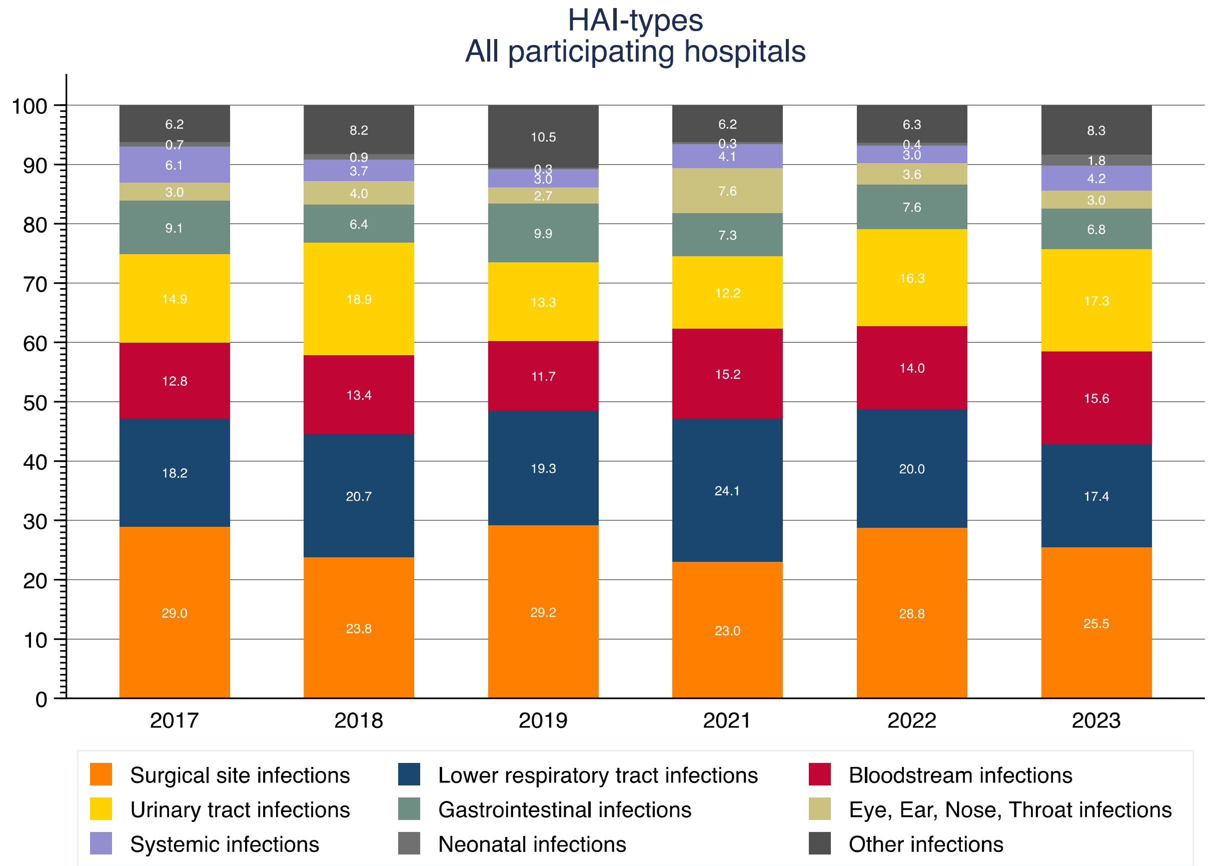
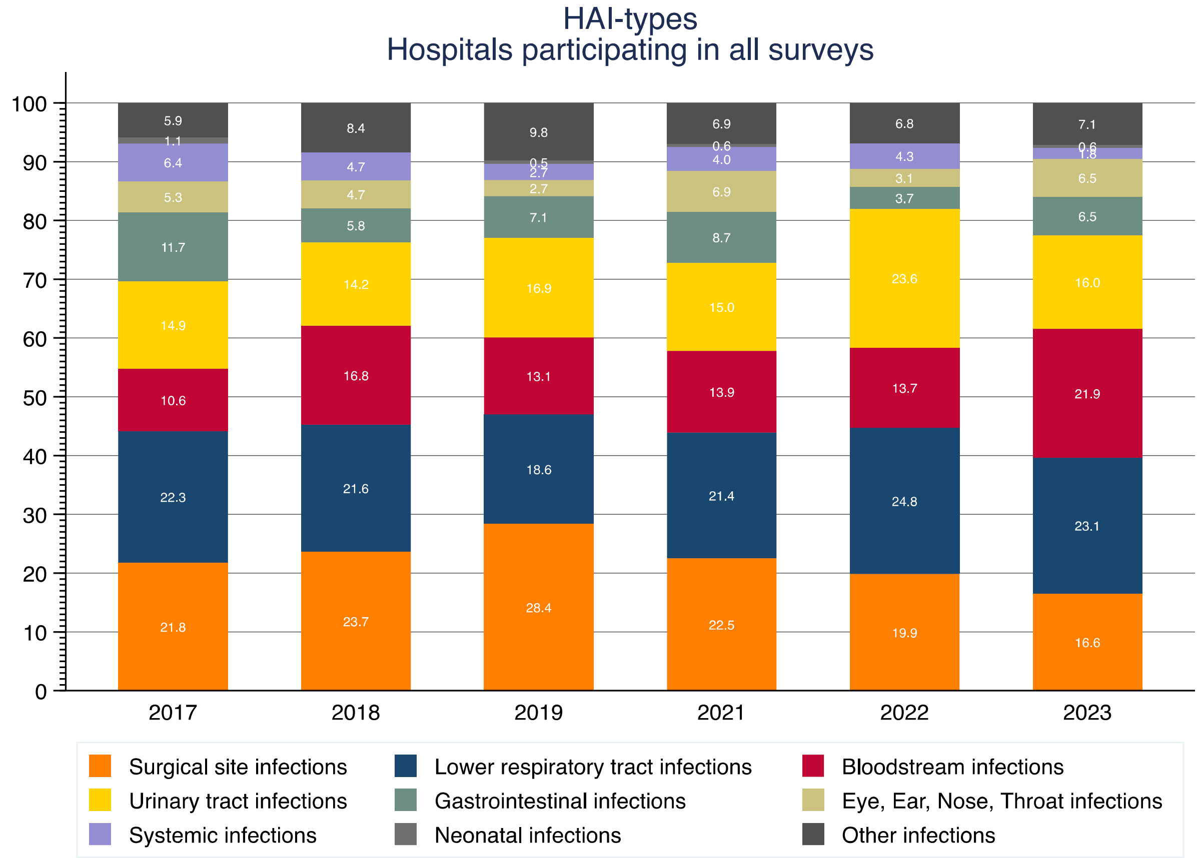


**Figure 10: HAI types (distribution) over time in the subset of hospitals participating in all surveys**



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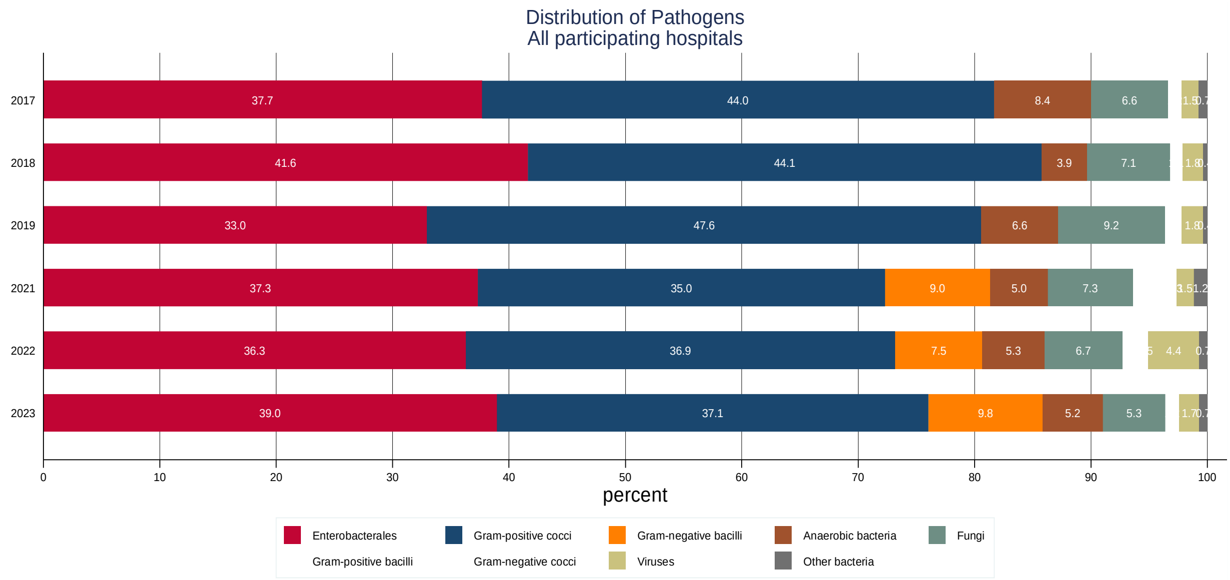
**Figures 11 and 12** are summarise the distribution of pathogens, which were microbiologically identified in HAI over time. In 2023, 64% of HAI were microbiologically documented.

**Figure 11: Distribution of pathogens over time in all participating hospitals**



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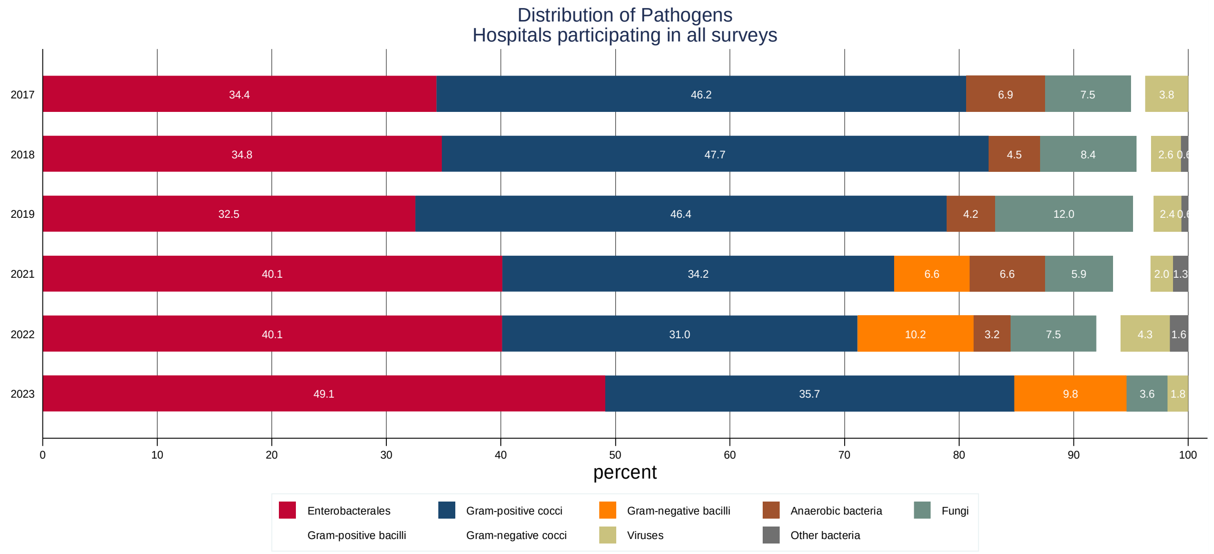
## Figure 12: Distribution of pathogens over time in the subset of hospitals participating in all surveys



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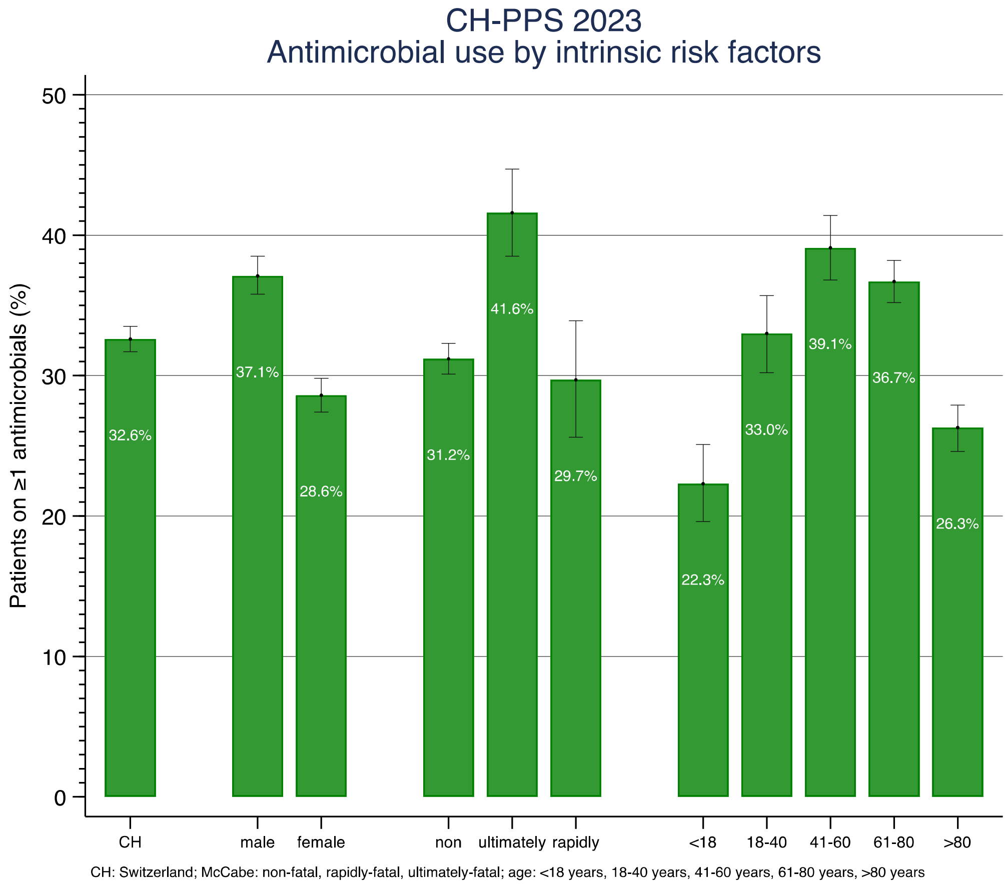
## 4.3 Antimicrobial use

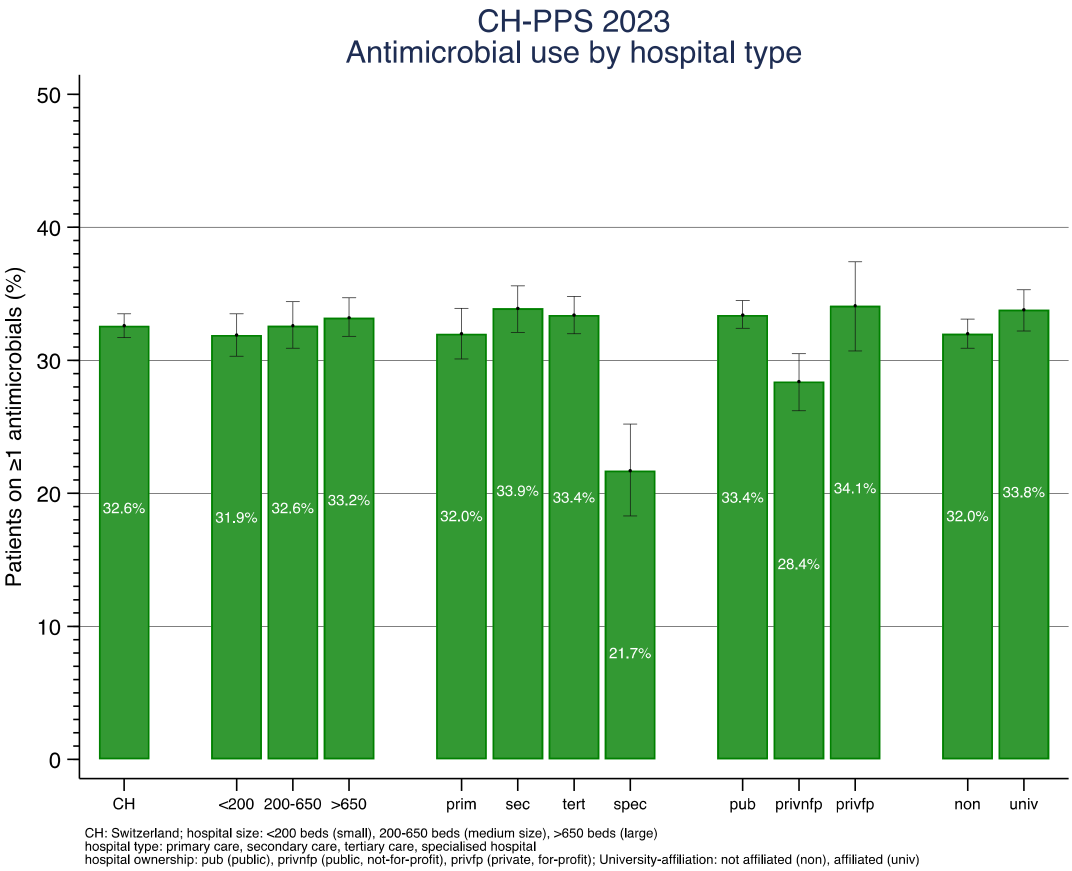
The use of antimicrobials depends on intrinsic (patient-related) risk factors. More antimicrobial use was identified for male gender, poorer prognosis (ultimately but not rapidly fatal outcome) and age (**Fig. 13**).

**Figure 13: AU prevalence by intrinsic risk factors**



Total antimicrobial use does not depend on hospital size, hospital type, ownership and whether a hospital is University-affiliated (**Fig. 14**). Only specialized hospitals had a lower proportion of patients who received antimicrobials. Most of these hospitals offered specialized elective surgery, and antimicrobial use represents pre-operative prophylaxis.

**Figure 14: AU prevalence by hospital size, hospital type, ownership and University-affiliation**



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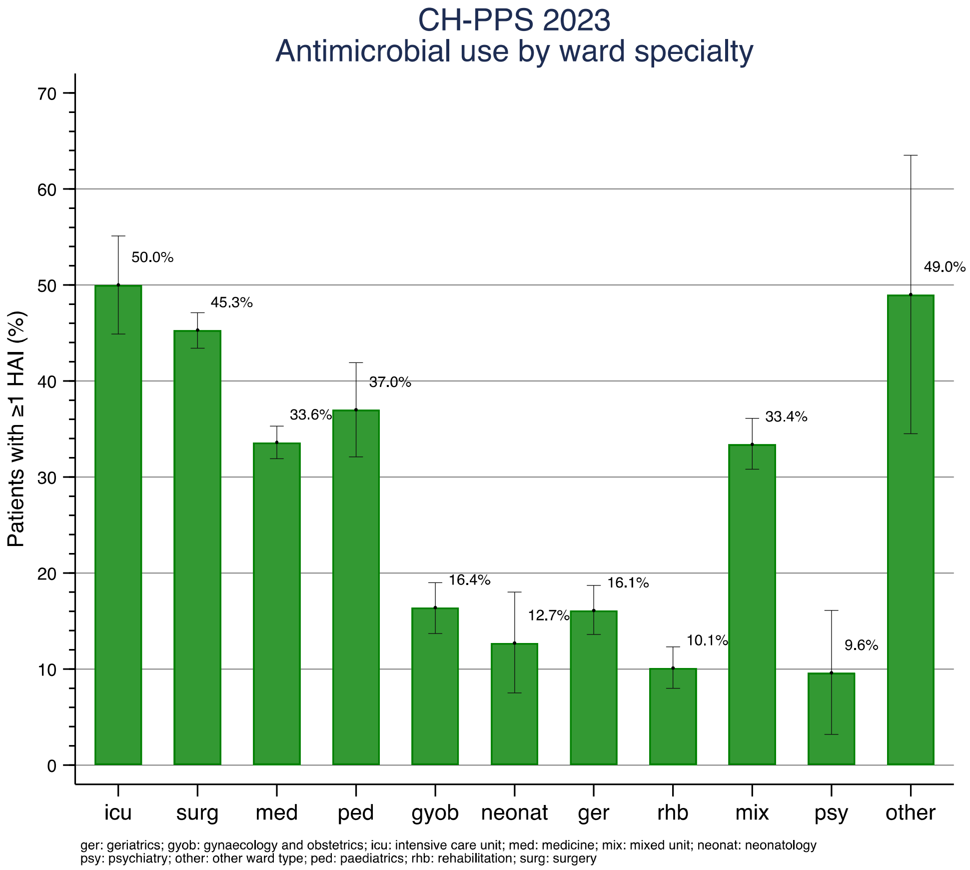
In intensive care and surgical wards, one in two patients receives one or more antimicrobials on the day of survey (**Fig. 15**). In surgical specialties, antimicrobials are used predominantly for surgical prophylaxis while in internal medicine, paediatrics and mixed wards, antimicrobials are used for therapeutic purposes.

**Figure 15: AU prevalence by ward specialty**



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**Figures 16 and 17** summarise antimicrobial use over time in all participating hospitals and in the subset of hospitals (N=9) participating in all surveys. No significant trend was identified on overall results. In the subset of hospitals participating in all surveys, there was a significant trend towards higher proportions of patients receiving one or more antimicrobials on the day of survey in the past three years (IRR: 1.03; 95%CI: 1.02-1.04).

**Figure 16: AU prevalence over time in all participating hospitals**

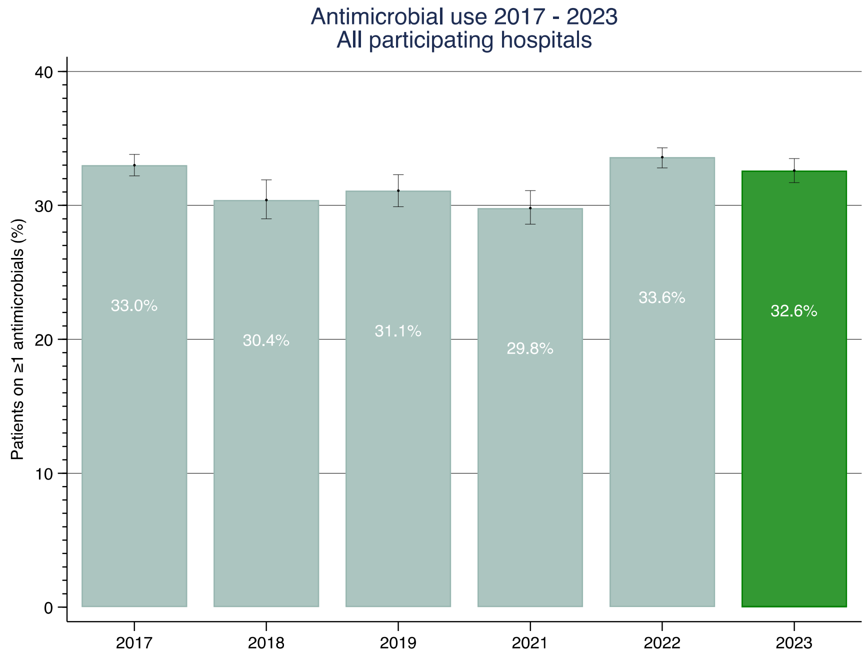




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**Figure 17: AU prevalence over time in the subset of hospitals participating in all surveys**
(Statistically significant trend – IRR: 1.03; 95%CI: 1.02-1.04)

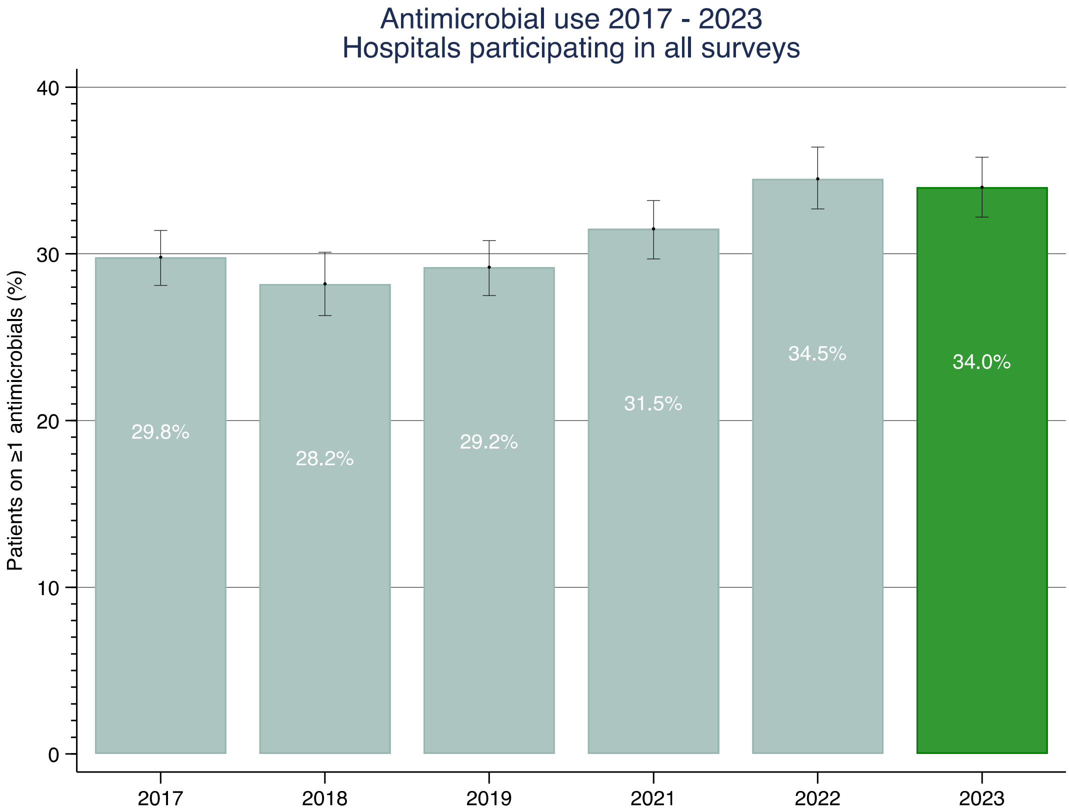




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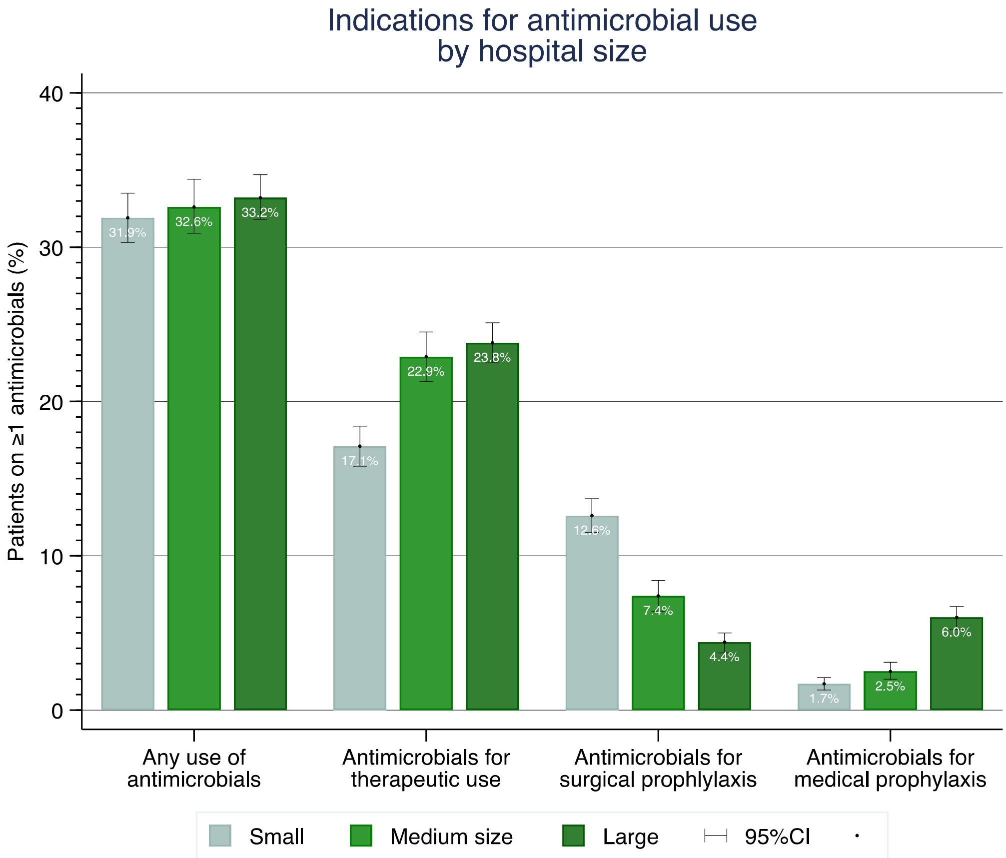
**Figure 18** shows the indications for antimicrobial use by hospital size. Middle-size and large hospitals use more antimicrobials for therapeutic purposes while small hospitals use more antimicrobials for surgical prophylaxis. This is due to the higher proportion of surgical patients in small-size hospitals (41%) compared to middle-size (35%) and large (29%) hospitals.

**Figure 18: Indications for antimicrobial use by hospital size**



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**Figures 19 and 20** show the indications for antimicrobial use in 2023 compared to 2022 in all participating hospitals and in the subset of hospitals participating in both surveys (N=62).

**Figure 19: Indications for antimicrobial use 2022 and 2023 in all participating hospitals**

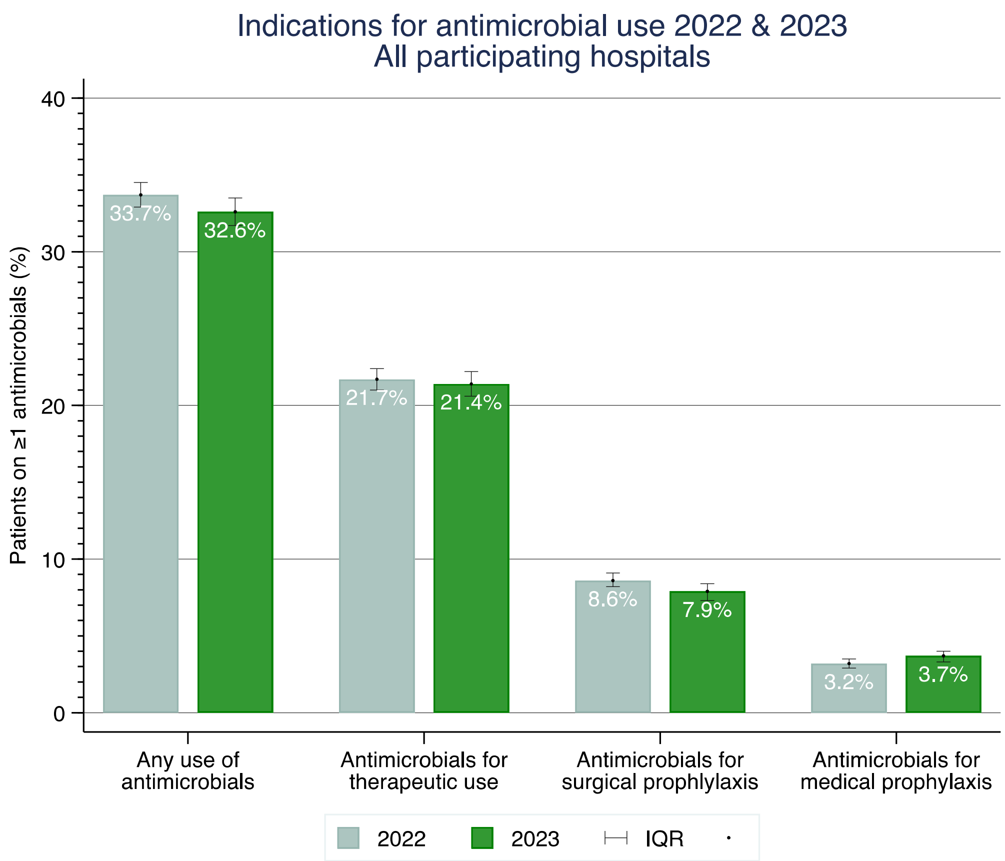




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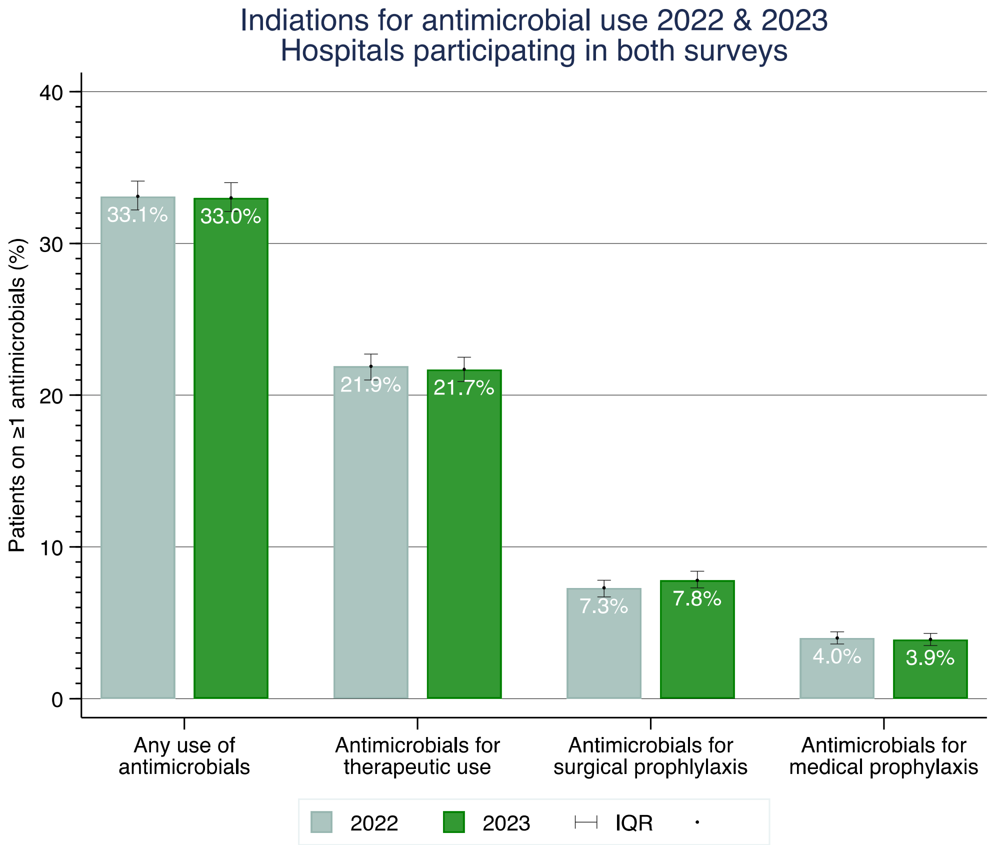
**Figure 20: Indications for antimicrobial use 2022 and 2023 in the subset of hospitals participating in both surveys**



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Antimicrobial use by antimicrobial classes (distribution) and by hospital size and type are shown in **Figures 21 and 22**. The proportion of cephalosporins in small and primary care hospitals is high because of their higher proportions of surgical patients with pre-operative prophylaxis. Large hospitals, particularly University-affiliated hospitals, have a significant proportion of Cotrimoxazole due to medical prophylaxis in immunocompromised patients. Similarly, the proportion of "Other antimicrobials" is higher in large and tertiary care hospitals because of using reserve antimicrobials to treat infections due to multidrug- or extremely drug-resistant microorganisms.

**Figure 21: Antimicrobial classes used by hospital size**

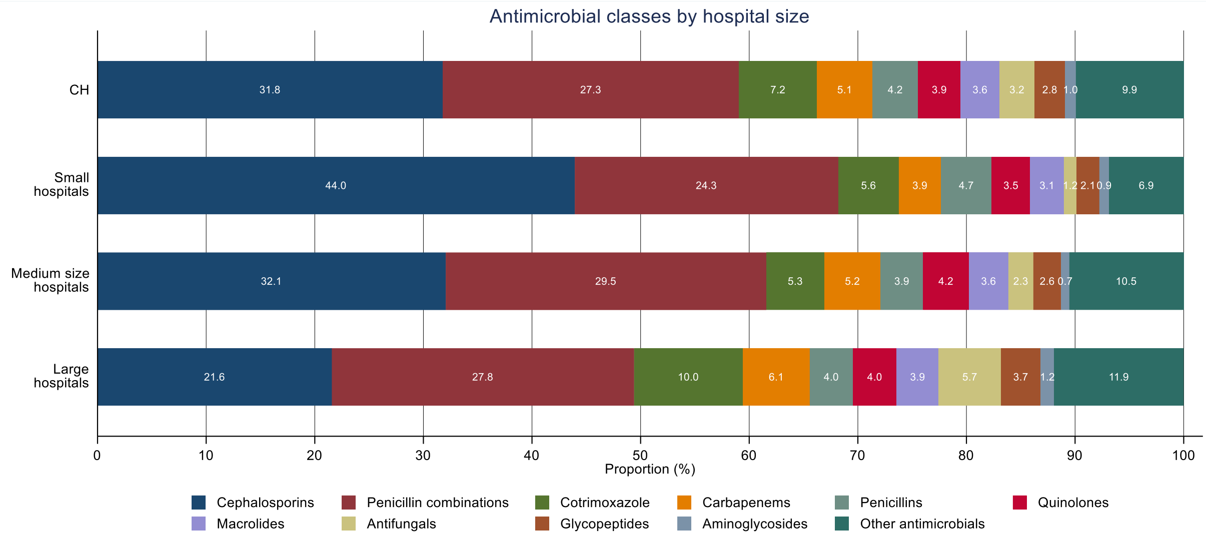
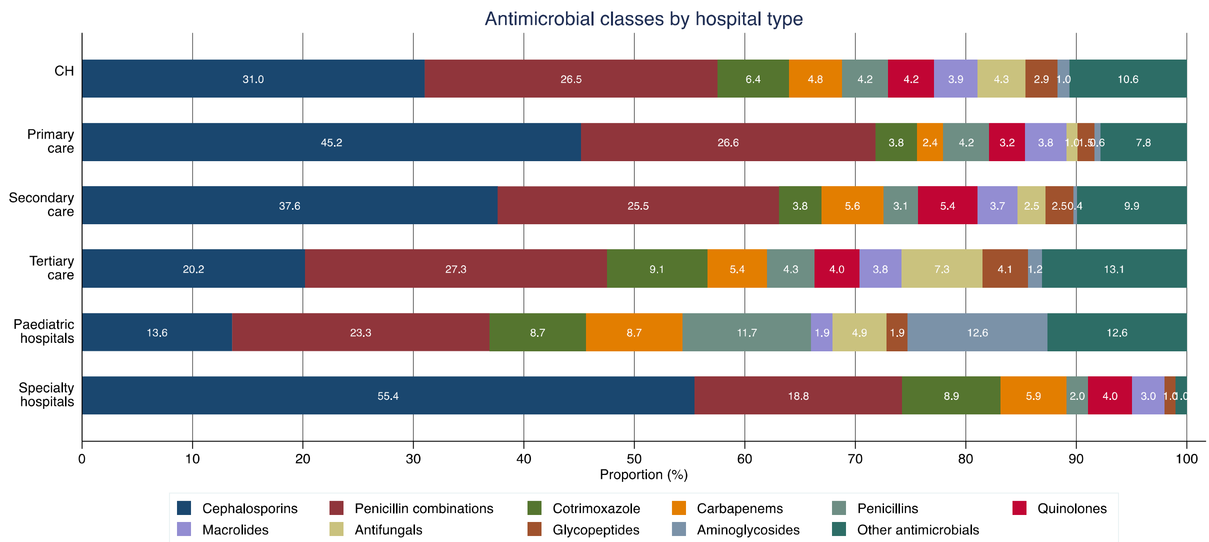



**Figure 22: Antimicrobial classes used by hospital type**



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Antimicrobial use by antimicrobial classes (distribution) over time are shown in **Figures 23 and 24**. In the subset of hospitals participating in all surveys (N=9), the proportion of "Other antimicrobials" is increasing over time. This group includes 2 University-affiliated, tertiary care hospitals, 2 secondary care middle-size hospitals and 4 primary care small-size hospitals. It can be speculated that the increase of "Other antimicrobials" in this subgroup is an indicator of emerging resistance, necessitating the use of reserve antimicrobials.

**Figure 23: Antimicrobial classes over time in all participating hospitals**

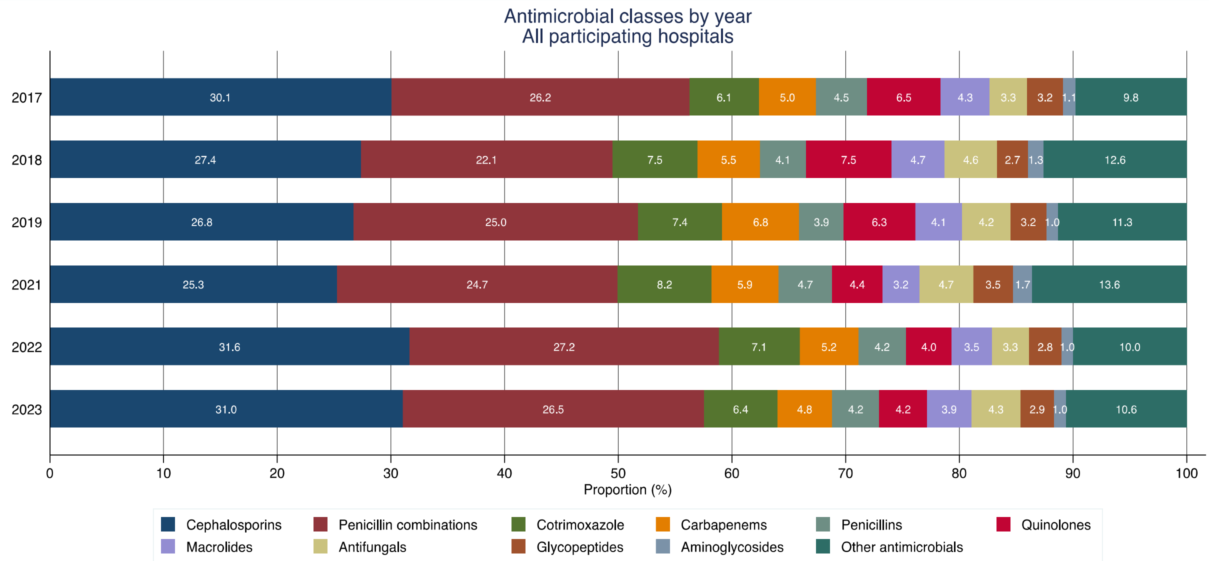
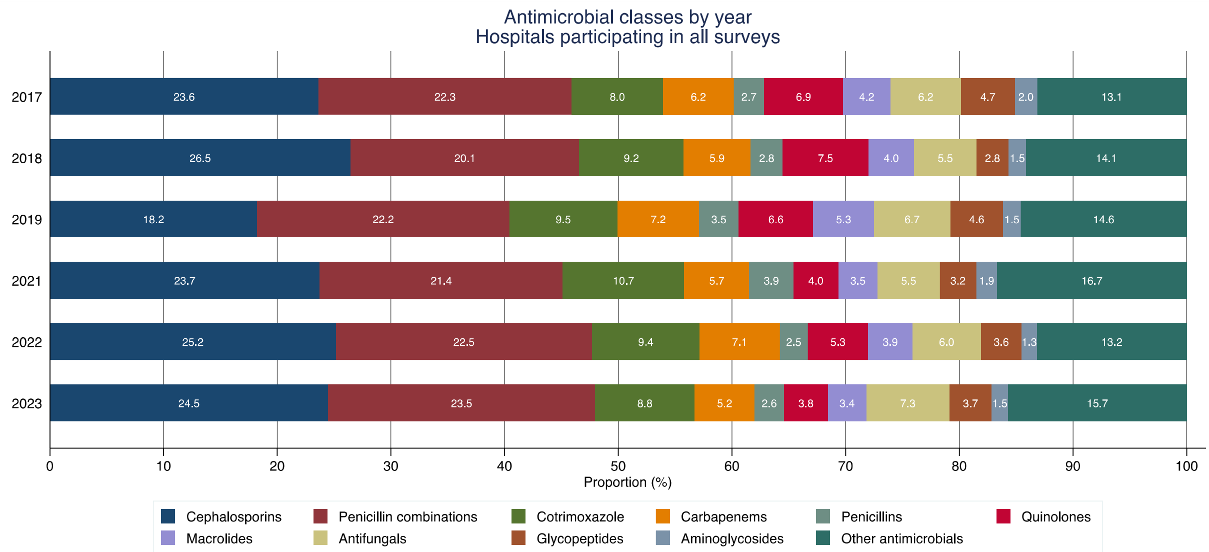



**Figure 24: Antimicrobial classes over time in the subgroup of hospitals participating in all surveys**



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**Figures 25 and 26** summarize the antimicrobial agents accounting for 75% of total antimicrobial use (DU75) – Figure 25 for all antimicrobial use, figure 26 for antimicrobials used for therapeutic purposes. CoAmoxicillin is the most commonly used drug, followed by Ceftriaxone, Cefuroxime and Piperacillin-tazobactam. Cefuroxime is used predominantly for pre-operative prophylaxis and Cotrimoxazole predominantly for medical prophylaxis.

**Figure 25: Antimicrobial agents accounting for 75% of total antimicrobial use**

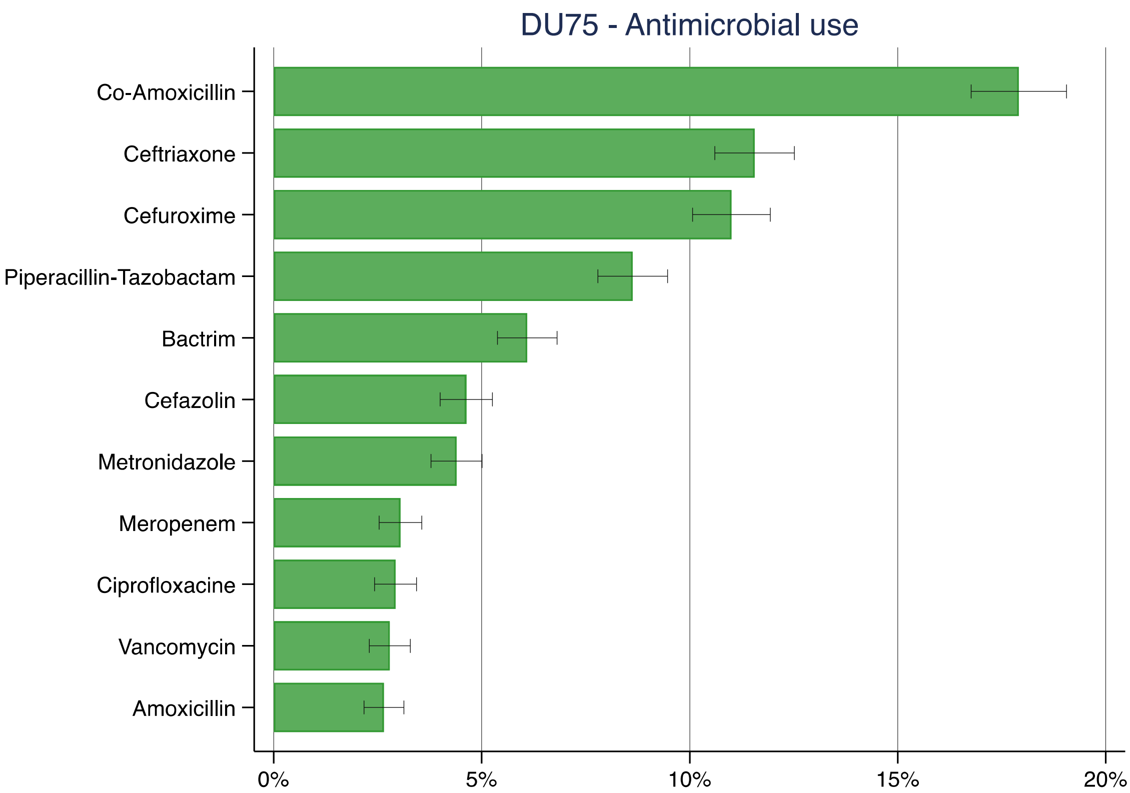




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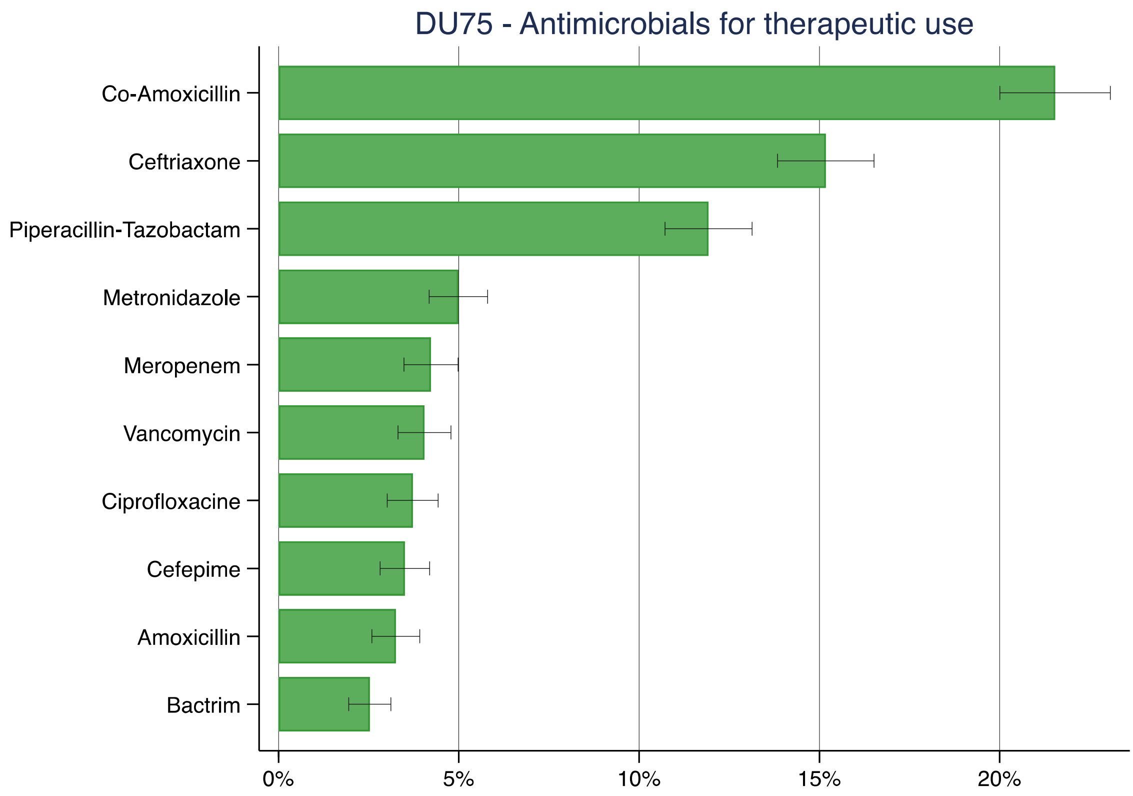
**Figure 26: Antimicrobial agents accounting for 75% of total antimicrobial use for therapeutic purposes**



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