



1.1. MRSA in acute care hospital (% of *S. aureus* isolates, median) (QS-7) and 3GC-R *E. coli* in acute care hospitals (% of *E. coli* infections, median) (QS-8)

1.1.1. Documentation sheet

Description	<p>Principal indicator Proportion of methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) on the total number of <i>S. aureus</i> isolates and proportion of <i>Escherichia coli</i> resistant to 3rd generation cephalosporins (3GC-R <i>E. coli</i>) on the total number of <i>E. coli</i> isolates in acute care hospitals</p> <p>Secondary indicator Proportion of healthcare-associated methicillin-resistant <i>Staphylococcus aureus</i> on the total number of MRSA</p>
Calculation	<p>Principal indicator Numerator: Number of MRSA and 3GC-R <i>E. coli</i> infections in acute care hospitals in the reporting period. Denominator: Number of <i>S. aureus</i> and <i>E. coli</i> infections in acute care hospitals in the reporting period.</p> <p>Secondary indicator Numerator: Number of healthcare-associated MRSA in acute care hospitals in the reporting period. Denominator: Number of MRSA in acute care hospitals in the reporting period.</p>
Rationale	<p><i>Staphylococcus aureus</i> is an important cause of infections of the skin and mucosae, of postoperative wound infections, catheter infections, pneumonia, bacteraemia and infections of articulations.¹ Since its first description,² MRSA has been a major source of healthcare-associated infections in European countries and abroad.</p> <p>Third-generation cephalosporins (3GC) are broad-spectrum antimicrobial agents useful in a variety of clinical situations. Their proven record of clinical efficacy, favourable pharmacokinetics, and low frequency of adverse effects make 3GC the preferred antibiotic in many clinical situations. Monitoring <i>S. aureus</i> (a skin bacterium) can inform about the effectiveness of infection prevention and control measures (including hand hygiene), while monitoring <i>E. coli</i> (a gut bacterium), additionally informs about antibiotic consumption.</p> <p>In 1994, Sciensano initiated the first national surveillance program of methicillin-resistant <i>Staphylococcus aureus</i> (MRSA). By the end of the 1990s, resistance in a wide range of Gram-negative bacteria started to escalate. In 2005, the surveillance program was therefore extended to also include resistance in <i>Escherichia coli</i> and several other Gram-negative bacteria. Belgian acute care hospitals must participate (at least one semester/year) in the surveillance of MRSA (since 2006) and multi-resistant Gram-negative bacteria (since 2015).³</p> <p>MRSA and 3GC-R <i>E. coli</i> are considered by ECDC primary indicators of antimicrobial resistance in bacteria from humans.</p>
Primary data source	<p>Sciensano, Service healthcare-associated infections & antimicrobial resistance (https://www.sciensano.be/nl/over-sciensano/organigram-van-sciensano/zorginfecties-en-antibioticaresistentie)</p> <p>International comparisons are based on EARS-Net data (https://ecdc.europa.eu/en/about-us/partnerships-and-networks/disease-and-laboratory-networks/ears-net)</p>



Source of results	<p>National Surveillance of Infections in Healthcare facilities: https://www.sciensano.be/nl/projecten/nationale-surveillance-van-antimicrobiele-resistentie</p> <p>Surveillance of antimicrobial resistant bacteria in Belgian hospitals: Report 2021⁴</p> <p>Surveillance of antimicrobial resistance in Europe: Surveillance Atlas of Infectious Diseases, ECDC https://atlas.ecdc.europa.eu/public/index.aspx?Dataset=27&HealthTopic=4</p>
Technical definitions	<p>MRSA is defined as <i>Staphylococcus aureus</i> (<i>S. aureus</i>) resistant to methicillin or oxacillin.</p> <p>3GC-R <i>E. coli</i> is defined as <i>Escherichia coli</i> (<i>E. coli</i>) resistant to 3rd generation cephalosporins (cefotaxime, ceftriaxone, ceftazidime) according to EUCAST or CLSI criteria.</p> <p>The resistance proportion (crude, mean, median, interquartile range) was calculated for each resistant bacterium by dividing the number of resistant bacterial species by the total number of isolated species in the hospital during the surveillance period.</p>
International comparability	<p>The only source of information for international comparisons is the European Antimicrobial Resistance Surveillance Network (EARS-Net). EARS-Net is a program managed and coordinated by the European Centre for Disease Prevention and Control (ECDC) and is the largest publicly funded system for antimicrobial resistance surveillance in Europe.</p> <p>The results of EARS-Net should however be interpreted with caution:</p> <ul style="list-style-type: none">• EARS-Net only considers invasive isolates (from blood cultures, cerebrospinal fluid, and urine), while the national surveillance includes all isolates.• EARS-Net is a voluntary programme, and estimates are therefore not nationally representative for Belgium. Differences between countries concerning the coverage and participation, the quality of the lab results, and the frequency of sampling are also possible. The national surveillance on the other hand is mandatory and does yield nationally representative estimates for Belgium.
Periodicity	Both the national surveillance and EARS-Net have an annual periodicity.
Dimensions	Quality (safety)
Reviewers	Katrien Latour, Service healthcare-associated infections & antimicrobial resistance, Sciensano



1.1.2. Results

Proportion of methicillin-resistant *Staphylococcus aureus*

In 2021, the crude proportion of MRSA on the total number of *S. aureus* isolates was 10.8% (n=3 064/28 450) in all 111 participating acute care hospitals. The median MRSA resistance proportion was 9,1%. The proportion was higher in Wallonia (Table 1).

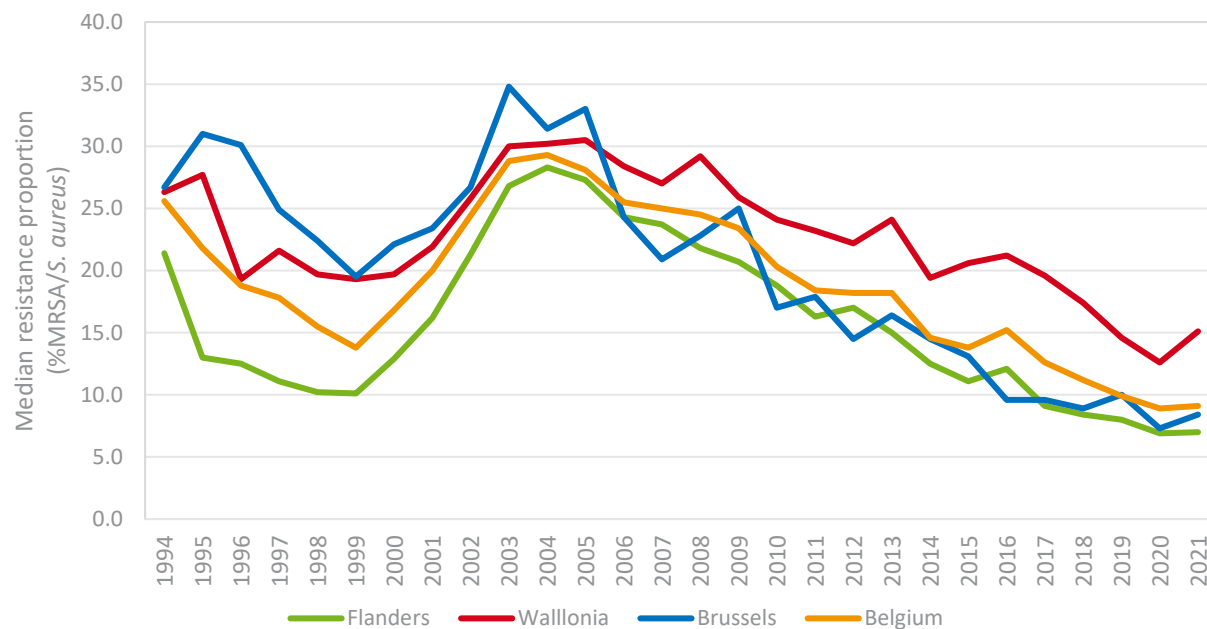
The overall median MRSA resistance proportion in acute care hospitals peaked around 2004 and has shown an overall steady decrease afterwards except between 2015 and 2016. Between 2020 and 2021, it again slightly increased overall (8.9% and 9.1%, respectively) and in all three regions: from 6.9% to 7.0% in Flanders, from 12.6% to 15.1% in Wallonia and from 7.3% to 8.4% in Brussels (Figure 1).

Table 1 – Resistance in *Staphylococcus aureus*: proportion of methicillin-resistant *S. aureus* (MRSA) on the total number of reported *S. aureus* isolates (clinical samples only) by region, Belgian acute care hospitals, 2021

	Number of participating hospitals	Proportion MRSA / <i>S. aureus</i> (%)			
		<i>Crude</i>	<i>Mean</i>	<i>Median</i>	<i>Interquartile range</i>
Belgium	111	10.8	10.9	9.1	5.7-13.9
Flanders	59	7.1	7.8	7.0	3.8-10.7
Wallonia	38	17.4	16.0	15.1	9.0-22.5
Brussels	14	10.0	10.3	8.4	7.0-12.7



Figure 1 – Evolution of the median proportion of methicillin resistant *Staphylococcus aureus* (MRSA) on the total number of reported *S. aureus* (clinical samples only) by region, Belgian acute care hospitals, 1994-2021



Source: Latour et al., 2021⁴

Proportion of healthcare-associated methicillin-resistant *Staphylococcus aureus*

In total, 111 acute care hospitals reported 614 clinical samples and 627 screening samples as MRSA positive more than 48 hours after admission. These MRSA cases can therefore be considered healthcare-associated. The crude proportion of clinical samples tested MRSA positive more than 48 hours after admission (healthcare-associated MRSA) on the total number of clinical samples tested positive for MRSA was 20.0% (n=614/3 064). More details on this proportion by region can be found in Table 1. The median

proportion of healthcare-associated MRSA has been decreasing in all regions.

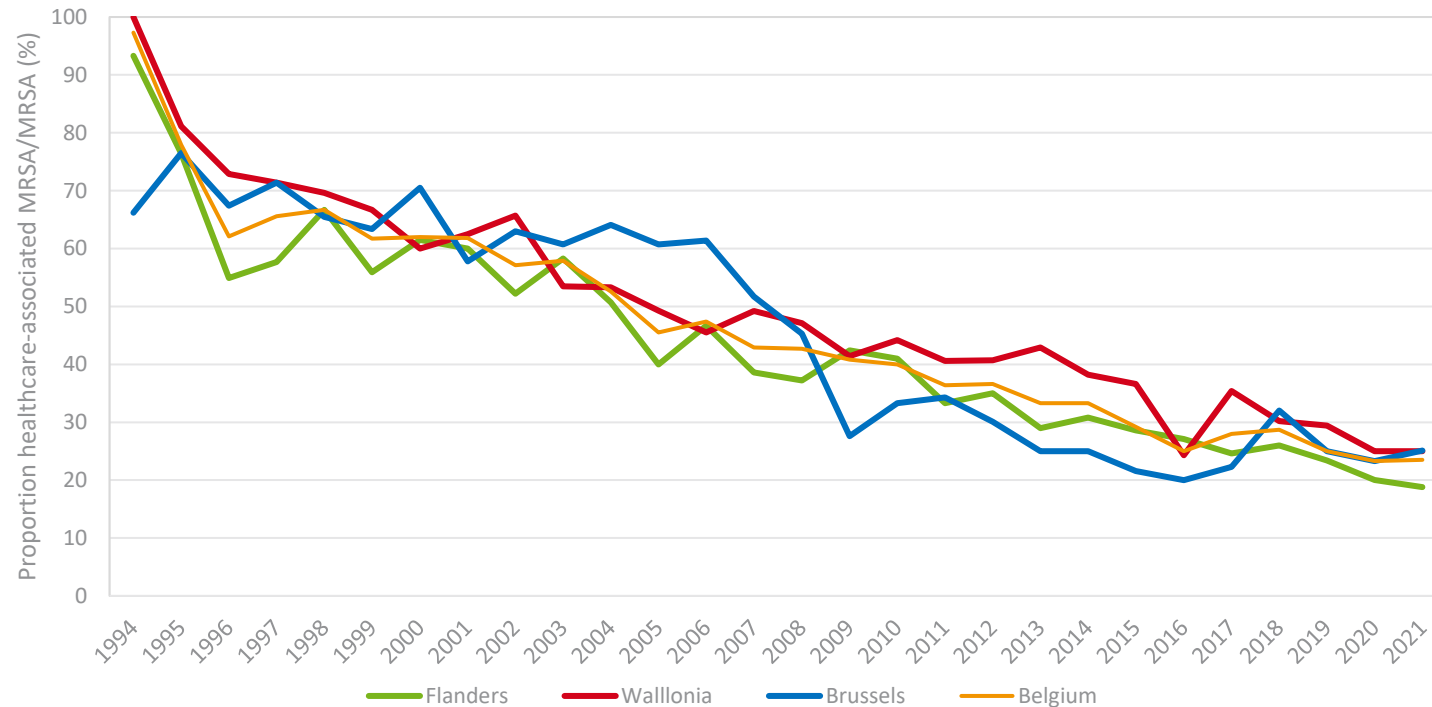


Table 2 – Proportion of healthcare-associated methicillin-resistant *Staphylococcus aureus* (MRSA) on the total number of reported MRSA isolates (clinical samples only) by region, Belgian acute care hospitals, 2021

	Number of participating hospitals	Proportion nosocomial MRSA / MRSA (%)			
		<i>Crude</i>	<i>Mean</i>	<i>Median</i>	<i>Interquartile range</i>
Belgium	111	20.0	25.0	23.1	10.0-33.3
Flanders	59	20.6	21.9	18.8	9.5-33.3
Wallonia	38	19.9	29.0	25.0	14.0-38.8
Brussels	14	19.2	27.4	25.1	9.5-44.4



Figure 2 – Evolution of the median proportion of healthcare-associated methicillin-resistant *Staphylococcus aureus* (MRSA) on the total number of reported MRSA isolates (clinical samples only) by region, Belgian acute care hospitals, 1994-2021



Source: Latour et al., 2021⁴

Proportion of 3GC-R *Escherichia coli*

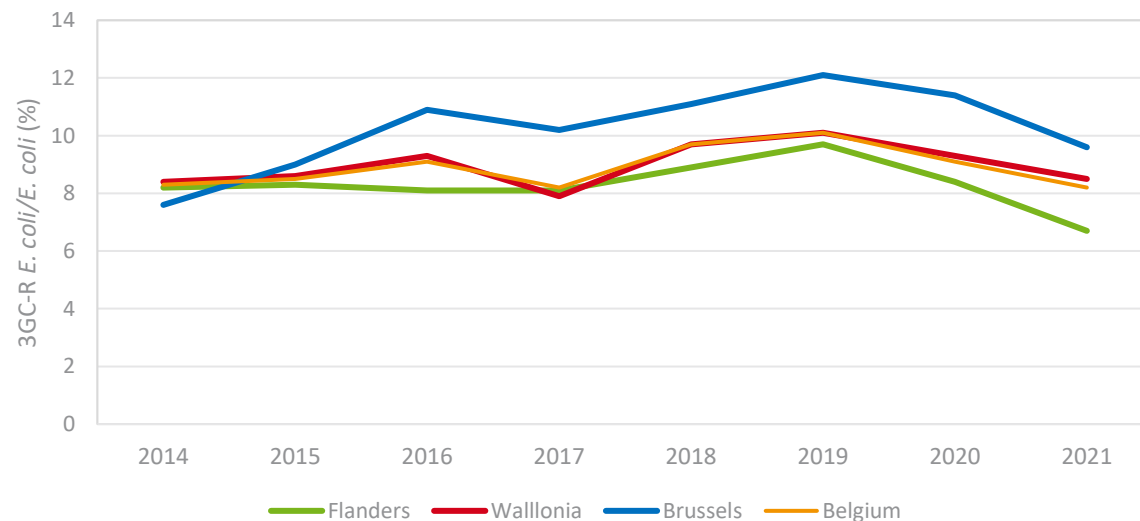
In 2021, the crude overall resistance proportion for 3GC-R *E. coli* was 7.8% (n=7 210/91 915). The median resistance proportion was 8,2% in the 111 participating acute care hospitals. The proportion was lower in Flanders (6,7%), intermediate in Wallonia (8,5%), and higher in Brussels (9,6%) (Table 3).



Table 3 – Resistance proportion of *Escherichia coli* resistant to 3rd generation cephalosporins (clinical samples only) by region, Belgian acute care hospitals, 2021

	Number of participating hospitals	Proportion 3GC-R (%)			
		<i>Crude</i>	<i>Mean</i>	<i>Median</i>	<i>Interquartile range</i>
Belgium	111	7.8	8.0	8.2	6.1-9.5
Flanders	59	7.2	6.9	6.7	5.4-8.7
Wallonia	38	8.2	8.6	8.5	7.9-10.2
Brussels	14	10.2	10.6	9.6	9.3-12.4

Figure 3 – Evolution of the median resistance proportion of *Escherichia coli* resistant to third-generation cephalosporins (clinical samples only) by region, Belgian acute care hospitals, 2014-2021



Source: Latour et al., 2023⁴. 3GC-R = resistance to 3rd generation cephalosporins; *note*: prior to 2018 non-susceptibility to 4th generation cephalosporins was included, prior to 2021 both intermediate susceptibility and resistance were considered



The median resistance proportion of 3GC-R *E. coli* fluctuated between 2014 (8.3%) and 2021 (8.2%), with a peak in 2016 (9.1%) and 2019 (10.1%). The median resistance proportion for 3GC-R *E. coli* is higher in Brussels since 2015 (Figure 3).

International comparisons

The European Antimicrobial Resistance Surveillance Network (EARS-Net) is the main EU surveillance system for AMR in bacteria that cause serious infections. Data reported from the network serve as important indicators of the occurrence and spread of AMR in Europe. All 28 EU Member States and two EEA countries (Iceland and Norway) participate in EARS-Net. The vast majority of the countries regularly report data for all bacteria and antimicrobial groups under surveillance. The number of participating laboratories continuously increased since the initiation of the network, indicating a strengthening of national AMR surveillance systems in the EU/EEA. The widespread and continuing implementation of European Committee on Antimicrobial Susceptibility Testing (EUCAST) guidelines for antibacterial susceptibility testing in Europe, and the high proportion of

laboratories that participate in the annual EARS-Net external quality assessment (EQA) exercise, contribute to improved data quality and an increasing ability of EU/EEA countries to report comparable AMR data.

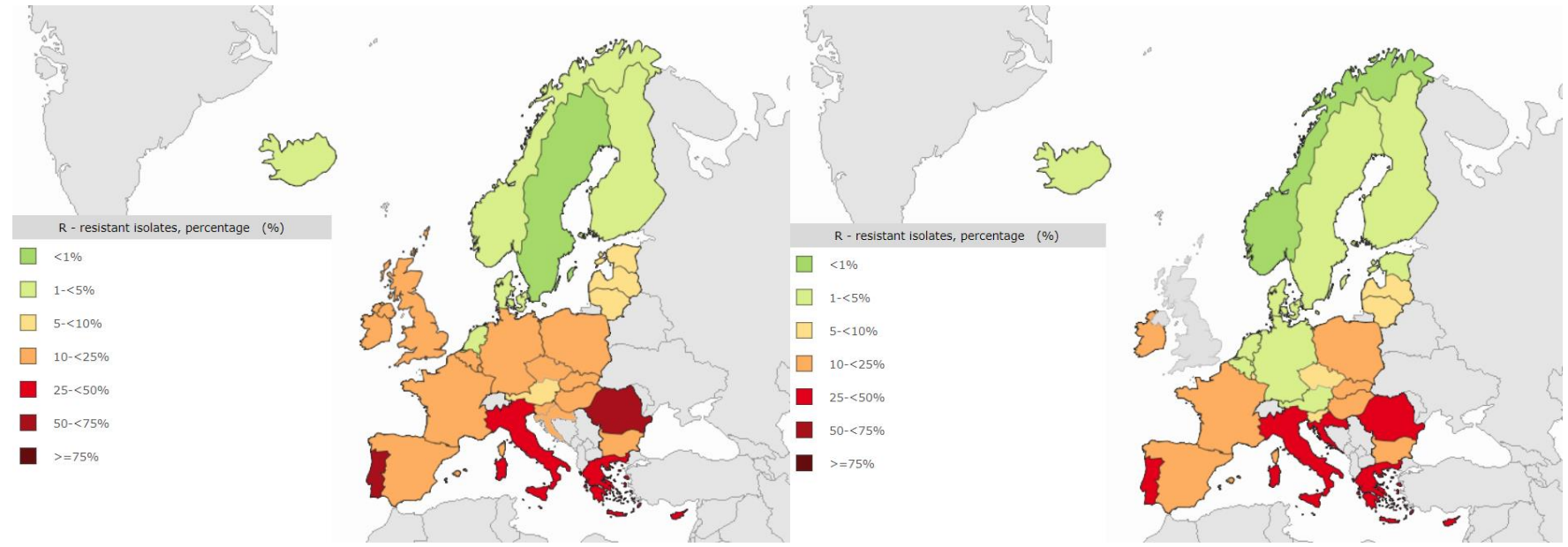
The results of EARS-Net should however be interpreted with caution:

- EARS-Net only considers invasive isolates (from blood cultures, cerebrospinal fluid, and urine), while the national surveillance includes all isolates.
- EARS-Net is a voluntary program, and estimates are therefore not nationally representative for Belgium. Differences between countries concerning the coverage and participation, the quality of the lab results, and the frequency of sampling are also possible. The national surveillance on the other hand is mandatory and does yield nationally representative estimates for Belgium.

Based on the EARS-Net data, the resistance proportion of both MRSA and 3GC *E. coli* in Belgium has a favourable position across EU-15 countries (Figure 4 and Figure 5).



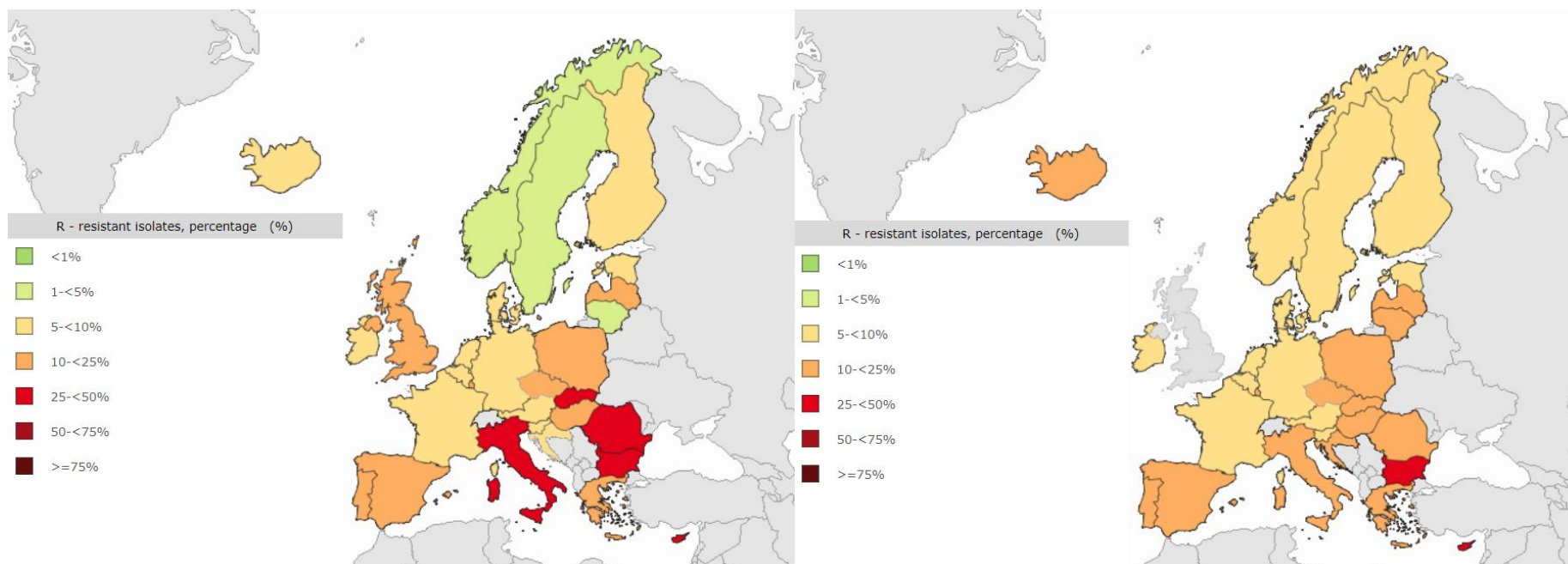
Figure 4 – Staphylococcus aureus. Percentage (%) of invasive isolated with resistance to methicillin (MRSA), EU/EEA, 2012, 2021



Source: EARS-Net, Surveillance Atlas of Infectious Diseases, ECDC



Figure 5 – Escherichia coli. Percentage (%) of invasive isolated with resistance to third-generation cephalosporins, EU/EEA, 2012, 2021



Source: EARS-Net, Surveillance Atlas of Infectious Diseases, ECDC

Impact of COVID-19 pandemic

Due to the COVID-19 pandemic, there was no legal obligation for hospitals to participate in the national surveillances (incl. MRSA and multi-resistant Gram-negative bacteria) in 2020 (collecting 2019 data) and 2021 (collecting 2020 data).

When interpreting the results, it is important to keep in mind that the 2019 surveillance findings presented in this report reflect the pre-pandemic period. The 2020 and 2021 data are however largely impacted by the altered hospital activities due to the COVID-19 crisis.



Key points

- In 2021, the median MRSA proportion in Belgian acute care hospitals was 9.1%.
- After an overall steady decrease since 2004, the median resistance proportion of MRSA in Belgian acute care hospitals slightly increased between 2015 and 2016 and, more recently, between 2020 and 2021.
- In 2021, the median 3GC-R *E. coli* proportion in Belgian acute care hospitals was 8.2%.
- Based on EARS-Net data, the resistance proportion of both MRSA and 3GC *E. coli* in Belgium has a favourable position across EU-15 countries.

References

1. Superior Health Council. Richtlijnen voor de beheersing en preventie van overdracht van methicilline-resistente *Staphylococcus aureus* (MRSA) in Belgische ziekenhuizen. 2005.
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3. Arrêté royal du 10 novembre 2006 modifiant l'arrêté royal du 25 avril 2002 relatif à la fixation et à la liquidation du budget des moyens financiers des hôpitaux, 10 november 2006. — Koninklijk besluit van 10 november 2006 tot wijziging van het koninklijk besluit van 25 april 2002 betreffende de vaststelling en de vereffening van het budget van financiële middelen van de ziekenhuizen, 2006.
4. Latour K, Vilain A, Denis O, Huang TD, Matheussen V, Yin N. Surveillance of antimicrobial resistant bacteria in Belgian hospitals: Report 2021-2022. Brussels, Belgium: Sciensano. Report to be published.