CIPARS Human Surveillance Component

Salmonella and *Campylobacter* AMR – 2024 Results

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World Antimicrobial Resistance Awareness Week

November 18, 2025

Agenda

- Background
- *Salmonella*
- *Campylobacter*
- Questions

AMR descriptions and colour gradient used throughout presentation

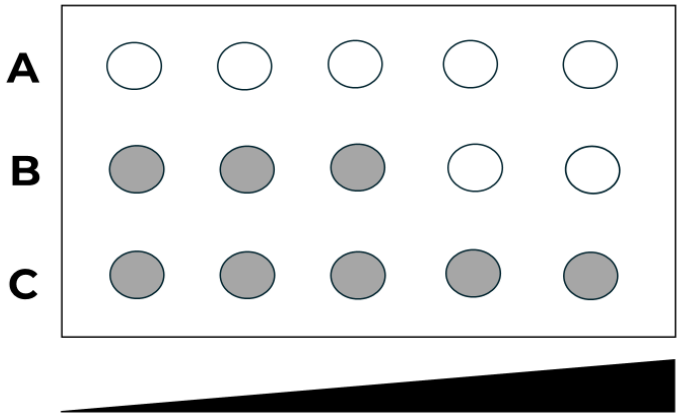
Description	Resistance (%)	Gradient
20 or fewer isolates	Any %	
Rare	< 0.1%	
Very low	0.1% to 1%	
Low	>1% to 10%	
Moderate	>10% to 20%	
High	>20% to 50%	
Very High	>50% to 70%	
Extremely High	>70%	

https://www.efsa.europa.eu/en/efsajournal/pub/7867

Methods for AMR evaluation

Campylobacter

Broth Microdilution

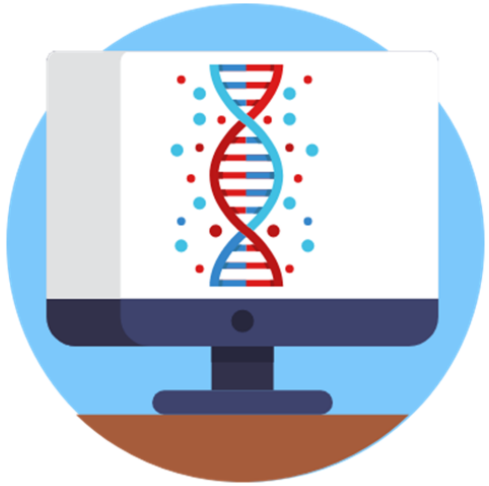


Increasing concentrations of antimicrobial

S I R

Salmonella

Whole Genome Sequencing (WGS)



Predicted phenotypes based on the resistance genes and/or mutations detected

Methods for AMR Interpretation

Campylobacter

For **CIPROFLOXACIN,** use CLSI breakpoint to classify MICs as either susceptible, intermediate or resistant

Report as resistant

R

Salmonella

For **CIPROFLOXACIN,** cannot discriminate between resistant and intermediate using the resistance genes

Report as not susceptible

I/R

NOTE: both “not susceptible to ciprofloxacin” and “resistant to ciprofloxacin” are referred to as “resistant to ciprofloxacin” for the remainder of the presentation

Human *Salmonella*

Most non-typhoidal *Salmonella* infections do NOT require treatment with antimicrobials.

- Non-typhoidal *Salmonella* have an animal reservoir and typhoidal *Salmonella* do not
- Non-typhoidal *Salmonella* infections most commonly cause self-limiting diarrhea
  - Treatment with antimicrobials is not required or recommended
- Treatment with antimicrobials is considered:
  - When clinical signs are severe or prolonged
    - >6 diarrheal episodes/day, bloody diarrhea, diarrhea lasting >1 week, persistent fever
  - When patient is immunocompromised
  - When patient is at increased risk for invasive infection
  - Culture and susceptibility testing directed treatment options include ciprofloxacin, ceftriaxone, azithromycin, trimethoprim-sulfamethoxazole or amoxicillin

bugsanddrugs.org/CFF1EDAF-526D-4B32-852A-25E3E7F1872E
IDSA 2017 Clinical Practice Guidelines for the Diagnosis and Management of Infectious Diarrhea

Invasive *Salmonella* infections require treatment with antimicrobials.

- Typhoidal *Salmonella* infections most commonly cause bloodstream infections

- Invasive infections including bloodstream infections can occur with non-typhoidal *Salmonella* infections, but are less common than gastrointestinal infections

    - Treatment with antimicrobials is required

    - Culture and susceptibility testing directed treatment options include ceftriaxone, ciprofloxacin, azithromycin, ampicillin or trimethoprim-sulfamethoxazole

bugsanddrugs.org/67b9e5cb-60f4-4b35-8581-374bd4c4cdbb
IDSA 2017 Clinical Practice Guidelines for the Diagnosis and Management of Infectious Diarrhea

***Salmonella* has the highest incidence rate of the enteric pathogens tracked by NESP.**

- Incidence rates of Canadians with *Salmonella* in 2024

	2024 Incidence Rates* (cases/100,000 population)
Total *Salmonella*	15.89
Non-typhoidal *Salmonella*	14.84
Typhoidal *Salmonella*	1.06

*2024 incidence rates are preliminary and subject to change with final validation of the data

Source of data – National Enteric Surveillance Program (NESP) - Canada.ca

CIPARS enhanced passive human *Salmonella* surveillance reports temporal and regional variation in the prevalence of AMR.

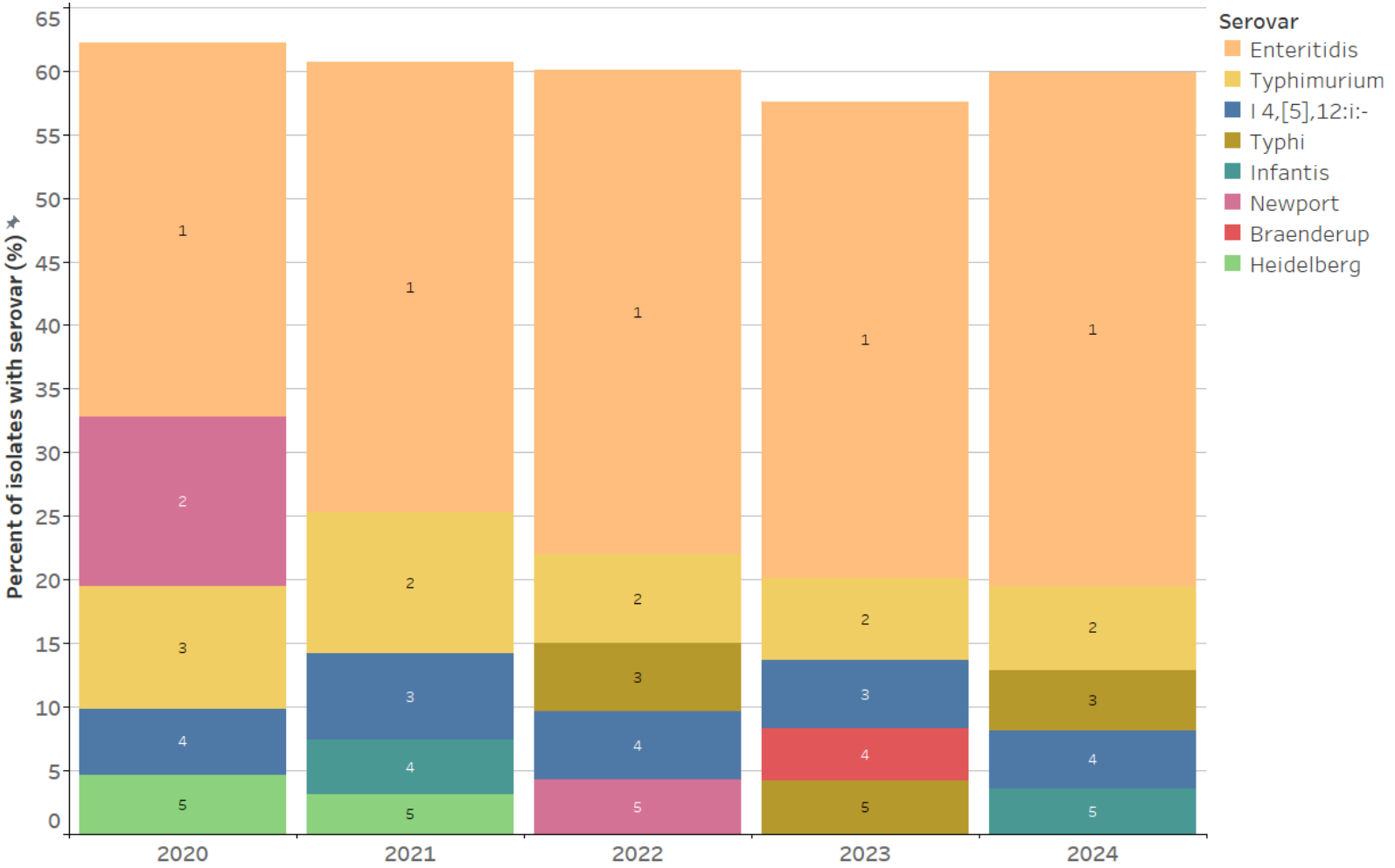
- Reporting of *Salmonella* infections is mandatory through laboratory notification of reportable diseases to the National Notifiable Disease Reporting System
  - However, forwarding of *Salmonella* isolates to provincial reference laboratories is voluntary and passive

- Isolates undergo whole genome sequencing
  - Predictive serotyping with SISTR
  - AMR prediction using Staramr
    - Validated for 14 antimicrobials in 11 antimicrobial classes (2020 to present)

- Data from 2020-2024 are presented

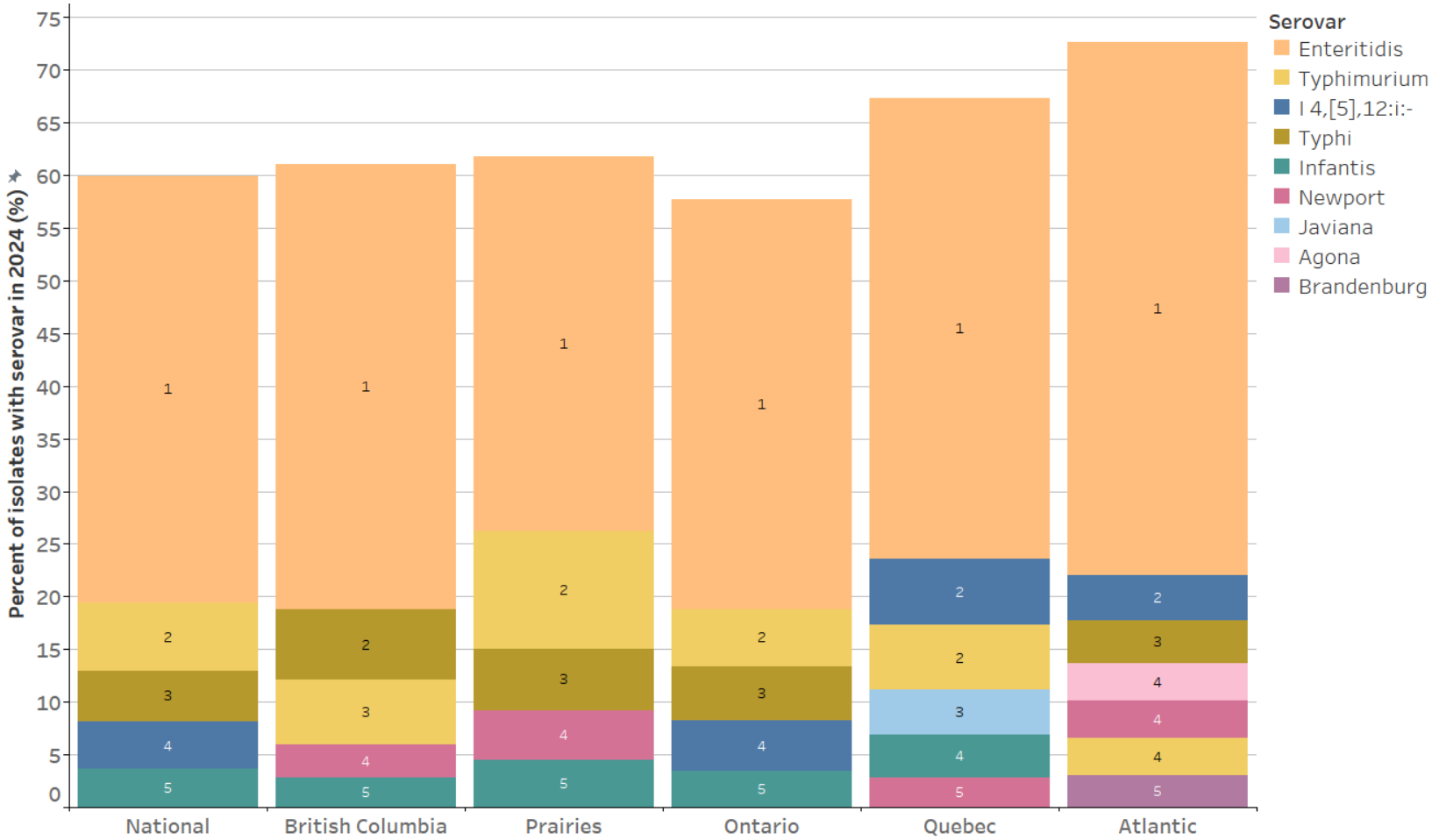
S. Enteritidis has been the top serovar nationally since 2005; ranking of other serovars varied from year to year.

- In 2024, 40% of the isolates were *S.* Enteritidis
- *S.* Heidelberg was not in the top 10 serovars nationally in 2023 and 2024
- There are temporal differences in the frequency of serovars



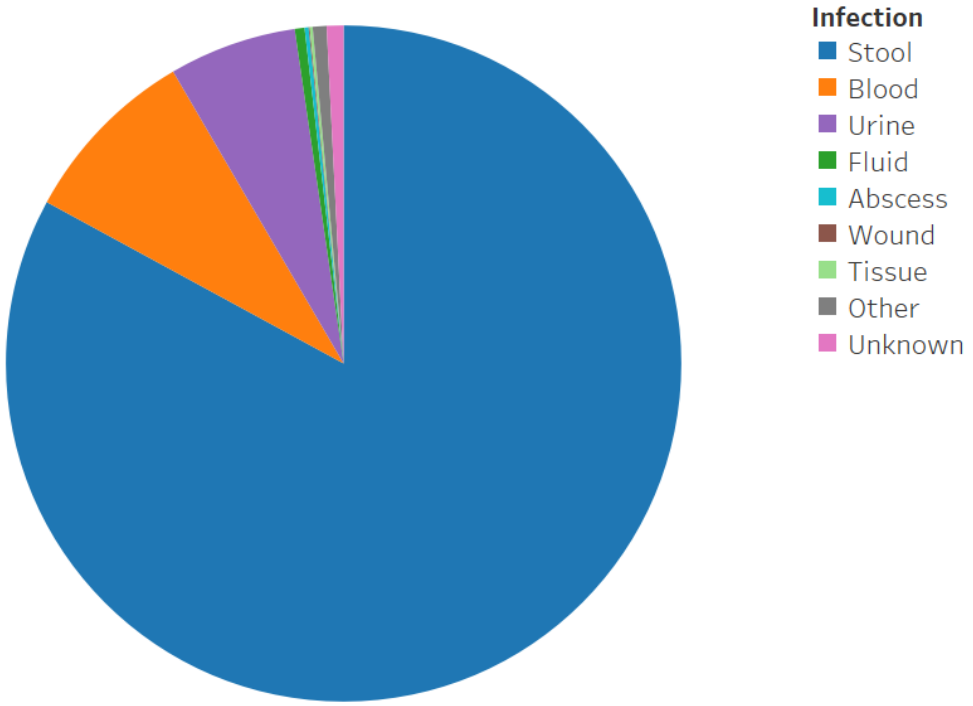
S. Enteritidis was consistently the top serovar in all regions in 2024; ranking of other serovars varied from region to region.

- *S.* Enteritidis was the top serovar in all regions in 2024
- There are regional differences in the frequency of serovars

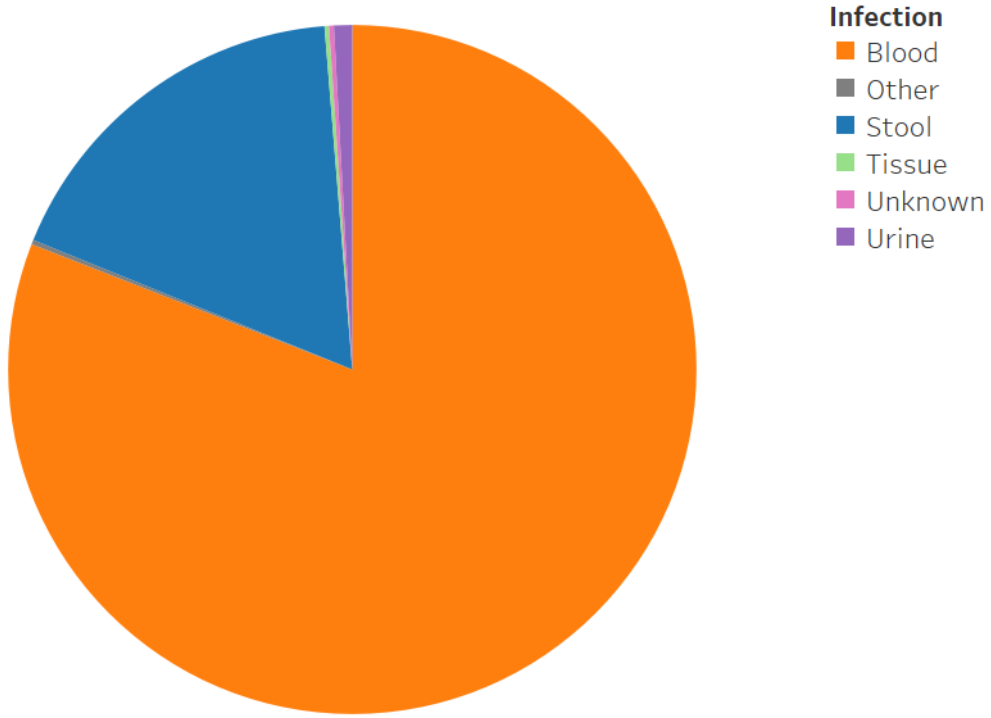


Non-typhoidal *Salmonella* are generally from non-invasive infections, whereas typhoidal *Salmonella* are generally from invasive infections.

- Non-typhoidal *Salmonella* predominantly from gastrointestinal infections (83% stool in 2024)



- Typhoidal *Salmonella* predominantly from bloodstream infections (81% blood in 2024)



More *Salmonella* invasive bloodstream infections in males than females.

Distribution of sex and sample types in human *Salmonella* cases from 2024

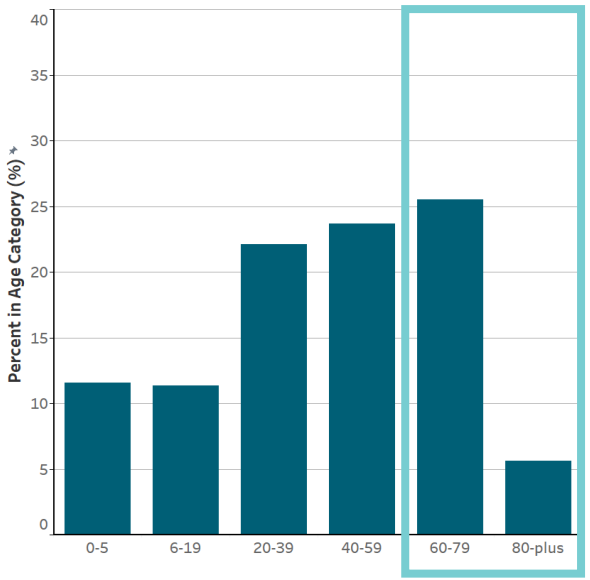
Salmonella	Sex	Sample Types			
		All samples	Stool	Blood	Urine
Non-typhoidal	All cases	93%	83%	9%	6%
	Female	53%	53%	43%	74%
	Male	46%	47%	56%	25%
Typhoidal	All cases	7%	18%	81%	1%
	Female	44%	53%	42%	n=1
	Male	55%	46%	57%	n=3

Note – unknown and other sample types, and unknown sexes are not shown

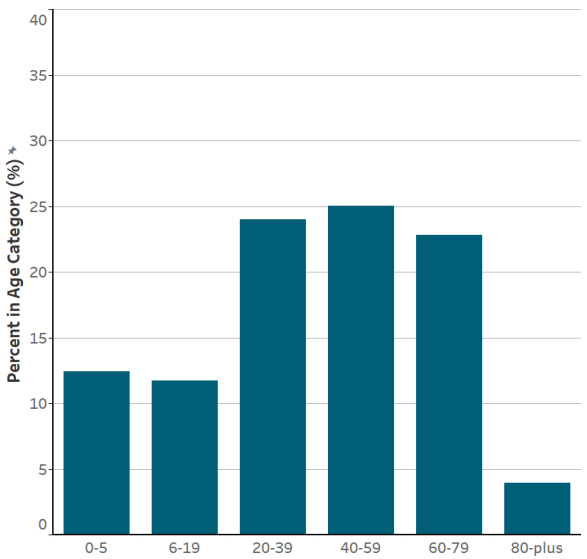
More non-typhoidal *Salmonella* bloodstream and urinary tract infections in people over 60 years of age.

Distribution of age categories and sample types in human non-typhoidal *Salmonella* cases from 2024

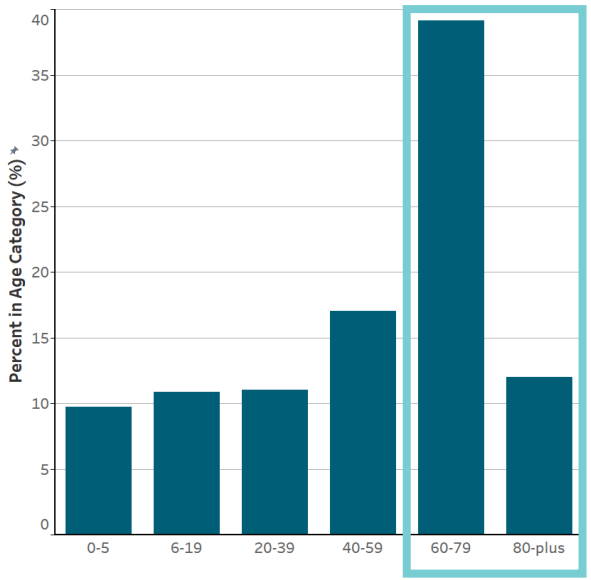
All sample types



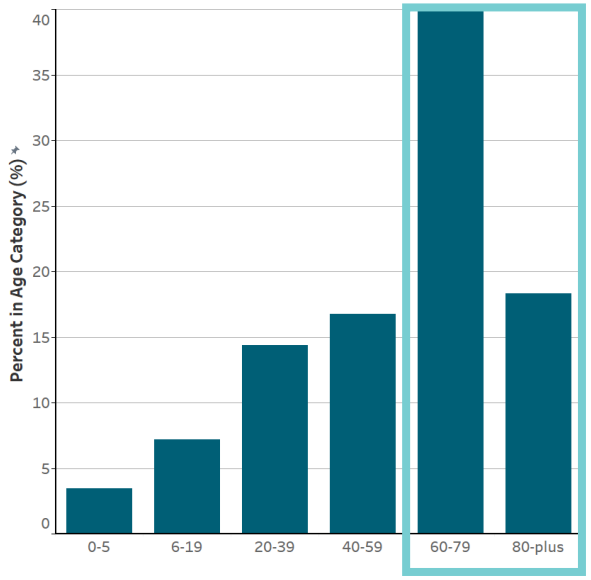
Stool



Blood



Urine

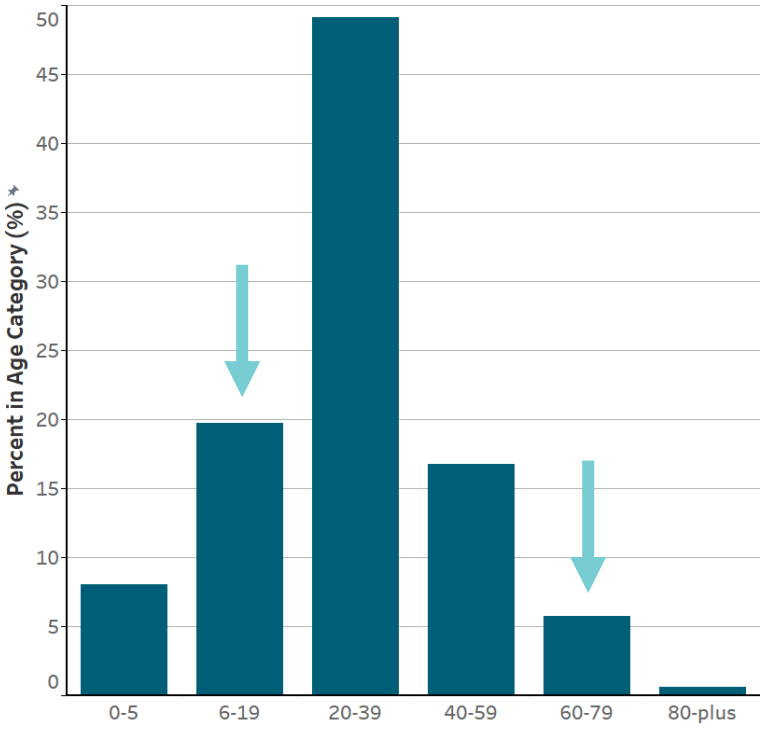


Note – unknown and other sample types, and unknown ages are not shown

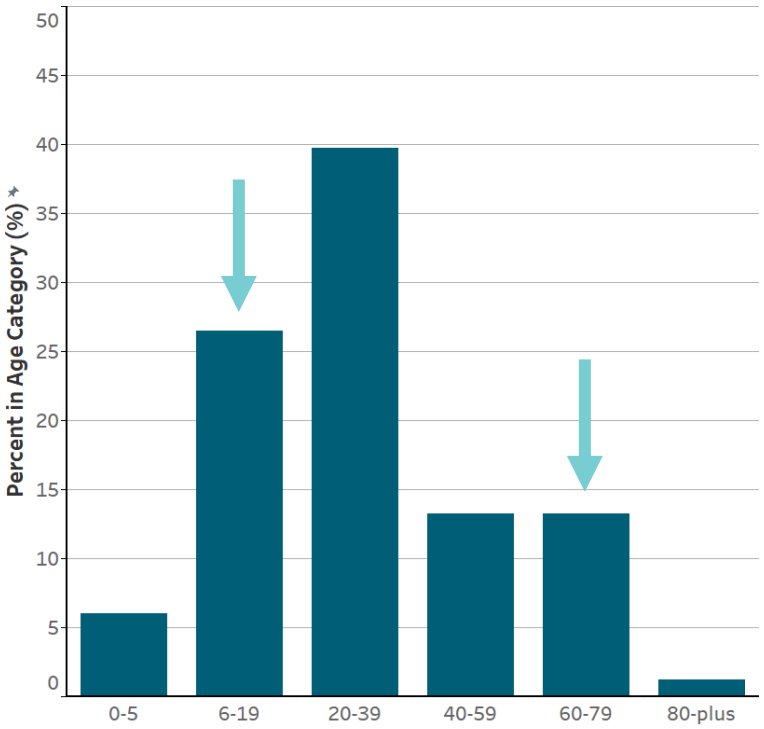
More typhoidal *Salmonella* infections in people 20 to 39 years of age.

Distribution of age categories and sample types in human typhoidal *Salmonella* cases from 2024

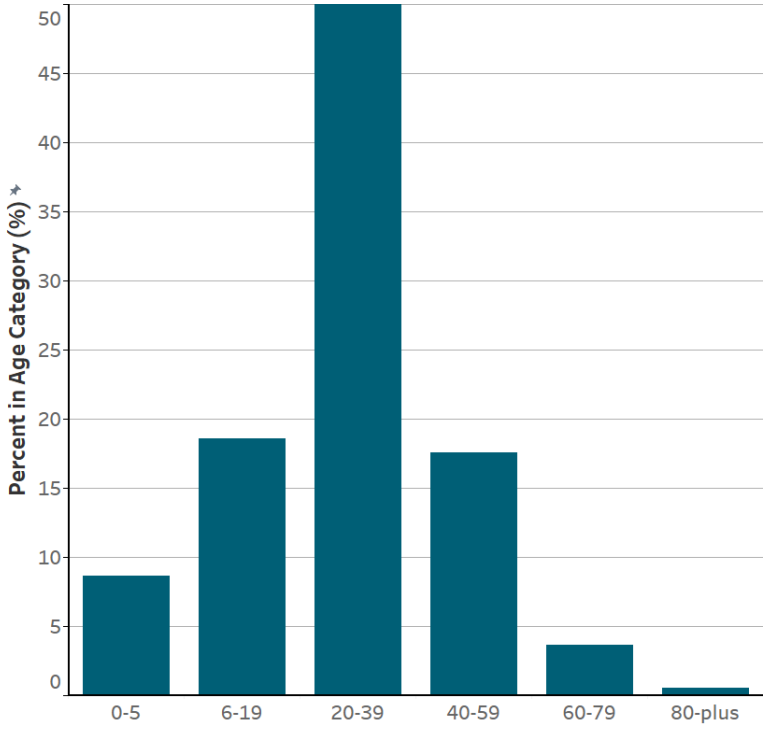
All sample types



Stool



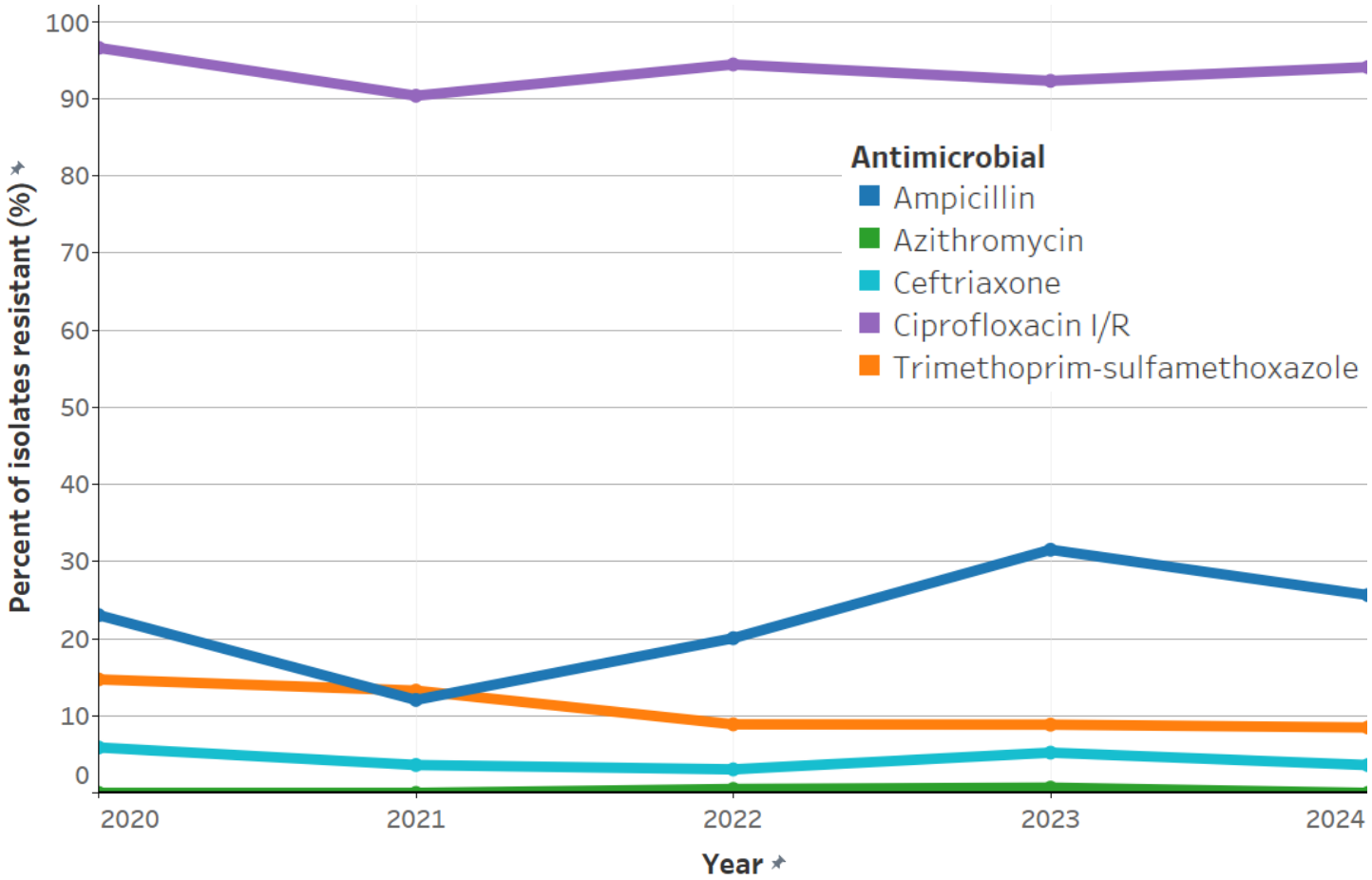
Blood



Note – unknown and other sample types, and unknown ages are not shown

Extremely high resistance to ciprofloxacin has implications for treatment selection.

- **Extremely high** resistance to ciprofloxacin (ranging from 90% to 97%)
- **Low** resistance to ceftriaxone; decreased from 2020 (6%) to 2024 (4%)
- **High** resistance to ampicillin (2020; 23% and 2024; 26%) with variability between
- **Moderate** resistance to trimethoprim-sulfamethoxazole **decreased to low** resistance (2020; 15% and 2024; 8%)
- **Very low** resistance to azithromycin in 2022 (0.5%) and 2023 (0.7%), no resistance reported in the other years



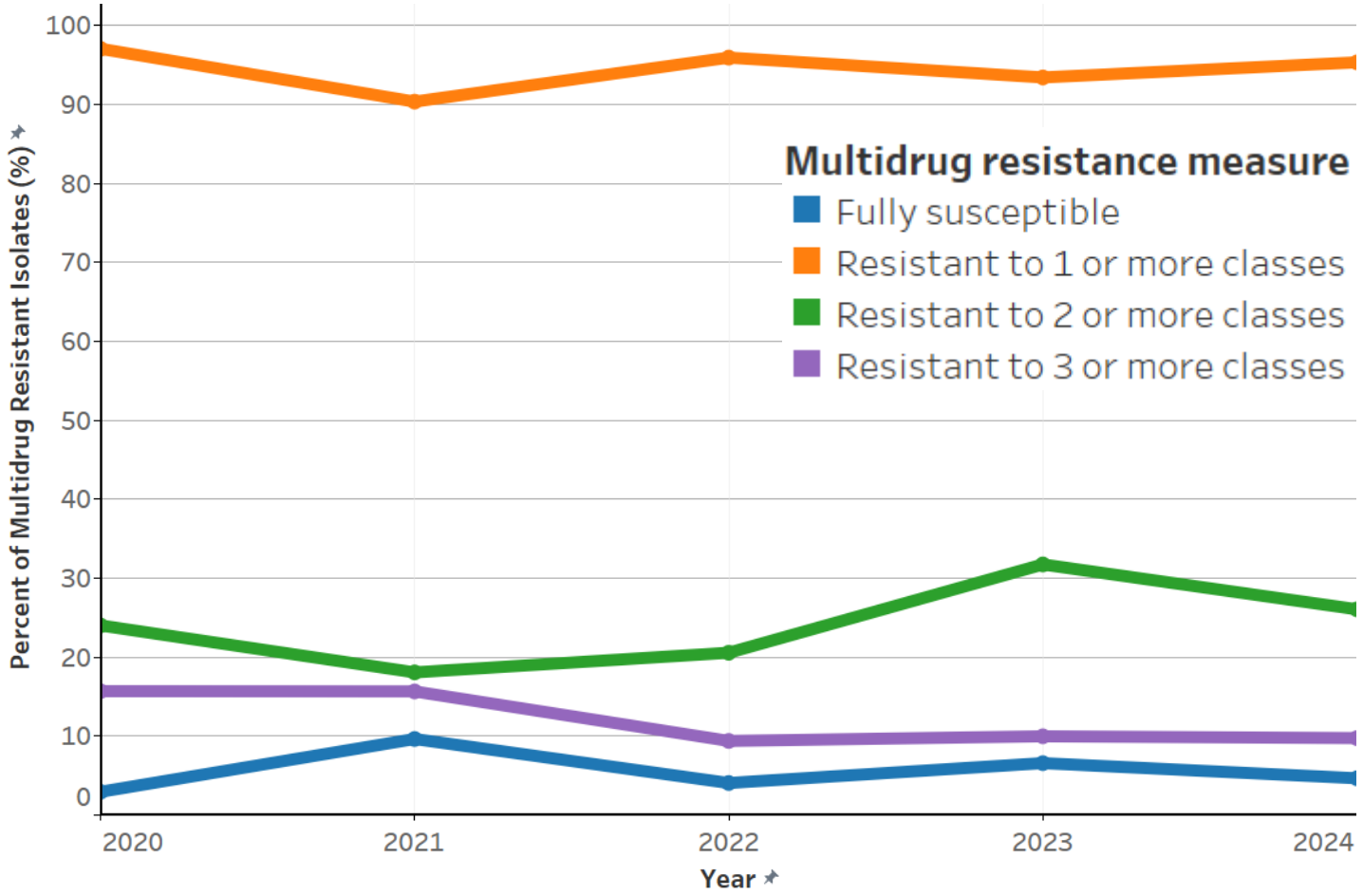
Wide regional variation, sparse data and small numbers of isolates make interpretation of regional differences challenging.

Region	2020		2021		2022		2023		2024	
	% R SXT	Total Isolates	% R SXT	Total Isolates	% R SXT	Total Isolates	% R SXT	Total Isolates	% R SXT	Total Isolates
National	15	204	13	83	9	394	9	441	9	472
Atlantic	-	0	0	2	25	8	0	7	8	24
British Columbia	6	32	11	19	3	76	1	99	4	93
Ontario	11	124	11	46	10	204	9	231	11	219
Prairies	41	34	9	11	8	85	15	79	4	110
Quebec	0	14	60	5	14	21	20	25	23	26

Legend	20 or fewer isolates	Rare 0-0.1%	Very low 0.1% to 1%	Low >1% to 10%	Moderate >10% to 20%	High >20% to 50%	Very high >50% to 70%	Extremely high >70%

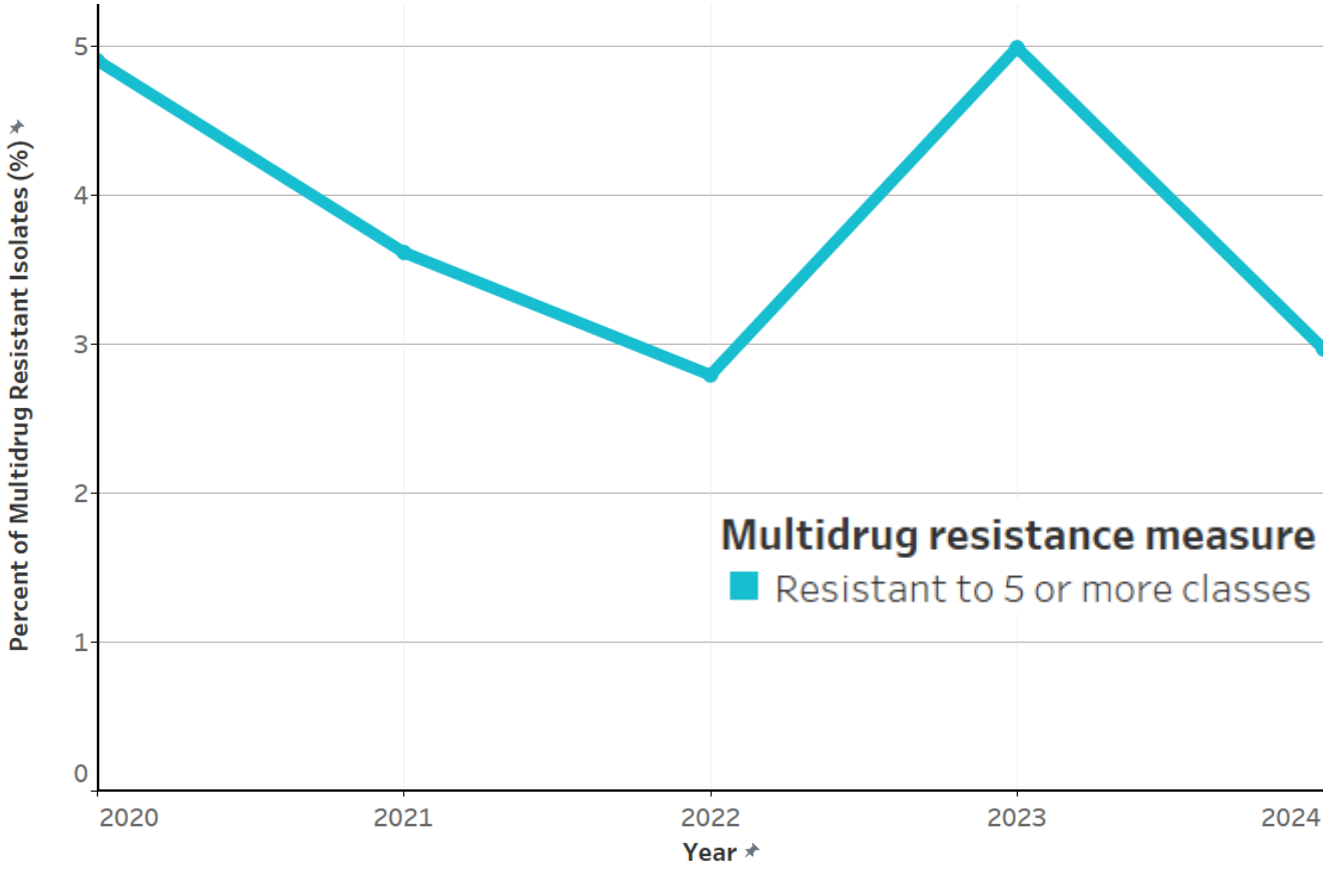
Few isolates fully susceptible and isolates predominantly resistant to 1 antimicrobial class.

- **Variable** full susceptibility (ranging between 3% and 10%)
- **Variable and high** resistance to 2 or more classes (2020; 24% and 2024; 26%)
- **Decreased from moderate to low** resistance to 3 or more classes (2020; 16% and 2024; 10%)



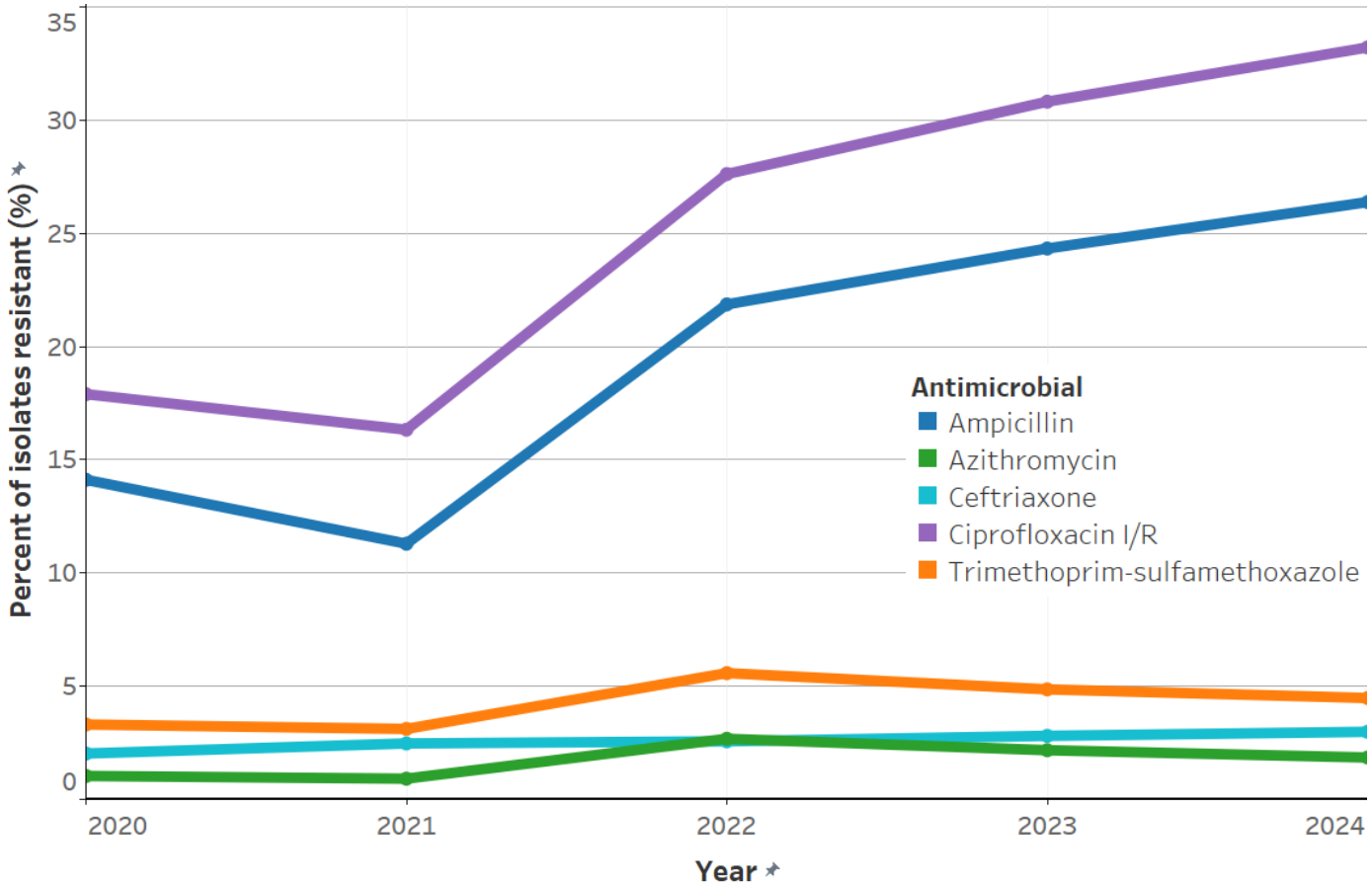
Maximum resistance between 2020 and 2024 was resistance to 5 antimicrobial classes and the frequency was low.

- **Low** resistance to 5 or more classes (2020; 5% and 2024; 3%)
- Patterns of resistance for 2024 isolates resistant to 5 classes
  - Folate pathway inhibitors, Macrolides, Penicillins, Phenicols and Quinolones
  - Cephalosporins, Folate pathway inhibitors, Penicillins, Phenicols and Quinolones
  - Folate pathway inhibitors, Penicillins, Phenicols, Quinolones and Tetracyclines
- Since 2020, **no** resistance to 6 or more classes



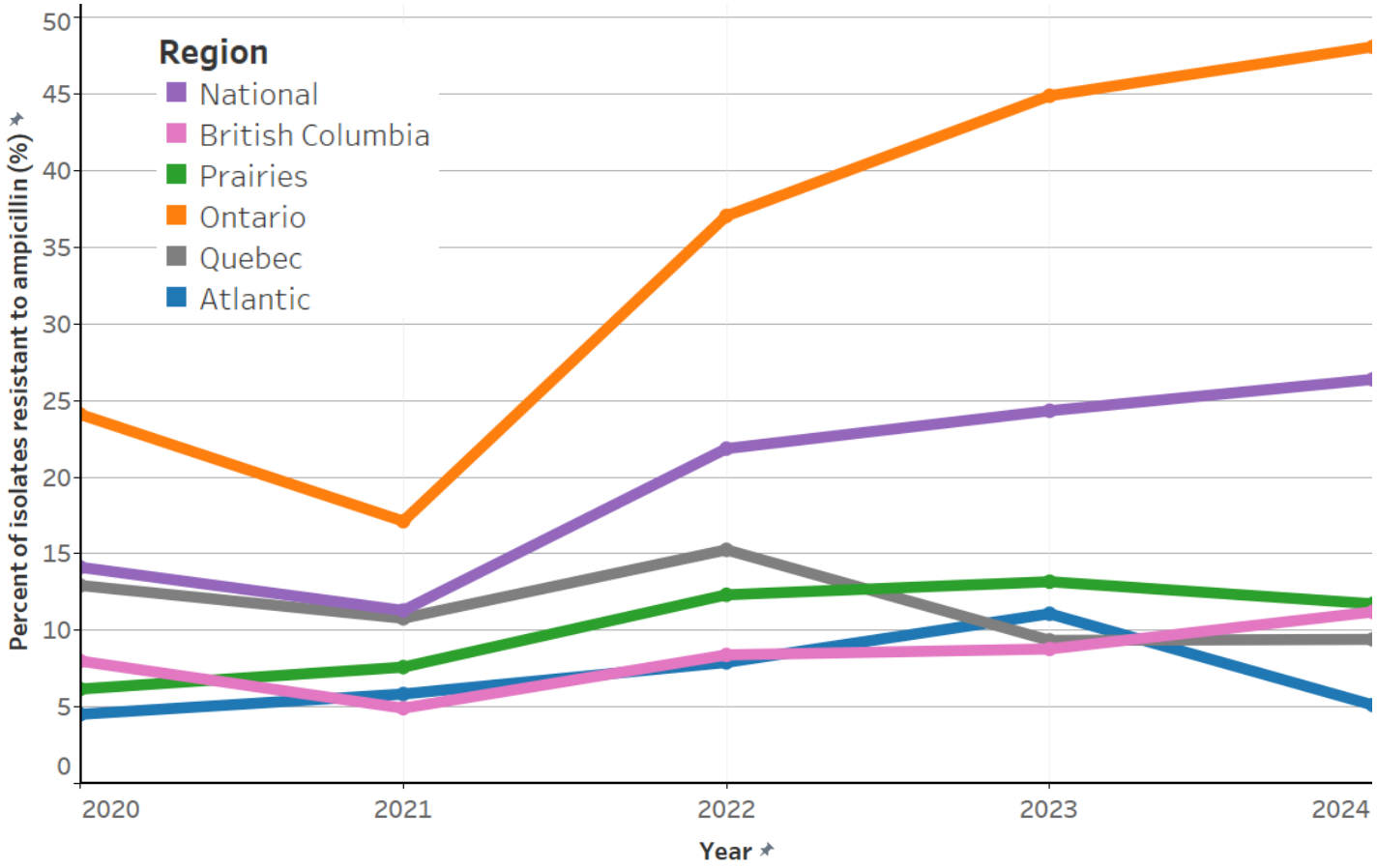
Resistance to ciprofloxacin and ampicillin continuing to increase.

- **Moderate** resistance to ciprofloxacin **increased** to **high** resistance (2020; 18% and 2024; 33%)
- **Low** and relatively stable resistance to ceftriaxone (ranging from 2% to 3%)
- **Moderate** resistance to ampicillin **increased** to **high** resistance (2020; 14% and 2023; 26%)
- **Low** and variable resistance to trimethoprim-sulfamethoxazole (ranging from 3% to 6%)
- **Low** resistance to azithromycin **increased** between 2020 (1%) and 2022 (3%) and **decreased slightly** in 2024 (2%)



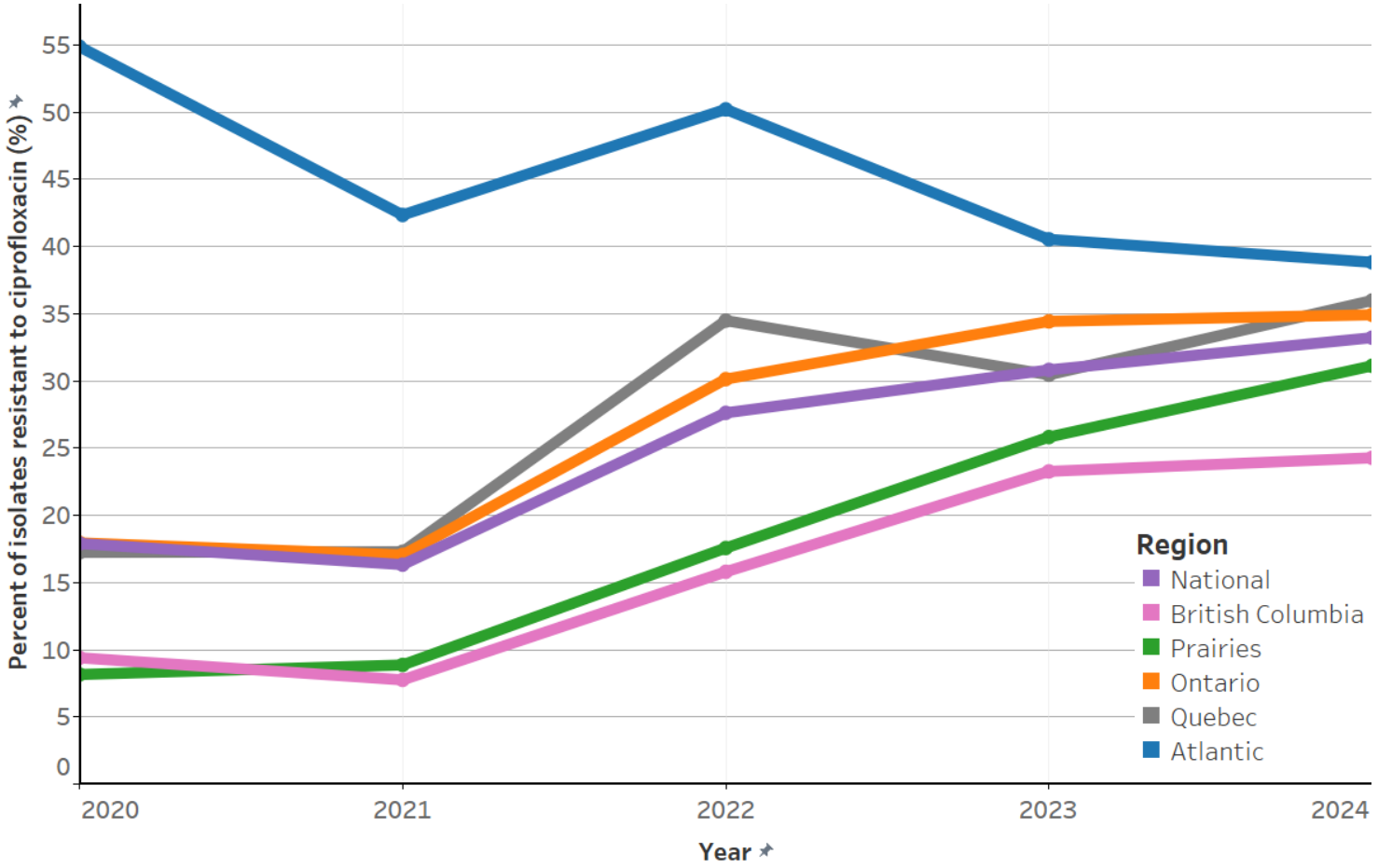
Substantial regional variation in ampicillin resistance.

- Compared to the frequency of ampicillin resistance nationally
  - Ontario was **higher** since 2020
  - Québec was **similar** until 2021 and **lower** starting in 2022
  - The Prairies, British Columbia and the Atlantic provinces were **lower** since 2020



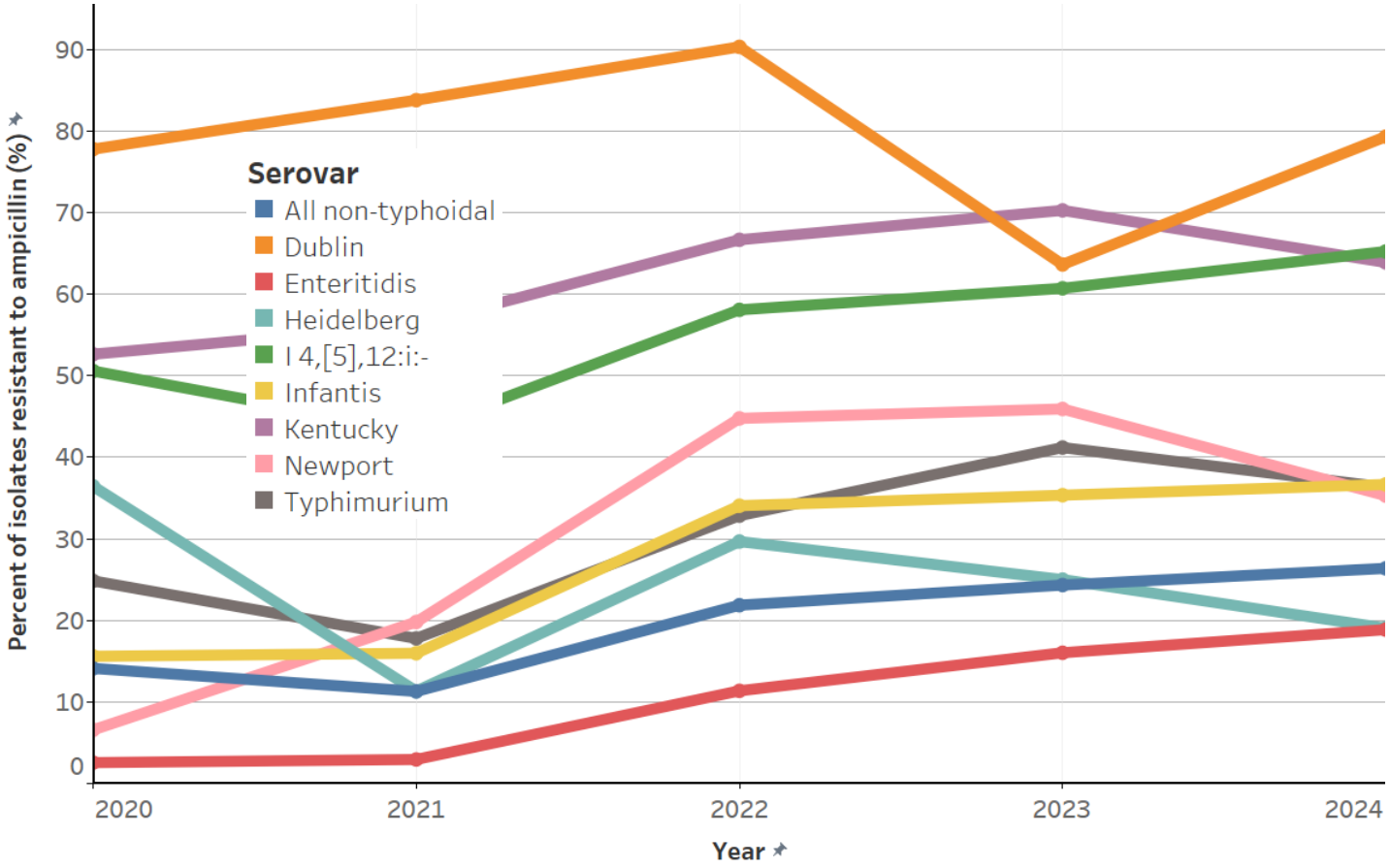
Decreasing regional variation in ciprofloxacin resistance.

- Compared to the frequency of ciprofloxacin resistance nationally
  - The Atlantic provinces were **higher**
  - The Prairies and British Columbia were **lower** and followed a similar temporal trend with British Columbia remaining **9% lower** in 2024



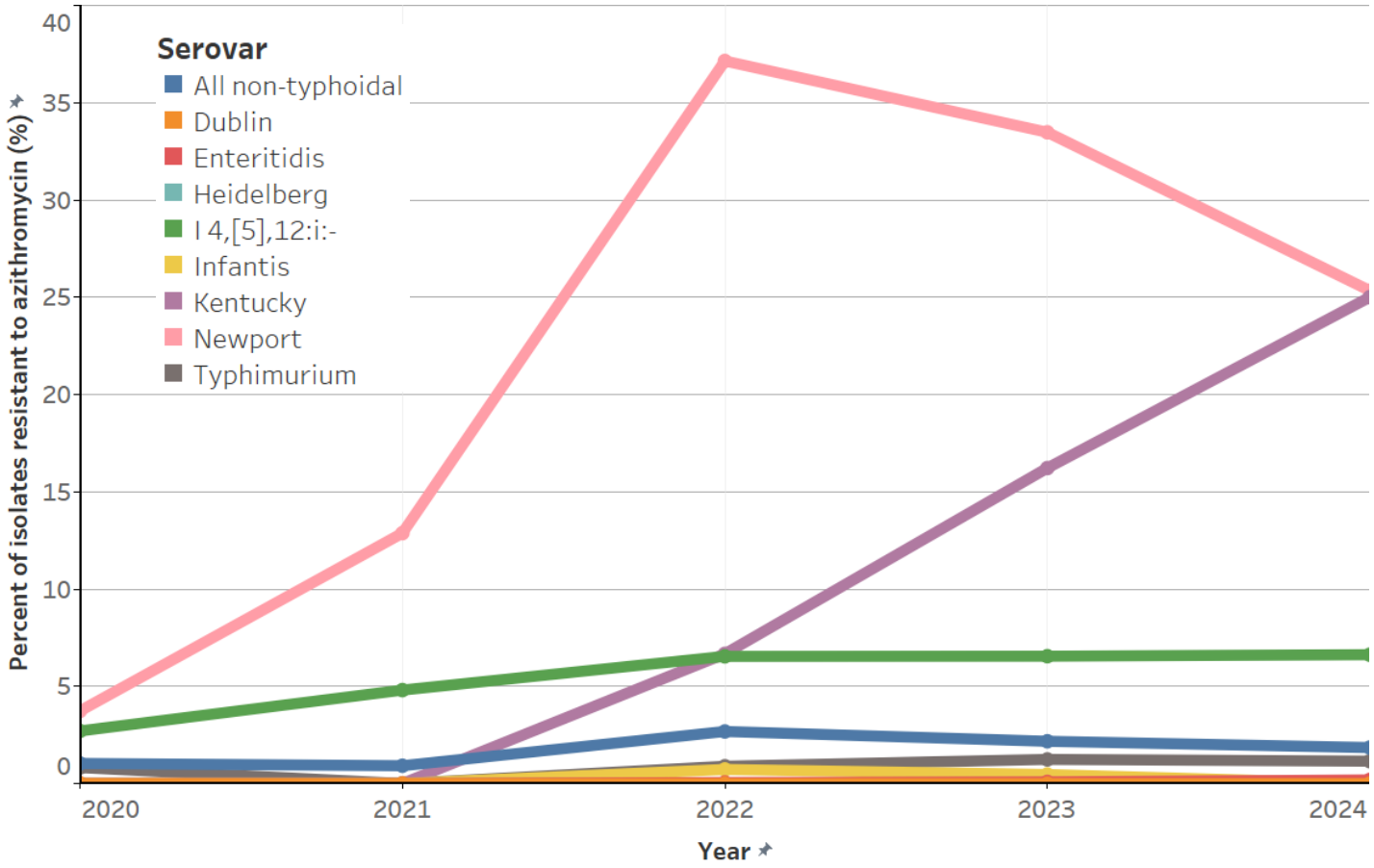
High to extremely high ampicillin resistance in *S.* Dublin, *S.* Kentucky and *Salmonella* I 4,[5],12:i:-.

- Compared to the frequency of ampicillin resistance in all non-typhoidal serovars
  - *S.* Dublin, *S.* Kentucky and *Salmonella* I 4,[5],12:i:- were consistently **substantially higher**
  - *S.* Enteritidis was consistently **lower**



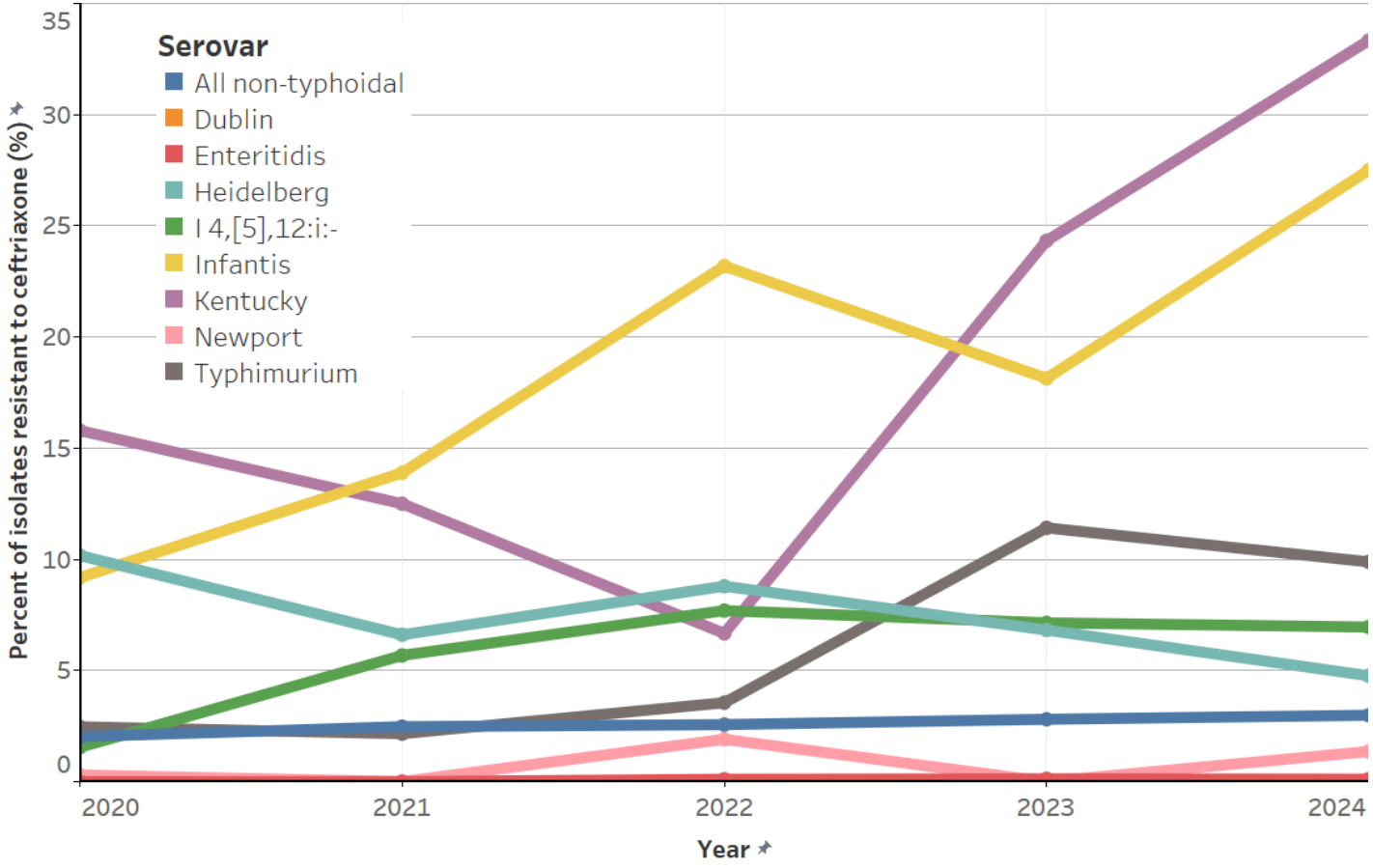
Azithromycin resistance increased to high in *S.* Newport and *S.* Kentucky.

- Compared to the frequency of azithromycin resistance in all non-typhoidal serovars
  - *S.* Newport and *S.* Kentucky **substantially increased to high resistance** since 2020
  - *Salmonella* I 4,[5],12:i:- was **higher** but still **low resistance**



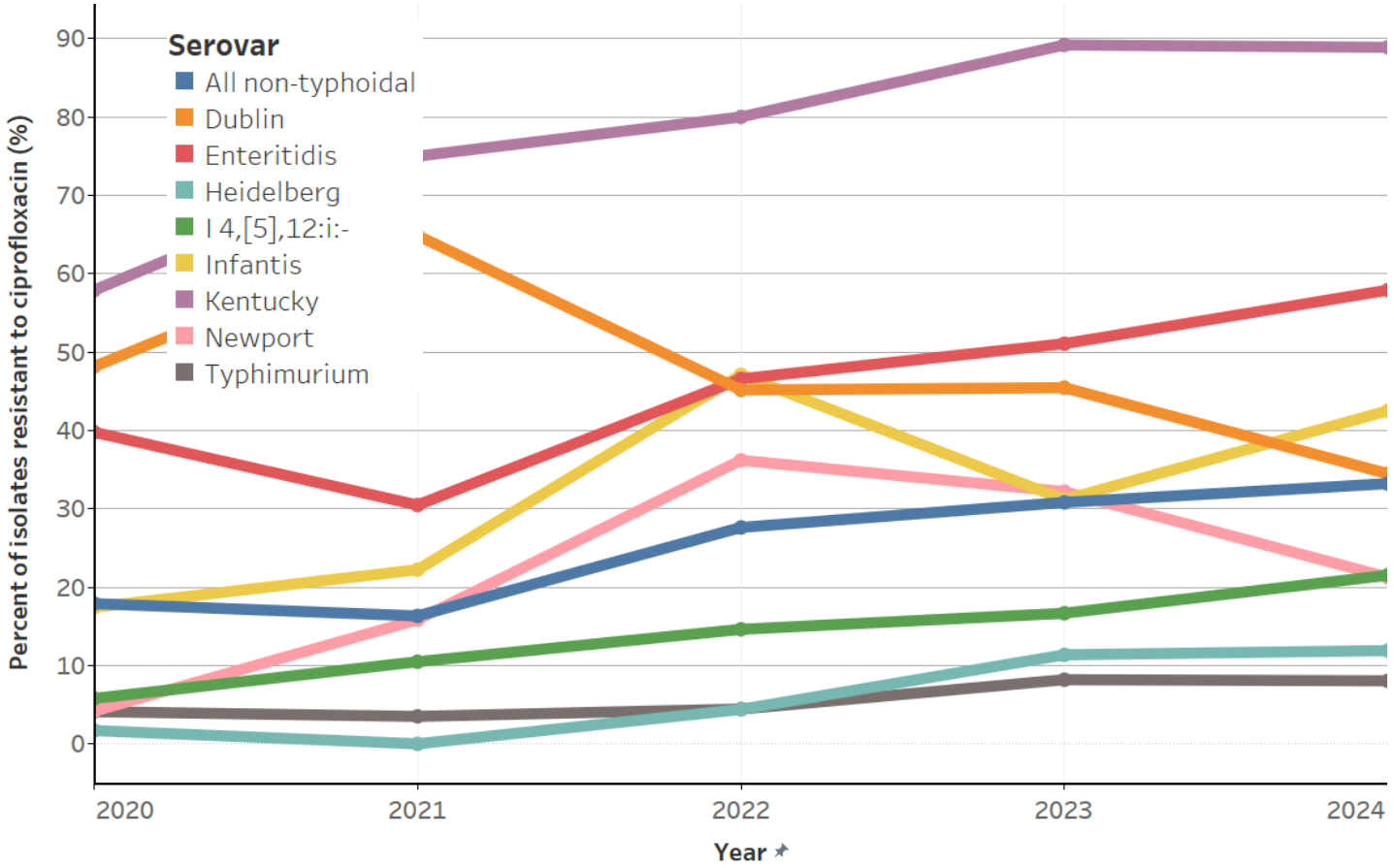
Ceftriaxone resistance increased to high in *S.* Kentucky and *S.* Infantis.

- Compared to the frequency of ceftriaxone resistance in all non-typhoidal serovars
    - *S.* Kentucky and *S.* Infantis substantially **increased to high resistance** since 2020
    - *S.* Typhimurium, *Salmonella* I 4,[5],12:i:- and *S.* Heidelberg were **higher** but **moderate to low resistance**



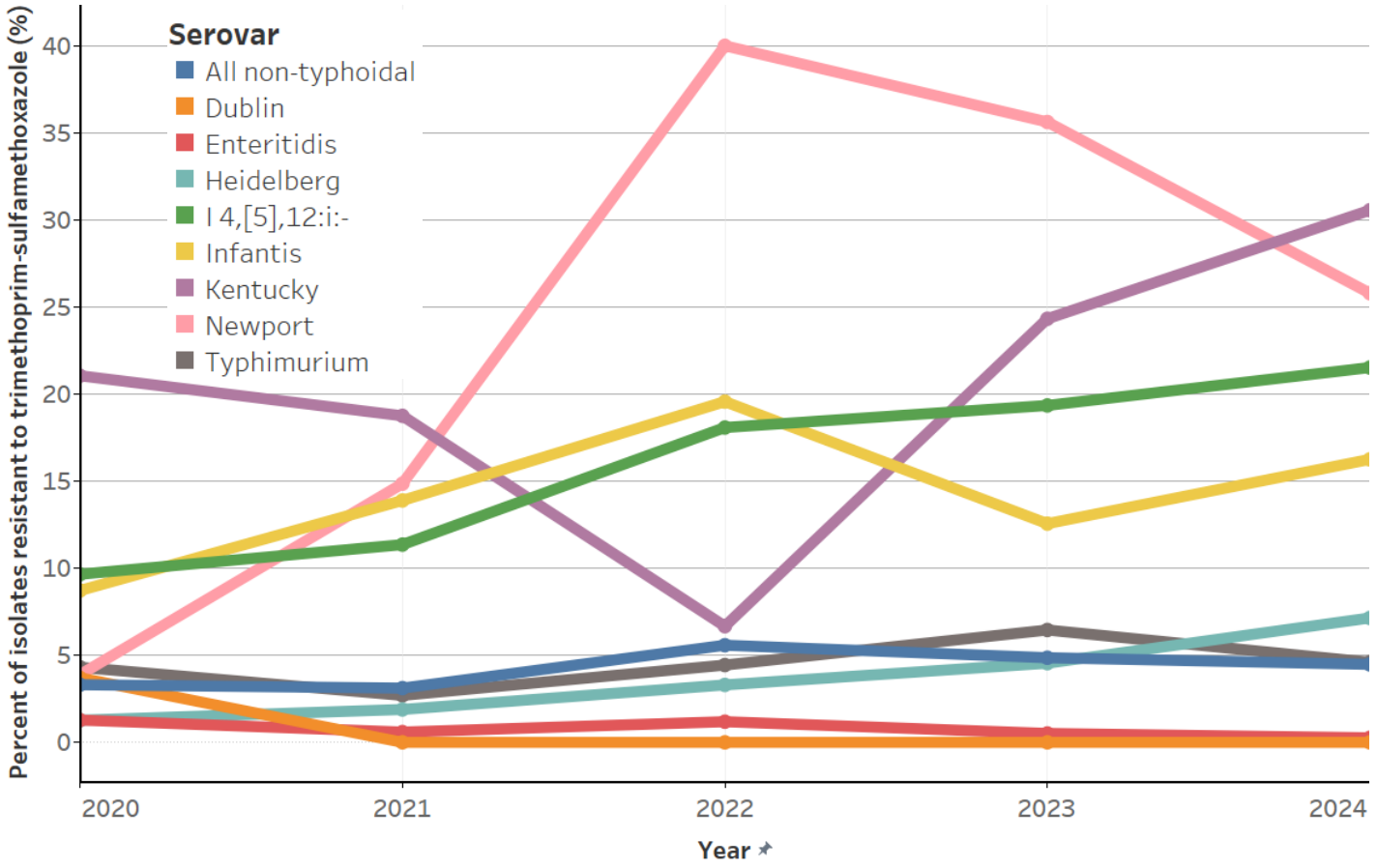
Ciprofloxacin resistance is substantially higher in *S.* Kentucky and *S.* Enteritidis.

- Compared to the frequency of ciprofloxacin resistance in all non-typhoidal serovars
  - *S.* Kentucky and *S.* Enteritidis were **substantially higher**
  - *Salmonella* I 4,[5],12:i:-, *S.* Heidelberg and *S.* Typhimurium were consistently **lower**



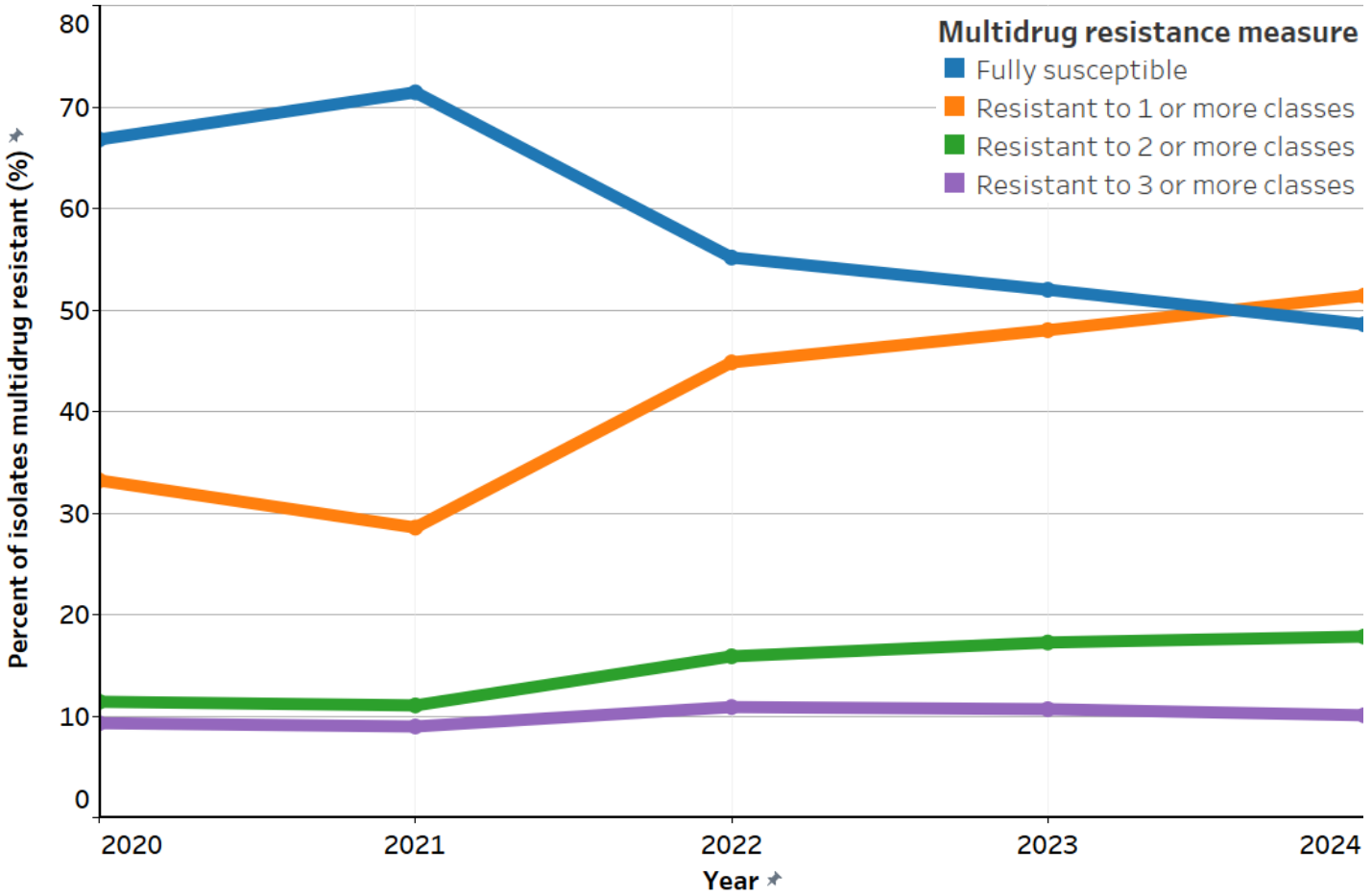
Trimethoprim-sulfamethoxazole resistance increased to high in *S.* Kentucky and *S.* Infantis.

- Compared to the frequency of trimethoprim-sulfamethoxazole resistance in all non-typhoidal serovars
  - *S.* Kentucky, *S.* Newport, *Salmonella* I 4,[5],12:i:- and *S.* Infantis were **substantially higher**
  - *S.* Dublin and *S.* Enteritidis were lower since 2021



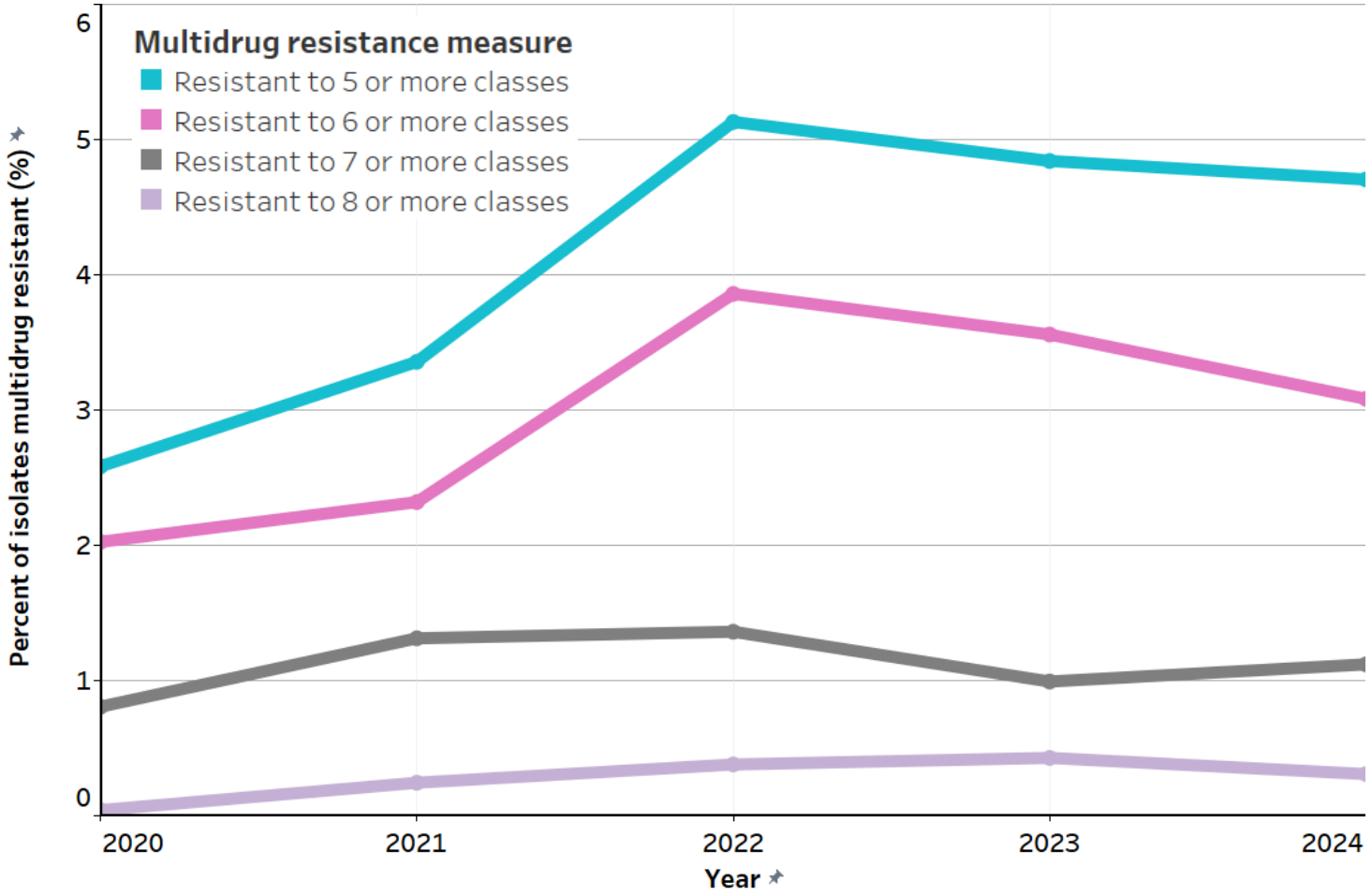
Increasing resistance to 1 and 2 classes, and decreasing full susceptibility.

- **Decreased** full susceptibility since 2021 (2021; 71% and 2024; 49%)
- **Moderate** resistance to 2 or more classes, **increased** since 2021 (2021; 11% and 2024; 18%)
- **Low** to **moderate** resistance to 3 or more classes, relatively **stable** (2020; 9% and 2024; 10%)



Resistance to 8 or more classes was rare to very low however reported.

- **Low** resistance to 5 or more classes, **increased** between 2020 (3%) and 2024 (5%)
- **Low** resistance to 6 or more classes (ranging from 2% to 4%)
- **Very low to low** and **stable** resistance to 7 or more classes (ranging from 0.8% to 1.4%)
- **Rare to very low** and **stable** resistance to 8 or more classes (ranging from 0 to 0.4%)



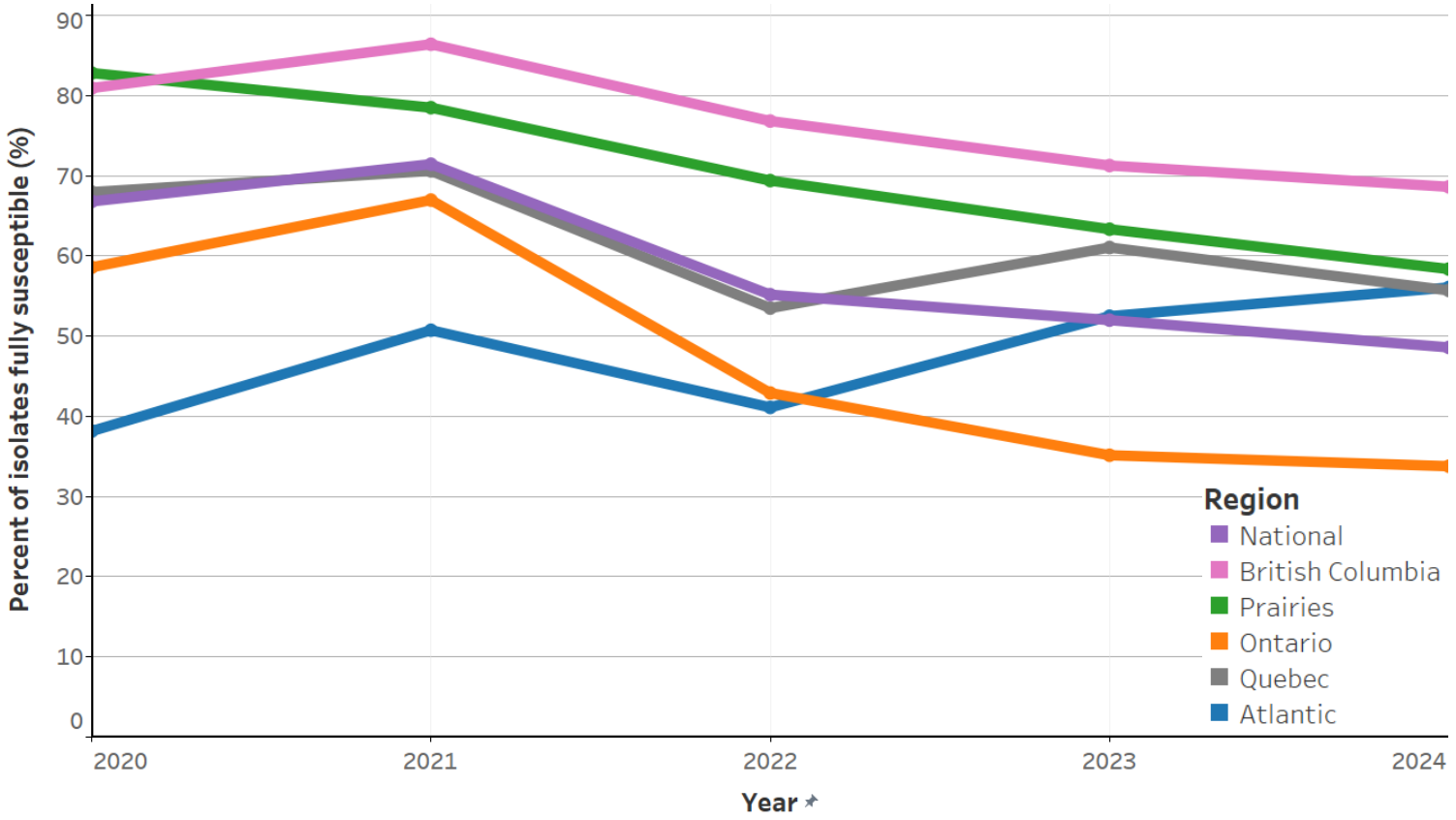
Resistance to 9 classes including Category I antimicrobials was infrequent, only present in 4 isolates.

- Maximum resistance seen between 2020 and 2024 was **resistance to 9 antimicrobial classes** (n=4)
  - All 4 isolates detected resistance to the same antimicrobial classes:

    Aminoglycosides, Beta-lactamase inhibitor combinations, Cephalosporins, Folate pathway inhibitors, Macrolides, Penicillins, Phenicols, Quinolones and Tetracyclines
  - All isolates detected resistance to 10 or 11 antimicrobials including 1 or 2 Category I antimicrobials
  - *Salmonella* I 4,[5],12:i:- (n=2, 2022; Ontario and 2024; British Columbia), *S.* Thompson (n=1, 2022; Ontario) and *S.* Typhimurium (n=1, 2023; Quebec)

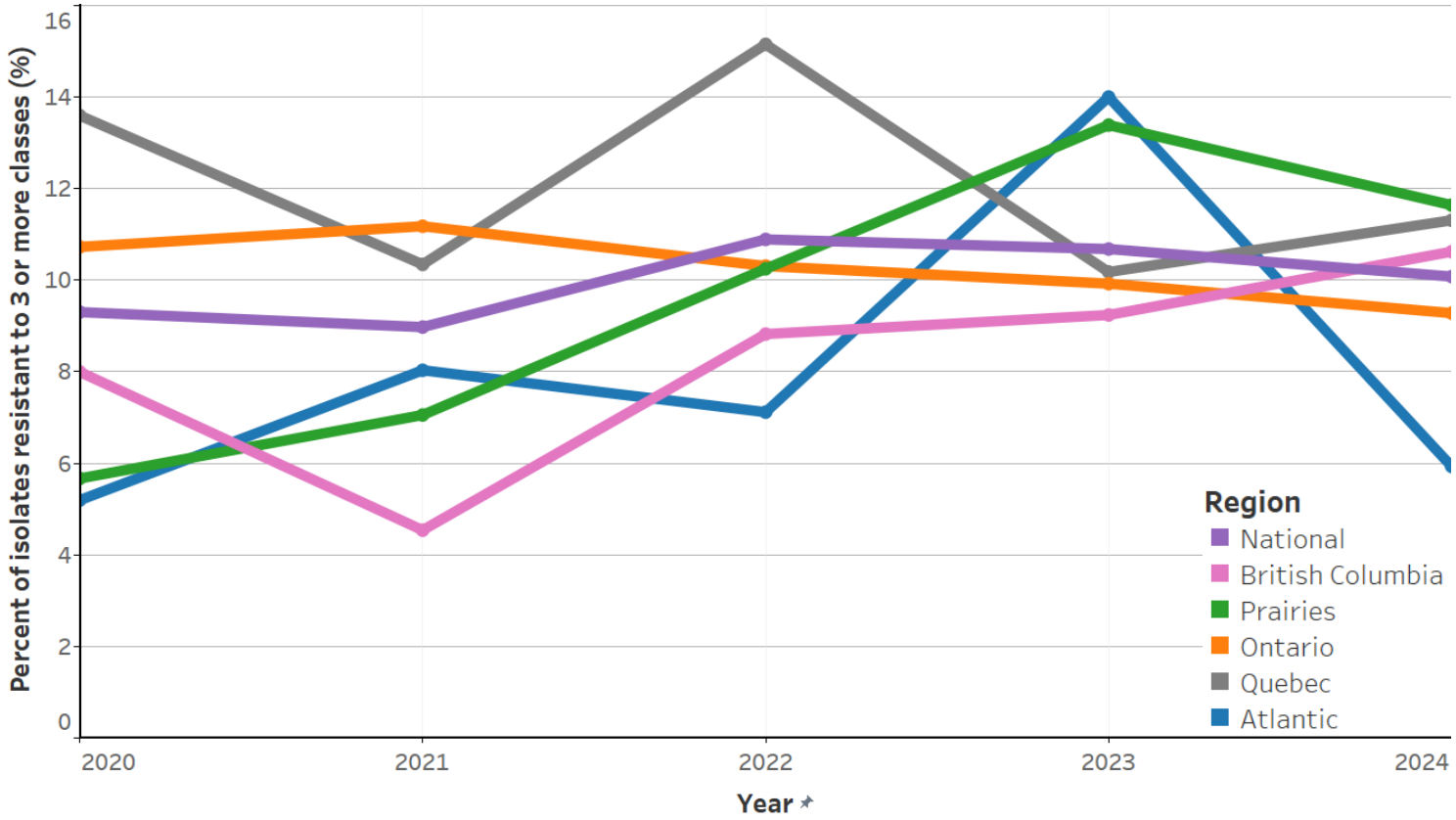
The Atlantic provinces had an increase in full susceptibility since 2020.

- Compared to the frequency of fully susceptible nationally
  - British Columbia and the Prairies were **higher** and followed a similar temporal trend
  - Ontario was **lower**
  - The Atlantic provinces and Quebec followed different temporal trends



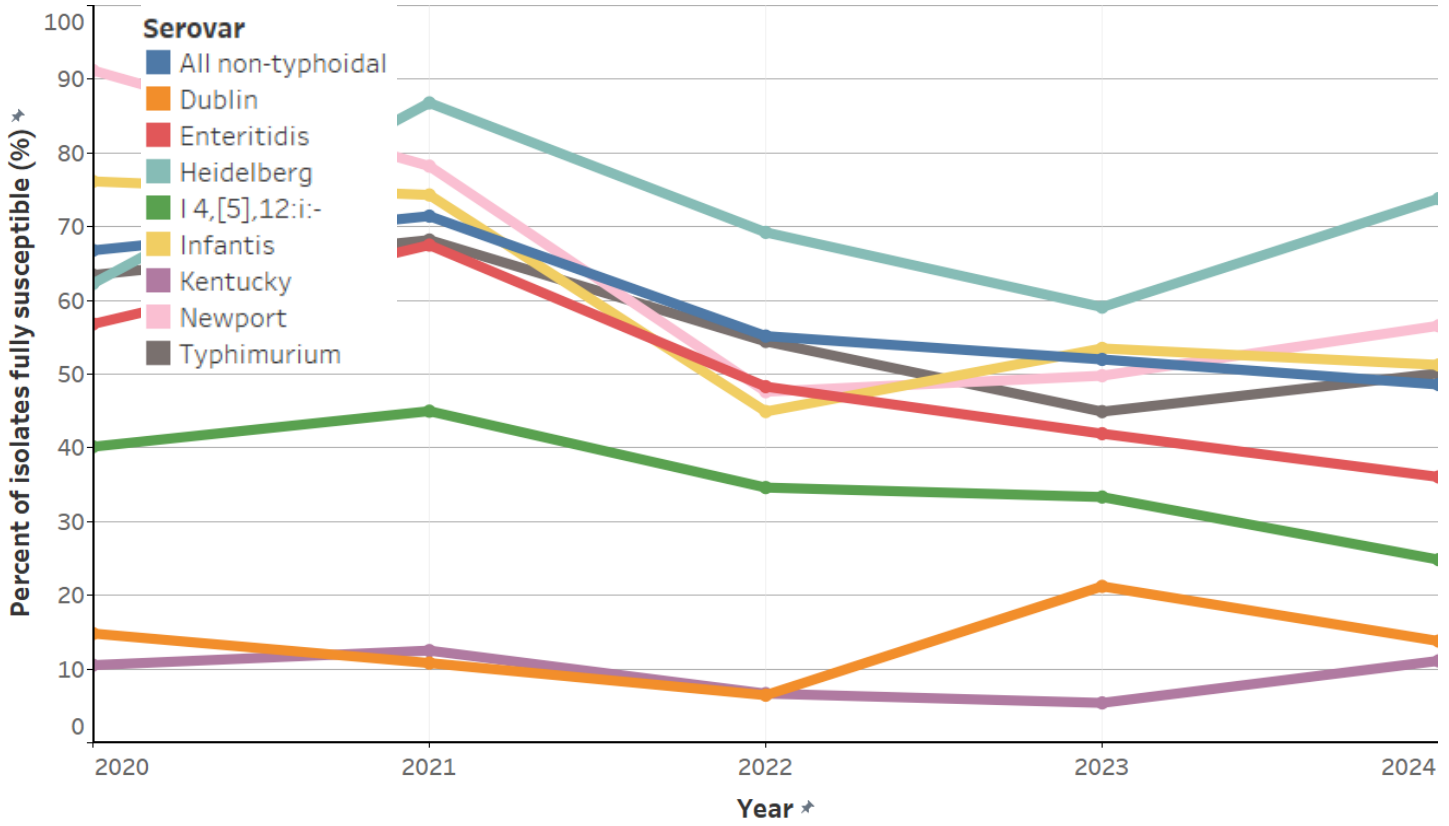
Substantial regional variation in resistance to 3 or more antimicrobial classes.

- Regional temporal trends in resistance to 3 or more antimicrobial classes varied widely, which makes comparisons difficult



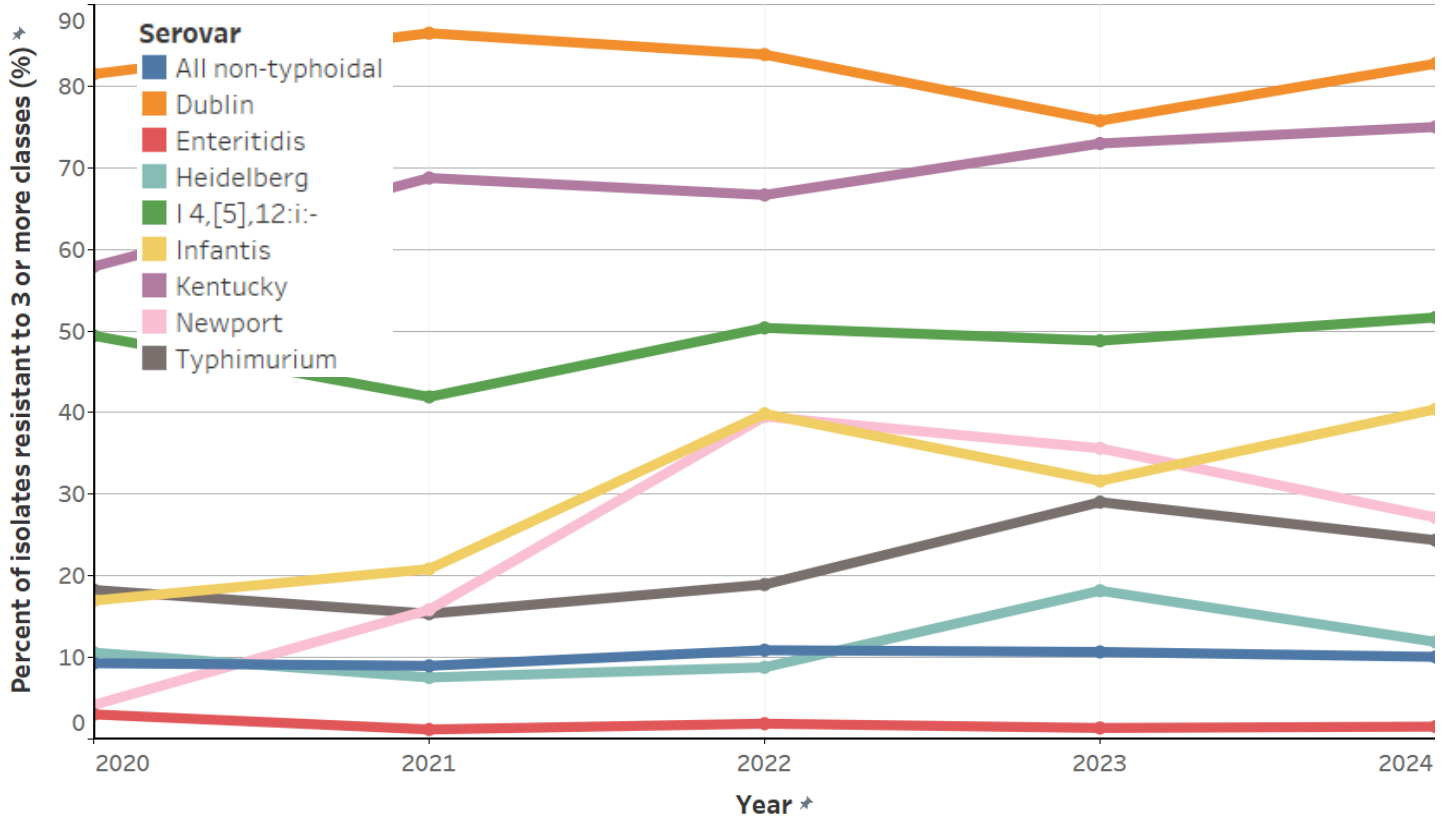
Fully susceptible is substantially lower in *S.* Kentucky, *S.* Dublin and *Salmonella* I 4,[5],12:i:-.

- Compared to the frequency of fully susceptible in all non-typhoidal serovars
  - *S.* Kentucky, *S.* Dublin and *Salmonella* I 4,[5],12:i:- were **substantially lower**
  - *S.* Enteritidis was also **lower**
  - *S.* Heidelberg was **higher**



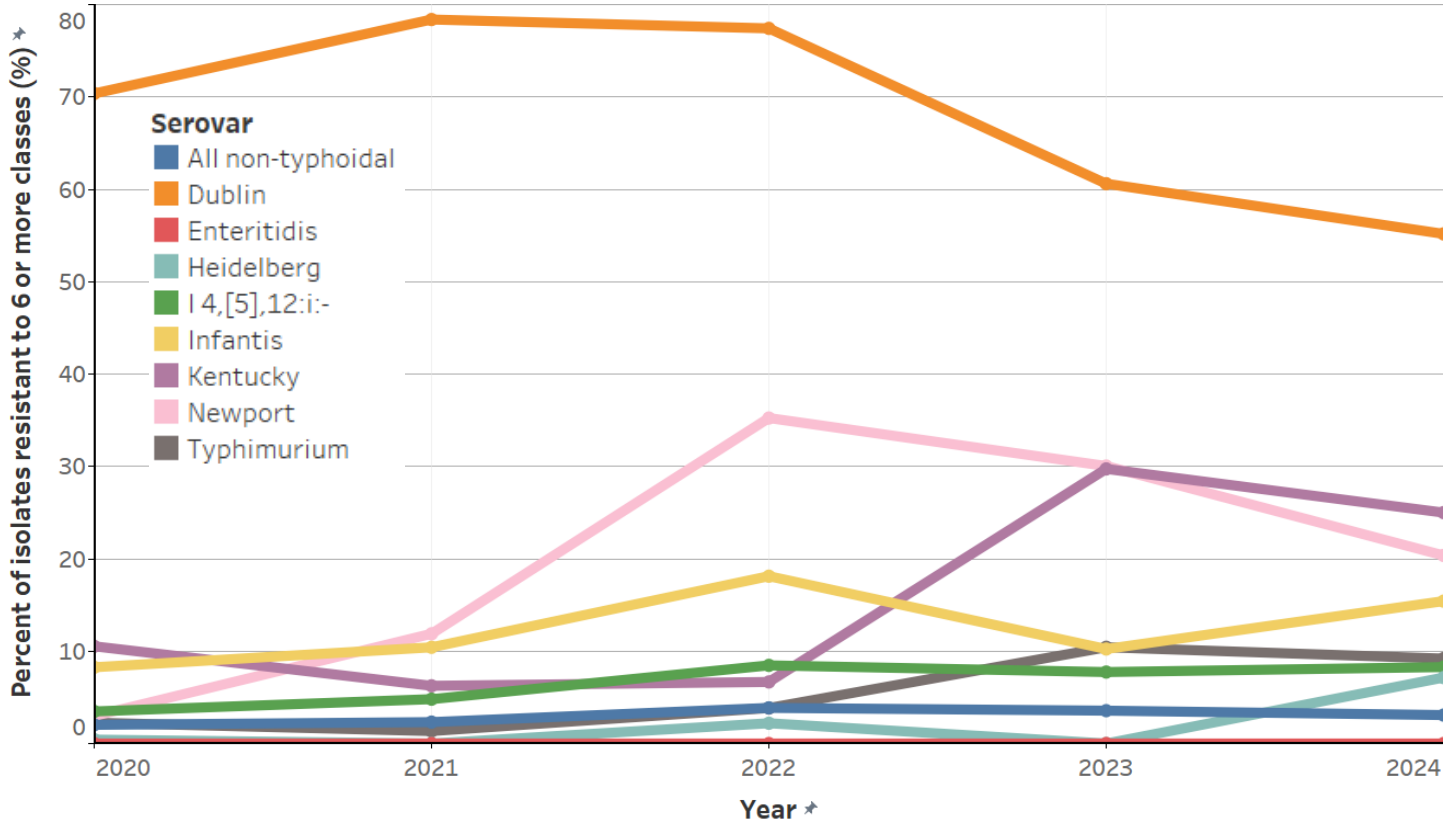
Resistance to 3 or more antimicrobial classes is lower in *S.* Enteritidis.

- Compared to the frequency of resistance to 3 or more classes in all non-typhoidal serovars
    - *S.* Dublin, *S.* Kentucky, *S.* Infantis and *Salmonella* I 4,[5],12:i:- were **substantially higher**
    - *S.* Newport and *S.* Typhimurium were also **higher**
    - *S.* Enteritidis was **lower**



Resistance to 6 or more antimicrobial classes is very high to extremely high in *S.* Dublin and not present in *S.* Enteritidis.

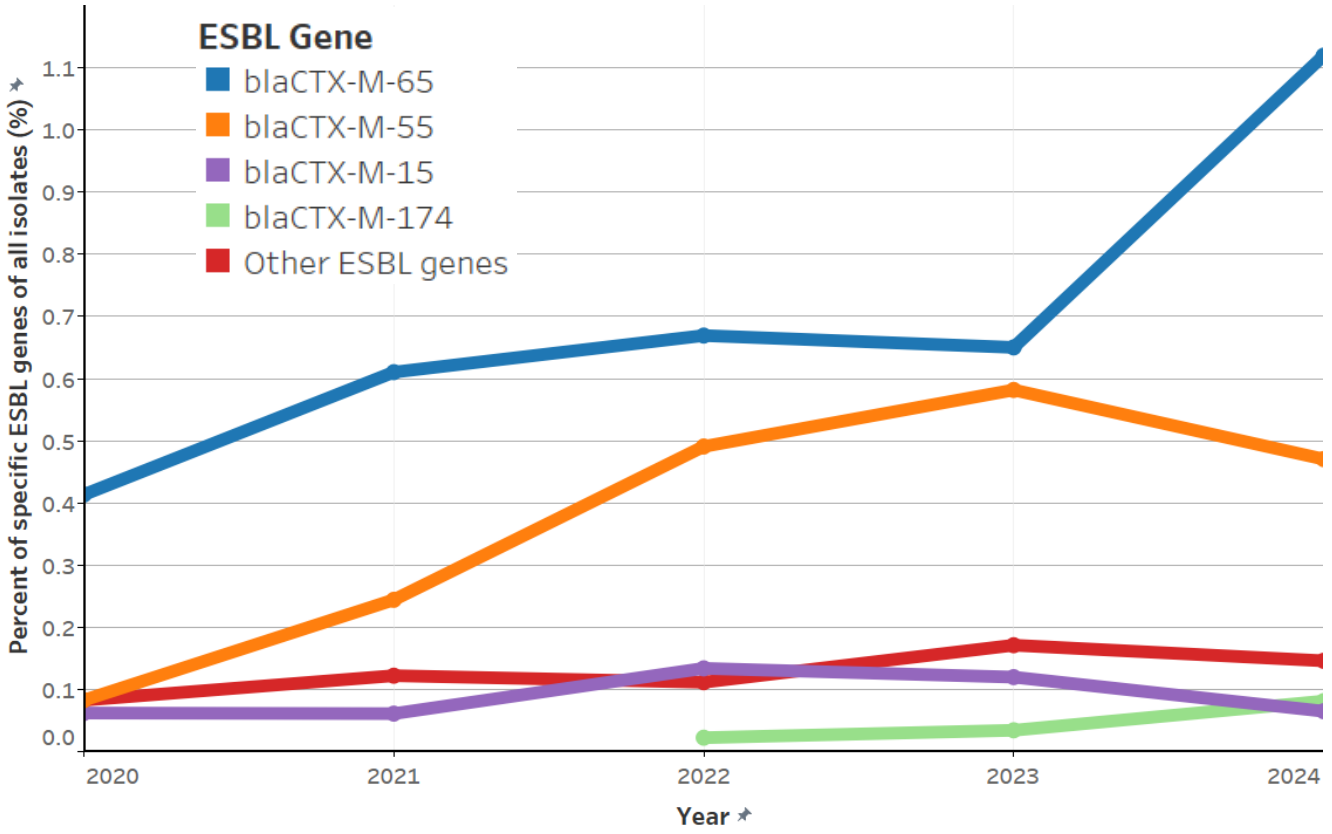
- Compared to the frequency of resistance to 6 or more classes in all non-typhoidal serovars
  - *S.* Dublin was **substantially higher**
  - *S.* Newport, *S.* Kentucky, *S.* Infantis and *Salmonella* I 4,[5],12:i:- were also **higher**
  - *S.* Enteritidis was **lower**



Overall ESBL genes in human non-typhoidal *Salmonella* are increasing with *bla*$_{\text{CTX-M-65}}$ and *bla*$_{\text{CTX-M-55}}$ increasing.

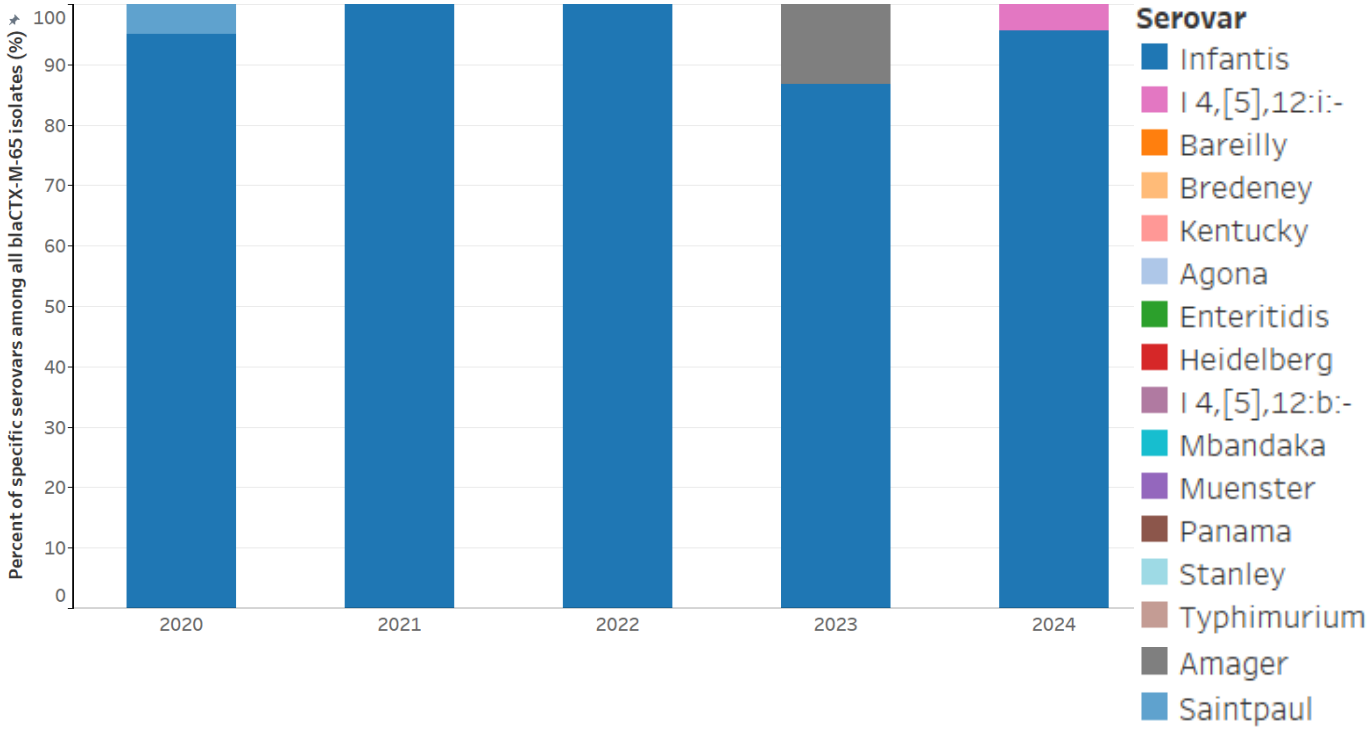
- Top 4 ESBL genes in 2024 (of all isolates)
  - *bla*$_{\text{CTX-M-65}}$ **increased** between 2020 (0.41%) and 2024 (1.12%)
  - *bla*$_{\text{CTX-M-55}}$ **increased** between 2020 (0.08%) and 2024 (0.47%), yet decreased since 2023 (0.58%)
  - *bla*$_{\text{CTX-M-174}}$ detected in 2022 (0.02%) and **increased** in 2024 (0.08%)
  - *bla*$_{\text{CTX-M-15}}$ **variable** from 2020 to 2024 (ranging between 0.06% and 0.13%)
- Other ESBL genes detected (2020 to 2024)

bla$_{\text{CTX-M-1}}$	*bla*$_{\text{CTX-M-8}}$	*bla*$_{\text{CTX-M-14}}$
bla$_{\text{CTX-M-14b}}$	*bla*$_{\text{CTX-M-27}}$	*bla*$_{\text{SHV-12}}$
bla$_{\text{SHV-30}}$	*bla*$_{\text{TEM-15}}$	*bla*$_{\text{TEM-93}}$

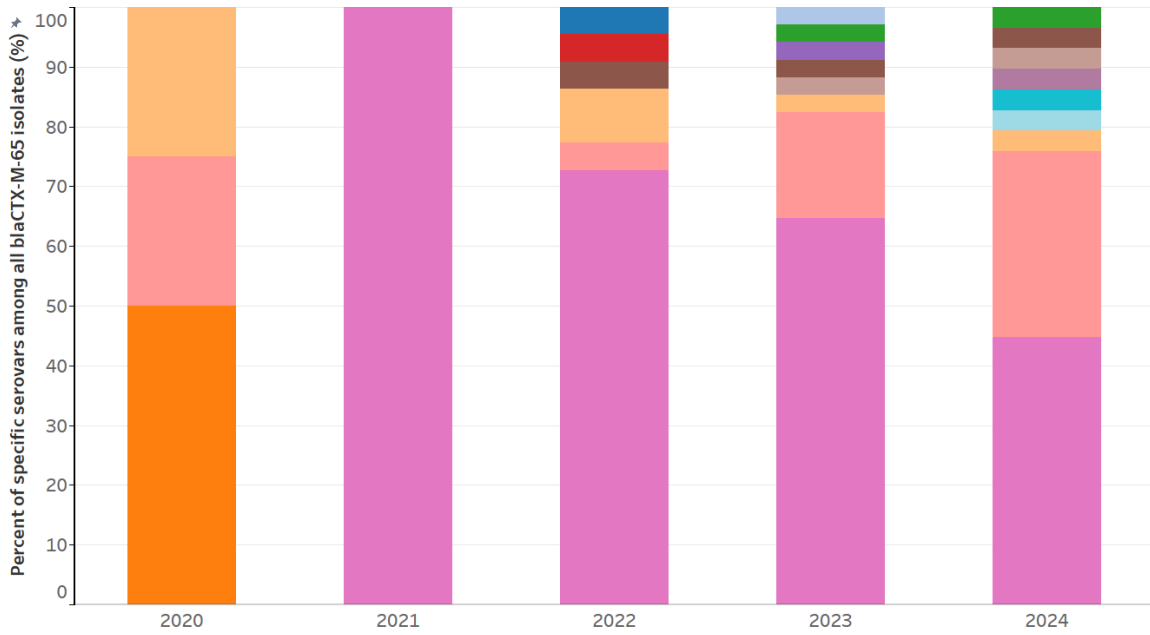


bla$_{CTX-M-65}$ is mostly in *S.* Infantis and *bla*$_{CTX-M-55}$ is mostly in *Salmonella* I 4,[5],12:i:-.

- *bla*$_{CTX-M-65}$ predominately in *S.* Infantis



- *bla*$_{CTX-M-55}$ predominately in *Salmonella* I 4,[5],12:i:-



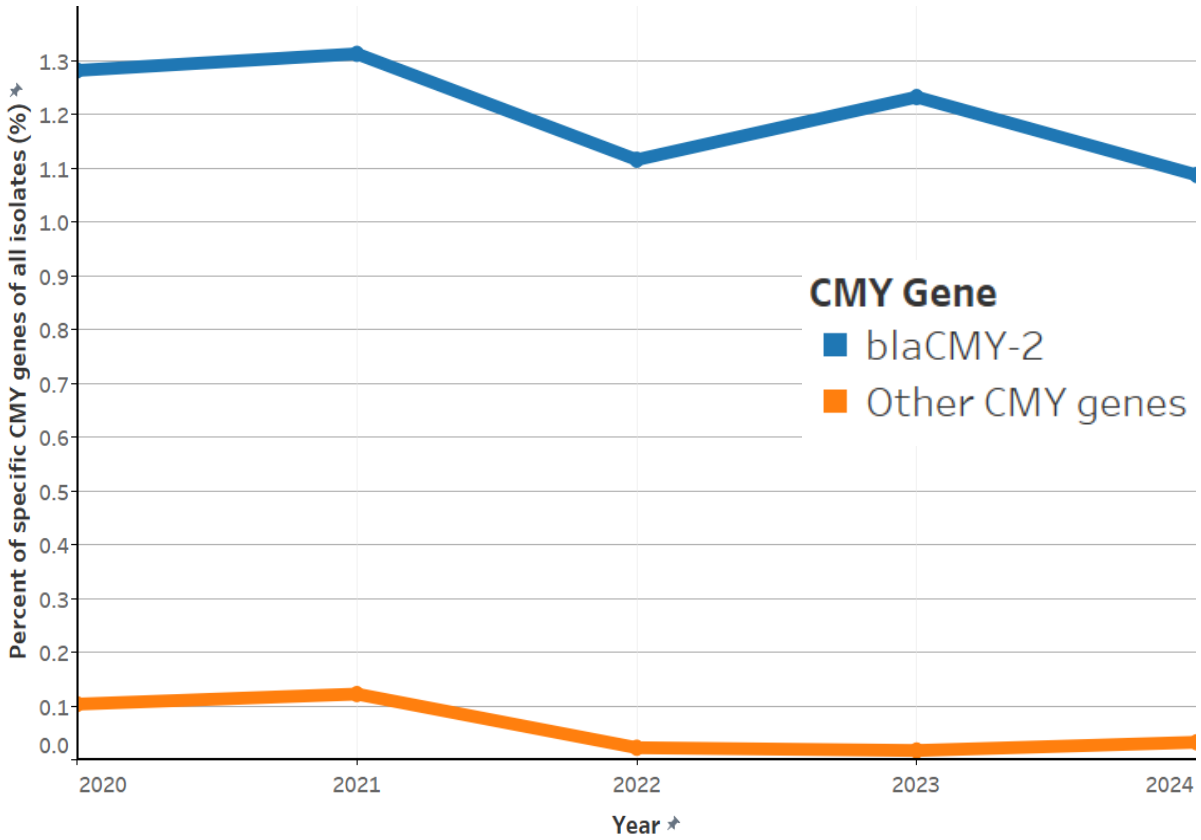
Overall *CMY* genes including *bla*$_{CMY-2}$ in human non-typhoidal *Salmonella* are stable.

- *CMY* genes stable between 2020 and 2024 (ranging between 1% and 1.5% of all isolates)

- *bla*$_{CMY-2}$, the predominate *CMY* gene, **stable** between 2020 (1.3%) and 2024 (1.1%)
  - Mostly in *S.* Dublin, *S.* Heidelberg and *S.* Typhimurium

- Other *CMY* genes ranged between 0.02% and 0.12% each year

  bla$_{CMY-4}$ *bla*$_{CMY-44}$ *bla*$_{CMY-54}$ *bla*$_{CMY-61}$



The number of XDR *Salmonella* I 4,[5],12:i:- isolates decreased since 2023.

- Extensively drug resistant (XDR) non-typhoidal *Salmonella* express resistance to **ampicillin, ceftriaxone, ciprofloxacin, azithromycin and trimethoprim sulfamethoxazole**

Year	# of XDR	Age			
		0-2 years	3-9 years	10-19 years	20 years and over
2020	0	N/A	N/A	N/A	N/A
2021	8	5	0	0	3
2022	16	6	1	1	8
2023	19	2	4	0	13
2024	13	4	0	1	8

- In 2024, **all** isolates were from stool samples, except **two** isolates from people 20 years and over were from urine samples

Take Away Messages – Human *Salmonella*

- Extremely high resistance to ciprofloxacin in typhoidal *Salmonella*
- Increasing frequency of resistance to ciprofloxacin and resistance to ampicillin in non-typhoidal *Salmonella*
- Variation in *Salmonella* antimicrobial resistance due to region and serovar are important to consider
- Overall ESBL genes in human non-typhoidal *Salmonella* are increasing with $bla_{\text{CTX-M-65}}$ and $bla_{\text{CTX-M-55}}$ increasing between 2020 and 2024

Human *Campylobacter*

Public Health Agency of Canada
Agence de la santé publique du Canada

Canada

Most *Campylobacter* infections do NOT require treatment with antimicrobials.

- *Campylobacter* infections most commonly cause self-limiting diarrhea
  - Treatment with antimicrobials is not required or recommended

- Treatment with antimicrobials is considered:
  - When clinical signs are severe or prolonged
    - >6 diarrheal episodes/day, bloody diarrhea, diarrhea lasting >1 week, persistent fever
  - When patient is immunocompromised

  - Culture and susceptibility testing directed treatments include azithromycin or ciprofloxacin (alternative)

bugsanddrugs.org/CFF1EDAF-526D-4B32-852A-25E3E7F1872E
IDSA 2017 Clinical Practice Guidelines for the Diagnosis and Management of Infectious Diarrhea

Campylobacter has a high incidence rate in Canadians.

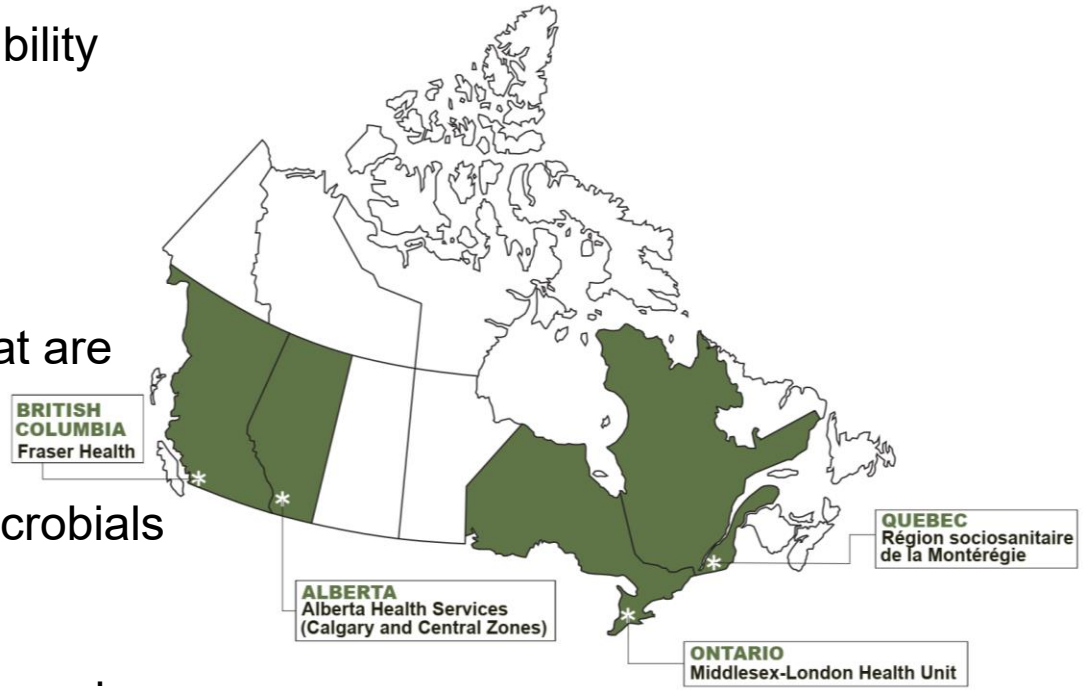
- Incidence rates of Canadians with *Campylobacter* in 2023

	2023 Incidence Rates (Cases/100,000 population)
Campylobacter	19.8

- Source of data – Canadian Notifiable Disease Surveillance System (CNDSS) Notifiable Diseases Online
  - The 2023 data from Manitoba were not available at time of data preparation. The population of this province was removed for rate calculation (CNDSS note).

FoodNet Canada (FNC), the integrated sentinel site surveillance network for enteric disease in Canada.

- *Campylobacter* isolates forwarded for antimicrobial susceptibility testing (AST) are a subset of all FNC *Campylobacter* cases
- Some laboratories within various FNC sentinel sites have implemented culture independent diagnostic testing for *Campylobacter,* which can impact the number of isolates that are culture confirmed and undergo AST
- Tested using broth microdilution for susceptibility to 9 antimicrobials in 7 antimicrobial classes
- <1% of cases were excluded due to unresolved data discrepancies
- Data from 2020-2024 are presented with all sentinel sites combined

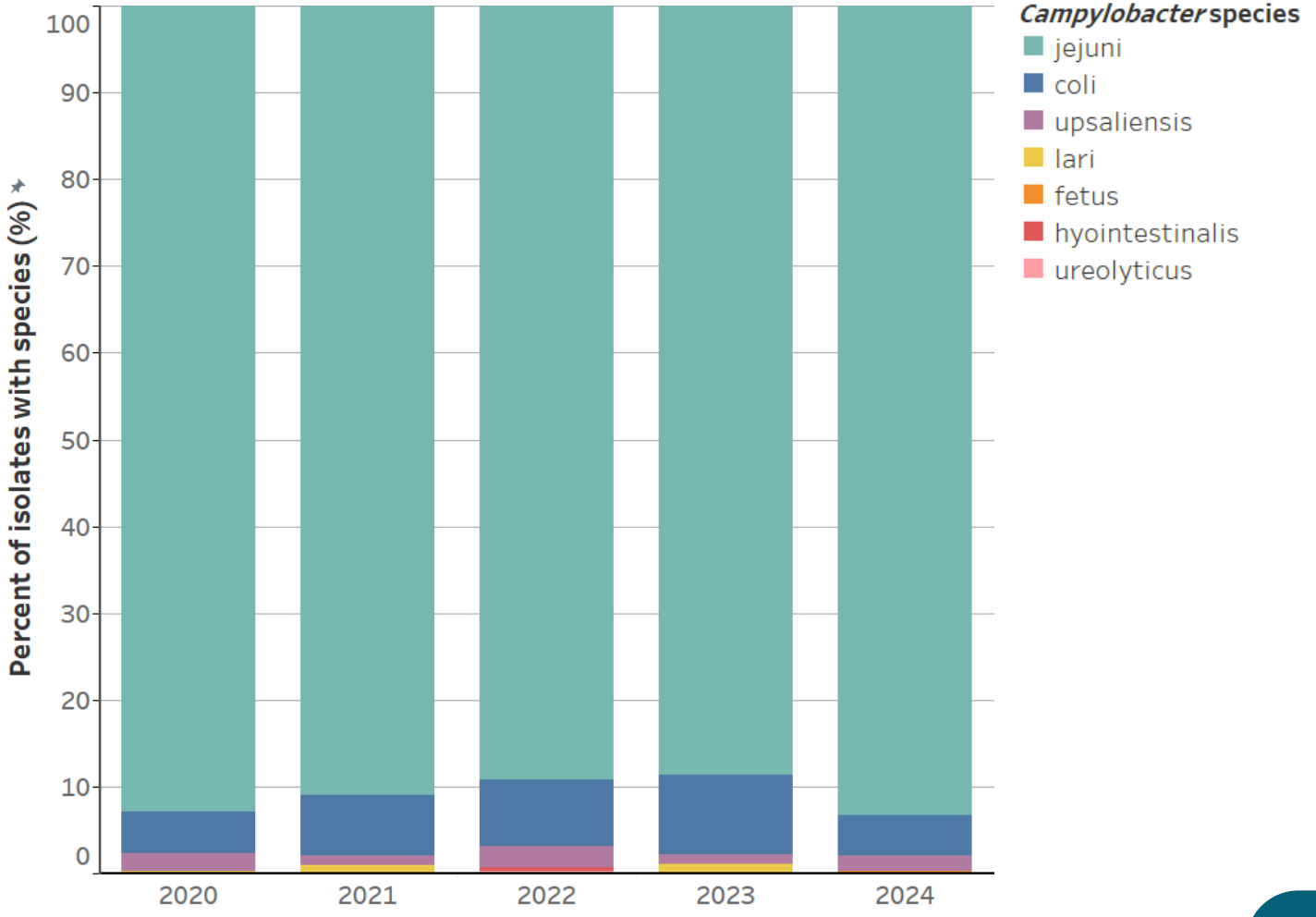


About FoodNet Canada - Canada.ca

IMPORTANT NOTE – Data for 2023 and 2024 are preliminary and subject to change

C. jejuni is the predominant *Campylobacter* species in humans.

- In 2024, 93% of the cases were *C. jejuni*
- Between 2020 and 2024, *C. jejuni* ranged between 89% and 93% of all cases
- *Campylobacter* predominantly causes gastrointestinal infections (99% stool in 2024)

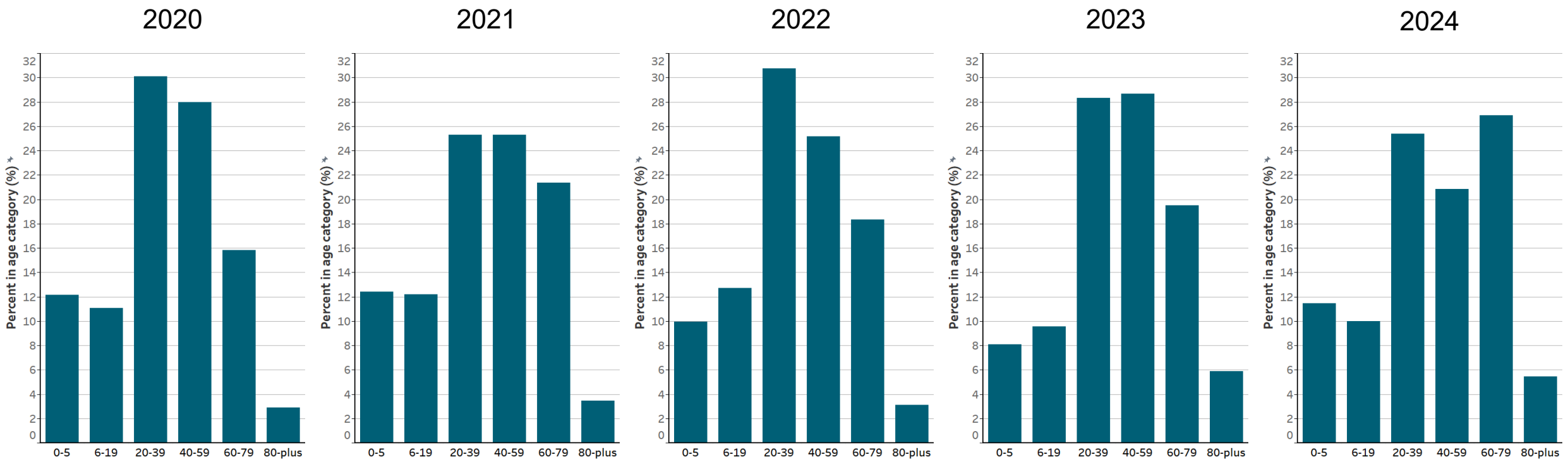


More *Campylobacter* cases in males than females.

- In 2024, 58% of the cases were in males
- Between 2020 and 2024, males with *Campylobacter* ranged between 54% and 59% of all cases

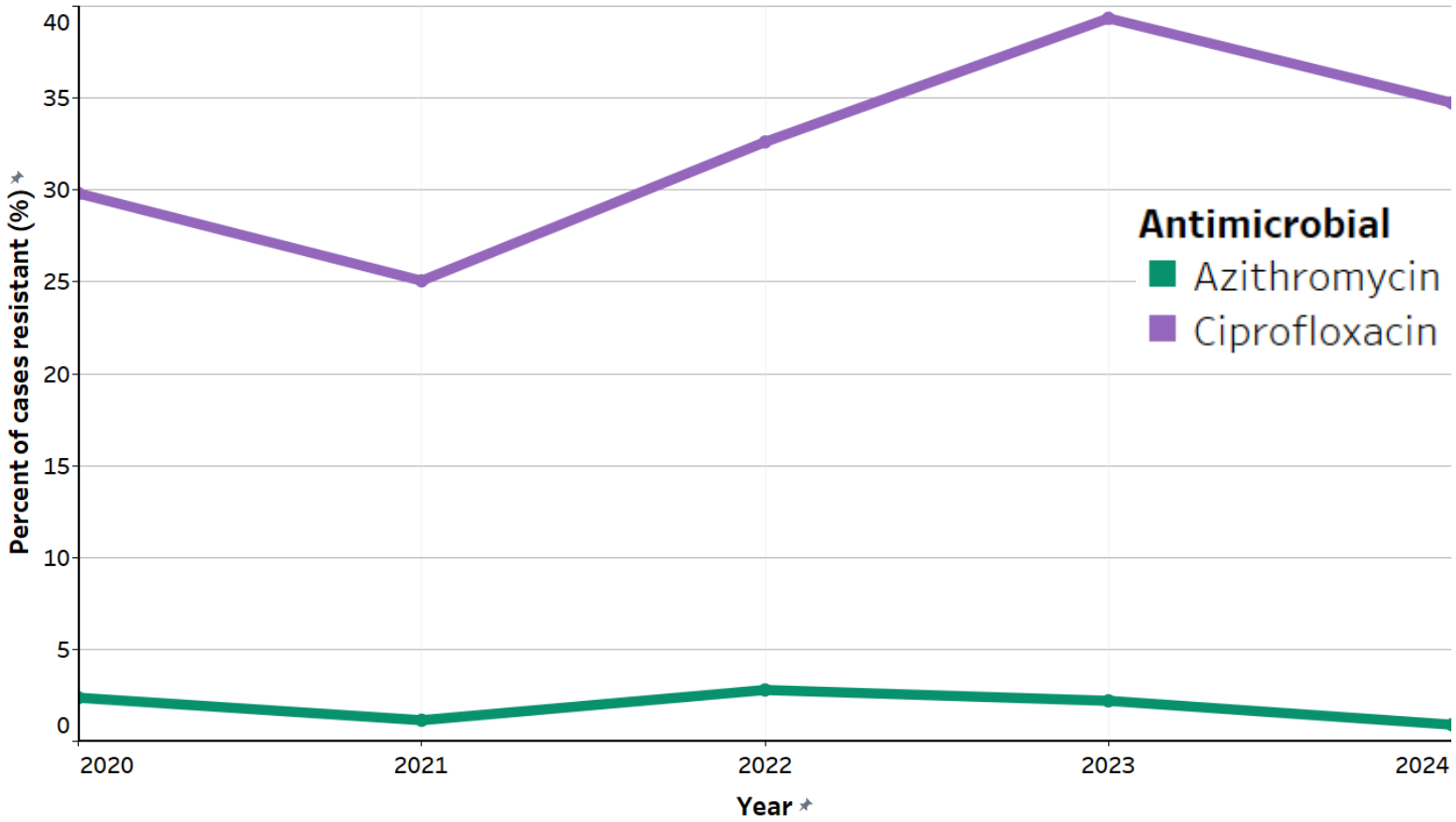
Variable distribution of age categories in *Campylobacter* cases.

Distribution of age category in human *Campylobacter* cases



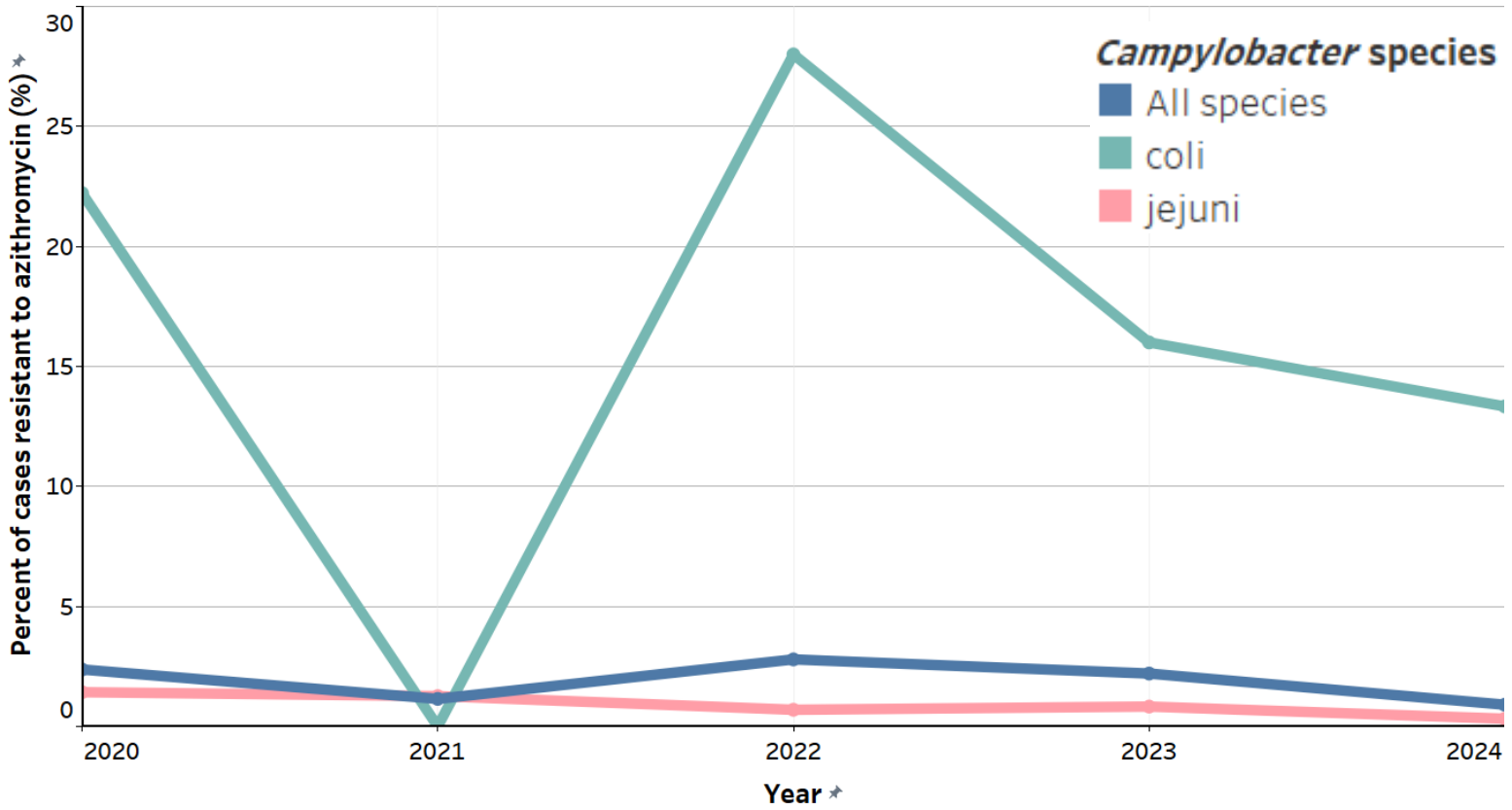
Higher resistance to ciprofloxacin compared to azithromycin.

- **Variable** and **high** resistance to ciprofloxacin, 35% in 2024
- **Low** to **very low** resistance to azithromycin, 0.9% in 2024



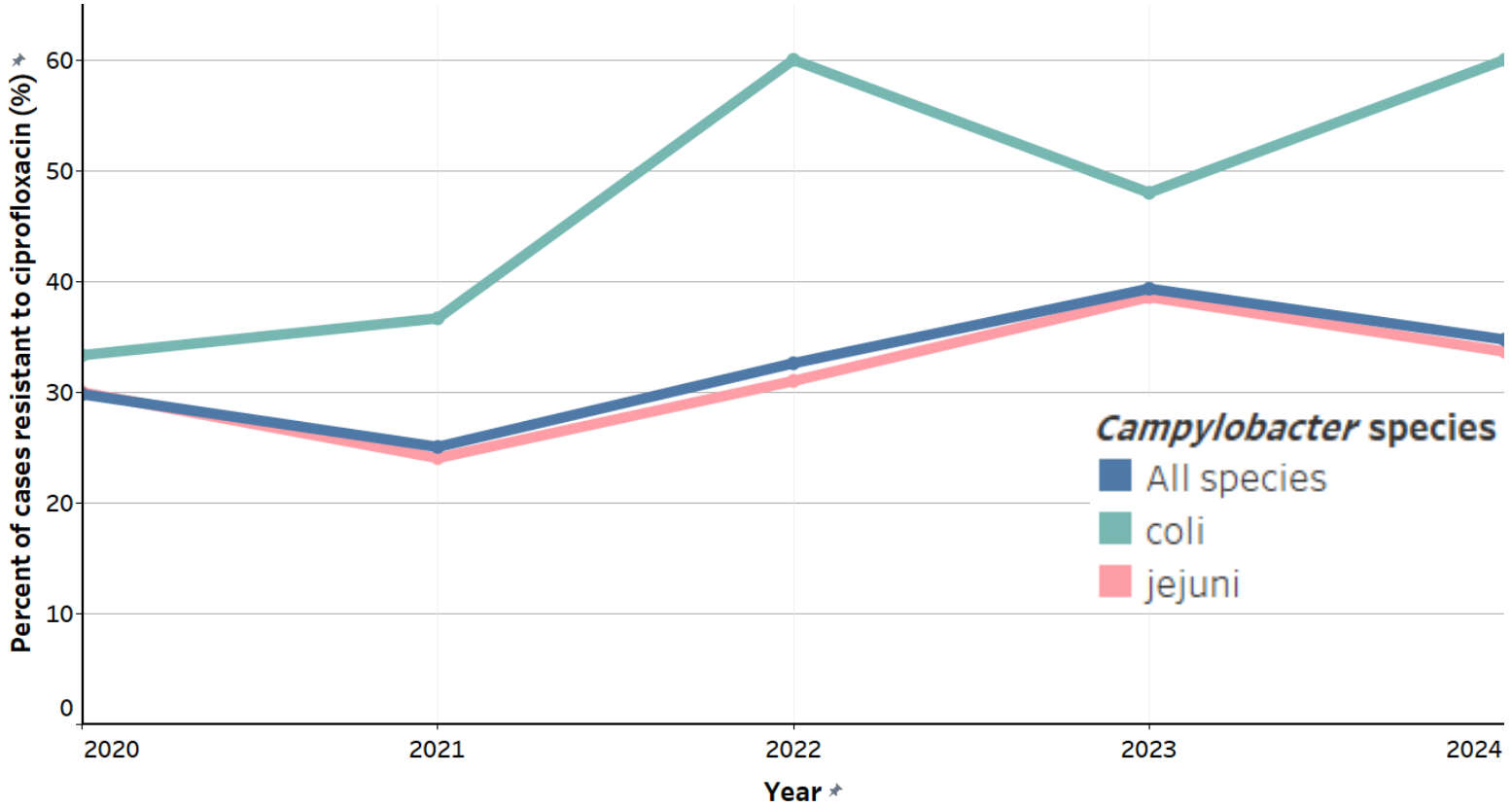
Higher resistance to azithromycin in *C. coli.*

- Compared to the frequency of azithromycin resistance in all *Campylobacter* species
  - *C. coli* was variable and generally **substantially higher** (**Note:** smaller number of cases, some years <20 cases)
  - *C. jejuni* was generally **lower**, 0.3% in 2024



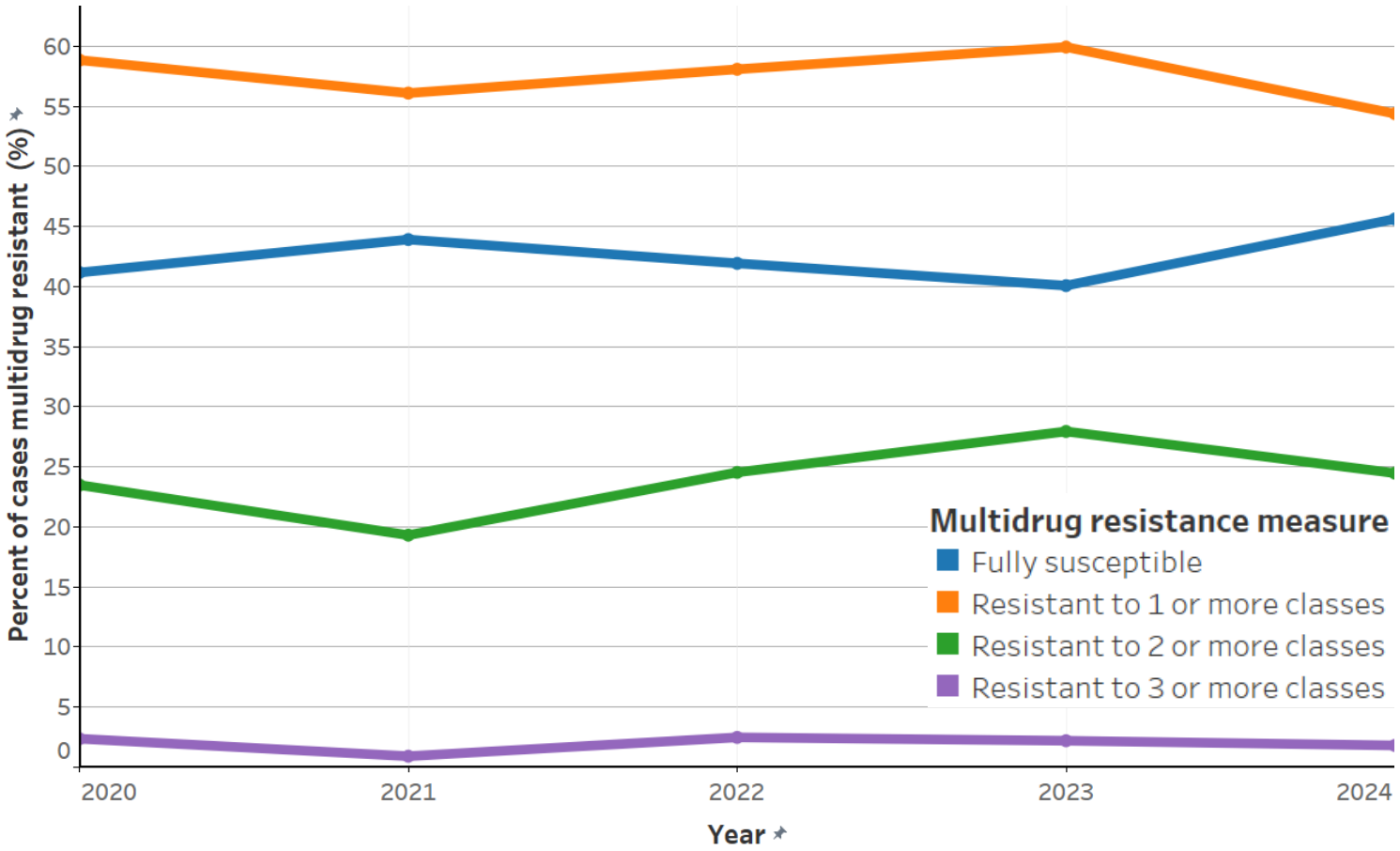
Higher resistance to ciprofloxacin in *C. coli.*

- Compared to the frequency of ciprofloxacin resistance in all *Campylobacter* species
  - *C. coli* was **variable** and **higher** (**Note:** smaller number of cases, some years <20 cases)
  - *C. jejuni* was **similar**, 34% in 2024



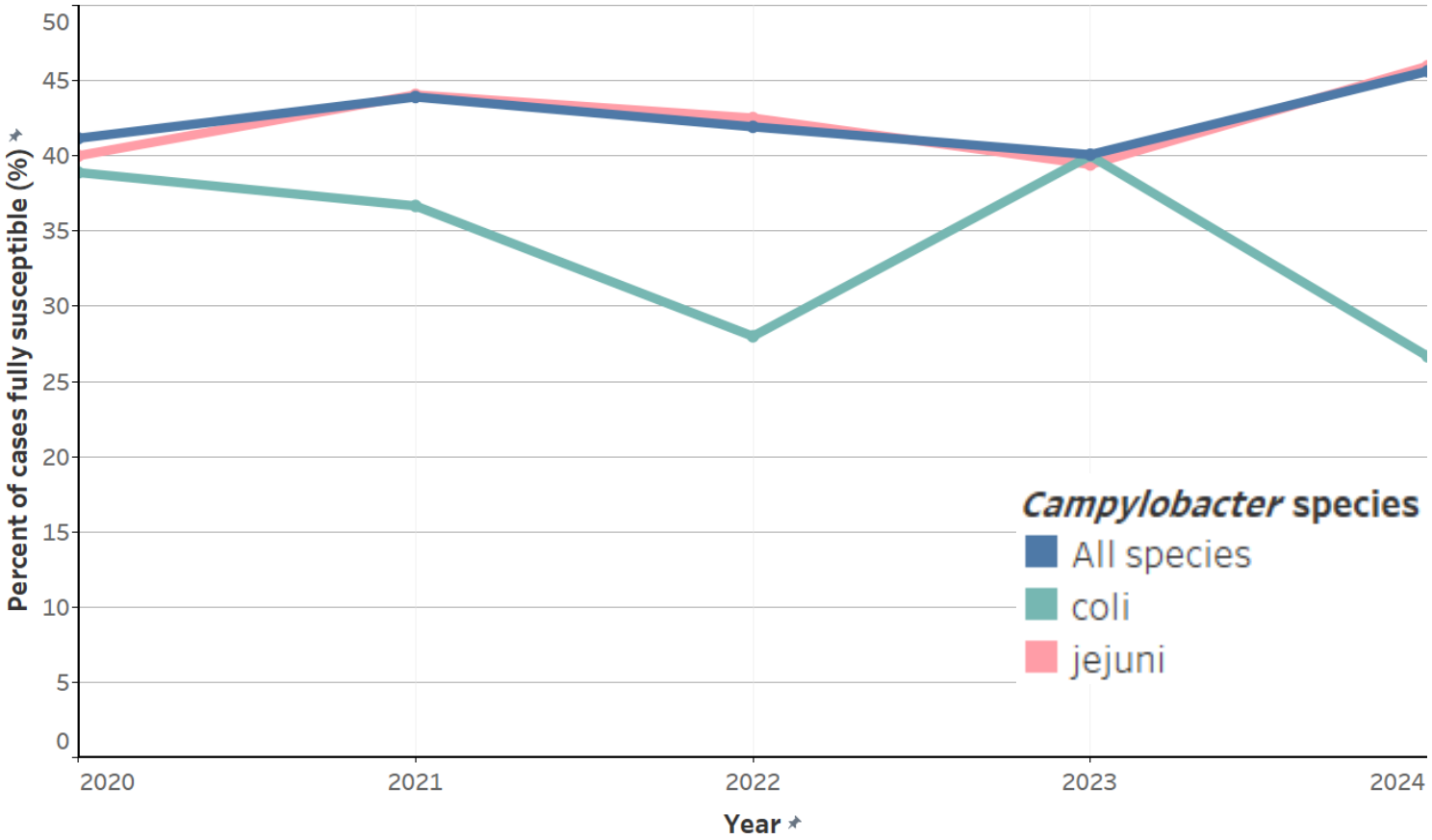
Resistance to 3 or more antimicrobial classes was low to very low.

- **Variable** full susceptibility, 46% in 2024
- **Relatively stable** and **low** to **very low** resistance to 3 or more classes, 1.8% in 2024



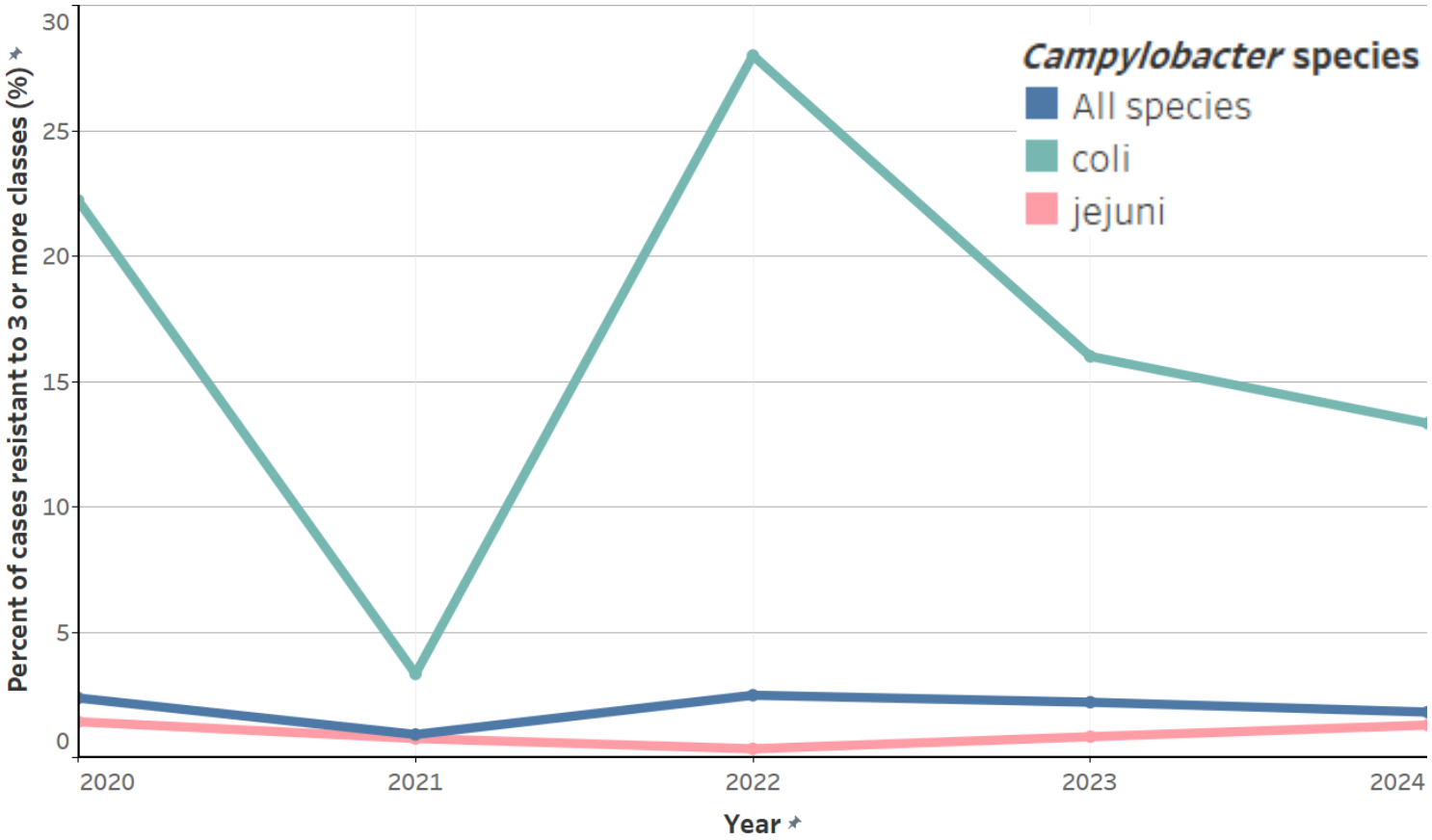
In general, less *C. coli* cases were fully susceptible.

- Compared to the frequency of fully susceptible in all *Campylobacter* species
  - *C. coli* was **variable** and generally **lower** (**Note:** smaller number of cases, some years <20 cases)
  - *C. jejuni* was **similar**, 46% in 2024



Higher resistance to 3 or more classes in *C. coli* cases.

- Compared to the frequency of resistance to 3 or more classes in all *Campylobacter* species
  - *C. coli* was **variable** and **higher** (**Note:** smaller number of cases, some years <20 cases)
  - *C. jejuni* was **generally lower**, 1% in 2024



Cases with resistance to 5 or more antimicrobial classes are infrequent; could complicate treatment, if required.

- Maximum resistance seen between 2020 and 2024 was **resistance to 6 antimicrobial classes** (n=1, *C. coli;* 2020)
  - Resistance to aminoglycosides, lincosamides, macrolides, phenicols, quinolones and tetracyclines including resistance to 8 antimicrobials
- Resistance to 5 antimicrobial classes was also **infrequent** between 2020 and 2024 (n=4, *C. coli;* 2022 (n=2) and 2024 (n=1), and *C. jejuni;* 2021 (n=1))
  - All 4 isolates reported resistance to the same antimicrobial classes: aminoglycosides, lincosamides, macrolides, quinolones and tetracyclines including resistance to 7 antimicrobials

Take Away Messages – Human *Campylobacter*

- *C. jejuni* is the predominant *Campylobacter* species in humans
- Higher resistance to ciprofloxacin (2024; 35%) compared to azithromycin (2024; 0.9%)
- Resistance to 3 or more classes was low to very low
- More resistance in *C. coli* compared to *C. jejuni*
- Cases with resistance to 5 or more antimicrobial classes are infrequent, however, they could complicate treatment, if required

Where can I find more information?

CIPARS interactive data visualizations (Health Infobase)

https://www.canada.ca/en/public-health/services/surveillance/canadian-integrated-program-antimicrobial-resistance-surveillance-cipars/interactive-data.html

CARSS interactive data visualizations (Health Infobase

Human *Salmonella*: https://health-infobase.canada.ca/carss/amr/results.html?ind=13

CIPARS web page

https://www.canada.ca/en/public-health/services/surveillance/canadian-integrated-program-antimicrobial-resistance-surveillance-cipars.html

FNC web page

https://www.canada.ca/en/public-health/services/surveillance/foodnet-canada.html

FNC interactive data visualizations (Health Infobase)

https://health-infobase.canada.ca/foodnet-canada/

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- NML Division of Enteric Diseases and PulseNet Canada
- Provincial Public Health Laboratories
- FoodNet Canada Sentinel Sites (*Campylobacter*)
- National Enteric Surveillance Program (NESP)

Questions

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