



GIG  
CYMRU  
NHS  
WALES

Iechyd Cyhoeddus  
Cymru  
Public Health  
Wales

## Healthcare Associated Infection, Antimicrobial Resistance and Prescribing Programme

# Antimicrobial Resistance in Blood Cultures Wales in 2016-2024



Version 1

Issued: 23/04/2025

The Healthcare Associated Infection, Antimicrobial Resistance and Prescribing (HARP) Programme can be accessed via the Public Health Wales website at:  
<https://phw.nhs.wales/>

Published by Public Health Wales NHS Trust, No. 2 Capital Quarter, Tyndall Street, Cardiff CF10 4BZ  
Published 11 March 2025, Version 1

## Acknowledgments

Mieko Yasunishi (PHW Informatics), Dr Lim Jones and Dr Mandy Wootton (SACU, PHW)

## Report Authors

Maggie Heginbotham, Siân Boots, Daryn Sutton and Robin Howe on behalf of the HARP Programme

## Reference this document as:

Public Health Wales NHS Trust: Antibacterial Resistance in Blood Cultures in Wales 2024

## Data requests and queries should be addressed to:

Public Health Wales NHS Trust  
HARP Programme  
4th floor, No. 2 Capital Quarter  
Tyndall Street  
Cardiff CF10 4BZ  
Email: [harp@wales.nhs.uk](mailto:harp@wales.nhs.uk)

## Contents

---

Introduction .....	3
Useful links:.....	3
Methodology .....	4
Resistance data .....	4
Data Sources.....	4
Antimicrobial Groups .....	4
Key Points of Interest.....	4
Antimicrobial resistance rates for the most common organisms causing bacteraemia .....	5
<i>Escherichia coli</i> (n = 2,143 in 2024) .....	5
<i>Klebsiella</i> spp. (n = 687 in 2024) .....	7
<i>Enterobacter</i> spp. (n = 80 in 2024) .....	9
<i>Serratia</i> spp. (n = 97 in 2024) .....	11
<i>Proteus</i> spp. (n = 258 in 2024) .....	13
<i>Pseudomonas aeruginosa</i> (n = 151 in 2024) .....	15
<i>Staphylococcus aureus</i> (n = 1,000 in 2024) .....	17
Methicillin Resistant <i>Staphylococcus aureus</i> (n = 78 in 2024) .....	18
Methicillin Sensitive <i>Staphylococcus aureus</i> (n = 922 in 2024) .....	20
<i>Enterococcus</i> spp. (n = 504 in 2024) .....	22
<i>Streptococcus pneumoniae</i> (n = 266 in 2024) .....	24

## Introduction

---

In 2014, Lord O'Neill was commissioned by the UK Prime Minister to review the global impact of antimicrobial resistance. He estimated that by 2050, 10 million lives a year and a cumulative 100 trillion USD of economic output would be at risk due to the rise of drug-resistant infections if no proactive solutions were found now to slow down the rise of drug resistance.

In response to the Lord O'Neill report and recommendations, in January 2019, the UK Government published its 20-year vision for antimicrobial resistance, and a five-year national action plan to tackle antimicrobial resistance. In May 2024, the UK Government published its second five-year action plan 'Confronting antimicrobial resistance'. The plan builds on the achievements and lessons of the first. It contains outcomes and commitments that will make progress towards the 20-year vision for antimicrobial resistance to be contained, controlled and mitigated.

Antimicrobial resistance is an increasing problem in Wales and has already led to a number of difficult to treat infections, leading to failed therapy and potential complications. Treatment for most infections is started empirically before antimicrobial susceptibilities are known. A particular problem with the spread of antimicrobial resistance is that it becomes more difficult to select empirical therapy that will have reliable activity.

The aim of this report from the HARP team at Public Health Wales is to provide surveillance data that can be used to design empirical therapy guidance, and to track antimicrobial resistance trends in Wales.

### Useful links:

Review on Antimicrobial Resistance May 2016

<https://amr-review.org/>

UK Antimicrobial Resistance Strategy 2013 – 18

<https://www.gov.uk/government/publications/uk-5-year-antimicrobial-resistance-strategy-2013-to-2018>

Antimicrobial Resistance Delivery Plan (Wales) 'Together for Health: Tackling antimicrobial resistance & improving antibiotic prescribing.

<http://www.wales.nhs.uk/sitesplus/documents/888/Antimicrobial%20Resistance%20Delivery%20Plan.pdf>

UK 20-year vision for antimicrobial resistance

<https://www.gov.uk/government/publications/uk-20-year-vision-for-antimicrobial-resistance>

Antimicrobial resistance: UK launches 5-year action plan and 20-year vision

<https://www.gov.uk/government/news/antimicrobial-resistance-uk-launches-5-year-action-plan-and-20-year-vision>

Policy paper: Confronting antimicrobial resistance 2024 to 2029

[Confronting antimicrobial resistance 2024 to 2029 - GOV.UK](#)



[https://eucast.org/clinical\\_breakpoints/](https://eucast.org/clinical_breakpoints/)

## Key Points of Interest

***Escherichia coli*** (the commonest cause of blood stream infections in Wales).

- ❖ In the 2024 All-Wales resistance rates to commonly used antibacterials varied:
  - Resistance to co-amoxiclav was **48.9%**.
  - Resistance to co-trimoxazole was **34.5%**.
  - Resistance to fluoroquinolones was **17.9%**.
  - Resistance to piperacillin/tazobactam was **15.5%**.
  - Resistance to third generation cephalosporins was **15.4%**.
  - Resistance to gentamicin was **12.5%**.
  - Resistance to ertapenem was **0.09%**.
  - Resistance to imipenem and meropenem was **0.00%**.

***Staphylococcus aureus***

- ❖ There has been a significant increase in the number of *Staphylococcus aureus* bacteraemia with AST results in the last year from **937** in 2023 to **1,000** in 2024.
- ❖ There has been an increase in the number of MRSA bacteraemia from **68** isolates in 2023 and **78** in 2024.
- ❖ There has been an increase in the number of MSSA bacteraemia from **869** in 2023 and **922** in 2024.

***Klebsiella spp.***

- ❖ In the 2024 All-Wales resistance rates to commonly used antibacterials varied:
  - Resistance to co-amoxiclav was **41.5%**.
  - Resistance to co-trimoxazole was **33.5%**.
  - Resistance to piperacillin/tazobactam was **30.2%**.
  - Resistance to third generation cephalosporins was **28.1%**.
  - Resistance to fluoroquinolones was **22.4%**.
  - Resistance to gentamicin was **17.3%**.
  - Resistance to amikacin was **1.6%**.
  - Resistance to ertapenem was **0.44%**.
  - Resistance to imipenem and meropenem was **0.00%**.

## Methodology

### Resistance data

#### Data Sources

Antimicrobial susceptibility testing data was extracted from the Public Health Wales DataStore system.

#### Antimicrobial Groups

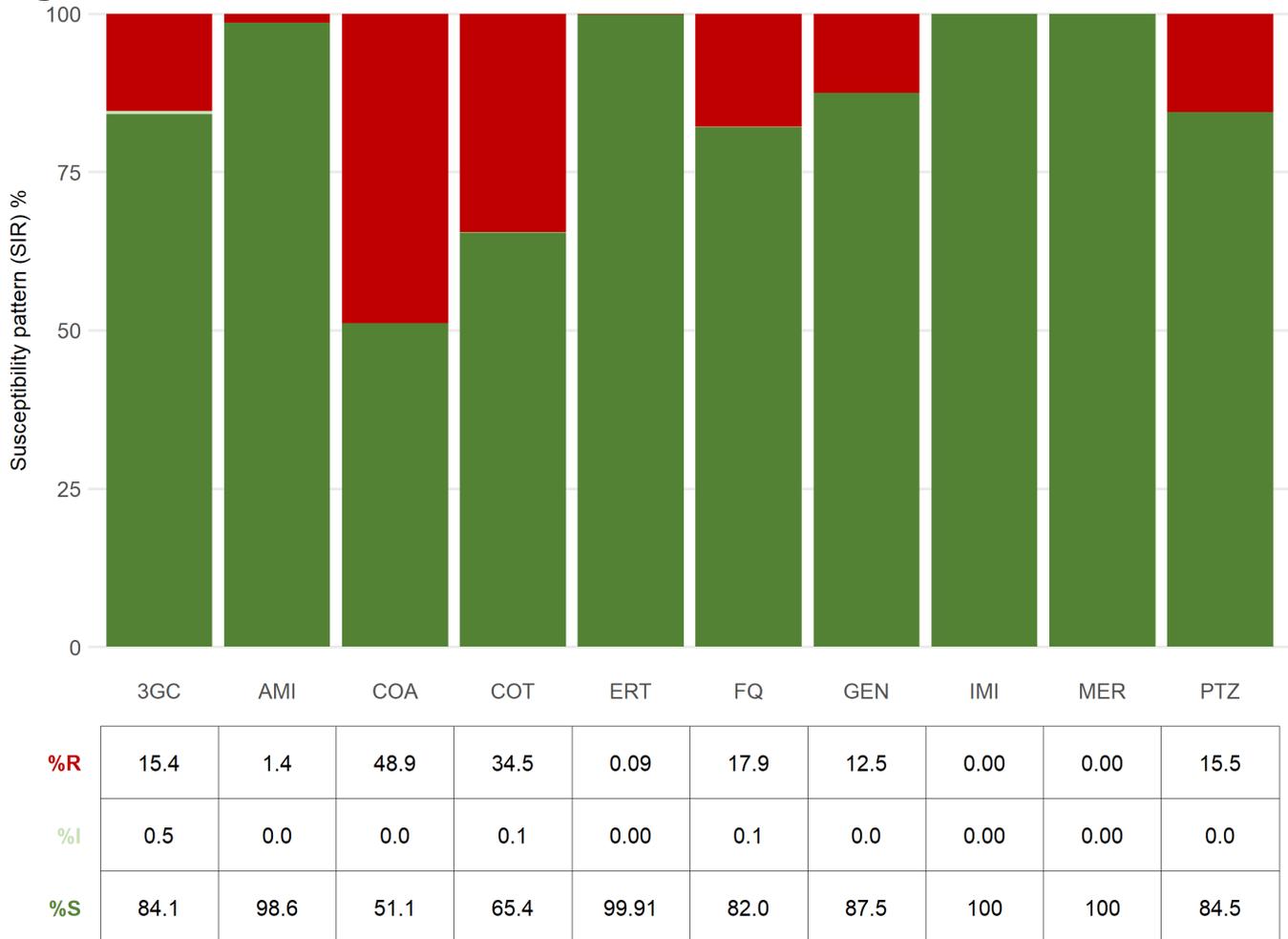
In 2012/2013 the European Committee on Antimicrobial Susceptibility Testing (EUCAST) methodology for antimicrobial susceptibility testing (AST) was implemented across the laboratories in Wales ([https://eucast.org/clinical\\_breakpoints](https://eucast.org/clinical_breakpoints)).

# Antimicrobial resistance rates for the most common organisms causing bacteraemia

## Escherichia coli (n = 2,143 in 2024)

*E. coli* is the commonest organism grown from blood cultures in Wales and the UK.

The All-Wales patterns of susceptibility (**S/I/R**) for *E. coli* bacteraemia in 2024 are shown in **Figure 1**. Trends in the resistance rates for the period 2016 to 2024 are shown in **Figure 2**.

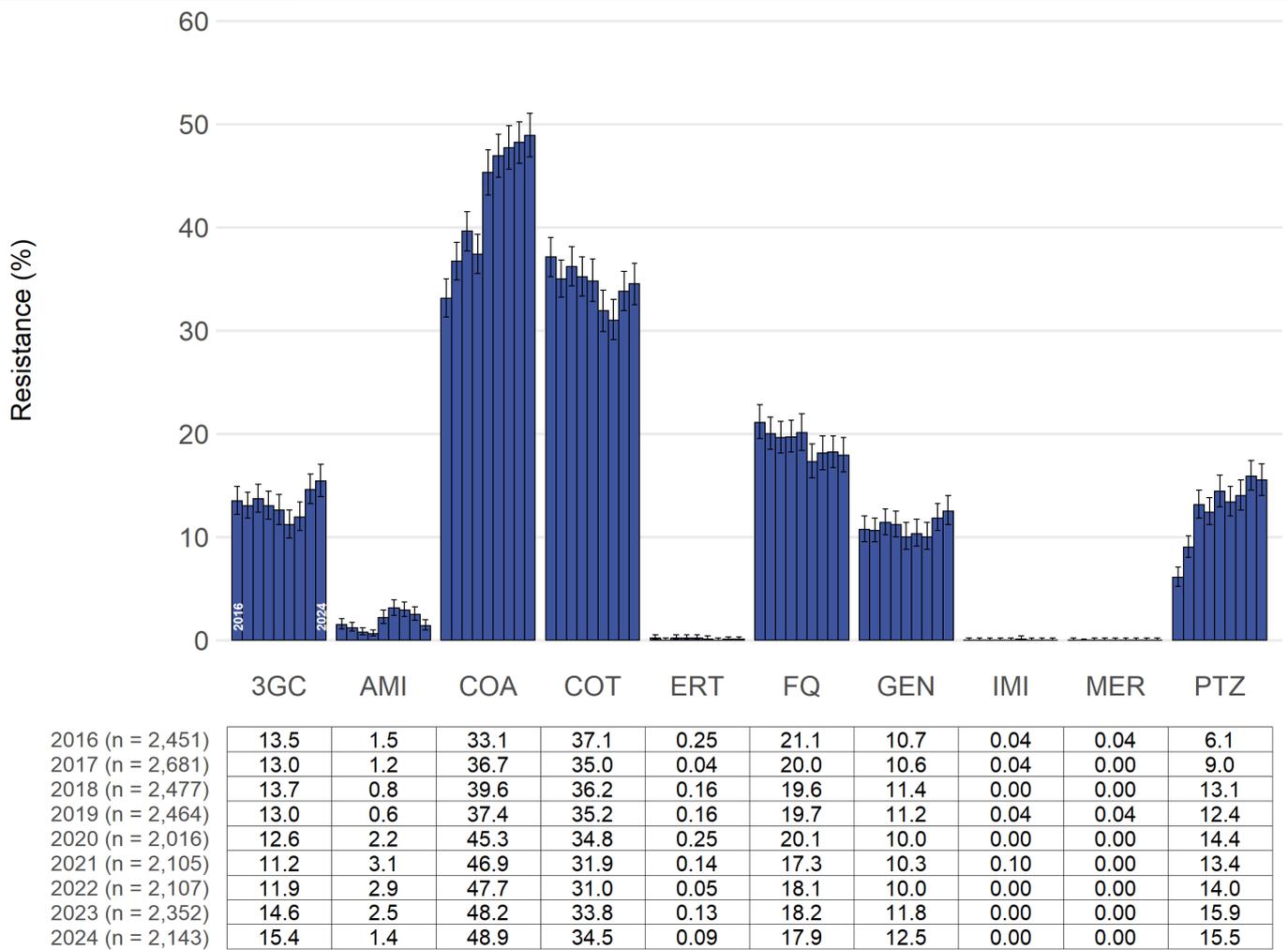


Key: 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMI = amikacin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, IMI = imipenem, MER = meropenem, PTZ = piperacillin/tazobactam

**Figure 1: All-Wales susceptibility patterns for *E. coli* bacteraemia in 2024**

### What the data shows

- Third generation cephalosporin (3GC) resistance was **15.4%** [14.0, 17.0].
- Amikacin (AMI) resistance was **1.4%** [1.0, 2.0].
- Co-amoxiclav (COA) resistance was **48.9%** [46.8, 51.0].
- Co-trimoxazole (COT) resistance was **34.5%** [32.5, 36.5].
- Fluoroquinolone (FQ) resistance was **17.9%** [16.3, 19.6].
- Gentamicin resistance was **12.5%** [11.2, 14.0].
- Piperacillin/tazobactam (PTZ) resistance was **15.5%** [14.1, 17.1].
- Ertapenem (ERT) resistance was **0.09%** [0.03, 0.34].
- Imipenem (IMI) resistance was **0.00%** [0.00, 0.18].
- Meropenem (MER) resistance was **0.00%** [0.00, 0.18].



Key: 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMI = amikacin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, IMI = imipenem, MER = meropenem, PTZ = piperacillin/tazobactam

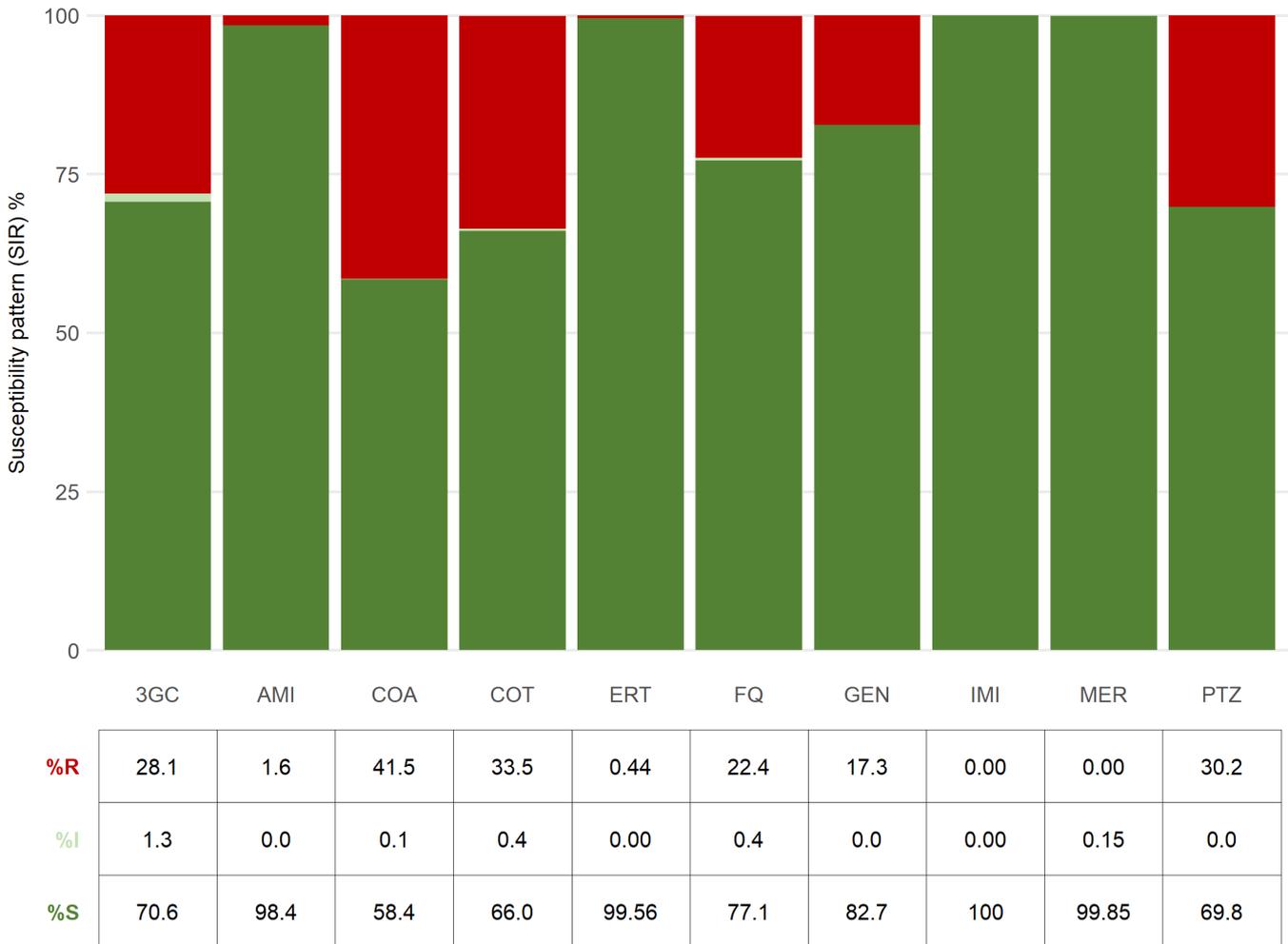
**Figure 2: All-Wales antimicrobial resistance rates for *E. coli* bacteraemia (2016 - 2024)**

### What the data shows

- There has been a decrease in the number of *E. coli* bacteraemia with AST results from **2,352** in 2023 to **2,143** in 2024 (duplicate cut-off ≤14 days).
- An increase in resistance to third generation cephalosporins to **15.4%** in 2024.
- A decrease in amikacin resistance to **1.4%** in 2024.
- An increase in co-amoxiclav resistance to **48.9%** in 2024.
- A general decrease in co-trimoxazole resistance from 2016-2022, with an increase to **34.5%** in 2024.
- A general decrease in fluoroquinolone resistance, levelling off at **17.9%** in 2024.
- An increase in gentamicin resistance to **12.5%** in 2024.
- A small decrease in piperacillin/tazobactam resistance to **15.5%** in 2024.
- Imipenem and meropenem resistance was undetected in 2024.
- Ertapenem resistance was **<0.1%** in 2024.

## Klebsiella spp. (n = 687 in 2024)

*Klebsiella* spp. are the second commonest group of gram-negative organisms grown from blood cultures. The All-Wales patterns of susceptibility (**S/I/R**) for *Klebsiella* spp. bacteraemia in 2024 are shown in **Figure 3**. Trends in the resistance rates for the period 2016 to 2024 are shown in **Figure 4**.

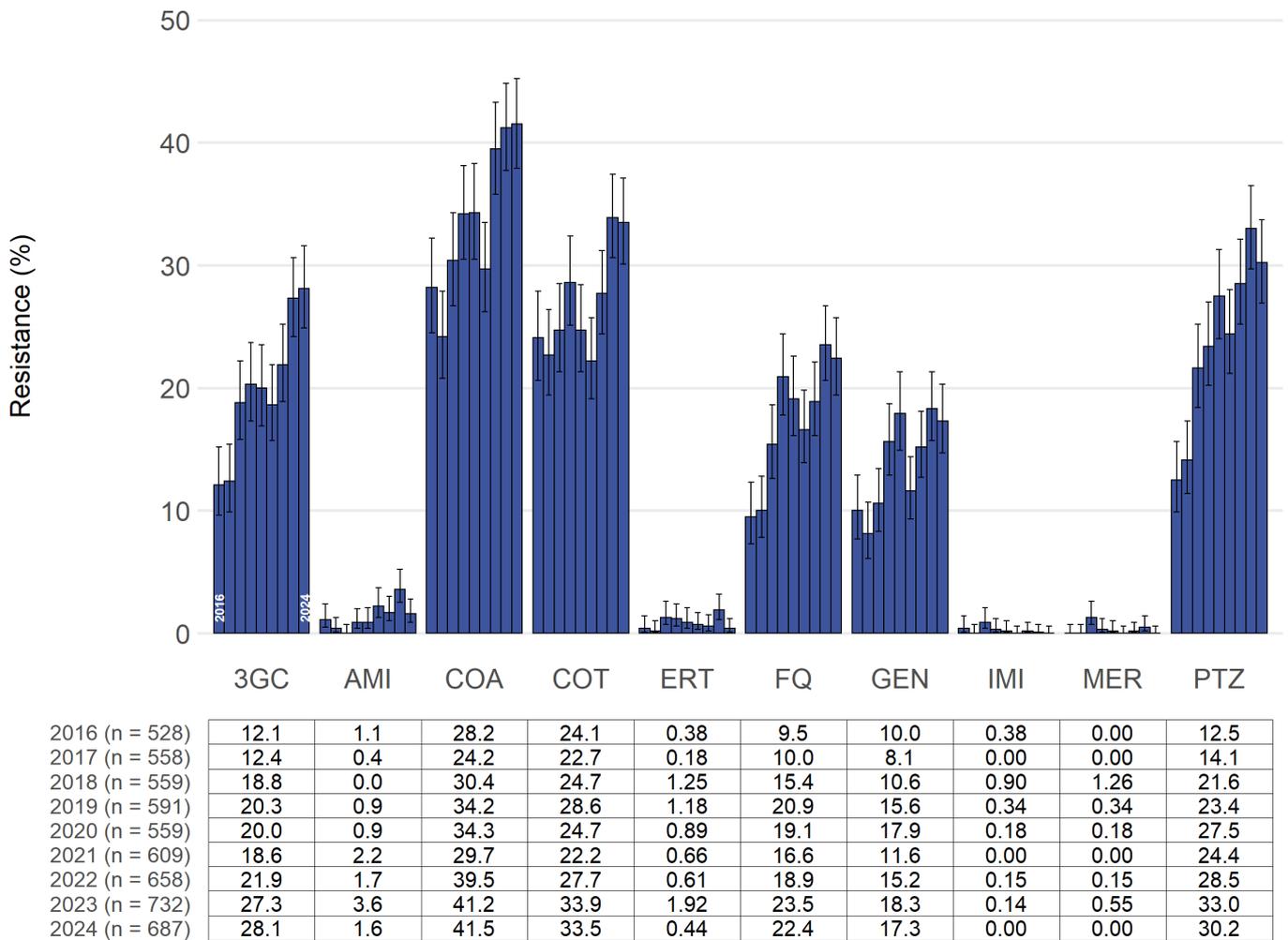


Key: 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMI = amikacin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, IMI = imipenem, MER = meropenem, PTZ = piperacillin/tazobactam

**Figure 3: All-Wales susceptibility patterns for *Klebsiella* spp. bacteraemia in 2024**

### What the data shows

- Third generation cephalosporin (3GC) resistance was **28.1%** [24.9, 31.6].
- Amikacin (AMI) resistance was **1.6%** [0.9, 2.8].
- Co-amoxiclav (COA) resistance was **41.5%** [37.8, 45.2].
- Co-trimoxazole (COT) resistance was **33.5%** [30.1, 37.1].
- Fluoroquinolone (FQ) resistance was **22.4%** [19.5, 25.7].
- Gentamicin resistance was **17.3%** [14.7, 20.4].
- Piperacillin/tazobactam (PTZ) resistance was **30.2%** [26.9, 33.7].
- Ertapenem (ERT) resistance was **0.44%** [0.15, 1.28].
- Imipenem (IMI) resistance was **0.00%** [0.00, 0.56].
- Meropenem (MER) resistance was **0.00%** [0.00, 0.56].



Key: 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMI = amikacin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, IMI = imipenem, MER = meropenem, PTZ = piperacillin/tazobactam

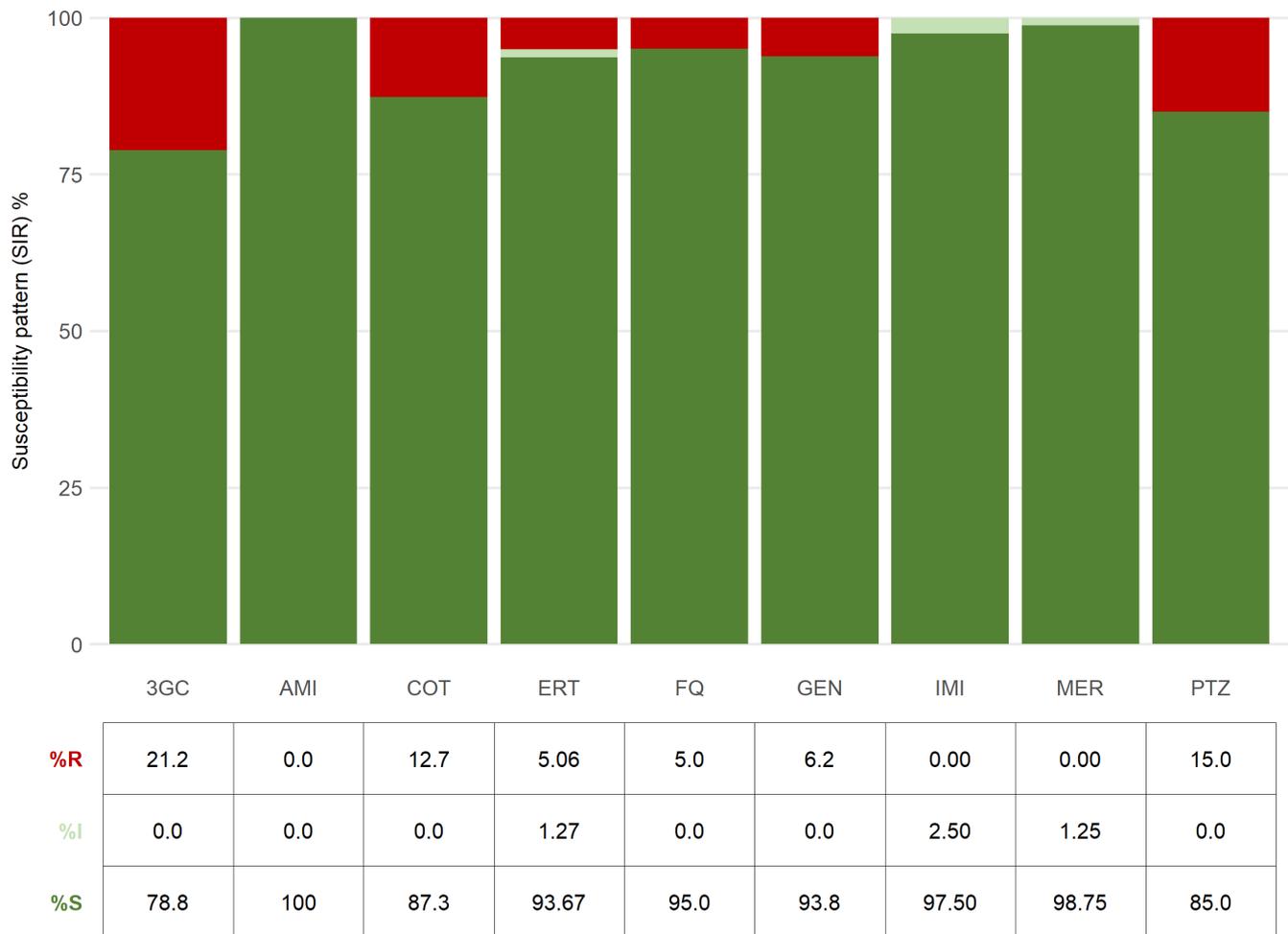
**Figure 4: All-Wales antimicrobial resistance rates for *Klebsiella* spp. bacteraemia (2016 - 2024)**

### What the data shows

- There has been a decrease in the number of *Klebsiella* spp. bacteraemia with AST results from **732** in 2023 to **687** in 2024 (duplicate cut-off ≤14 days).
- A small increase in resistance to third generation cephalosporins to **28.1%** in 2024.
- A decrease in amikacin resistance to **1.6%** in 2024.
- A small increase co-amoxiclav resistance to **41.5%** in 2024.
- A small decrease in co-trimoxazole resistance to **33.5%** in 2024.
- A decrease in fluoroquinolone resistance to **22.4%** in 2024.
- A decrease in gentamicin resistance to **17.3%** in 2024.
- A decrease in piperacillin/tazobactam resistance to **30.2%** in 2024.
- Imipenem and meropenem resistance remain **<1.5%** across All-Wales.
- There has been a decrease in ertapenem resistance to **0.44%** in 2024.

## Enterobacter spp. (n = 80 in 2024)

The All-Wales patterns of susceptibility (**S/I/R**) for *Enterobacter* spp. bacteraemia in 2024 are shown in **Figure 5**. Trends in the resistance rates for the period 2016 to 2024 are shown in **Figure 6**.

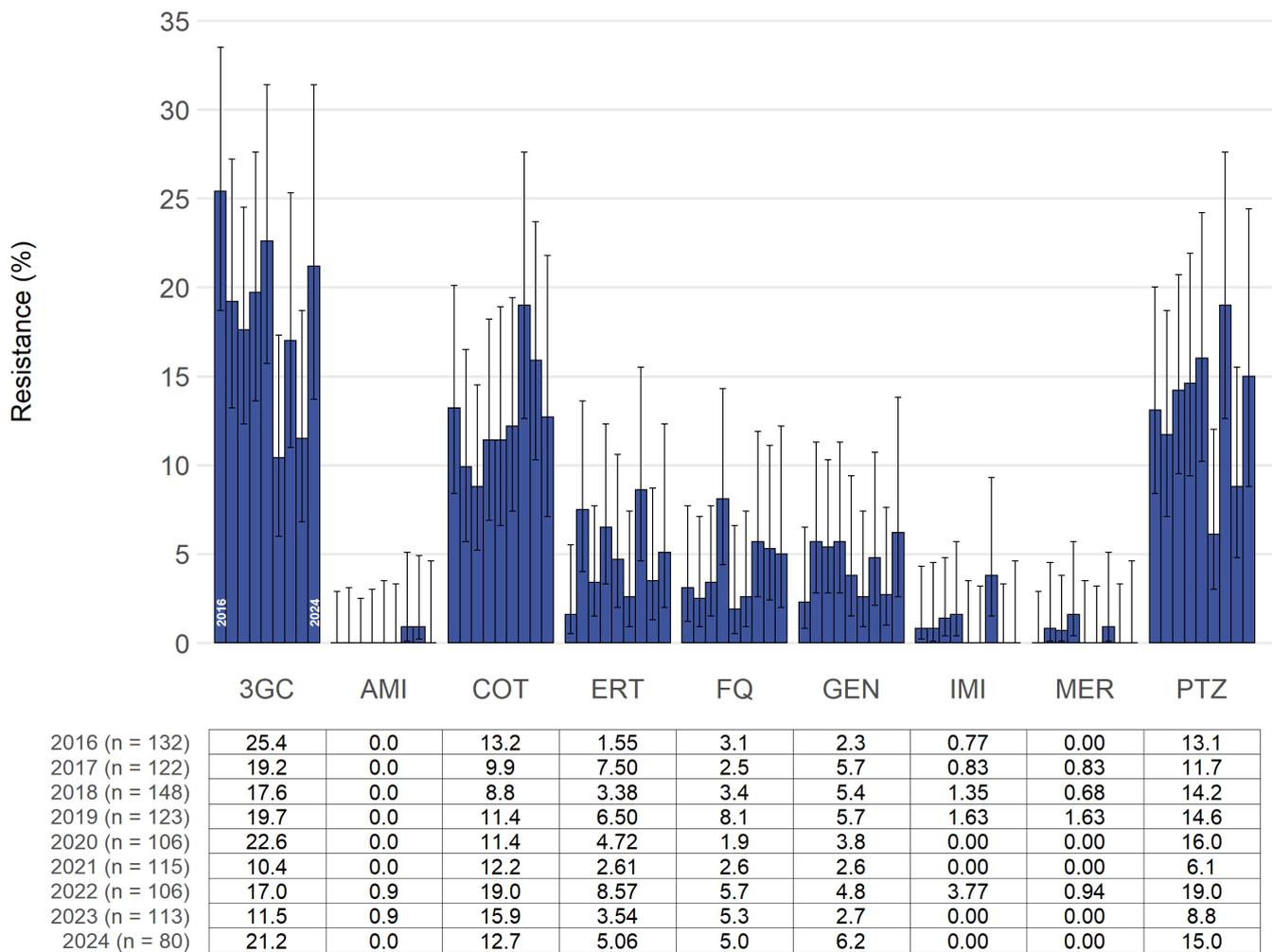


Key: 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMI = amikacin, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, IMI = imipenem, MER = meropenem, PTZ = piperacillin/tazobactam

**Figure 5: All-Wales susceptibility patterns for *Enterobacter* spp. bacteraemia in 2024**

### What the data shows

- Third generation cephalosporin (3GC) resistance was **21.2%** [13.7, 31.4].
- Amikacin (AMI) resistance was **0.0%** [0.0, 4.6].
- Co-trimoxazole (COT) resistance was **12.7%** [7.0, 21.8].
- Fluoroquinolone (FQ) resistance was **5.0%** [2.0, 12.2].
- Gentamicin resistance was **6.2%** [2.7, 13.8].
- Piperacillin/tazobactam (PTZ) resistance was **15.0%** [8.8, 24.4].
- Ertapenem (ERT) resistance was **5.06%** [1.99, 12.31].
- Imipenem (IMI) resistance was **0.00%** [0.00, 4.58].
- Meropenem (MER) resistance was **0.00%** [0.00, 4.58].



Key: 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMI = amikacin, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, IMI = imipenem, MER = meropenem, PTZ = piperacillin/tazobactam

**Figure 6: All-Wales antimicrobial resistance rates for *Enterobacter* spp. bacteraemia (2016 - 2024)**

### What the data shows

- There has been a general decrease in the number of *Enterobacter* spp. bacteraemia with AST results to **80** in 2024 (duplicate cut-off  $\leq 14$  days). This may be due in part to the reclassification of *Enterobacter aerogenes* to *Klebsiella aerogenes* in 2019.
- Due to small numbers in 2024, the 95% confidence intervals are large, and apart from the notable downward trend in third generation cephalosporin resistance, the other rates are changeable with no clear trend.

## Serratia spp. (n = 97 in 2024)

The All-Wales patterns of susceptibility (**S/I/R**) for *Serratia* spp. bacteraemia in 2024 are shown in **Figure 7**. Trends in the resistance rates for the period 2016 to 2024 are shown in **Figure 8**.

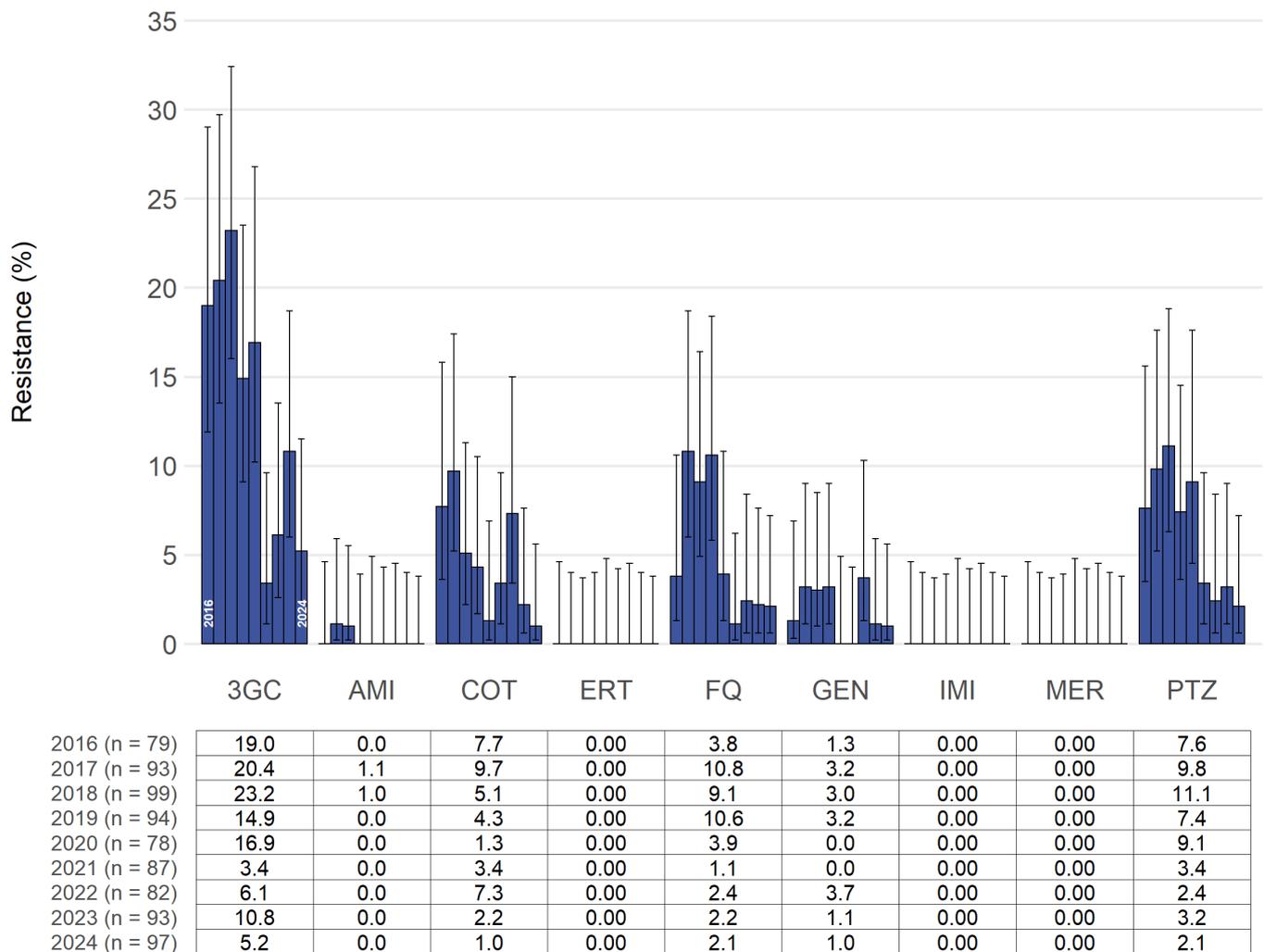


Key: 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMI = amikacin, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, IMI = imipenem, MER = meropenem, PTZ = piperacillin/tazobactam

**Figure 7: All-Wales susceptibility patterns for *Serratia* spp. bacteraemia in 2024**

### What the data shows

- Third generation cephalosporin (3GC) resistance was **5.2%** [2.2, 11.5].
- Amikacin (AMI) resistance was **0.0%** [0.0, 3.8].
- Co-trimoxazole (COT) resistance was **1.0%** [0.2, 5.6].
- Fluoroquinolone (FQ) resistance was **2.1%** [0.6, 7.2].
- Gentamicin resistance was **1.0%** [0.2, 5.6].
- Piperacillin/tazobactam (PTZ) resistance was **2.1%** [0.6, 7.2].
- Ertapenem (ERT) resistance was **0.00%** [0.00, 3.81].
- Imipenem (IMI) resistance was **0.00%** [0.00, 3.81].
- Meropenem (MER) resistance was **0.00%** [0.00, 3.81].



Key: 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMI = amikacin, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, IMI = imipenem, MER = meropenem, PTZ = piperacillin/tazobactam

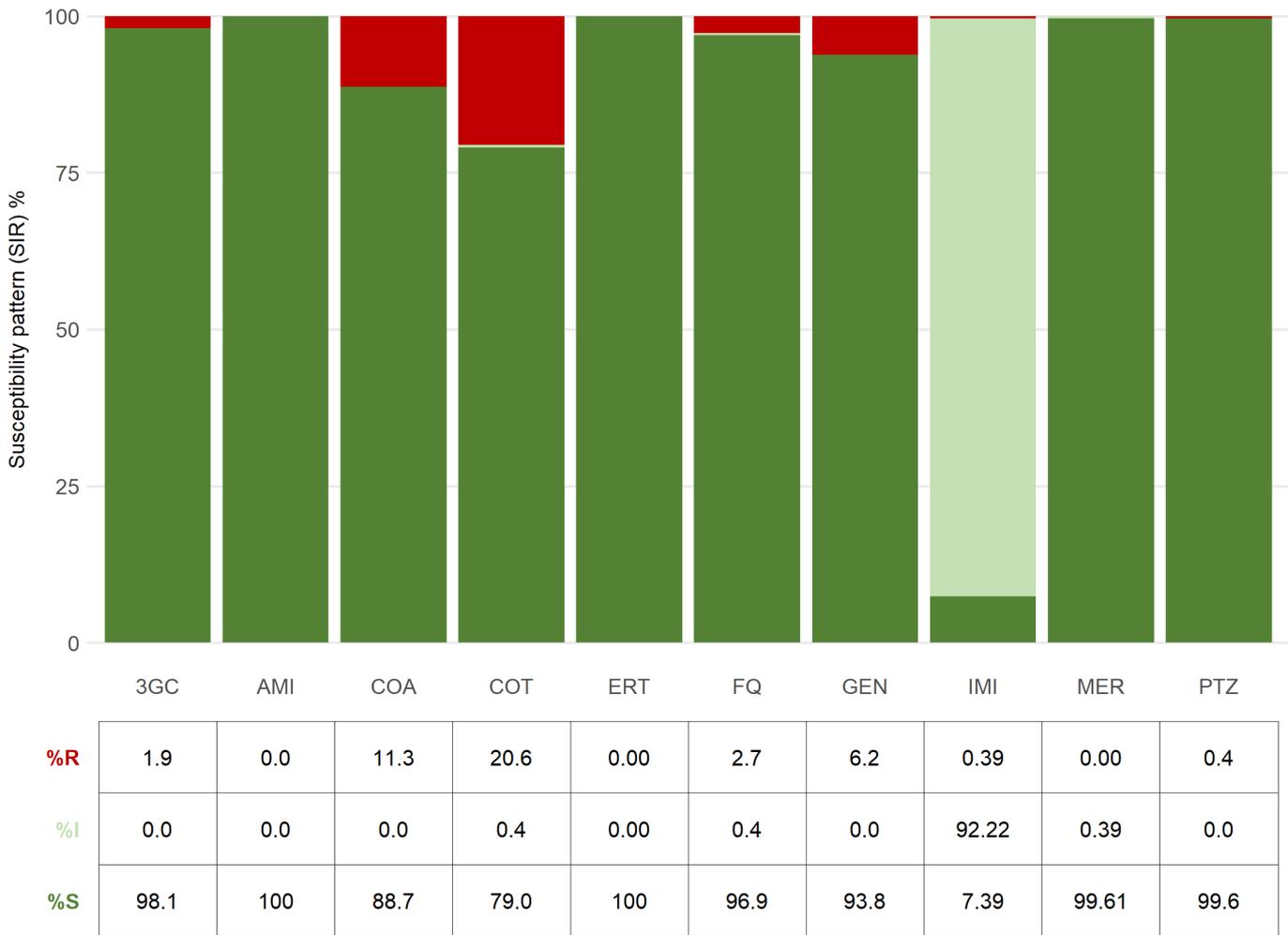
**Figure 8: All-Wales antimicrobial resistance rates for *Serratia* spp. bacteraemia (2016 - 2024)**

### What the data shows

- There has been an increase in the number of *Serratia* spp. bacteraemia with AST results from **93** in 2023 to **97** in 2024 (duplicate cut-off  $\leq 14$  days).
- A general decrease in third generation cephalosporin resistance (3GC) to **5.2%** in 2024.
- Amikacin (AMI) resistance was not reported in 2024.
- A general decrease in co-trimoxazole resistance to **1.0%** in 2024.
- A levelling off of fluoroquinolone resistance, with resistance at **2.1%** in 2024.
- No significant change in gentamicin resistance, with resistance at **1.0%** in 2024.
- A general decrease in piperacillin/tazobactam resistance to **2.1%** in 2024.
- Carbapenem (ertapenem, imipenem, meropenem) resistance was undetected.

## Proteus spp. (n = 258 in 2024)

The All-Wales patterns of susceptibility (**S/I/R**) for *Proteus* spp. bacteraemia in 2024 are shown in **Figure 9**. Trends in the resistance rates for the period 2016 to 2024 period are shown in **Figure 10**.

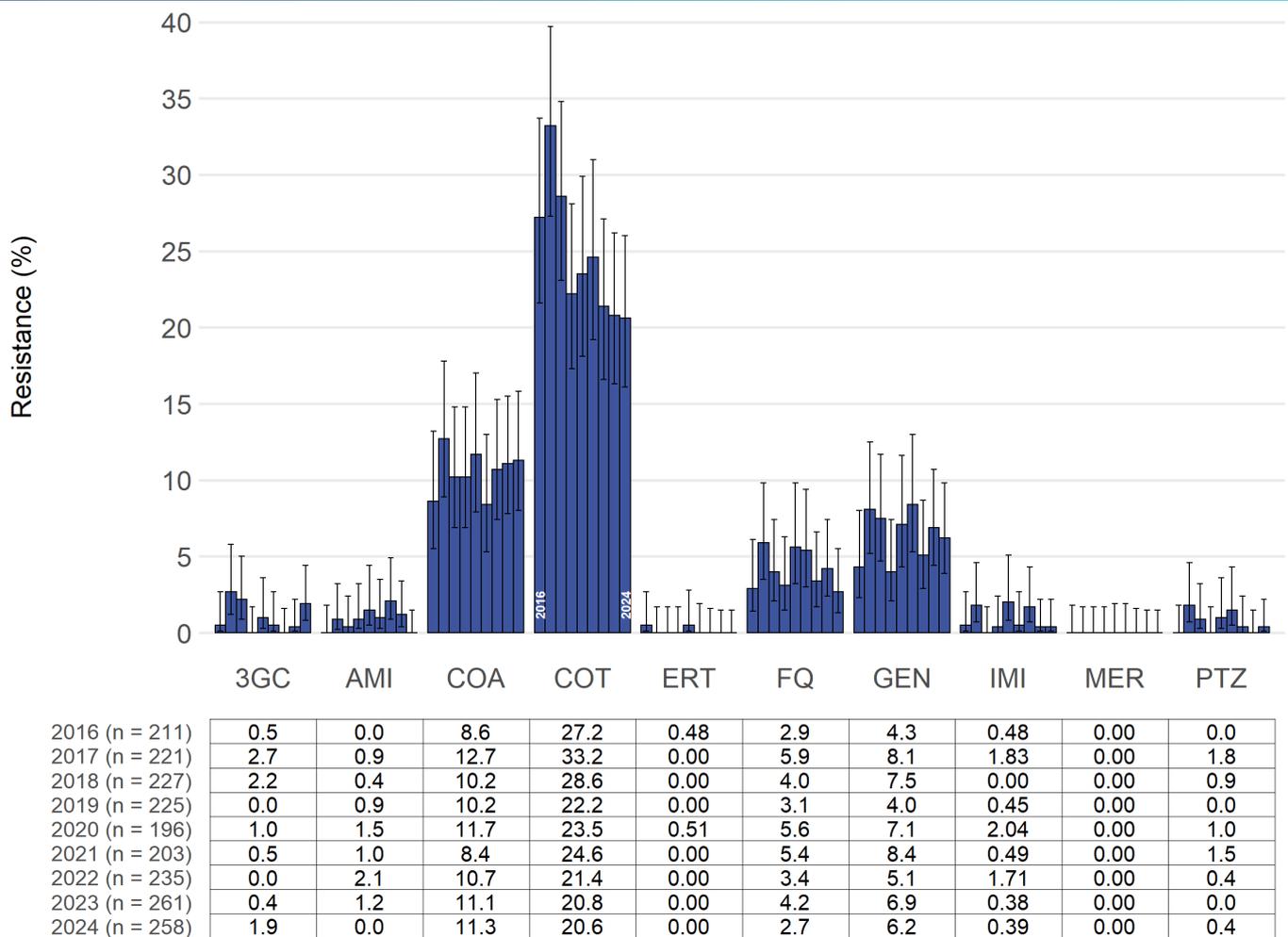


Key: 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMI = amikacin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, IMI = imipenem, MER = meropenem, PTZ = piperacillin/tazobactam

**Figure 9: All-Wales susceptibility patterns for *Proteus* spp. bacteraemia in 2024**

### What the data shows

- Third generation cephalosporin (3GC) resistance was **1.9%** [0.8, 4.5].
- Amikacin (AMI) resistance was **0.0%** [0.0, 1.5].
- Co-amoxiclav (COA) resistance was **11.3%** [8.0, 15.7].
- Co-trimoxazole (COT) resistance was **20.6%** [16.1, 26.0].
- Fluoroquinolone (FQ) resistance was **2.7%** [1.3, 5.5].
- Gentamicin resistance was **6.2%** [3.9, 9.8].
- Piperacillin/tazobactam (PTZ) resistance was **0.4%** [0.1, 2.2].
- Ertapenem (ERT) resistance was **0.00%** [0.00, 1.47].
- Imipenem (IMI) resistance was **0.39%** [0.07, 2.17].
- Meropenem (MER) resistance was **0.00%** [0.00, 1.47].



Key: 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMI = amikacin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, IMI = imipenem, MER = meropenem, PTZ = piperacillin/tazobactam

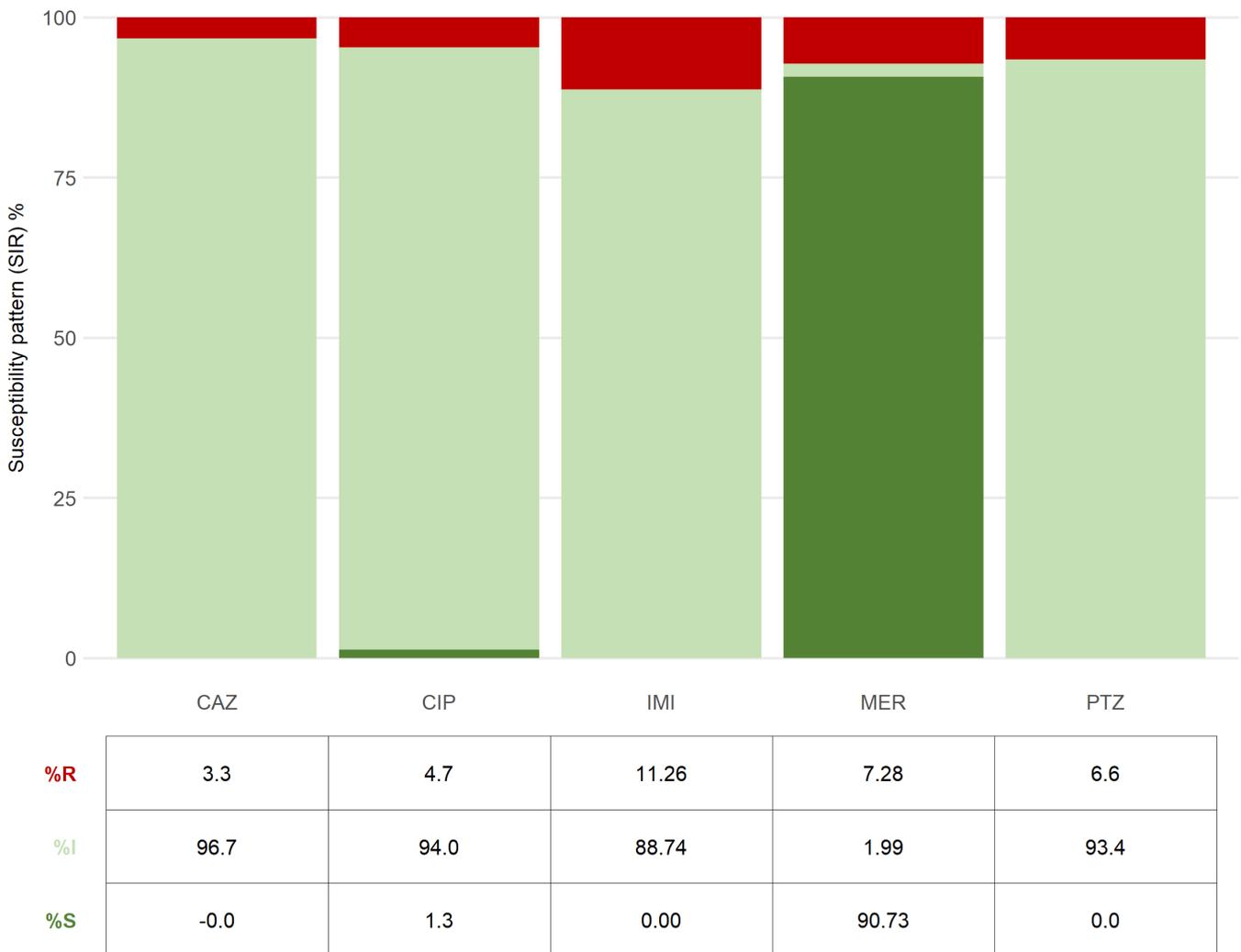
**Figure 10: All-Wales antimicrobial resistance rates for *Proteus* spp. bacteraemia (2016 - 2024)**

### What the data shows

- There has been a small decrease in the number of *Proteus* spp. bacteraemia with AST results from **261** in 2023 to **258** in 2024 (duplicate cut-off ≤14 days).
- Variability in third generation cephalosporin resistance, with resistance at **1.9%** in 2024.
- Variability in amikacin resistance, with resistance at **0.0%** in 2024.
- No significant change in co-amoxiclav resistance, with resistance at **11.3%** in 2024.
- A general decrease in co-trimoxazole resistance, with resistance at **20.6%** in 2024.
- Variability in fluoroquinolone resistance, with resistance at **2.7%** in 2024.
- Variability in gentamicin resistance, with resistance at **6.2%** in 2024.
- Variability in piperacillin/tazobactam resistance, with resistance at **0.4%** in 2024.
- Ertapenem and meropenem resistance was undetected in 2024.
- Variability in imipenem resistance, with resistance at **0.39%** in 2024.

## *Pseudomonas aeruginosa* (n = 151 in 2024)

The All-Wales patterns of susceptibility (**S/I/R**) for *Ps. aeruginosa* bacteraemia in 2024 are shown in **Figure 11**. Trends in the resistance rates for the period 2016 to 2024 are shown in **Figure 12**.

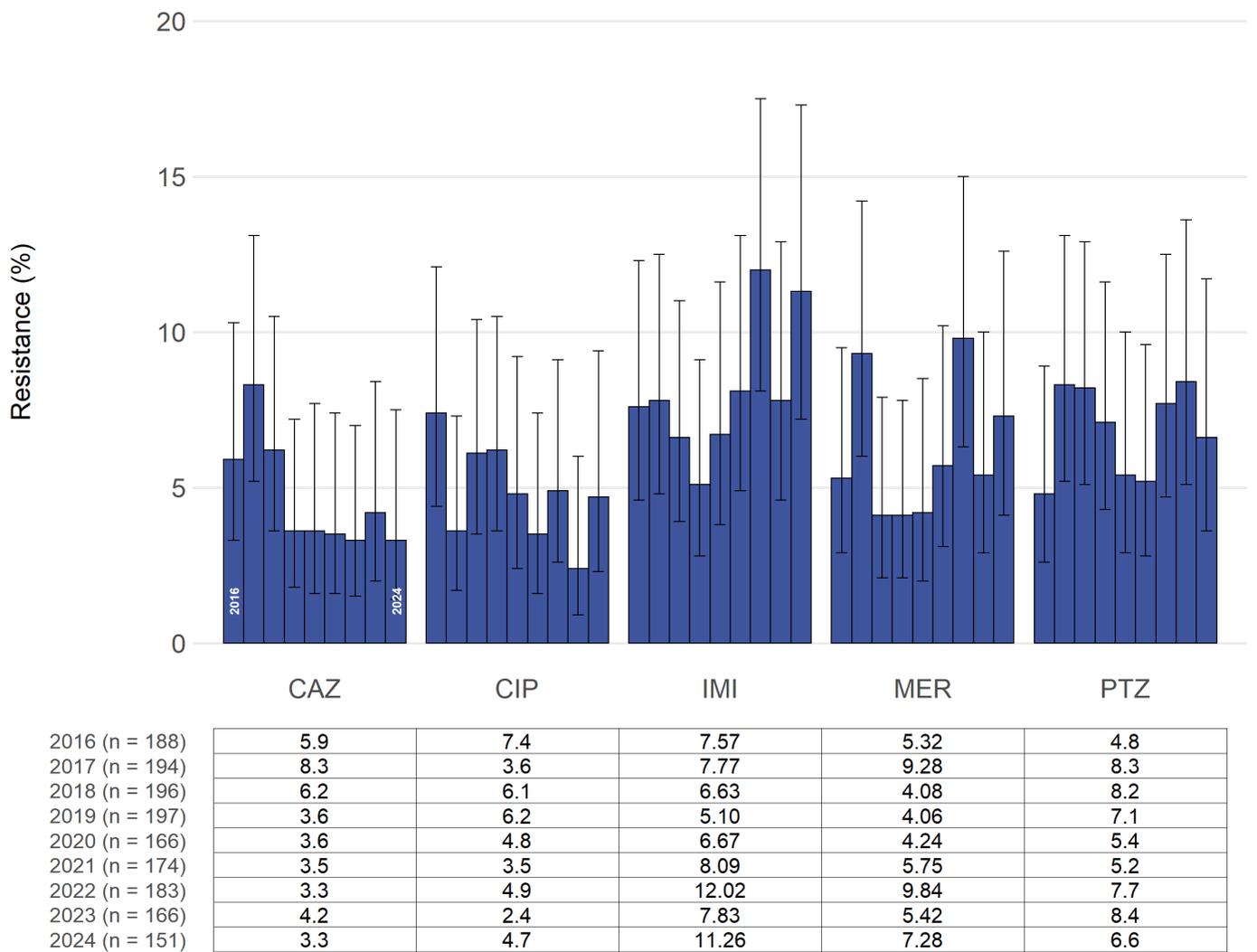


Key: CAZ = ceftazidime, CIP = ciprofloxacin, IMI = imipenem, MER = meropenem, PTZ = piperacillin/tazobactam

**Figure 11: All-Wales susceptibility patterns for *Ps. aeruginosa* bacteraemia in 2024**

### What the data shows

- Ceftazidime (CAZ) resistance was **3.3%** [1.4, 7.5].
- Ciprofloxacin (CIP) resistance was **4.7%** [2.3, 9.3].
- Imipenem (IMI) resistance was **11.26%** [7.15, 17.29].
- Meropenem (MER) resistance was **7.28%** [4.12, 12.57].
- Piperacillin/tazobactam (PTZ) resistance was **6.6%** [3.6, 11.8].



Key: CAZ = ceftazidime, CIP = ciprofloxacin, IMI = imipenem, MER = meropenem, PTZ = piperacillin/tazobactam

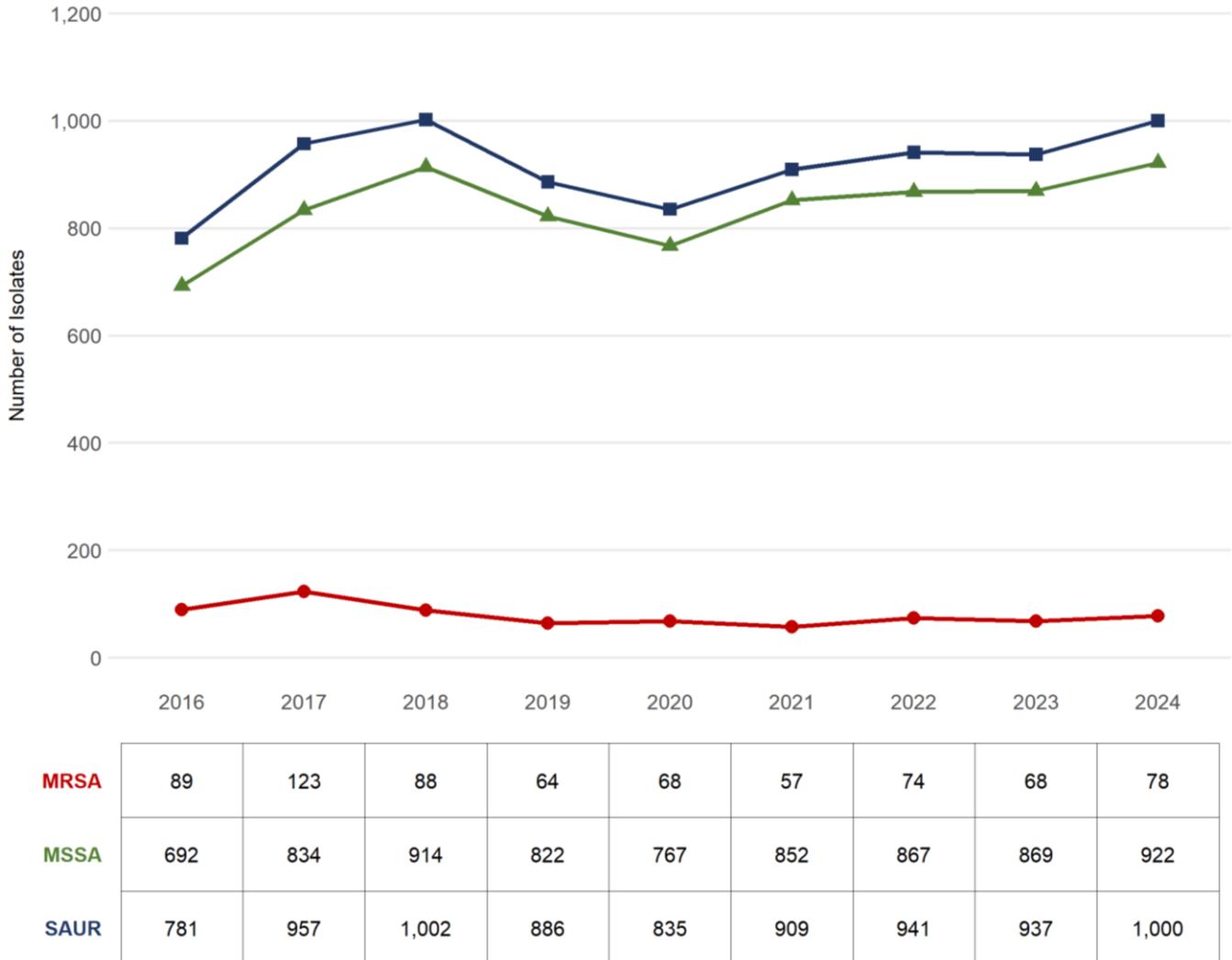
**Figure 12: All-Wales antimicrobial resistance rates for *Ps. aeruginosa* bacteraemia (2016 - 2024)**

### What the data shows

- There has been a decrease in the number of *Ps. aeruginosa* bacteraemia with AST results from **166** in 2023 to **158** in 2024 (duplicate cut-off ≤14 days).
- A general decrease in ceftazidime resistance, with resistance at **3.3%** in 2024.
- A general decrease in ciprofloxacin resistance, with resistance at **4.7%** in 2024.
- A general increase in imipenem resistance across time, with resistance at **11.26%** in 2024.
- No significant change in meropenem resistance, with resistance at **7.28%** in 2024.
- No significant change in piperacillin/tazobactam resistance, with resistance at **6.6%** in 2024.

## Staphylococcus aureus (n = 1,000 in 2024)

Trends in the All-Wales resistance rates for *S. aureus* bacteraemias in the period 2016 to 2024 are shown in **Figure 13**.



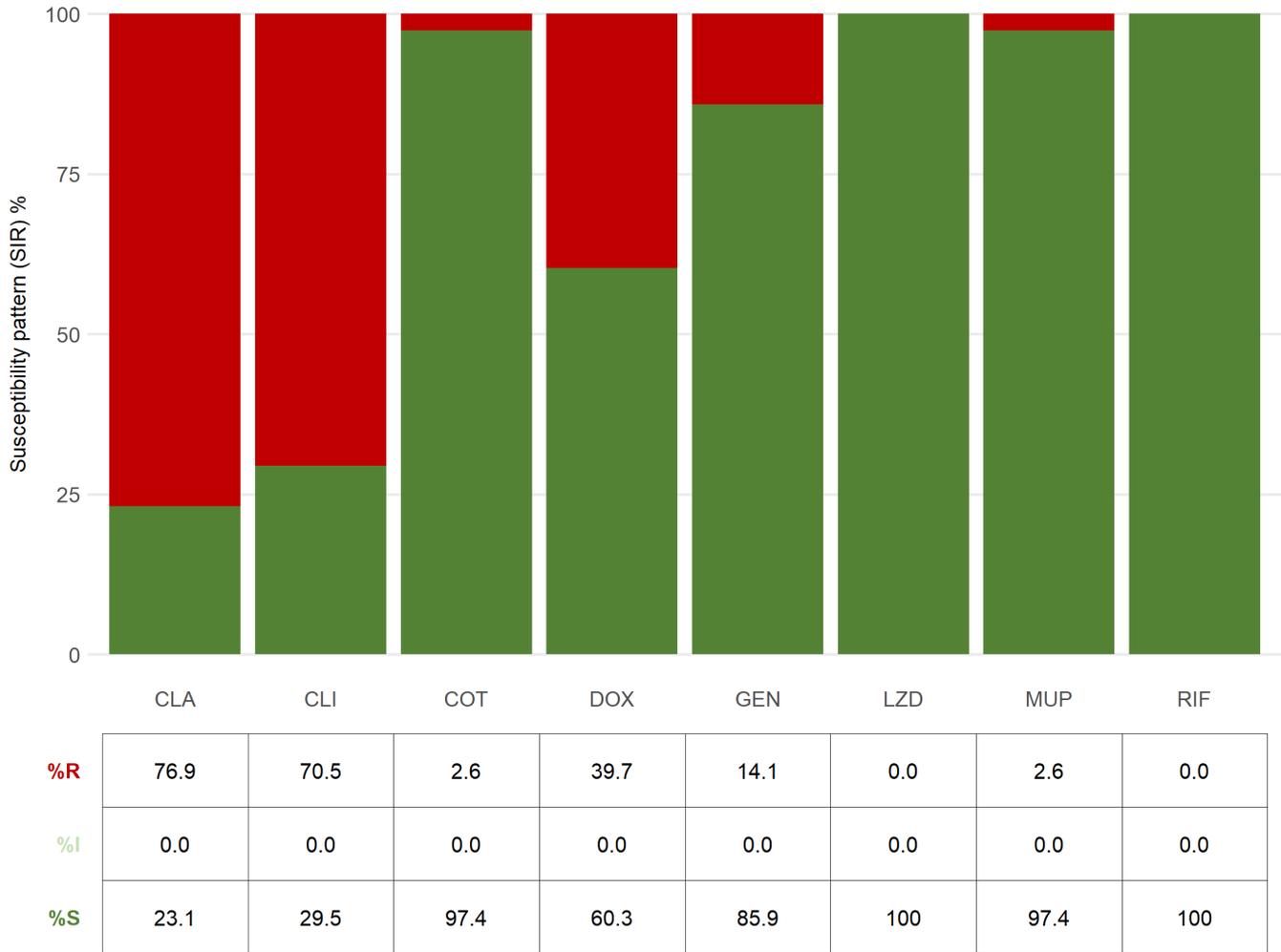
**Figure 13: All-Wales *S. aureus* bacteraemia total number of isolates numbers (2016 - 2024)**

### What the data shows

- There has been a significant increase in the number of *Staphylococcus aureus* (SAUR) bacteraemia with AST results in the last year from **937** in 2023 to **1,000** in 2024 (duplicate cut-off  $\leq 14$  days).
- A general increase in the number of methicillin resistant *S. aureus* (MRSA) to **78** in 2024 (duplicate cut-off  $\leq 14$  days).
- A general increase in the number of methicillin sensitive *S. aureus* (MSSA) to **922** in 2024.

## Methicillin Resistant *Staphylococcus aureus* (n = 78 in 2024)

The All-Wales patterns of susceptibility (**S/I/R**) for Methicillin Resistant *S. aureus* (MRSA) in 2024 are shown in **Figure 14**. Trends in the All-Wales resistance rates for the period 2016 to 2024 are shown in **Figure 15**.

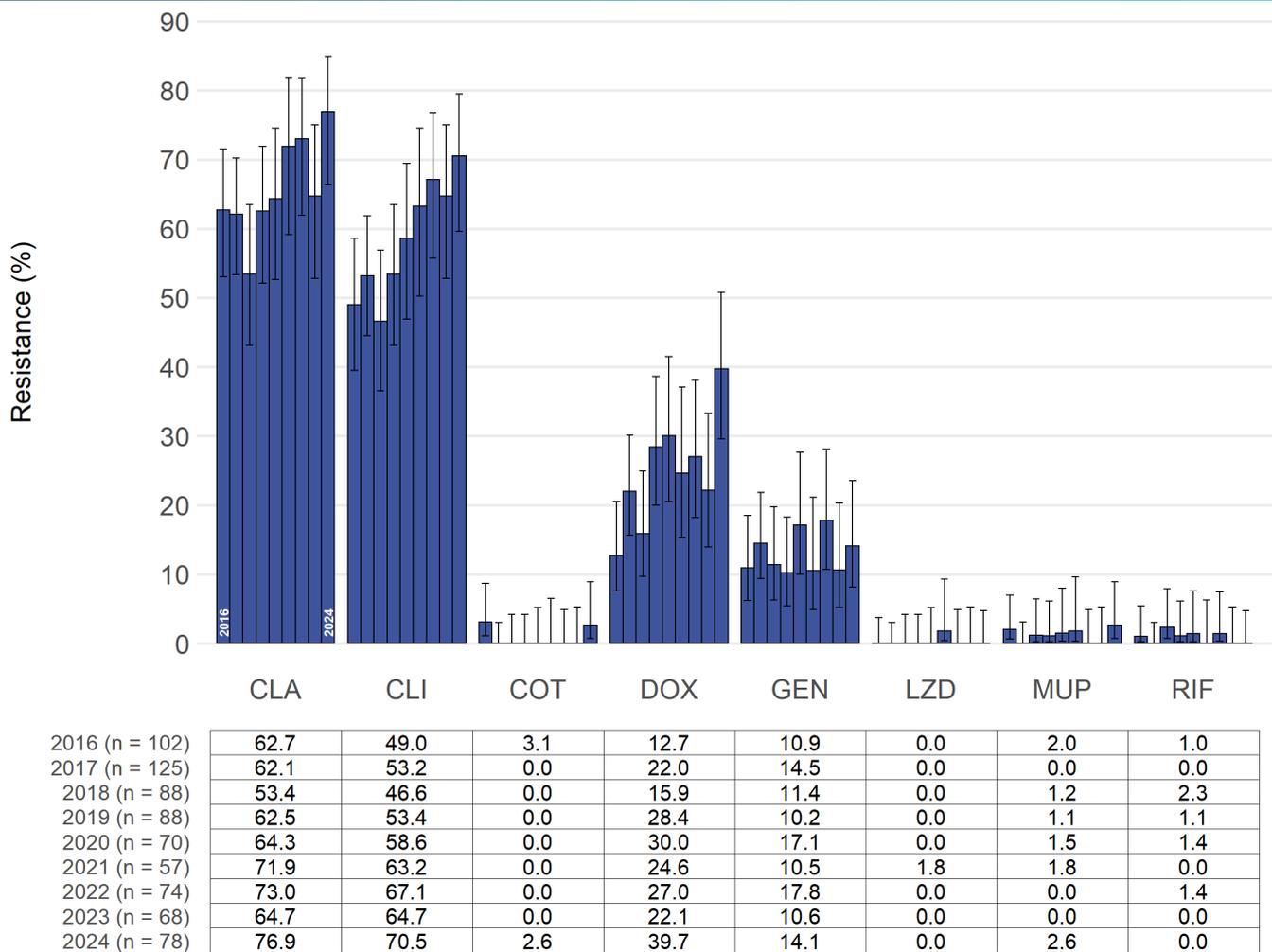


Key: CLA = clarithromycin, CLI = clindamycin, COT = co-trimoxazole, DOX = doxycycline, GEN = gentamicin, LZD = linezolid, MUP = mupirocin, RIF = rifampicin

**Figure 14: All-Wales susceptibility patterns for MRSA bacteraemia in 2024**

### What the data shows

- Clarithromycin (CLA) resistance was **76.9%** [66.4, 84.9].
- Clindamycin (CLI) resistance was **70.5%** [59.6, 79.5].
- Co-trimoxazole (COT) resistance was **2.6%** [0.7, 8.9].
- Doxycycline (DOX) resistance was **39.7%** [29.6, 50.8].
- Gentamicin resistance was **14.1%** [8.1, 23.5].
- Linezolid (LZD) resistance was **0.0%** [0.0, 4.7].
- Mupirocin (MUP) resistance was **2.6%** [0.7, 8.9].
- Rifampicin (RIF) resistance was **0.0%** [0.0, 4.7].



Key: CLA = clarithromycin, CLI = clindamycin, COT = co-trimoxazole, DOX = doxycycline, GEN = gentamicin, LZD = linezolid, MUP = mupirocin, RIF = rifampicin

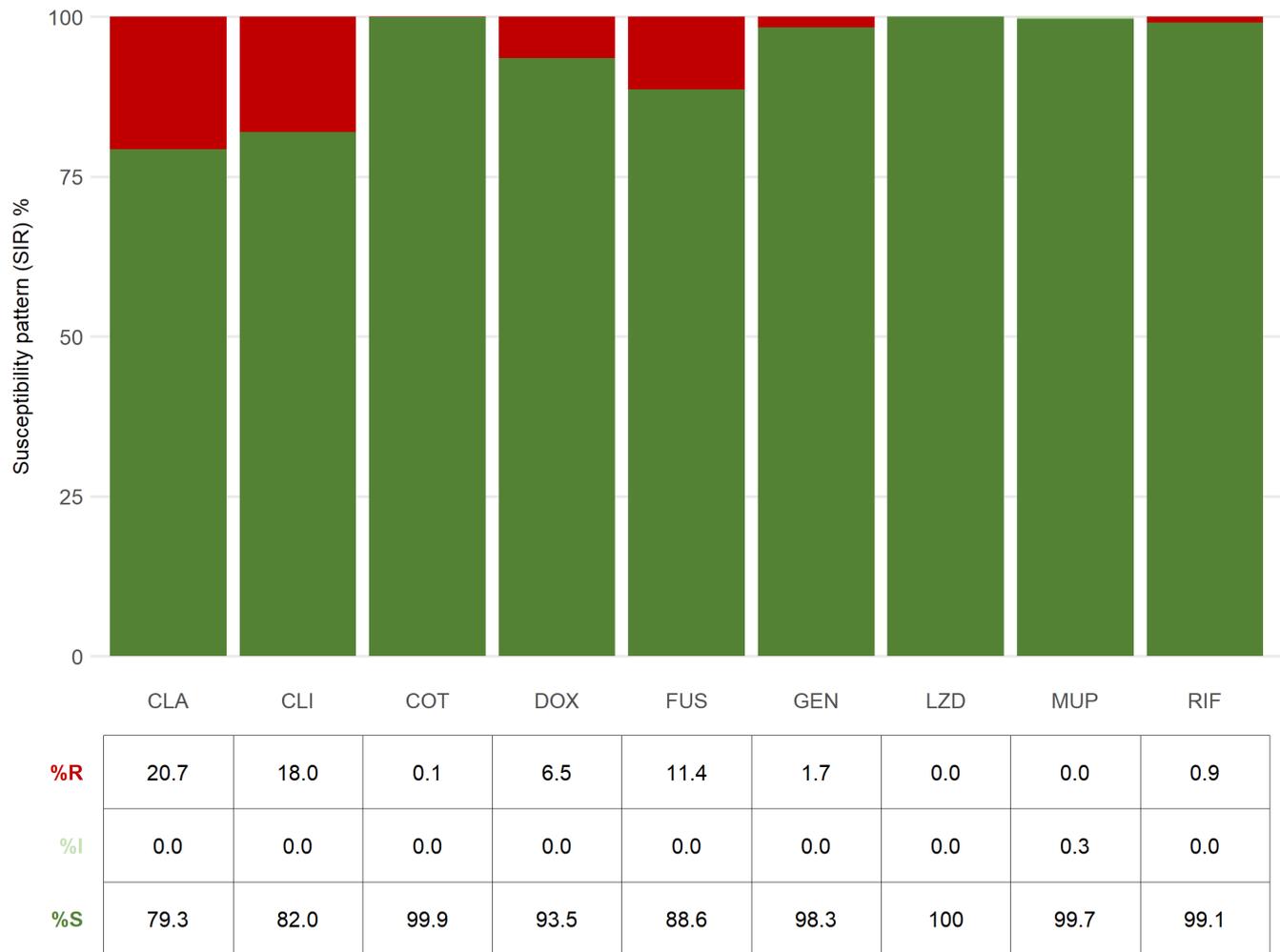
**Figure 15: All-Wales antimicrobial resistance rates for MRSA bacteraemia (2016 - 2024)**

### What the data shows

- There has been an increase in the number of MRSA bacteraemia with AST results, with **68** isolates in 2023 and **78** in 2024 (duplicate cut-off ≤14 days).
- A general increase in clarithromycin resistance, with resistance at **76.9%** in 2024.
- A general increase in clindamycin resistance, with resistance at **70.5%** in 2024.
- Resistance for co-trimoxazole and mupirocin was at **2.6%** in 2024.
- A general increase in doxycycline resistance, with resistance at **39.7%** in 2024.
- No significant change in gentamicin resistance across time, with resistance at **14.1%** in 2024.
- Resistance rates for linezolid and rifampicin was undetected in 2024.

## Methicillin Sensitive *Staphylococcus aureus* (n = 922 in 2024)

The All-Wales patterns of susceptibility (**S/I/R**) for Methicillin Sensitive *Staphylococcus aureus* (MSSA) bacteraemia in 2024 are shown in **Figure 16**. Trends in the All-Wales resistance rates for the period 2016 to 2024 are shown in **Figure 17**.

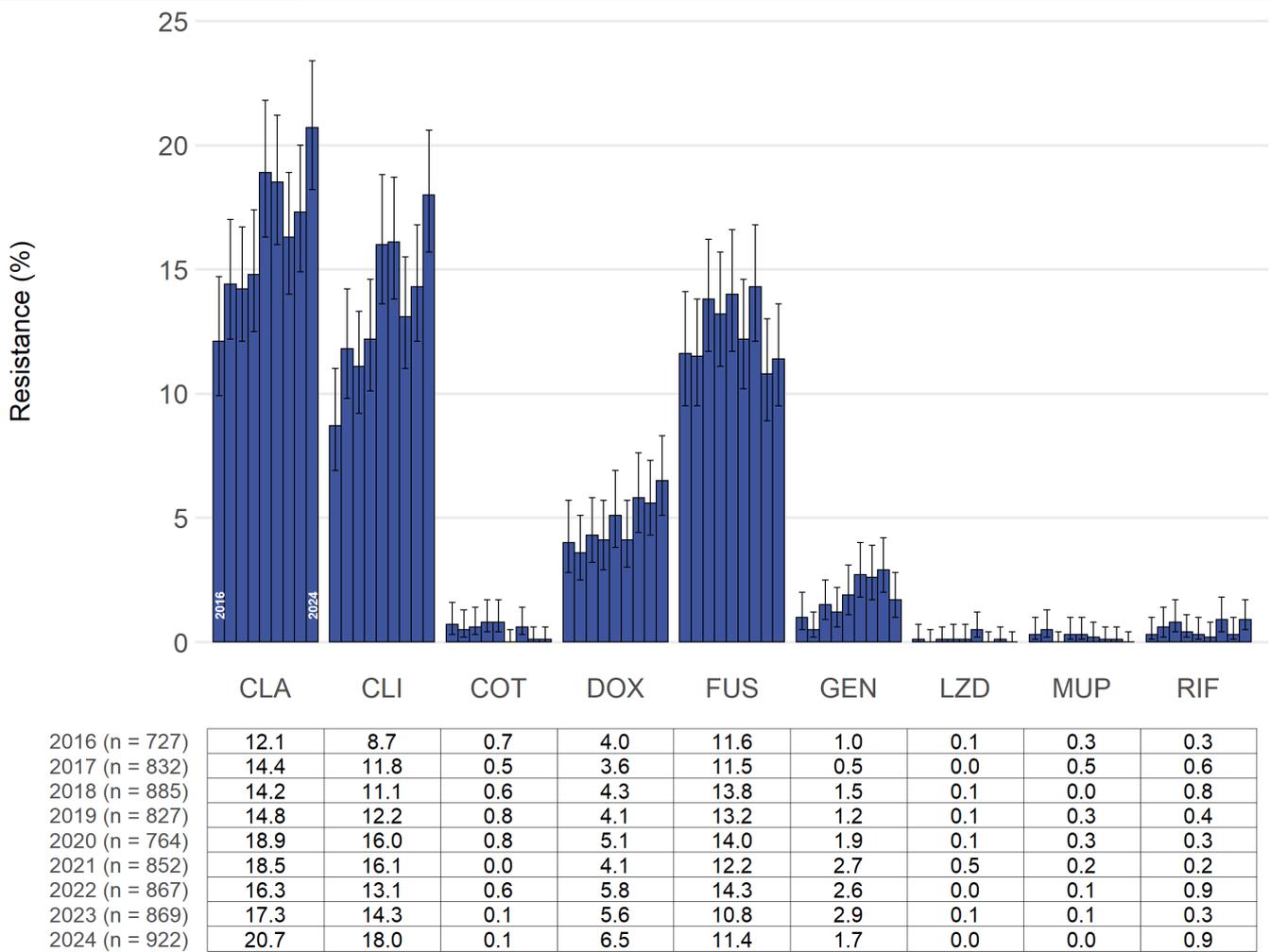


Key: CLA = clarithromycin, CLI = clindamycin, COT = co-trimoxazole, DOX = doxycycline, FUS = fusidic acid, GEN = gentamicin, LZD = linezolid, MUP = mupirocin, RIF = rifampicin

**Figure 16: All-Wales susceptibility patterns for MSSA bacteraemia in 2024**

### What the data shows

- Clarithromycin (CLA) resistance was **20.7%** [18.2, 23.5].
- Clindamycin (CLI) resistance was **18.0%** [15.7, 20.6].
- Co-trimoxazole (COT) resistance was **0.1%** [0.0, 0.6].
- Doxycycline (DOX) resistance was **6.5%** [5.1, 8.3].
- Fusidic acid (FUS) resistance was **11.4%** [9.5, 13.6].
- Gentamicin (GEN) resistance was **1.7%** [1.1, 2.8].
- Linezolid (LZD) resistance was **0.0%** [0.0, 0.4].
- Mupirocin (MUP) resistance was **0.0%** [0.0, 0.4].
- Rifampicin (RIF) resistance was **0.9%** [0.4, 1.7].



Key: CLA = clarithromycin, CLI = clindamycin, COT = co-trimoxazole, DOX = doxycycline, FUS = fusidic acid, GEN = gentamicin, LZD = linezolid, MUP = mupirocin, RIF = rifampicin

**Figure 17: All-Wales antimicrobial resistance rates for MSSA bacteraemia (2016 - 2024)**

### What the data shows

- There has been an increase in the number of MSSA bacteraemia with AST results, with **869** in 2023 and **922** in 2024 (duplicate cut-off ≤14 days).
- A general increase in clarithromycin resistance, with resistance at **20.7%** in 2024.
- A general increase in clindamycin resistance, with resistance at **18.0%** in 2024.
- Resistance rate for co-trimoxazole has remained **<1%**.
- A general increase in doxycycline resistance, with resistance at **6.5%** in 2024.
- No significant change in fusidic acid resistance, with resistance at **11.4%** in 2024.
- No significant change in gentamicin resistance, with resistance at **1.7%** in 2024.
- Resistance rates for linezolid, mupirocin and rifampicin have remained **<1%**.

### Enterococcus spp. (n = 504 in 2024)

The All-Wales patterns of susceptibility (**S/I/R**) for *Enterococcus* spp. bacteraemia in 2024 are shown in **Figure 18**. Trends in the All-Wales resistance rates for the period 2016 to 2024 are shown in **Figure 19**.

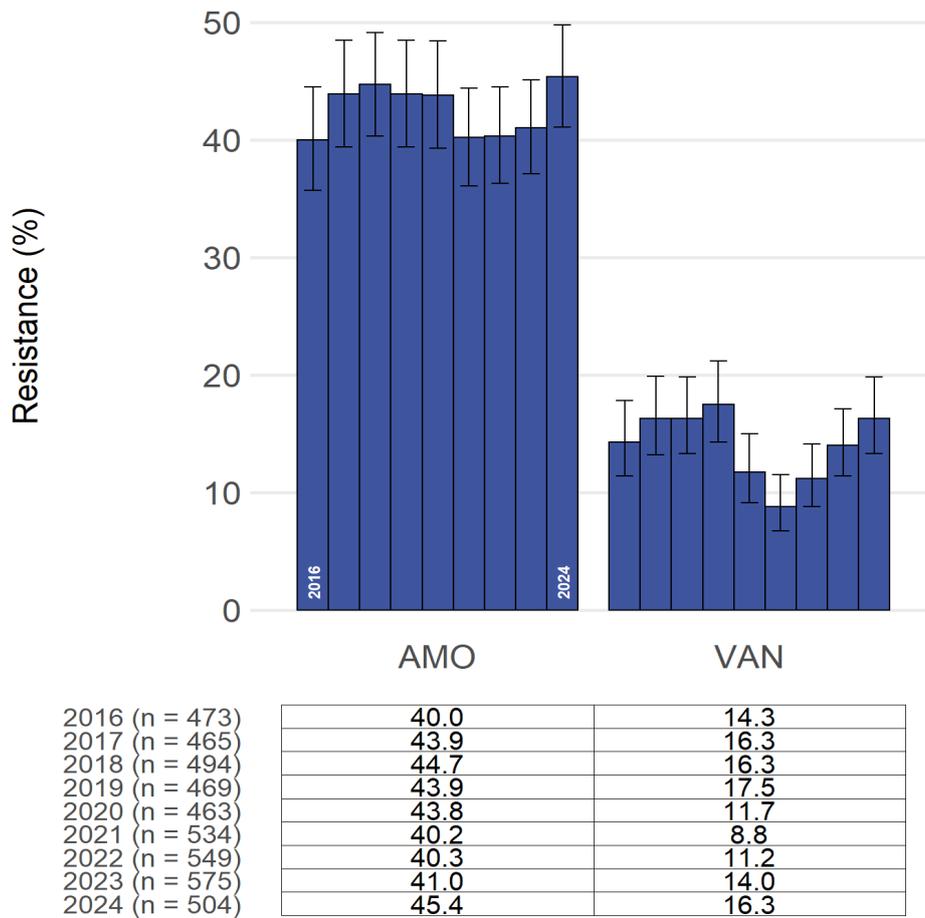


Key: AMO = amoxicillin, VAN = vancomycin

**Figure 18: All-Wales susceptibility patterns for *Enterococcus* spp. bacteraemia in 2024**

#### What the data shows

- Amoxicillin (AMO) resistance was **45.4%** [41.1, 49.8].
- Vancomycin (VAN) resistance was **16.3%** [13.3, 19.8].



Key: AMO = amoxicillin, VAN = vancomycin

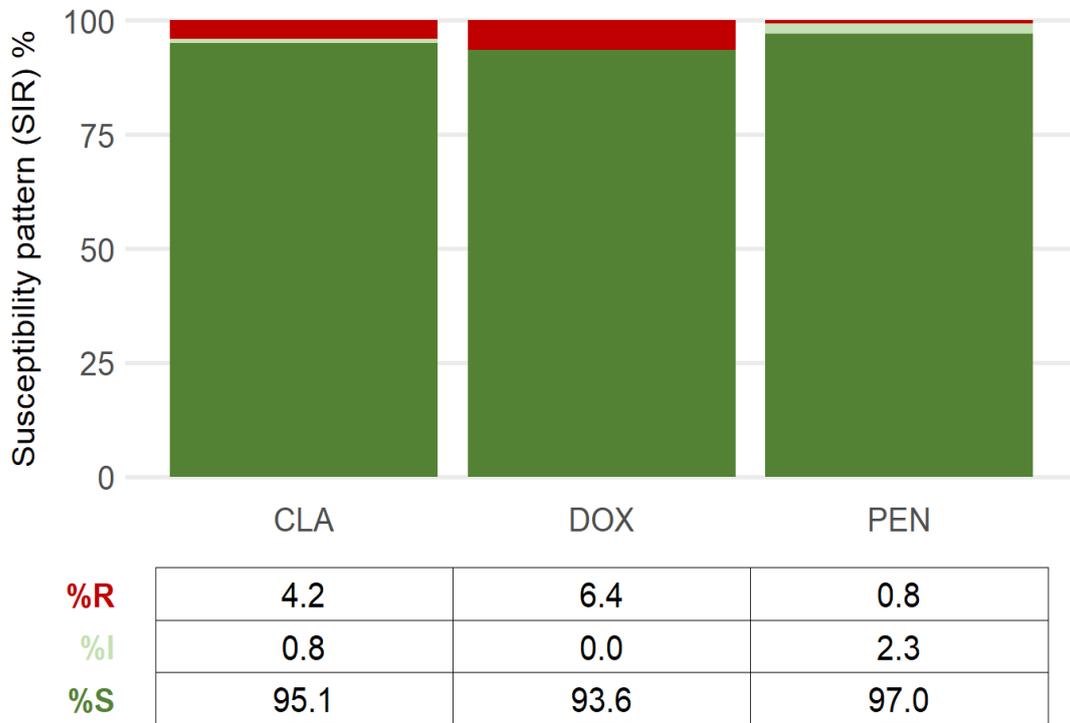
**Figure 19: All-Wales antimicrobial resistance rates for *Enterococcus* spp. bacteraemia (2016 - 2024)**

### What the data shows

- There has been a decrease in the number of *Enterococcus* spp. bacteraemia with AST results from **575** in 2023 to **504** in 2024 (duplicate cut-off ≤14 days).
- In 2024, the All-Wales resistance rate for amoxicillin in *Enterococcus* spp. was **45.4%**. Susceptibility to amoxicillin is a guide to speciation of the organism, *E. faecalis* being normally susceptible and *E. faecium* being normally resistant, and suggests that in 2024, **54.6%** of enterococcal bacteraemias were due to *E. faecalis*.
- There has been variability in resistance to vancomycin, with resistance at **16.3%** in 2024.

## Streptococcus pneumoniae (n = 266 in 2024)

The All-Wales patterns of susceptibility (**S/I/R**) for *St. pneumoniae* bacteraemia in 2024 are shown in **Figure 20**. Trends in the All-Wales resistance rates for the period 2016 to 2024 are shown in **Figure 21**.

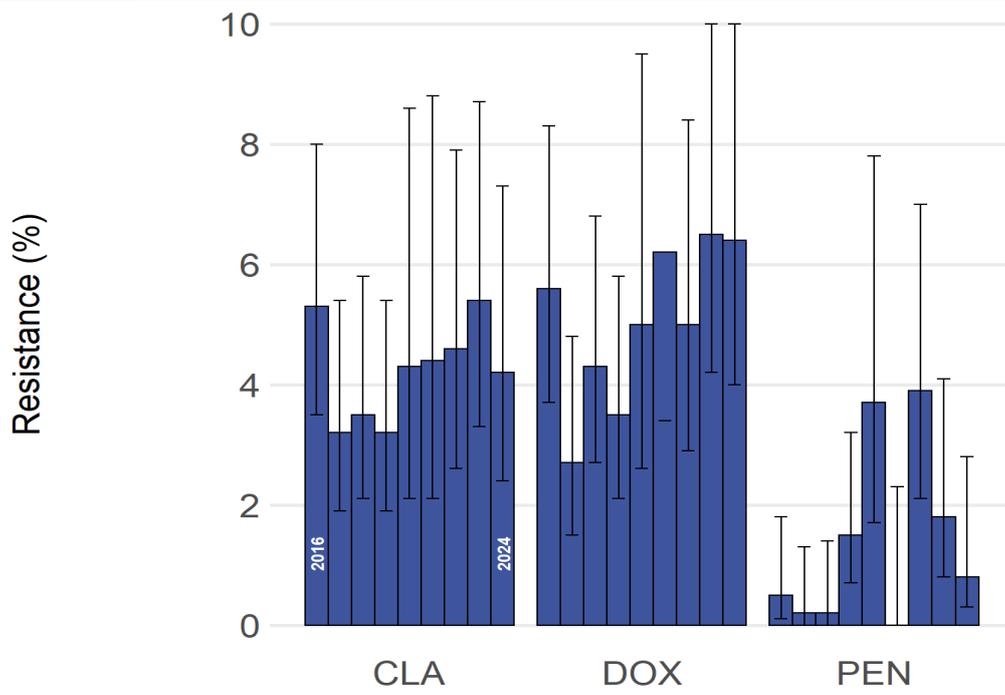


Key: CLA = clarithromycin, DOX = doxycycline, PEN = penicillin

**Figure 20: All-Wales susceptibility patterns for *St. pneumoniae* bacteraemia in 2024**

### What the data shows

- Clarithromycin (CLA) resistance was **4.2%** [2.3, 7.3].
- Doxycycline (DOX) resistance was **6.4%** [4.0, 10.0].
- Penicillin (PEN) resistance was **0.8%** [0.2, 2.7].



2016 (n = 400)	5.3	5.6	0.5
2017 (n = 405)	3.2	2.7	0.2
2018 (n = 400)	3.5	4.3	0.2
2019 (n = 405)	3.2	3.5	1.5
2020 (n = 163)	4.3	5.0	3.7
2021 (n = 161)	4.4	6.2	0.0
2022 (n = 260)	4.6	5.0	3.9
2023 (n = 280)	5.4	6.5	1.8
2024 (n = 266)	4.2	6.4	0.8

Key: CLA = clarithromycin, DOX = doxycycline, PEN = penicillin

**Figure 21: All-Wales antimicrobial resistance rates for *St. pneumoniae* bacteraemia (2016 - 2024)**

### What the data shows

- There has been a decrease in the number of *St. pneumoniae* bacteraemia with AST results from **280** in 2023 to **266** in 2024 (duplicate cut-off ≤14 days).
- No significant change in resistance over time for clarithromycin or doxycycline, with resistance at **4.2%**, and **6.4%** respectively in 2024.
- Variability in penicillin resistance, with resistance at **0.8%** in 2024.