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Public Health Wales

Healthcare Associated Infection, Antimicrobial Resistance and Prescribing Programme

Antimicrobial Resistance in Urinary Coliforms 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

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Reference this document as:

Public Health Wales NHS Trust: Antibacterial Resistance in Urinary Coliforms in Wales 2024

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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

EUCAST EUROPEAN COMMITTEE ON ANTIMICROBIAL SUSCEPTIBILITY TESTING
European Society of Clinical Microbiology and Infectious Diseases

https://eucast.org/clinical_breakpoints/

Key Points of Interest

Escherichia coli (the commonest cause of urinary tract infections in Wales)

- Resistance to co-amoxiclav has levelled off in *E. coli* from urine samples between 2023 and 2024 at around 45.0%.
- There has been a significant decrease in trimethoprim resistance in *E. coli* from urine samples between 2016 and 2021; this may be linked to reduced use of trimethoprim for the treatment of UTI.
- Fluoroquinolone and nitrofurantoin resistance has generally decreased across the settings in Wales.

Non-*Escherichia coli* coliforms (Non-ECOL)

- Data for non-*Escherichia coli* coliforms is presented in the second part of this report and shows similar changes in resistance trends for co-amoxiclav and trimethoprim as *E. coli*.

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).

Organisms

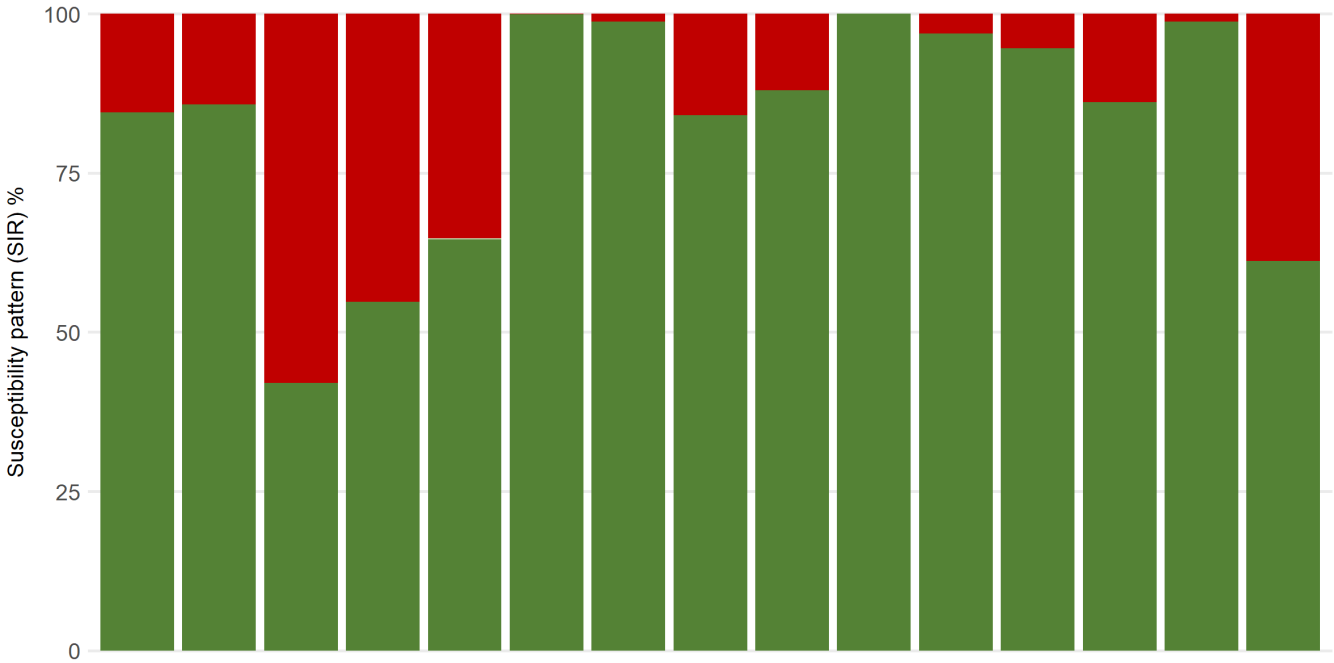
The urinary organisms are split into two groups in this report (1) *E. coli* and (2) non-ECOL. The Non-ECOL comprise the family *Enterobacterales*, **excluding** *E. coli*.
The group comprises:

- Citrobacter spp.
- Coliform
- Cronobacter spp.
- Enterobacter spp.
- Escherichia spp.
- Hafnia spp.
- Klebsiella spp.
- Kluyvera spp.
- Leclercia spp.
- Morganella spp.
- Pantoea spp.
- Proteus spp.
- Providencia spp.
- Rahnella spp.
- Raoultella spp.
- Salmonella spp.
- Serratia spp.
- Yersinia spp.

Escherichia coli

E. coli from inpatient urine samples (n = 10,124 in 2024)

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



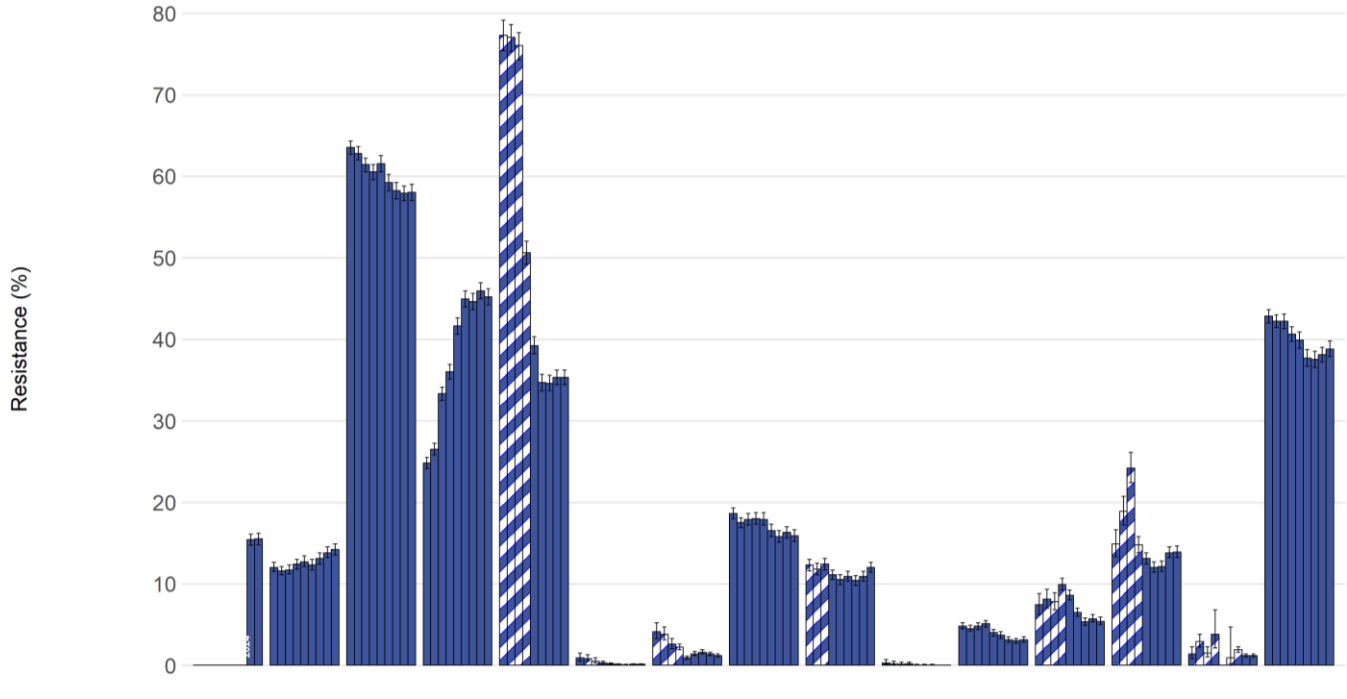
	1GC	3GC	AMO	COA	COT	ERT	FOS	FQ	GEN	MER	NIT	PIV	PTZ	TEM	TRI
%R	15.5	14.2	58.0	45.2	35.3	0.06	1.2	15.9	12.0	0.01	3.1	5.4	13.9	1.2	38.8
%I	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-
%S	84.5	85.8	42.0	54.8	64.6	99.94	98.8	84.1	88.0	99.99	96.9	94.6	86.1	98.8	61.2

Key: 1GC = resistance to cefalexin &/or cefradine, 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMO = amoxicillin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FOS = fosfomycin, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, MER = meropenem, NIT = nitrofurantoin, PIV = pivmecillinam, PTZ = piperacillin/tazobactam, TEM = temocillin, TRI = trimethoprim

Figure 1: All-Wales susceptibility patterns for *E. coli* from inpatient urine samples (2024)

What the data shows

- Third generation cephalosporin (3GC) resistance was **14.2%** [13.6, 14.9].
- Amoxicillin (AMO) resistance was **58.0%** [57.1, 59.0].
- Co-amoxiclav (COA) resistance was **45.2%** [44.2, 46.2].
- Co-trimoxazole (COT) resistance was **35.3%** [34.4, 36.2].
- Ertapenem (ERT) resistance was **0.06%** [0.03, 0.13].
- Fosfomycin (FOS) resistance was **1.2%** [1.0, 1.5].
- Fluoroquinolone (FQ) resistance was **15.9%** [15.2, 16.6].
- Gentamicin (GEN) resistance was **12.0%** [11.4, 12.7].
- Meropenem (MER) resistance was **0.01%** [0.00, 0.06].
- Nitrofurantoin (NIT) resistance was **3.1%** [2.8, 3.5].
- Pivmecillinam (PIV) resistance was **5.4%** [4.9, 5.8].
- Piperacillin/tazobactam (PTZ) resistance was **13.9%** [13.2, 14.5].
- Temocillin (TEM) resistance was **1.2%** [1.0, 1.4].
- Trimethoprim (TRI) resistance was **38.8%** [37.8, 39.7].



	1GC	3GC	AMO	COA	COT	ERT	FOS	FQ	GEN	MER	NIT	PIV	PTZ	TEM	TRI
2016 (n = 13,789)	*	12.0	63.5	24.8	77.3	0.91	4.1	18.6	12.3	0.34	4.8	7.4	14.9	1.4	42.8
2017 (n = 13,648)	*	11.6	62.8	26.5	77.0	0.75	3.8	17.5	11.8	0.21	4.5	8.1	18.9	2.9	42.2
2018 (n = 12,718)	*	11.7	61.4	33.3	76.0	0.55	2.6	17.9	12.4	0.15	4.8	7.8	24.2	1.5	42.2
2019 (n = 11,473)	*	12.4	60.5	36.0	50.6	0.28	2.2	18.0	11.1	0.17	5.1	9.9	14.8	3.8	40.6
2020 (n = 9,773)	*	12.7	61.5	41.6	39.2	0.16	0.9	17.9	10.5	0.05	4.0	8.6	13.1	*	39.9
2021 (n = 9,722)	*	12.3	59.2	44.9	34.7	0.09	1.4	16.5	10.9	0.02	3.7	6.5	12.0	0.9	37.7
2022 (n = 9,784)	*	13.1	58.2	44.6	34.6	0.02	1.6	15.8	10.4	0.02	3.1	5.3	12.1	1.9	37.5
2023 (n = 10,539)	15.4	13.8	57.9	45.9	35.3	0.06	1.4	16.3	10.9	0.01	3.0	5.7	13.8	1.2	38.1
2024 (n = 10,124)	15.5	14.2	58.0	45.2	35.3	0.06	1.2	15.9	12.0	0.01	3.1	5.4	13.9	1.2	38.8

Key: 1GC = resistance to cefalexin &/or cefradine, 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMO = amoxicillin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FOS = fosfomycin, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, MER = meropenem, NIT = nitrofurantoin, PIV = pivmecillinam, PTZ = piperacillin/tazobactam, TEM = temocillin, TRI = trimethoprim

Figure 2: All-Wales antimicrobial resistance rates for *E. coli* from inpatient urine samples (2016 to 2024)

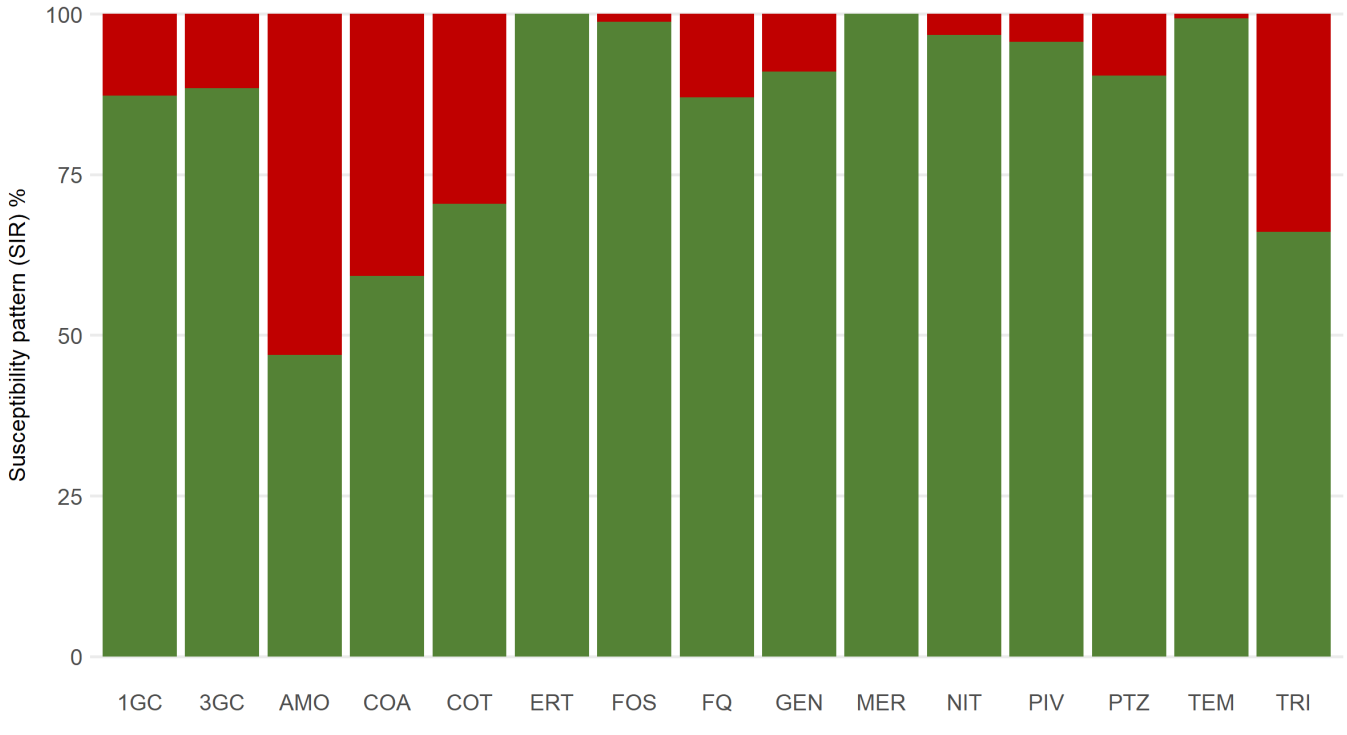
What the data shows

- There has been a decrease in the number of *E. coli* with AST results for inpatient urine samples from **10,539** in 2023 to **10,124** in 2024.

- An increase in resistance to third generation cephalosporins to **14.2%** in 2024.
- A levelling off of amoxicillin resistance at **58.0%** in 2024.
- A levelling off of co-amoxiclav resistance at **45.2%** in 2024.
- No significant change in co-trimoxazole resistance from 2021 onwards, with resistance at **35.3%** in 2023 and 2024.
- No significant change in fosfomycin resistance from 2021 onwards, with resistance at **1.2%** in 2024.
- A general decrease in fluoroquinolones resistance, with resistance at **15.9%** in 2024.
- No significant change in gentamicin resistance, with resistance at **12.0%** in 2024.
- A levelling off of nitrofurantoin resistance at **3.1%** in 2024.
- A levelling off of pivmecillinam resistance at **5.4%** in 2024.
- A levelling off of piperacillin/tazobactam resistance at **13.9%** in 2024.
- Selective AST testing only for temocillin until 2023, trends cannot be inferred. *The resistance rates for temocillin for 2020 are not presented as <10 isolates were tested.
- A small increase in trimethoprim resistance, with resistance at **38.8%** in 2024.
- Ertapenem and meropenem resistance remains **<1%**.

E. coli from outpatient urine samples (n = 4,263 in 2024)

The **All-Wales** patterns of susceptibility (**S/I/R**) for *E. coli* from outpatient urine samples in 2024 are shown in **Figure 3**. Trends in the resistance rates for the period 2016 to 2024 are shown in **Figure 4**.



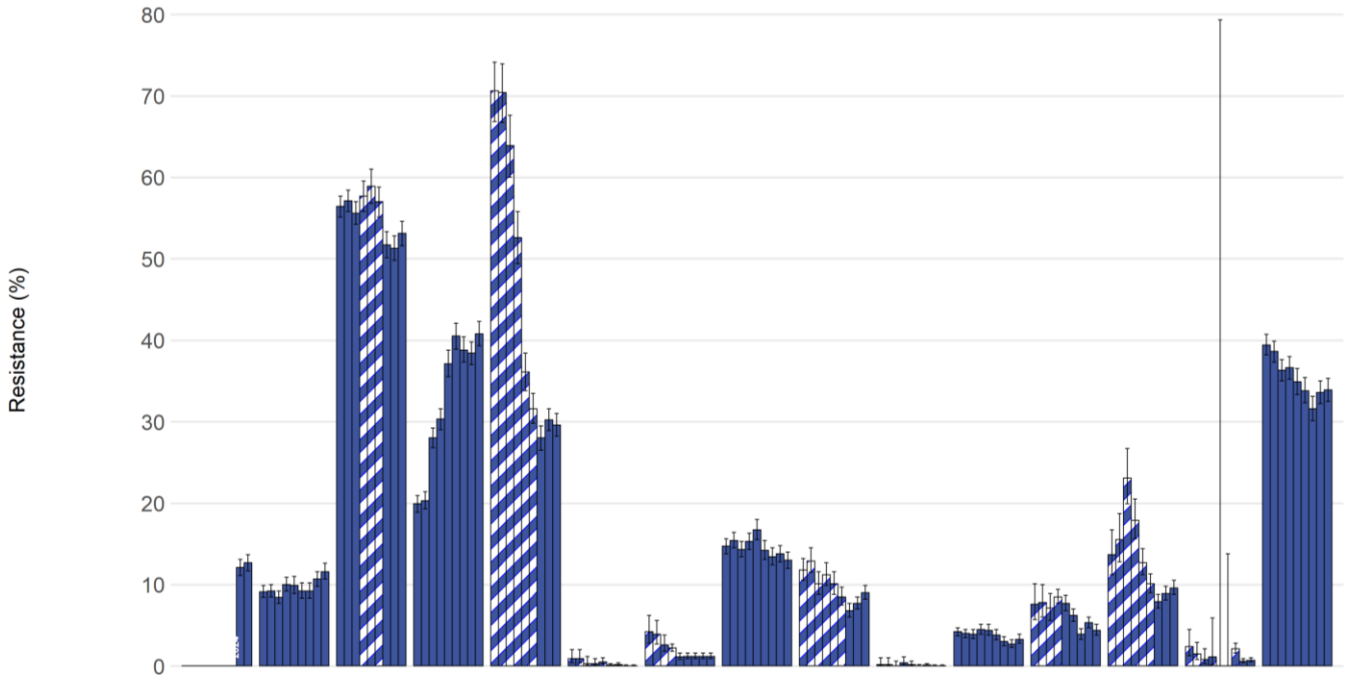
	1GC	3GC	AMO	COA	COT	ERT	FOS	FQ	GEN	MER	NIT	PIV	PTZ	TEM	TRI
%R	12.7	11.6	53.1	40.8	29.6	0.00	1.2	13.0	9.0	0.02	3.3	4.4	9.6	0.7	33.9
%I	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-
%S	87.3	88.4	46.9	59.2	70.4	100	98.8	87.0	91.0	99.98	96.7	95.6	90.4	99.3	66.1

Key: 1GC = resistance to cefalexin &/or cefradine, 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMO = amoxicillin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FOS = fosfomycin, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, MER = meropenem, NIT = nitrofurantoin, PIV = pivmecillinam, PTZ = piperacillin/tazobactam, TEM = temocillin, TRI = trimethoprim

Figure 3: All-Wales susceptibility patterns for *E. coli* from outpatient urine samples (2024)

What the data shows

- Third generation cephalosporin (3GC) resistance was **11.6%** [10.6, 12.5].
- Amoxicillin (AMO) resistance was **53.1%** [51.6, 54.6].
- Co-amoxiclav (COA) resistance was **40.8%** [39.4, 42.3].
- Co-trimoxazole (COT) resistance was **29.6%** [28.2, 31.0].
- Ertapenem (ERT) resistance was **0.00%** [0.00, 0.09].
- Fosfomycin (FOS) resistance was **1.2%** [0.9, 1.6].
- Fluoroquinolone (FQ) resistance was **13.0%** [12.1, 14.1].
- Gentamicin resistance was **9.0%** [8.2, 9.9].
- Meropenem (MER) resistance was **0.02%** [0.00, 0.13].
- Nitrofurantoin (NIT) resistance was **3.3%** [2.8, 3.9].
- Pivmecillinam (PIV) resistance was **4.4%** [3.9, 5.1].
- Piperacillin/tazobactam (PTZ) resistance was **9.6%** [8.8, 10.5].
- Temocillin (TEM) resistance was **0.7%** [0.5, 1.0].
- Trimethoprim (TRI) resistance was **33.9%** [32.5, 35.3].



	1GC	3GC	AMO	COA	COT	ERT	FOS	FQ	GEN	MER	NIT	PIV	PTZ	TEM	TRI
2016 (n = 5,828)	*	9.1	56.4	19.9	70.6	0.86	4.2	14.7	11.8	0.17	4.2	7.6	13.7	2.4	39.4
2017 (n = 5,528)	*	9.2	57.1	20.3	70.4	0.86	3.9	15.4	12.9	0.17	4.0	7.8	15.5	1.5	38.6
2018 (n = 5,331)	*	8.4	55.6	28.0	63.9	0.34	2.6	14.3	10.1	0.00	3.9	7.1	23.1	0.8	36.3
2019 (n = 4,799)	*	10.0	57.7	30.3	52.6	0.32	2.2	15.3	11.2	0.35	4.5	8.5	17.9	1.1	36.6
2020 (n = 3,332)	*	9.9	58.9	37.1	36.1	0.48	1.1	16.7	10.1	0.24	4.4	7.7	12.7	0.0	34.9
2021 (n = 3,600)	*	9.2	57.0	40.5	31.6	0.12	1.2	14.2	8.5	0.00	3.8	6.2	10.1	0.0	33.8
2022 (n = 3,808)	*	9.2	51.7	38.8	28.0	0.17	1.2	13.4	6.8	0.11	3.0	3.9	7.9	2.1	31.6
2023 (n = 4,424)	12.1	10.7	51.3	38.4	30.2	0.00	1.2	13.8	7.7	0.02	2.7	5.3	8.9	0.6	33.6
2024 (n = 4,263)	12.7	11.6	53.1	40.8	29.6	0.00	1.2	13.0	9.0	0.02	3.3	4.4	9.6	0.7	33.9

Key: 1GC = resistance to cefalexin &/or cefradine, 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMO = amoxicillin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FOS = fosfomycin, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, MER = meropenem, NIT = nitrofurantoin, PIV = pivmecillinam, PTZ = piperacillin/tazobactam, TEM = temocillin, TRI = trimethoprim

Figure 4: All-Wales antimicrobial resistance rates for *E. coli* from outpatient urine samples (2016 to 2024)

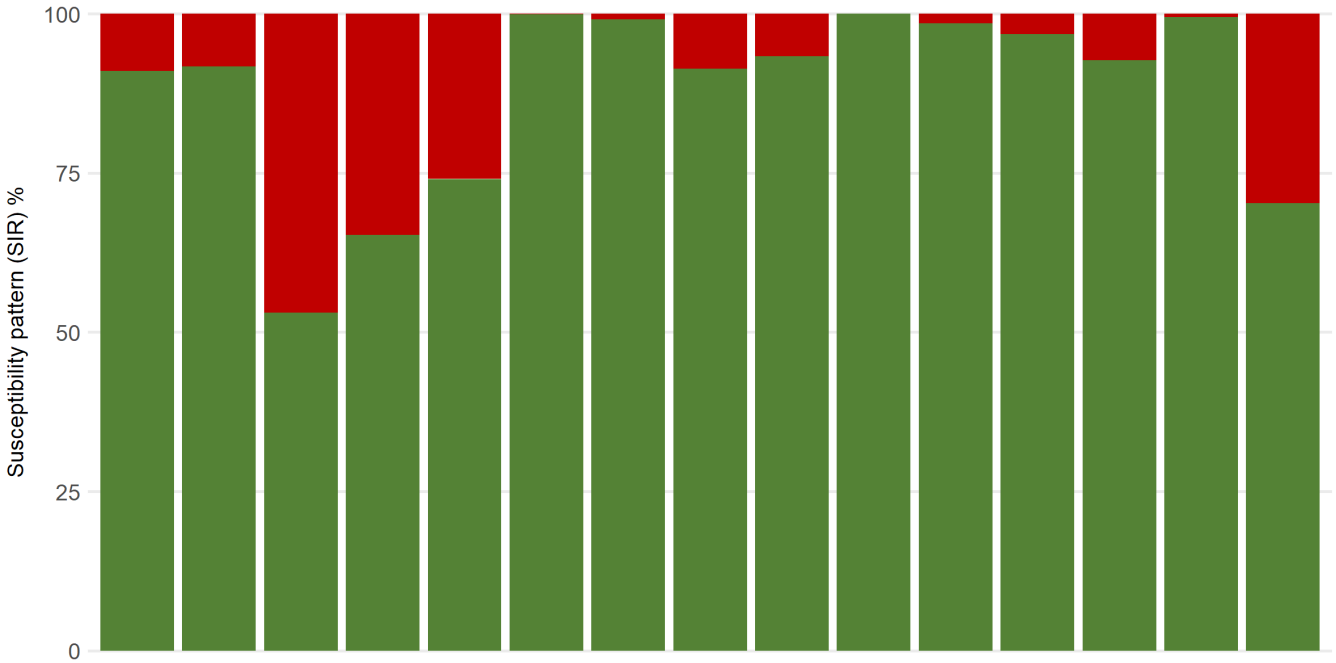
What the data shows

- There has been a decrease in the number of *E. coli* with AST results for outpatient urine samples from **4,424** in 2023 to **4,263** in 2024.

- A general increase in third generation cephalosporins resistance to **11.6%** in 2024.
- A general decrease in amoxicillin resistance to **53.1%** in 2024.
- A general increase in co-amoxiclav resistance at **40.8%** in 2024.
- No significant change in co-trimoxazole resistance compared to the 2022 rate, with resistance at **29.6%** in 2024.
- No significant change in fosfomycin resistance from 2020 onwards, with resistance remaining at **1.2%** in 2024.
- A general decrease in fluoroquinolones resistance to **13.0%** in 2024.
- A small increase in gentamicin resistance compared to the 2022 rate, with resistance at **9.0%** in 2024.
- A small increase in nitrofurantoin resistance to **3.3%** in 2024.
- Variability in pivmecillinam resistance, with resistance at **4.4%** in 2024.
- A small increase in piperacillin/tazobactam resistance compared to the 2022 rate, with resistance at **9.6%** in 2024.
- Selective AST testing only for temocillin until 2024, trends cannot be inferred.
- A levelling off of trimethoprim resistance at **33.9%** in 2024.
- Ertapenem and meropenem resistance remains **≤0.02%**.

E. coli from community urine samples (n = 61,070 in 2024)

The **All-Wales** patterns of susceptibility (**S/I/R**) for *E. coli* from community urine samples in 2024 are shown in **Figure 5**. Trends in the resistance rates for the period 2016 to 2024 are shown in **Figure 6.**



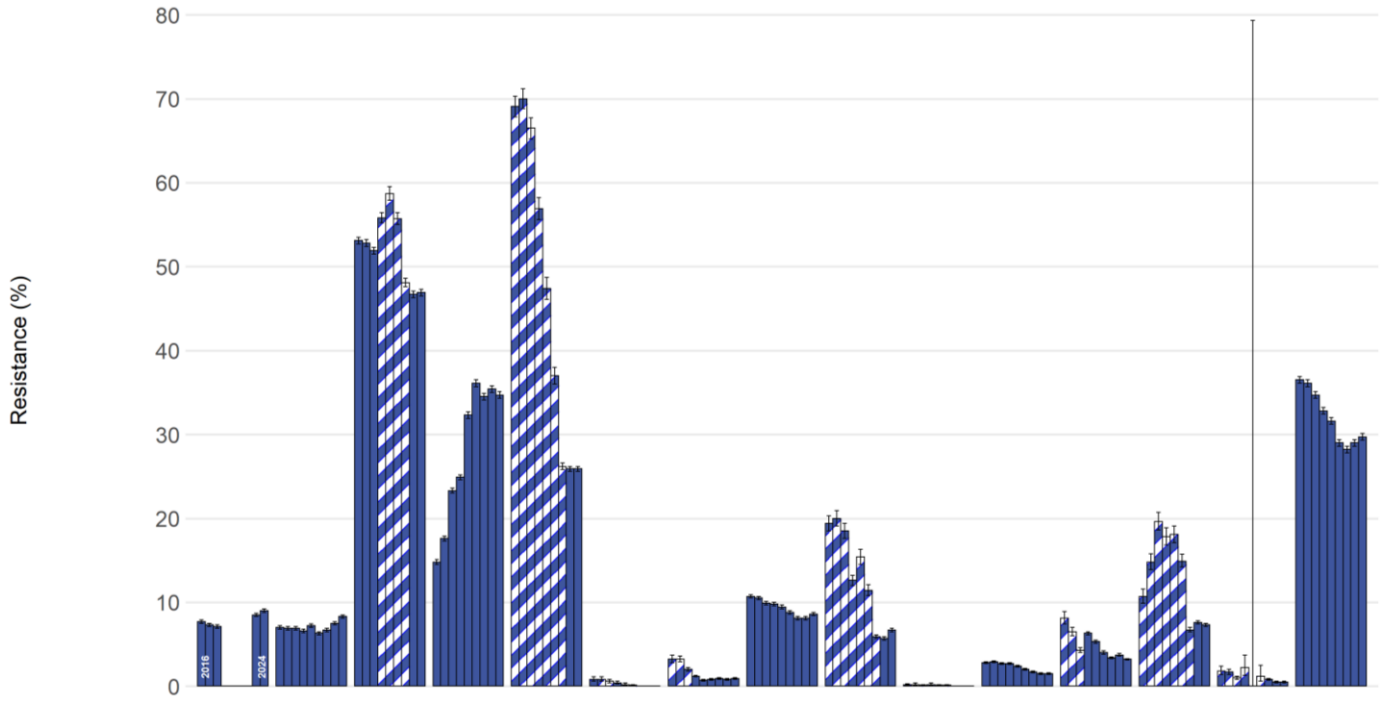
	1GC	3GC	AMO	COA	COT	ERT	FOS	FQ	GEN	MER	NIT	PIV	PTZ	TEM	TRI
%R	9.0	8.3	46.9	34.7	25.9	0.04	0.9	8.6	6.7	0.01	1.5	3.2	7.3	0.5	29.7
%I	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-
%S	91.0	91.7	53.1	65.3	74.0	99.96	99.1	91.4	93.3	99.99	98.5	96.8	92.7	99.5	70.3

Key: 1GC = resistance to cefalexin &/or cefradine, 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMO = amoxicillin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FOS = fosfomycin, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, MER = meropenem, NIT = nitrofurantoin, PIV = pivmecillinam, PTZ = piperacillin/tazobactam, TEM = temocillin, TRI = trimethoprim

Figure 5: All-Wales susceptibility patterns for *E. coli* from community urine samples (2024)

What the data shows

- Third generation cephalosporin (3GC) resistance was **8.3%** [8.0, 8.5].
- Amoxicillin (AMO) resistance was **46.9%** [46.5, 47.3].
- Co-amoxiclav (COA) resistance was **34.7%** [34.4, 35.1].
- Co-trimoxazole (COT) resistance was **25.9%** [25.5, 26.2].
- Ertapenem (ERT) resistance was **0.04%** [0.03, 0.06].
- Fosfomycin (FOS) resistance was **0.9%** [0.8, 1.0].
- Fluoroquinolone (FQ) resistance was **8.6%** [8.4, 8.8].
- Gentamicin resistance was **6.7%** [6.5, 6.9].
- Meropenem (MER) resistance was **0.01%** [0.00, 0.02].
- Nitrofurantoin (NIT) resistance was **1.5%** [1.4, 1.6].
- Pivmecillinam (PIV) resistance was **3.2%** [3.1, 3.4].
- Piperacillin/tazobactam (PTZ) resistance was **7.3%** [7.1, 7.5].
- Temocillin (TEM) resistance was **0.5%** [0.5, 0.6].
- Trimethoprim (TRI) resistance was **29.7%** [29.4, 30.1].



	1GC	3GC	AMO	COA	COT	ERT	FOS	FQ	GEN	MER	NIT	PIV	PTZ	TEM	TRI
2016 (n = 68,511)	7.7	7.0	53.1	14.8	69.1	0.83	3.2	10.7	19.4	0.15	2.8	8.1	10.7	1.8	36.5
2017 (n = 69,987)	7.3	6.9	52.8	17.6	70.0	0.81	3.2	10.5	20.0	0.20	2.9	6.5	14.8	1.7	36.1
2018 (n = 69,622)	7.1	6.9	51.9	23.3	66.5	0.57	2.0	9.9	18.5	0.15	2.7	4.3	19.6	1.0	34.7
2019 (n = 66,531)	*	6.6	55.8	24.9	56.9	0.36	1.2	9.8	12.6	0.21	2.7	6.3	17.8	2.2	32.8
2020 (n = 52,557)	*	7.2	58.7	32.3	47.4	0.24	0.7	9.4	15.4	0.12	2.4	5.3	18.1	0.0	31.6
2021 (n = 55,795)	*	6.3	55.7	36.1	37.0	0.15	0.8	8.8	11.4	0.06	2.0	4.0	14.9	1.2	29.0
2022 (n = 58,407)	*	6.7	48.1	34.5	26.2	0.04	0.9	8.1	5.9	0.03	1.7	3.4	6.7	0.8	28.2
2023 (n = 62,924)	8.5	7.5	46.7	35.4	25.9	0.04	0.8	8.1	5.7	0.00	1.5	3.7	7.6	0.5	29.0
2024 (n = 61,070)	9.0	8.3	46.9	34.7	25.9	0.04	0.9	8.6	6.7	0.01	1.5	3.2	7.3	0.5	29.7

Key: 1GC = resistance to cefalexin &/or cefradine, 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMO = amoxicillin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FOS = fosfomycin, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, MER = meropenem, NIT = nitrofurantoin, PIV = pivmecillinam, PTZ = piperacillin/tazobactam, TEM = temocillin, TRI = trimethoprim

Figure 6: All-Wales antimicrobial resistance rates for *E. coli* from community urine samples (2016 to 2024)

What the data shows

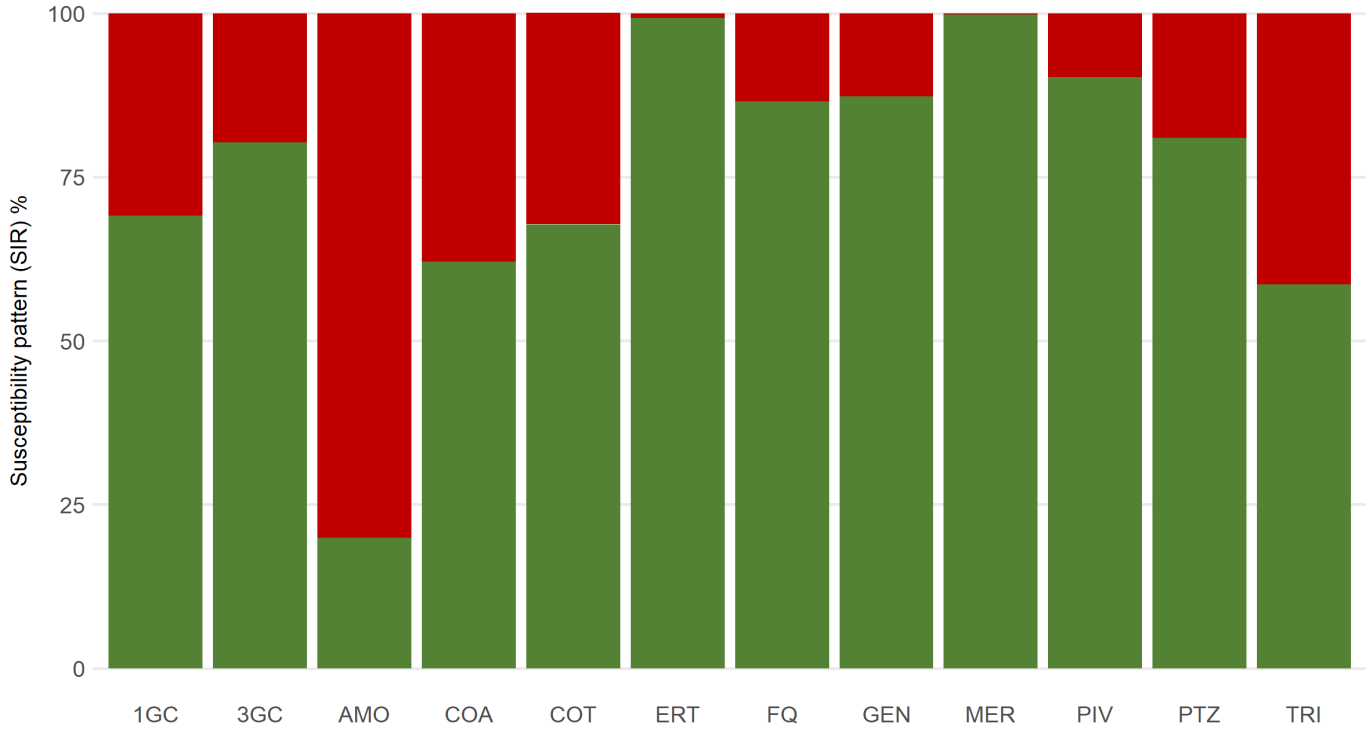
- There has been a decrease in the number of *E. coli* with AST results from community urine samples from **62,924** in 2023 to **61,070** in 2024.

- A general increase in third generation cephalosporins resistance, with resistance at **8.3%** in 2024.
- A levelling off in amoxicillin resistance to **46.9%** in 2024.
- A levelling off in co-amoxiclav resistance at **34.7%** in 2024.
- No significant change in fosfomycin resistance from 2020 onwards, with resistance at **0.9%** in 2024.
- A small increase in fluoroquinolones resistance to **8.6%** in 2024.
- A levelling off in nitrofurantoin resistance, with resistance at **1.5%** in 2024.
- A small increase in trimethoprim resistance to **29.7%** in 2024.
- A general decrease in pivmecillinam resistance, with resistance at **3.2%** in 2024.
- Selective AST testing for co-trimoxazole, ertapenem, gentamicin, meropenem, temocillin and piperacillin/ tazobactam until 2023, trends cannot be inferred.

Non-*Escherichia coli* coliforms

Non-ECOL from inpatient urine samples (n = 6,225 in 2024)

The **All-Wales** patterns of susceptibility (**S/I/R**) for Non-ECOL from inpatient urine samples in 2024 are shown in **Figure 7**. Trends in the resistance rates for the period 2016 to 2024 are shown in **Figure 8.**



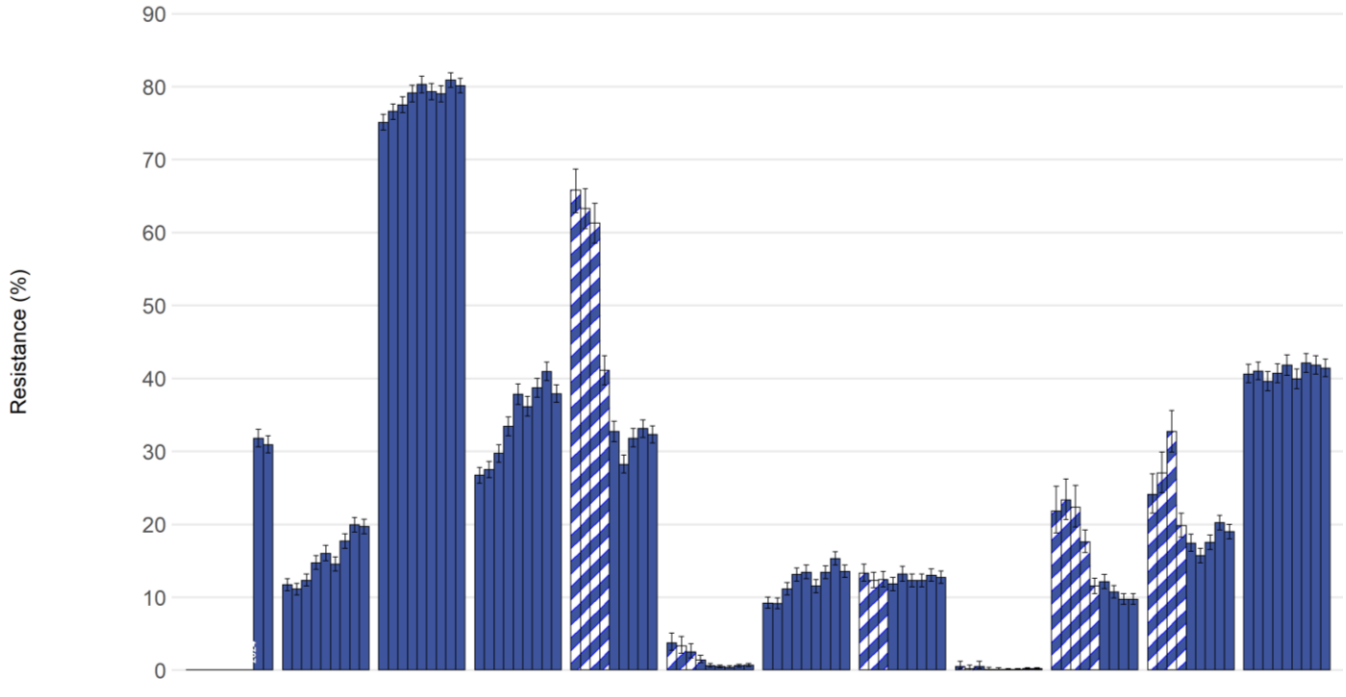
	1GC	3GC	AMO	COA	COT	ERT	FQ	GEN	MER	PIV	PTZ	TRI
%R	30.9	19.7	80.1	37.9	32.3	0.74	13.5	12.7	0.18	9.7	19.0	41.4
%I	-	-	-	-	0.1	-	-	-	-	-	-	-
%S	69.1	80.3	19.9	62.1	67.7	99.26	86.5	87.3	99.82	90.3	81.0	58.6

Key: 1GC = resistance to cefalexin &/or cefradine, 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMO = amoxicillin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, MER = meropenem, PIV = pivmecillinam, PTZ = piperacillin/tazobactam, TRI = trimethoprim

Figure 7: All-Wales susceptibility patterns for Non-ECOL from inpatient urine samples (2024)

What the data shows

- Third generation cephalosporin (3GC) resistance was **19.7%** [18.7, 20.7].
- Amoxicillin (AMO) resistance was **80.1%** [79.1, 81.1].
- Co-amoxiclav (COA) resistance was **37.9%** [36.7, 39.1].
- Co-trimoxazole (COT) resistance was **32.3%** [31.1, 33.4].
- Ertapenem (ERT) resistance was **0.74%** [0.55, 0.98].
- Fluoroquinolone (FQ) resistance was **13.5%** [12.6, 14.3].
- Gentamicin (GEN) resistance was **12.7%** [11.9, 13.6].
- Meropenem (MER) resistance was **0.18%** [0.10, 0.32].
- Pivmecillinam (PIV) resistance was **9.7%** [8.9, 10.5].
- Piperacillin/tazobactam (PTZ) resistance was **19.0%** [18.1, 20.0].
- Trimethoprim (TRI) resistance was **41.4%** [40.2, 42.6].



	1GC	3GC	AMO	COA	COT	ERT	FQ	GEN	MER	PIV	PTZ	TRI
2016 (n = 5,908)	*	11.7	75.1	26.7	65.8	3.67	9.2	13.3	0.55	21.8	24.1	40.6
2017 (n = 6,052)	*	11.1	76.6	27.5	63.3	3.25	9.1	12.3	0.21	23.3	27.0	41.0
2018 (n = 5,588)	*	12.3	77.5	29.7	61.3	2.46	11.1	12.4	0.49	22.3	32.7	39.6
2019 (n = 5,169)	*	14.7	79.1	33.4	41.1	1.36	13.1	11.8	0.14	17.6	19.8	40.7
2020 (n = 4,723)	*	16.0	80.3	37.8	32.7	0.65	13.4	13.2	0.12	11.5	17.4	41.8
2021 (n = 5,011)	*	14.5	79.3	36.1	28.2	0.49	11.5	12.3	0.06	12.1	15.7	39.9
2022 (n = 5,438)	*	17.7	79.0	38.7	31.8	0.39	13.4	12.3	0.15	10.7	17.5	42.1
2023 (n = 5,992)	31.8	19.9	80.9	40.9	33.1	0.57	15.3	13.0	0.17	9.7	20.2	41.8
2024 (n = 6,225)	30.9	19.7	80.1	37.9	32.3	0.74	13.5	12.7	0.18	9.7	19.0	41.4

Key: 1GC = resistance to cefalexin &/or cefradine, 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMO = amoxicillin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, MER = meropenem, PIV = pivmecillinam, PTZ = piperacillin/tazobactam, TRI = trimethoprim

Figure 8: All-Wales antimicrobial resistance rates for Non-ECOL from inpatient urine samples (2016 to 2024)

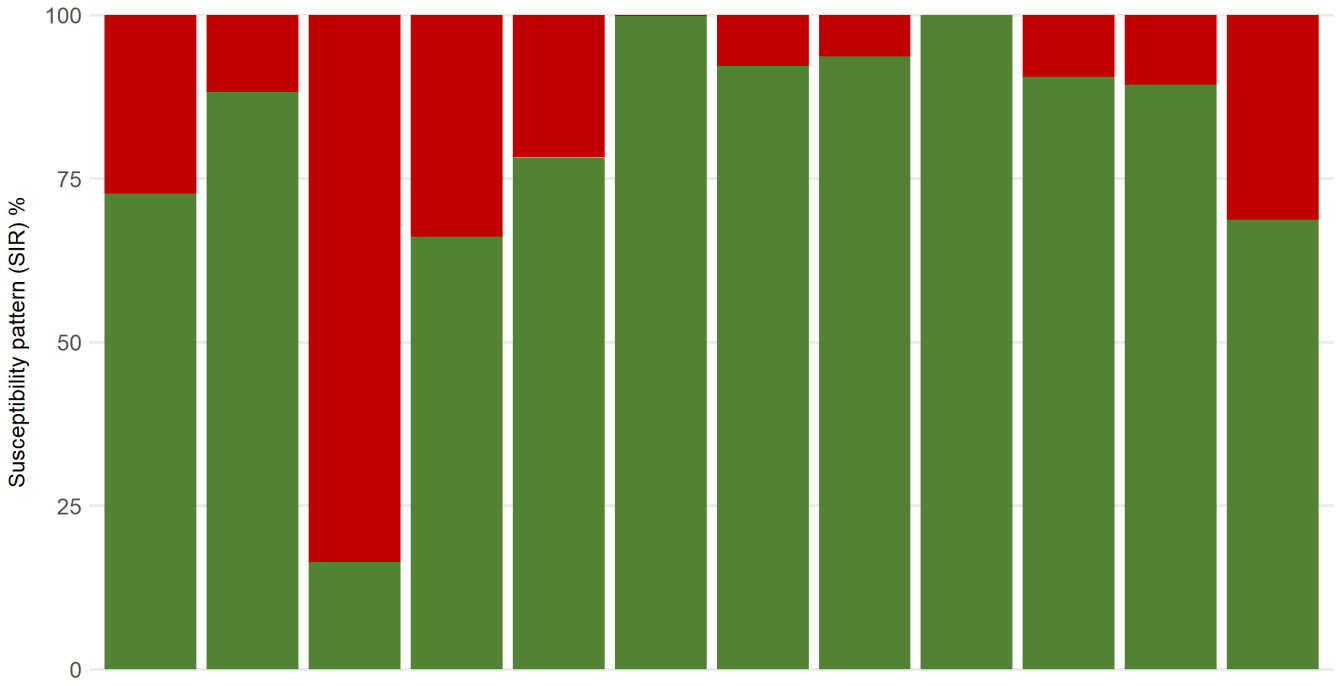
What the data shows

- There has been an increase in the number of non-*Escherichia coli* with AST results for inpatient urine samples from **5,992** in 2023 to **6,225** in 2024.

- Selective AST testing for first generation cephalosporins until 2023, trends cannot be inferred.
- A levelling off of third generation cephalosporins resistance, with resistance at **19.7%** in 2024.
- A levelling off of amoxicillin resistance, with resistance at **80.1%** in 2024.
- A levelling off of co-amoxiclav resistance, with resistance at **37.9%** in 2024.
- No significant change in co-trimoxazole resistance from 2020 onwards, with resistance at **32.3%** in 2024.
- A levelling off of fluoroquinolones resistance, with resistance at **13.5%** in 2024.
- No significant change in gentamicin resistance, with resistance at **12.7%** in 2024.
- A levelling off of pivmecillinam resistance, with resistance at **9.7%** in 2024.
- A levelling off of piperacillin/tazobactam resistance, with resistance at **19.0%** in 2024.
- No significant change in trimethoprim resistance, with resistance at **41.4%** in 2024.
- There has been an increase in ertapenem and meropenem resistance from 2021 onwards (when routine testing began). Resistance to both agents remains **<1%** at an All-Wales level.

Non-ECOL from outpatient urine samples (n = 2,081 in 2024)

The **All-Wales** patterns of susceptibility (**S/I/R**) for Non-ECOL from outpatient urine samples in 2024 are shown in **Figure 9**. Trends in the resistance rates for the period 2016 to 2024 are shown in **Figure 10**.



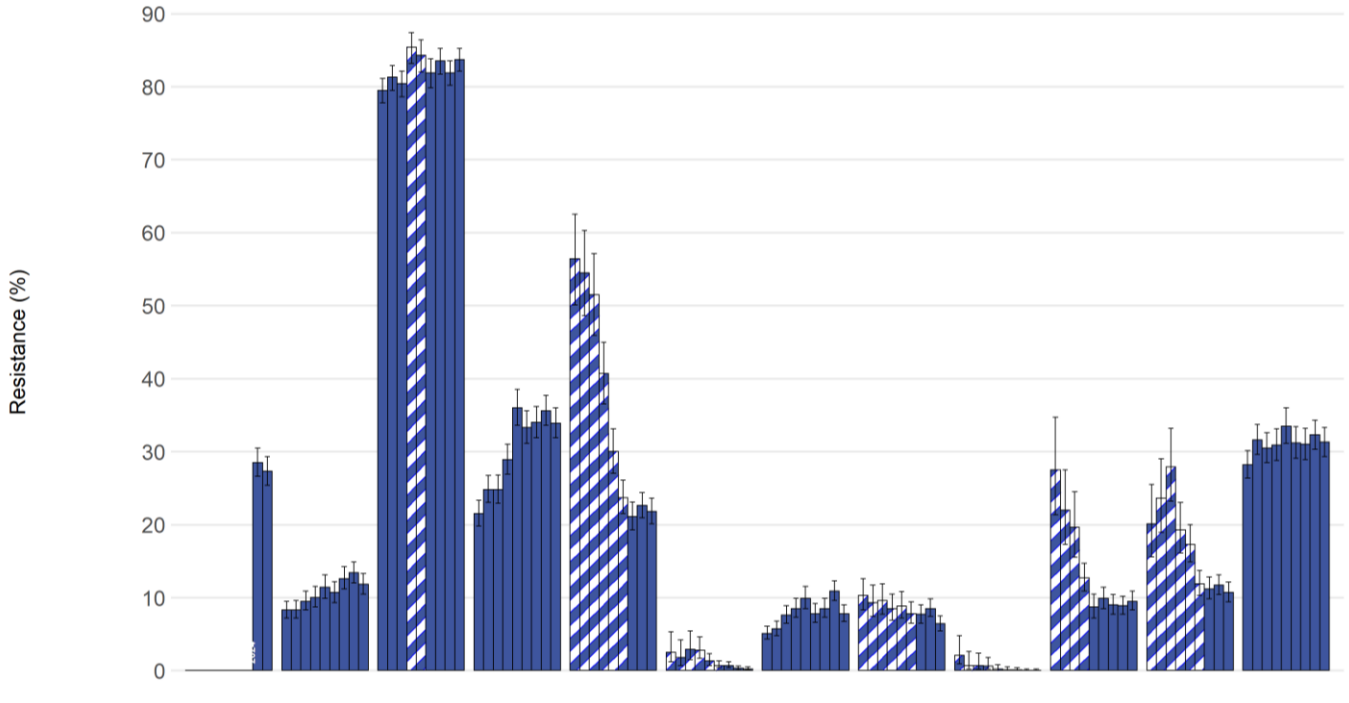
	1GC	3GC	AMO	COA	COT	ERT	FQ	GEN	MER	PIV	PTZ	TRI
%R	27.3	11.8	83.7	33.9	21.8	0.19	7.8	6.4	0.00	9.5	10.7	31.3
%I	-	-	-	-	0.1	-	-	-	-	-	-	-
%S	72.7	88.2	16.3	66.1	78.1	99.81	92.2	93.6	100	90.5	89.3	68.7

Key: 1GC = resistance to cefalexin &/or cefradine, 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMO = amoxicillin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, MER = meropenem, PIV = pivmecillinam, PTZ = piperacillin/tazobactam, TRI = trimethoprim

Figure 9: All-Wales susceptibility patterns for Non-ECOL from outpatient urine samples (2024)

What the data shows

- Third generation cephalosporin (3GC) resistance was **11.8%** [10.5, 13.2].
- Amoxicillin (AMO) resistance was **83.7%** [82.1, 85.2].
- Co-amoxiclav (COA) resistance was **33.9%** [31.9, 36.0].
- Co-trimoxazole (COT) resistance was **21.8%** [20.1, 23.6].
- Ertapenem (ERT) resistance was **0.19%** [0.07, 0.49].
- Fluoroquinolone (FQ) resistance was **7.8%** [6.7, 9.0].
- Gentamicin (GEN) resistance was **6.4%** [5.5, 7.6].
- Meropenem (MER) resistance was **0.00%** [0.00, 0.19].
- Pivmecillinam (PIV) resistance was **9.5%** [8.3, 10.9].
- Piperacillin/tazobactam (PTZ) resistance was **10.7%** [9.4, 12.1].
- Trimethoprim (TRI) resistance was **31.3%** [29.3, 33.3].



	1GC	3GC	AMO	COA	COT	ERT	FQ	GEN	MER	PIV	PTZ	TRI
2016 (n = 2,235)	*	8.3	79.5	21.5	56.4	2.46	5.1	10.3	2.06	27.5	20.1	28.2
2017 (n = 2,014)	*	8.3	81.3	24.8	54.5	1.85	5.7	9.3	0.74	22.0	23.6	31.6
2018 (n = 1,972)	*	9.5	80.4	24.8	51.5	2.92	7.6	9.6	0.65	19.6	27.9	30.5
2019 (n = 1,818)	*	10.0	85.4	28.9	40.7	2.76	8.5	8.5	0.63	12.7	19.3	30.9
2020 (n = 1,455)	*	11.4	84.3	36.0	30.0	1.26	9.9	8.8	0.23	8.7	17.3	33.5
2021 (n = 1,721)	*	10.7	81.9	33.3	23.7	0.67	7.8	7.8	0.08	9.9	11.9	31.2
2022 (n = 1,838)	*	12.6	83.5	34.0	21.1	0.68	8.5	7.7	0.06	9.0	11.2	31.0
2023 (n = 2,128)	28.5	13.4	81.9	35.6	22.6	0.33	10.9	8.5	0.05	8.9	11.7	32.3
2024 (n = 2,081)	27.3	11.8	83.7	33.9	21.8	0.19	7.8	6.4	0.00	9.5	10.7	31.3

Key: 1GC = resistance to cefalexin &/or cefradine, 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMO = amoxicillin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, MER = meropenem, PIV = pivmecillinam, PTZ = piperacillin/tazobactam, TRI = trimethoprim

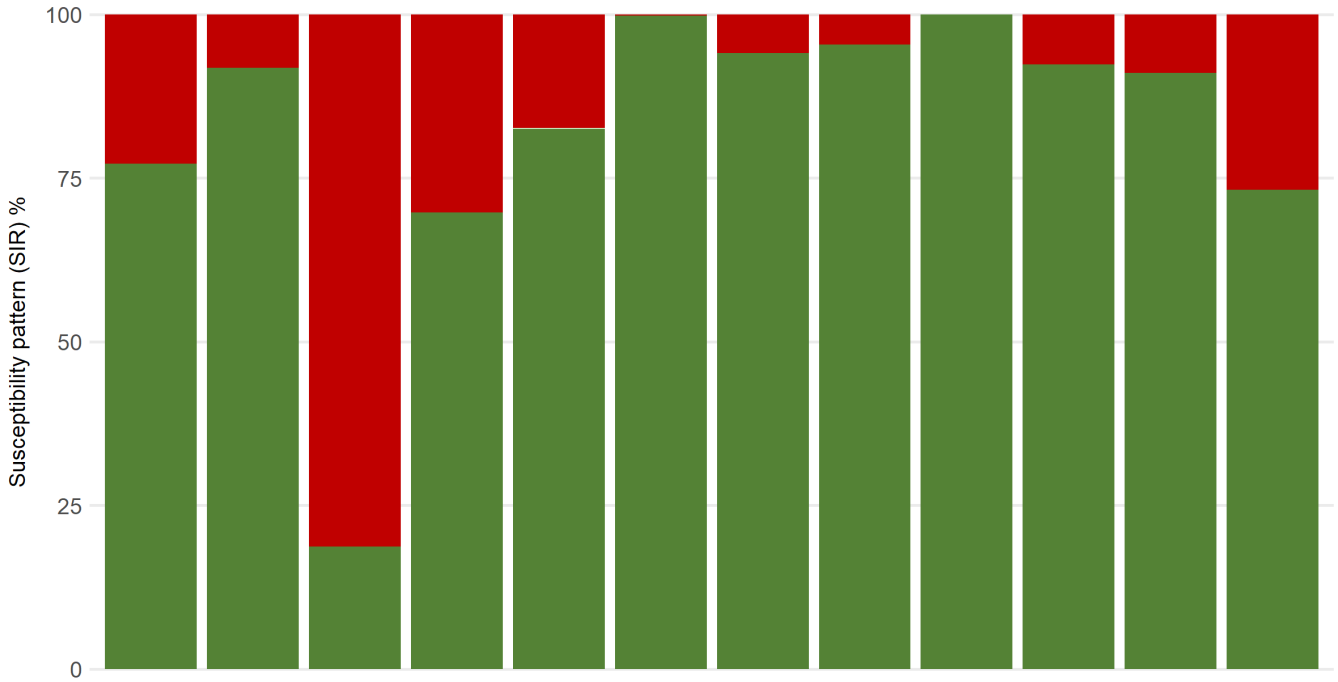
Figure 10: All-Wales antimicrobial resistance rates for Non-ECOL from outpatient urine samples (2016 to 2024)

What the data shows

- Selective AST testing for first generation cephalosporins until 2023, trends cannot be inferred.
- A levelling off in third generation cephalosporins resistance, with resistance at 11.8**%** in 2024.
- An increase in amoxicillin resistance to **83.7%** in 2024.
- A levelling off of co-amoxiclav resistance to **33.9%** in 2024.
- No significant change in co-trimoxazole resistance from 2022 onwards, with resistance at **21.8%** in 2024.
- A levelling off of fluoroquinolones resistance to **7.8%** in 2024.
- A general decrease in gentamicin resistance, with resistance at **6.4%** in 2024.
- A levelling off of pivmecillinam resistance from 2020 onwards, with resistance at **9.5%** in 2024.
- A general decrease in piperacillin/tazobactam resistance from 2021 onwards, with resistance at **10.7%** in 2024.
- No significant change in trimethoprim resistance, with resistance at **31.3%** in 2024.
- A general decrease in ertapenem and meropenem resistance from 2021 onwards, (when routine testing began). Resistance to both agents remains **<1%** at an All-Wales level.

Non-ECOL from community urine samples (n = 20,231 in 2024)

The **All-Wales** patterns of susceptibility (**S/I/R**) for Non-ECOL from community urine samples in 2024 are shown in **Figure 11**. Trends in the resistance rates for the period 2016 to 2024 are shown in **Figure 12**.



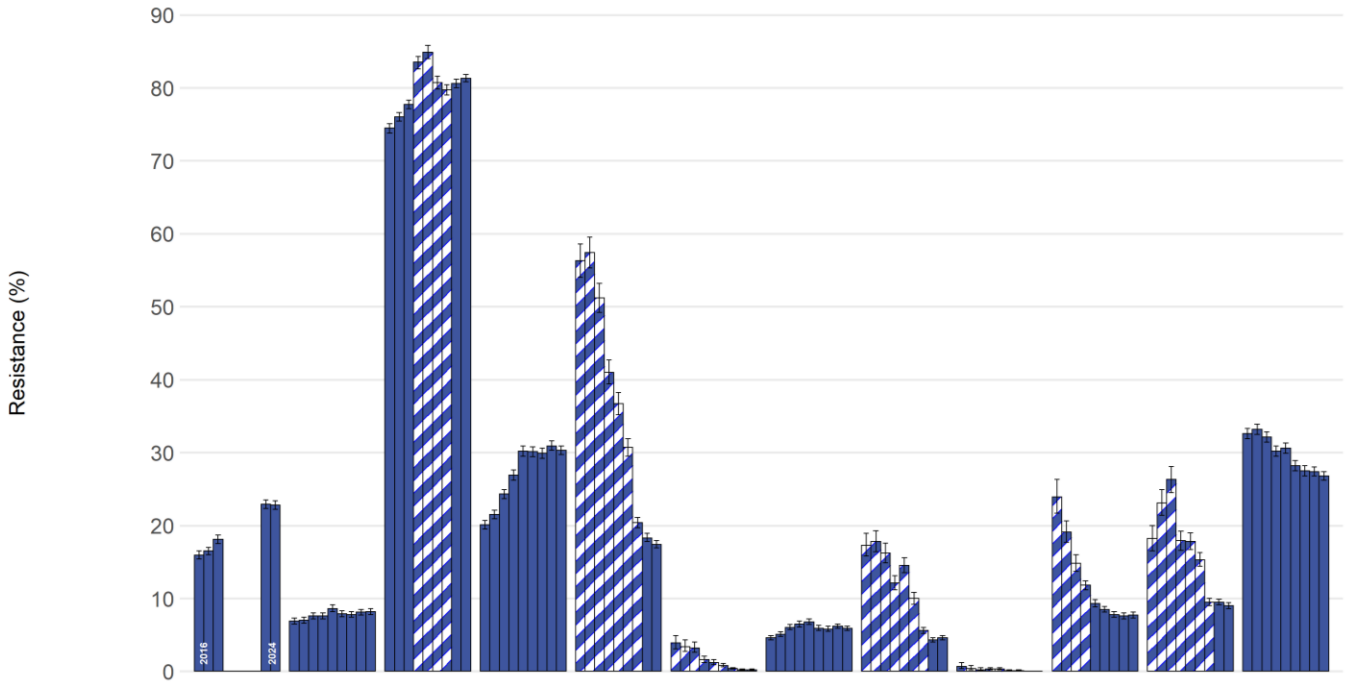
	1GC	3GC	AMO	COA	COT	ERT	FQ	GEN	MER	PIV	PTZ	TRI
%R	22.8	8.2	81.3	30.3	17.4	0.23	5.9	4.6	0.04	7.7	9.0	26.8
%I	-	-	-	-	0.1	-	-	-	-	-	-	-
%S	77.2	91.8	18.7	69.7	82.5	99.77	94.1	95.4	99.96	92.3	91.0	73.2

Key: 1GC = resistance to cefalexin &/or cefradine, 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMO = amoxicillin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, MER = meropenem, PIV = pivmecillinam, PTZ = piperacillin/tazobactam, TRI = trimethoprim

Figure 11: All-Wales susceptibility patterns for Non-ECOL from community urine samples (2024)

What the data shows

- Third generation cephalosporin (3GC) resistance was **8.2%** [7.8, 8.5].
- Amoxicillin (AMO) resistance was **81.3%** [80.7, 81.8].
- Co-amoxiclav (COA) resistance was **30.3%** [29.7, 30.9].
- Co-trimoxazole (COT) resistance was **17.4%** [16.9, 17.9].
- Ertapenem (ERT) resistance was **0.23%** [0.17, 0.31].
- Fluoroquinolone (FQ) resistance was **5.9%** [5.6, 6.2].
- Gentamicin (GEN) resistance was **4.6%** [4.3, 4.9].
- Meropenem (MER) resistance was **0.04%** [0.02, 0.08].
- Pivmecillinam (PIV) resistance was **7.7%** [7.3, 8.1].
- Piperacillin/tazobactam (PTZ) resistance was **9.0%** [8.6, 9.4].
- Trimethoprim (TRI) resistance was **26.8%** [26.2, 27.4].



	1GC	3GC	AMO	COA	COT	ERT	FQ	GEN	MER	PIV	PTZ	TRI
2016 (n = 17,504)	15.9	6.9	74.5	20.1	56.3	3.88	4.6	17.3	0.66	23.9	18.2	32.6
2017 (n = 18,991)	16.5	7.0	76.0	21.5	57.4	3.40	5.1	17.8	0.42	19.1	23.1	33.2
2018 (n = 18,742)	18.1	7.6	77.7	24.3	51.2	3.20	6.0	16.2	0.17	14.8	26.3	32.1
2019 (n = 17,085)	*	7.6	83.5	26.9	41.0	1.60	6.5	12.1	0.28	11.8	17.9	30.2
2020 (n = 15,481)	*	8.6	84.9	30.2	36.7	1.20	6.8	14.5	0.29	9.3	17.8	30.6
2021 (n = 16,598)	*	7.9	80.7	30.1	30.7	0.82	5.9	10.0	0.13	8.5	15.3	28.2
2022 (n = 17,441)	*	7.8	79.7	29.9	20.4	0.42	5.8	5.6	0.06	7.8	9.5	27.5
2023 (n = 19,605)	22.9	8.1	80.6	30.9	18.3	0.23	6.2	4.3	0.04	7.6	9.5	27.4
2024 (n = 20,231)	22.8	8.2	81.3	30.3	17.4	0.23	5.9	4.6	0.04	7.7	9.0	26.8

Key: 1GC = resistance to cefalexin &/or cefradine, 3GC = resistance to ceftazidime &/or cefotaxime, ceftriaxone, cefpodoxime, AMO = amoxicillin, COA = co-amoxiclav, COT = co-trimoxazole, ERT = ertapenem, FQ = ciprofloxacin &/or levofloxacin, or norfloxacin, GEN = gentamicin, MER = meropenem, PIV = pivmecillinam, PTZ = piperacillin/tazobactam, TRI = trimethoprim

Figure 12: All-Wales antimicrobial resistance rates for Non-ECOL from community urine samples (2016 to 2024)

What the data shows

- There has been an increase in the number of non-*Escherichia coli* with AST results for community urine samples from **19,605** isolates in 2023 to **20,231** in 2024.

- Selective AST testing for first generation cephalosporins from 2019 to 2023, trends cannot be inferred, but the rates for 2023 and 2024 are comparable.
- An increase in third generation cephalosporins resistance, with resistance at **8.2%** in 2024.
- An increase in amoxicillin resistance to **81.3%** in 2024.
- A levelling off of co-amoxiclav resistance to **30.3%** in 2024.
- A levelling off of fluoroquinolones resistance, with resistance at **5.9%** in 2024.
- A levelling off of pivmecillinam resistance, with resistance at **7.7%** in 2024.
- A decrease in trimethoprim resistance, with resistance at **26.8%** in 2024.
- Previous selective AST testing for co-trimoxazole, ertapenem, gentamicin, meropenem and piperacillin/ tazobactam (indicated by the hashed bars) make interpretation of data difficult. Current trends cannot be inferred but the rates for 2023 and 2024 are comparable.