CIPARS Farm Surveillance Component: Grower-Finisher Pigs

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World Antimicrobial Resistance Awareness Week
November 19, 2024

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

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CIPARS Grower-finisher Pig Component Presentation 2023

World Antimicrobial Resistance Awareness Week

November 19, 2023

Agenda

- CIPARS Farm Swine component overview
- Animal Health and Farm information
- Antimicrobial use
  - Farm results
  - Sales data (VASR)
- Antimicrobial resistance
- Key messages

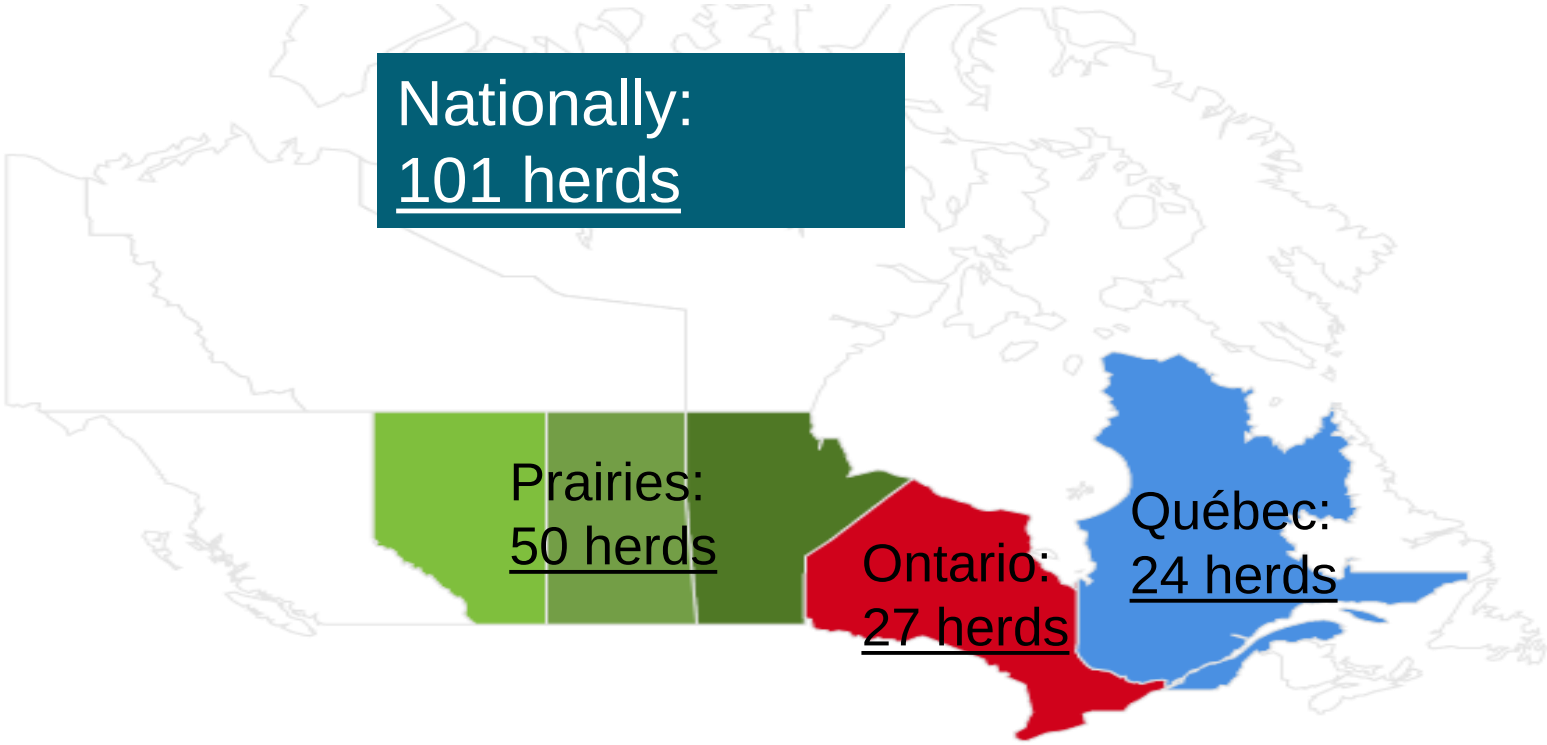
CIPARS Farm Swine Surveillance component

Distribution of herds 2023

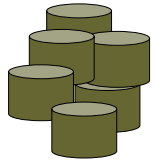
Proportional allocation of herds to provinces

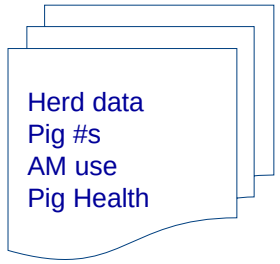
Herd Veterinarians (contracted)

- Recruit/enroll herds to program
- Inclusion/exclusion criteria – representativeness
- Conduct sample and data collection visits



Data collection





Sampling Seasons

WINTER	SUMMER	FALL

- Production phase of interest: **grower-finisher pigs,** sample from pigs that are close-to-market (95-110 kg)
- One sampling/data collection visit per herd per year
- Veterinarians distribute sampling of herds over the calendar year

Composite fecal samples from pens collected & submitted by the herd veterinarian

Questionnaire:
- Herd/site demographic data
- **Antimicrobial use** data (feed, water, injection)
- Animal health data

Antimicrobial Categorization

- Antimicrobials are categorized according to their importance to human medicine by Health Canada's Veterinary Drugs Directorate (VDD)
- Included: List A antimicrobials
- Excluded: antifungals, antiparasitics, antivirals, Category IV antimicrobials, and uncategorized not-medically important antimicrobials

Medically important antimicrobials

Category I: Very high importance

E.g. 3rd generation cephalosporins, fluoroquinolones

Category II: High importance

E.g., aminoglycosides, macrolides

Category III: Medium importance

E.g., tetracyclines, sulfonamides

Category IV: Low importance

E.g., ionophores, flavophospholipids

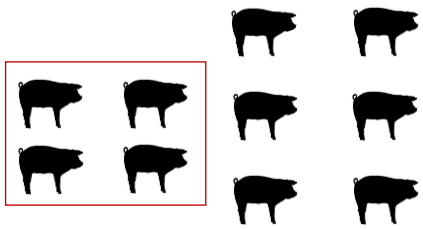
Medically important antimicrobials

Measures and indicators of AMU

FREQUENCY MEASURES

1. Tells us **how extensive** the use practice is across Canada
   - Number (%) of farms/**herds**
   - Number (%) of medicated **rations**

2. Tells us **how intensive** a drug may be used on farm
   - Number (%) of **pigs** exposed



Measures and indicators of AMU

MEASURES OF QUANTITY

3. Weight-based measures - tells us the **raw quantity** used

$AB_a \neq AB_b$

- Unadjusted: kilograms
- Adjusted for the number and weight (biomass) of pigs (indicators)
  - ❖ Mg/population correction unit (PCU)
  - ❖ Mg/kg biomass

4. Dose-based measures - tells us the **number of standard doses** used

$AB_a = AB_b$

- Dose-based indicators of AMU
  - ❖ DDDvetCA/1,000 pig-days at risk
- Adjusts for <u>differences in doses</u> among the antimicrobials used

Biosecurity and Farm Information

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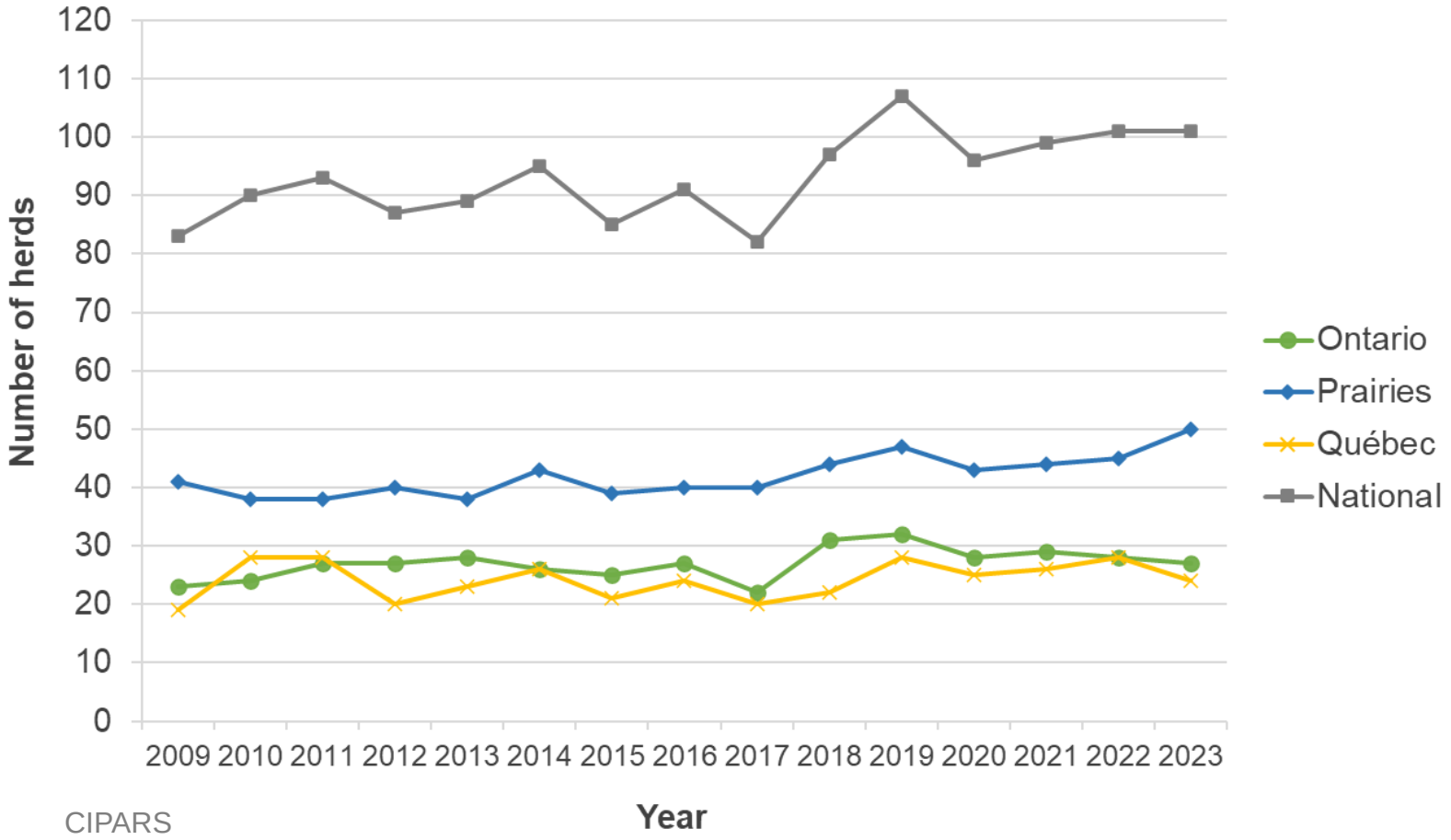
Number of participating herds



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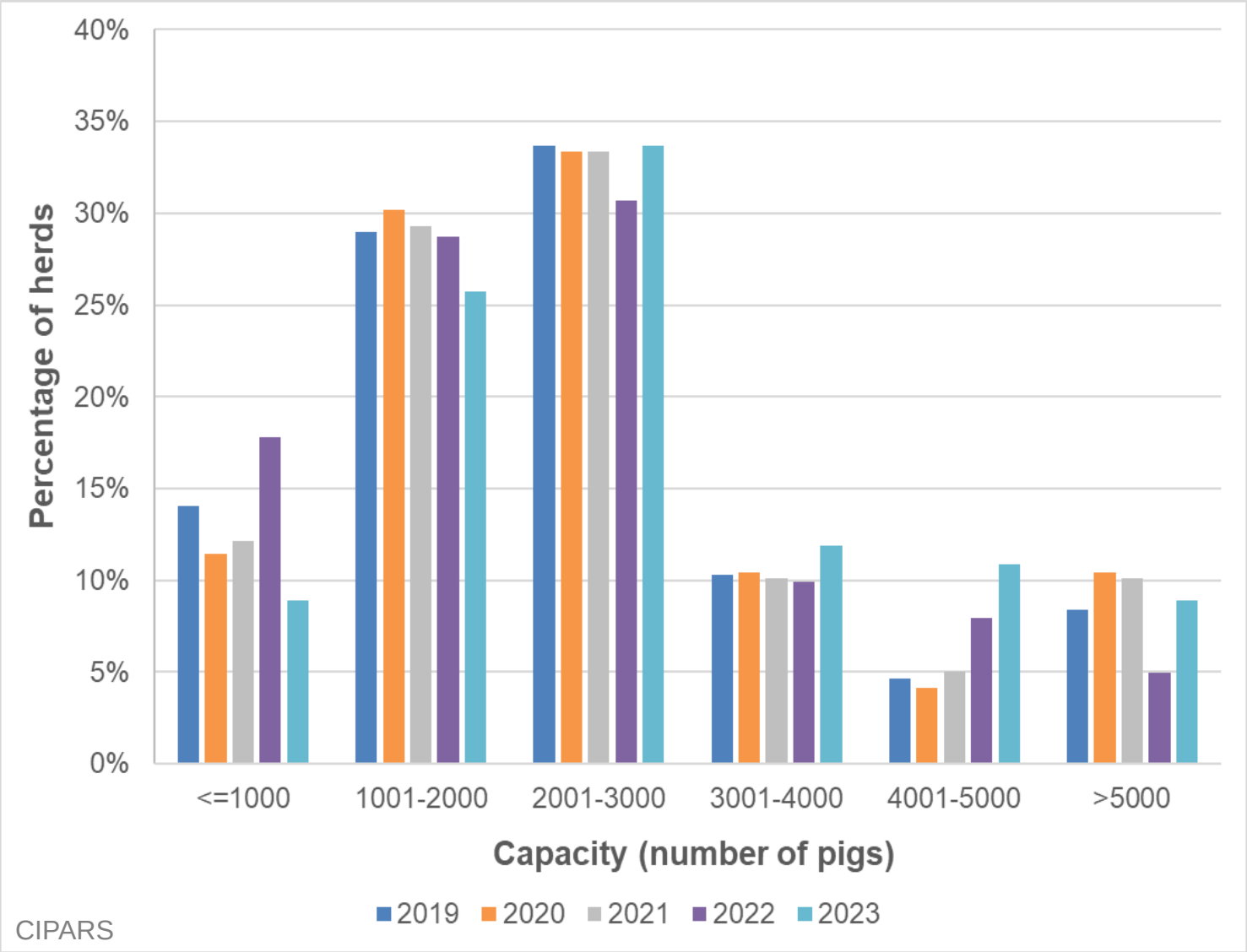
In 2023, there were 101 participating herds (similar to 2022).

There was a slight increase in the number of participating herds in the Prairies, and a decrease in the number of herd in Ontario and Québec.

Farm information



Most herds range in capacity from 1001 to 3000 pigs.

There has been an increase over time in the percentage of herds with 4001 to 5000 pigs.

In 2023, there were fewer small herds and more larger herds.

In 2023, 74% herds reported as all-in-all-out and 26% as continuous flow.

In 2023, 10 herds (10%) identified as being on an antibiotic-free production system.

Biosecurity

In 2023, 33% of herds:

- Had boots and coveralls provided by the farm
- Had a biosecurity sign
- Required showering in and out
- Required downtime between visiting farms

An additional 10% of herds used boot dips.

In 2023, one herd indicated they disinfected their hauling trucks.

No herds indicated they had locked doors.

Antimicrobial Use (Farm) and Sales (VASR)

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Frequency of antimicrobial use (AMU)

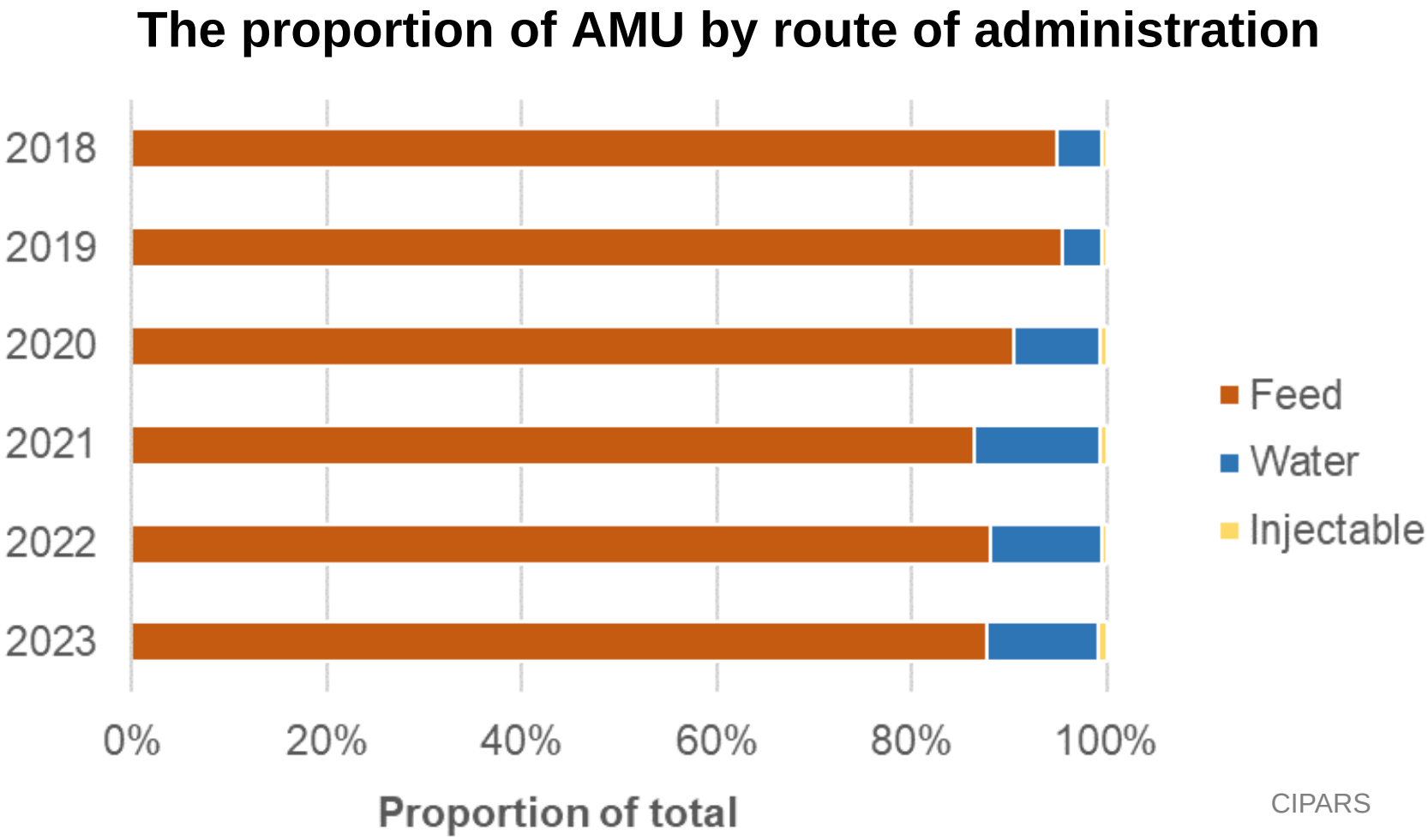
Route of administration

In 2023:

Feed 85%

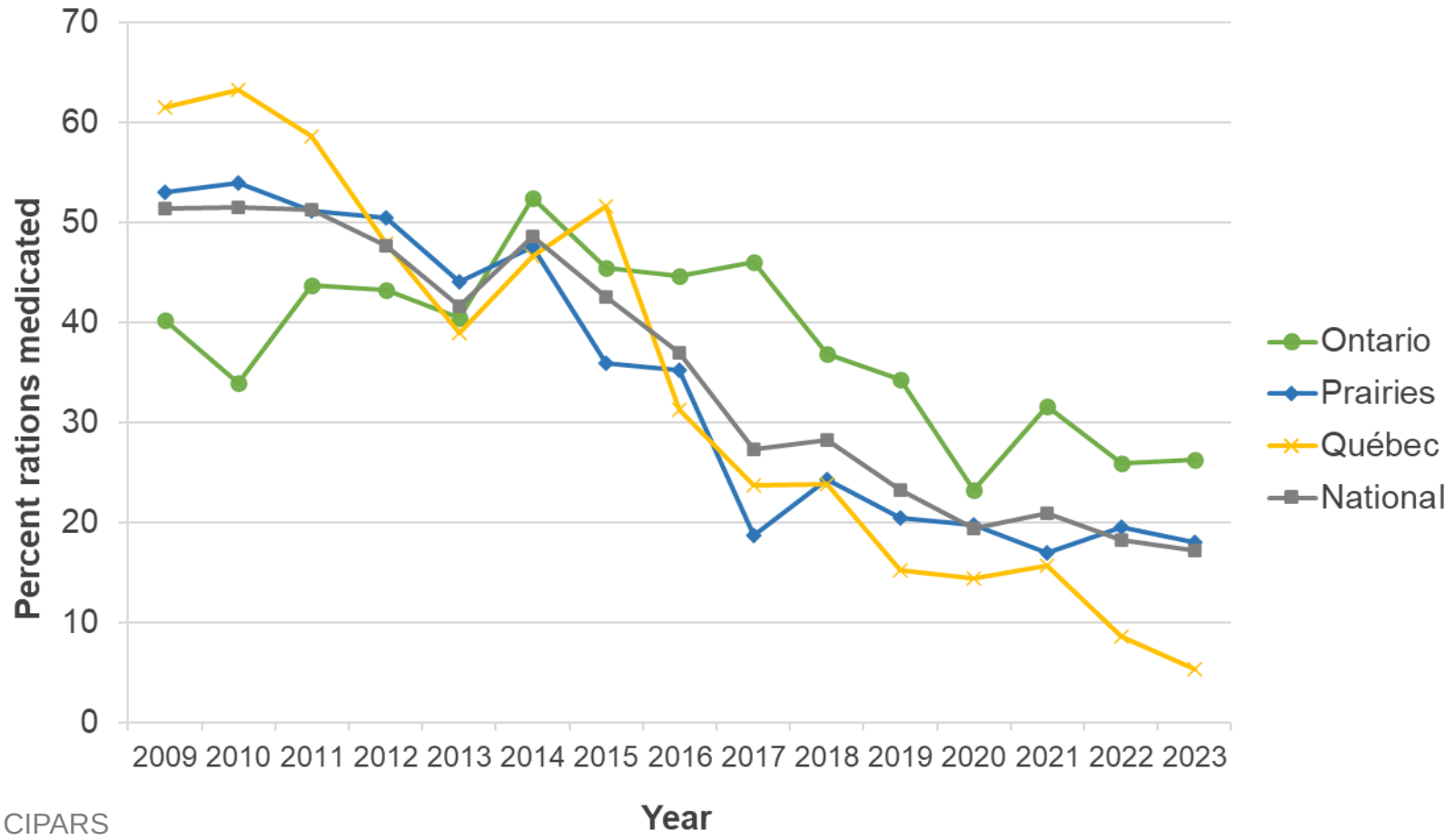
Water 14%

Injection 1%



Estimated on a quantitative basis, the proportion of nDDDvetCA/1000 pig-days at risk aggregated over all 3 routes of administration

Frequency of use in feed



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The **percentage of rations** that include medically important antimicrobials (MIAs) has decreased (y 66% between 2009 and 2019.

Since 2019 the percentage of medicated rations has plateaued in Ontario and the Prairies, while there have been ongoing reductions in Québec since 2021.

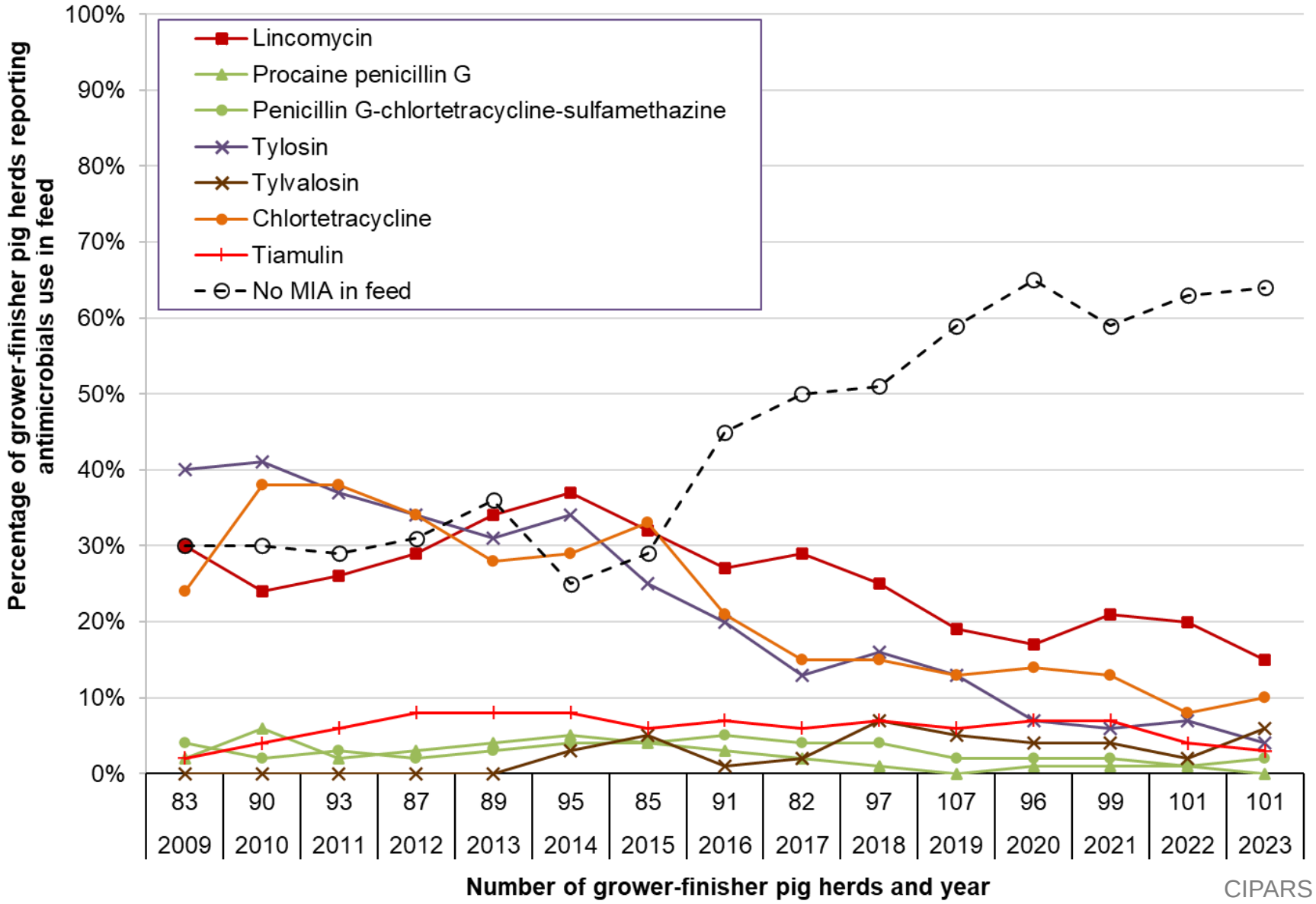
Days exposed to medicated feed (2023):

- 0-126 days Ontario
- 0-112 days Prairies
- 0-28 days Québec

Frequency of use in feed

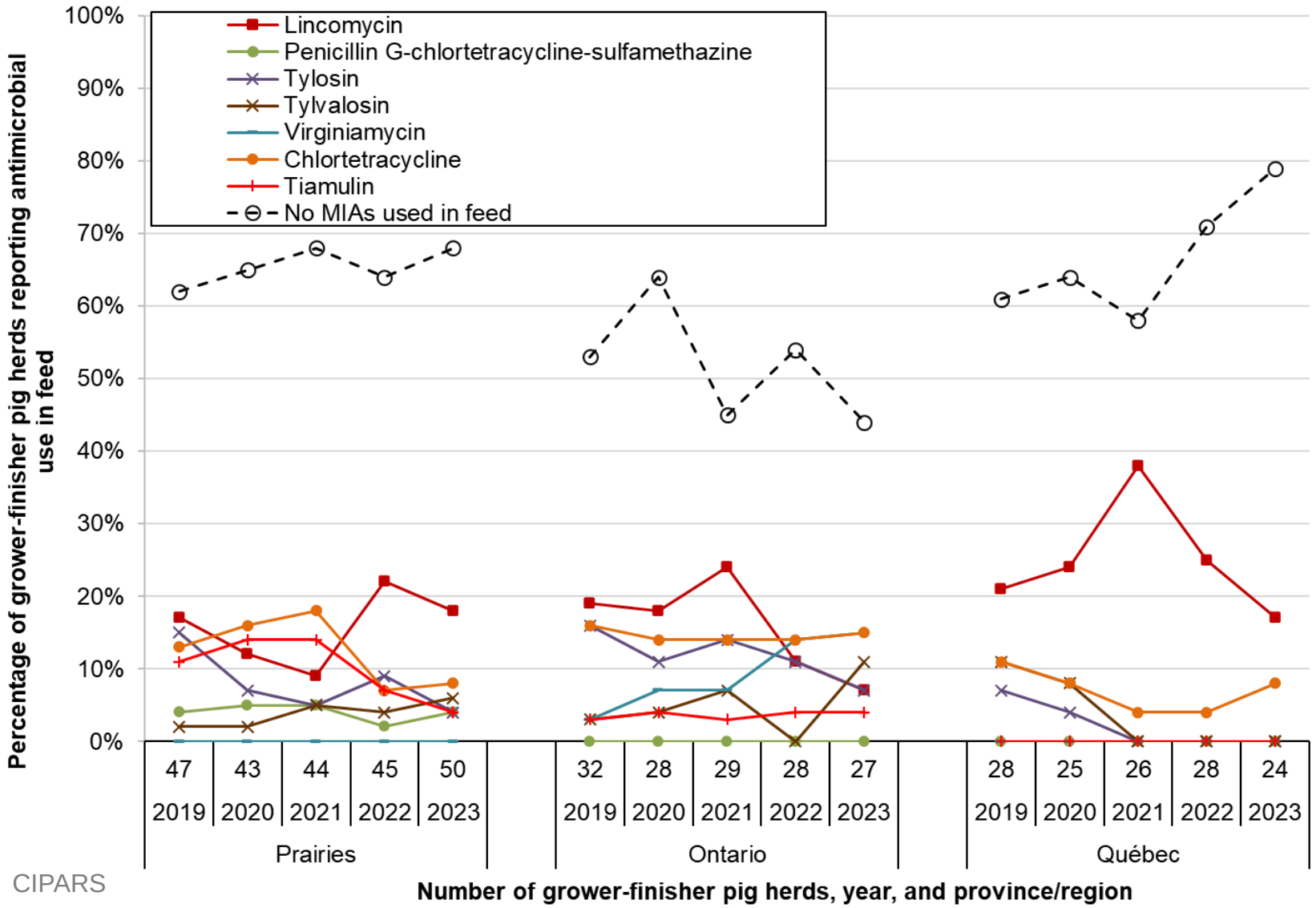
The **percentage of herds** not using any MIAs in feed increased between 2014 and 2019 and has plateaued since.

Since 2022, there has been no significant changes in the frequency of use of the active ingredients shown in the figure.



Medically important antimicrobials used by fewer than 5% of herds were excluded from the figure.

Frequency of use in feed



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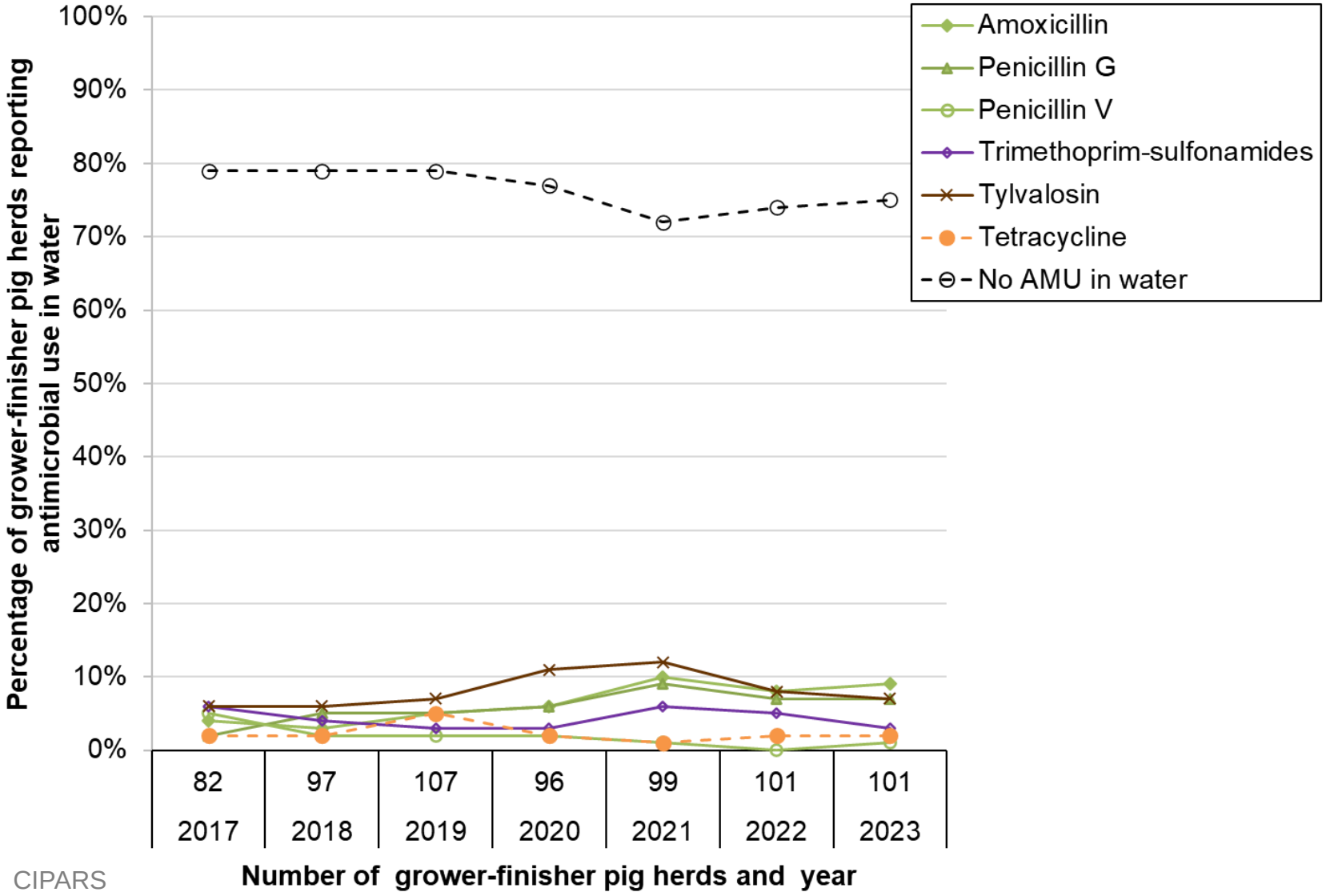
Regionally, there has been an increase in the **percentage of herds** not using MIAs in feed in Québec.

The **percentage of herds** not using MIAs in feed has been stable in the Prairies and is decreasing in Ontario.

There is yearly variation in the frequency of active ingredients used, however, the most frequently used antimicrobials continue to be lincomycin, chlortetracycline, tylvalosin and tylosin.

Frequency of use in water



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Nationally, there has been little change in the frequency of antimicrobial use in water since 2017.

The **percentage of herds** not using any antimicrobials in water has ranged from 72 to 79%.

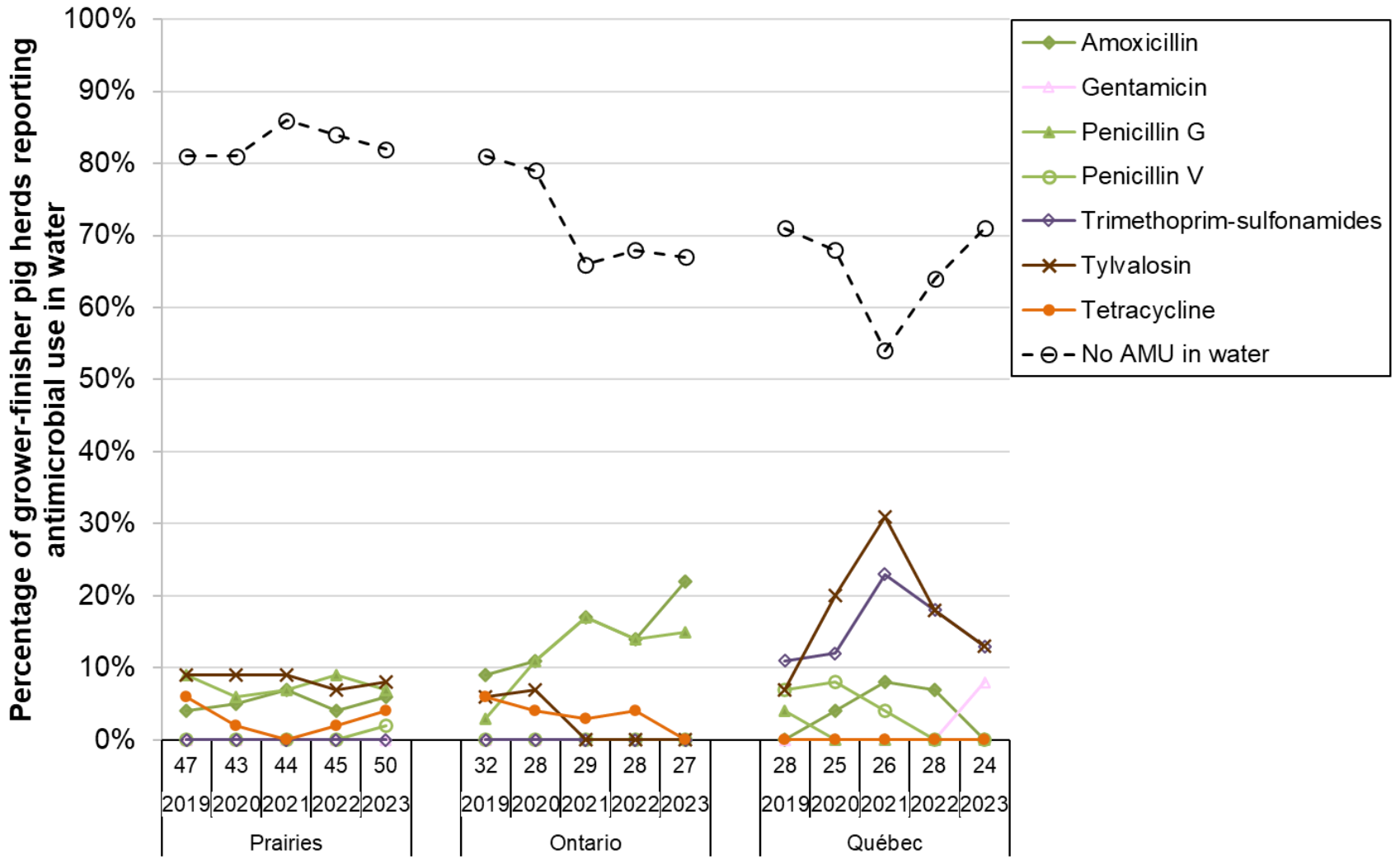
In, 2023, the most frequently used antimicrobials in water were amoxicillin, penicillin G, and tylvalosin (all Category II antimicrobials).

Frequency of use in water

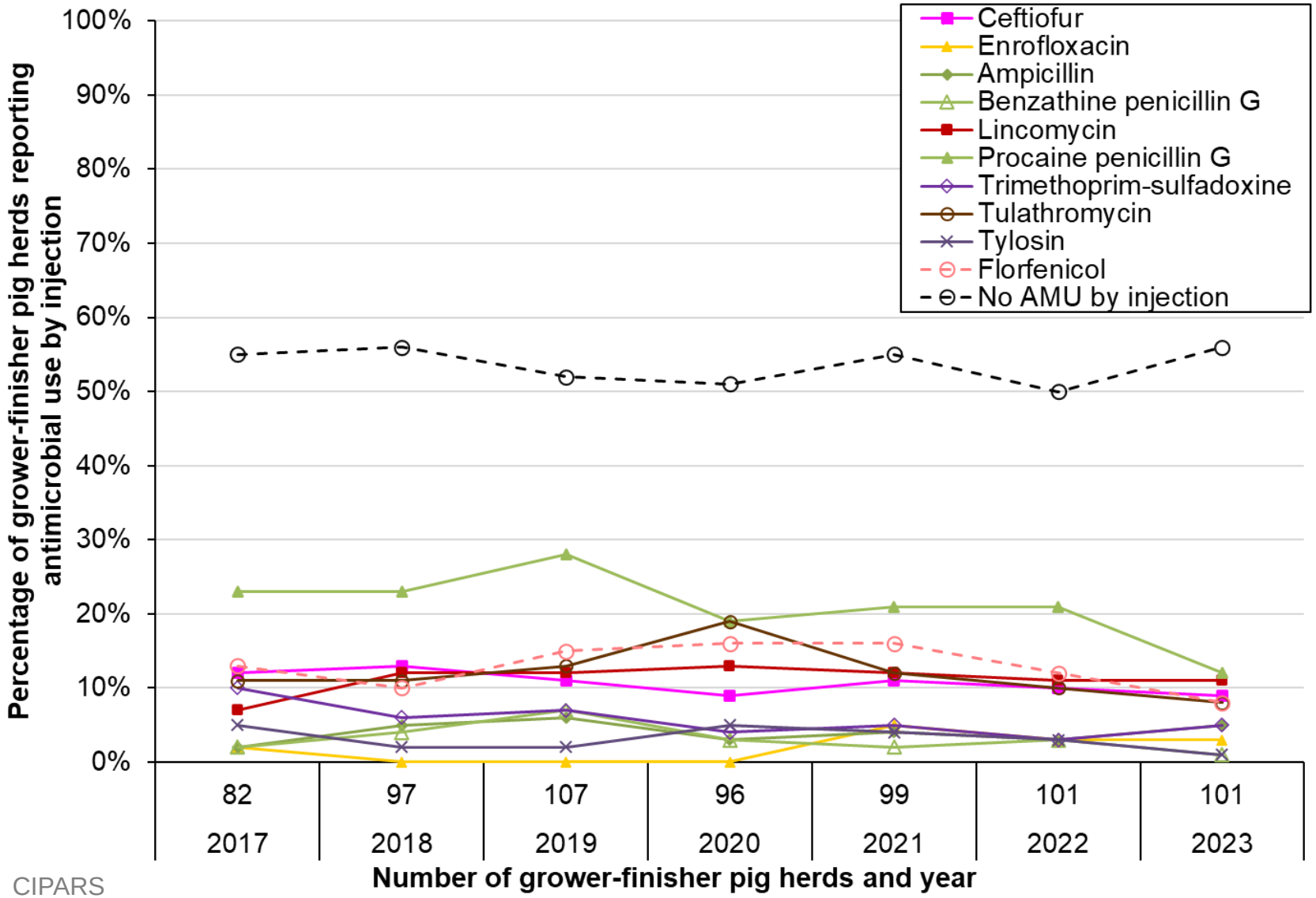
The overall trend in the **percentage of herds** not using any antimicrobials has decreased in Ontario and remained stable in Québec.

The frequency of AMU in water has increased in Ontario. In 2023, only penicillins were used in water in Ontario.

2023 was the first year that gentamicin use was reported in water.



Frequency of use by injection



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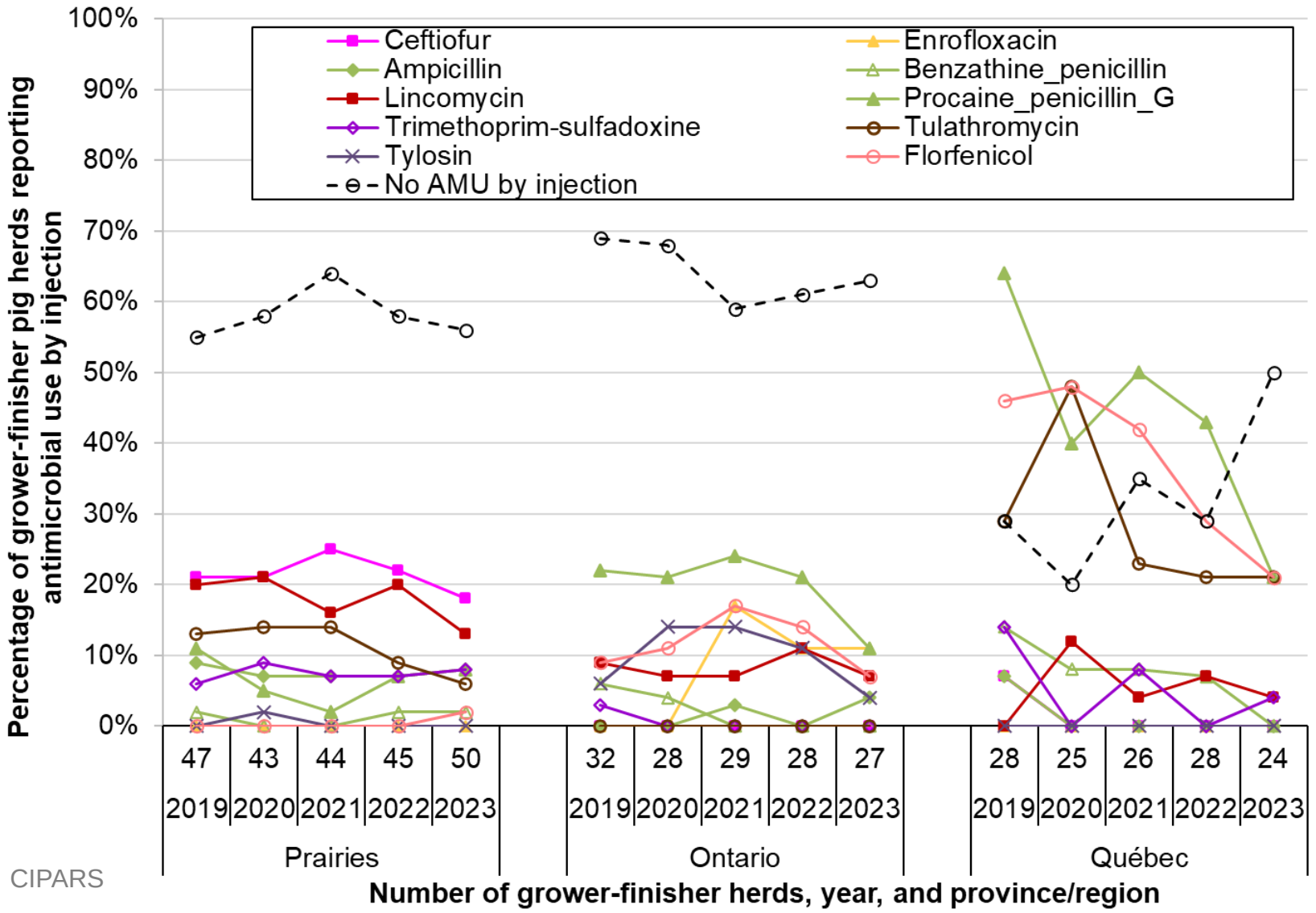
Nationally, there were no significant changes in the frequency of AMU by injection.

The **percentage of herds** not using any antimicrobials by injection varied between 50 and 55% since 2017.

In 2023, the most frequently used antimicrobials by injection were procaine penicillin G, lincomycin, florfenicol, tulathromycin and ceftiofur.

Frequency of use by injection



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Regionally, since 2019, the **percentage of herds** not using antimicrobials by injection has risen from 29% to 50% in Québec, remained stable in the Prairies, and decreased from 69% to 63% in Ontario.

Québec :
Less frequent use of procaine penicillin G, florfenicol, and tulathromycin.

Ontario:
Less frequent use of procaine penicillin G.
More frequent use of enrofloxacin.

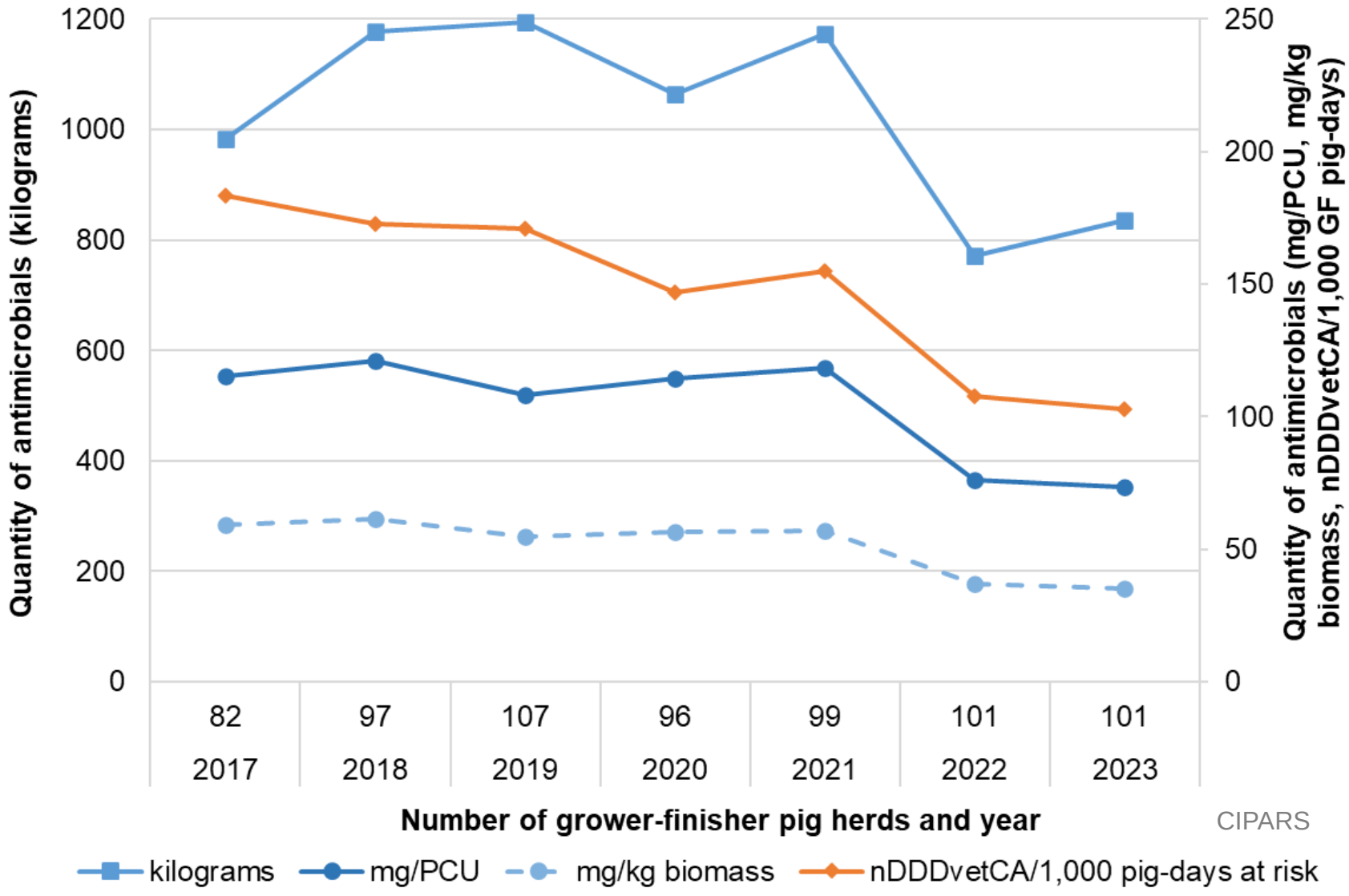
Prairies:
Less frequent use of lincomycin and tulathromycin.

Quantity of antimicrobial use

All routes summary

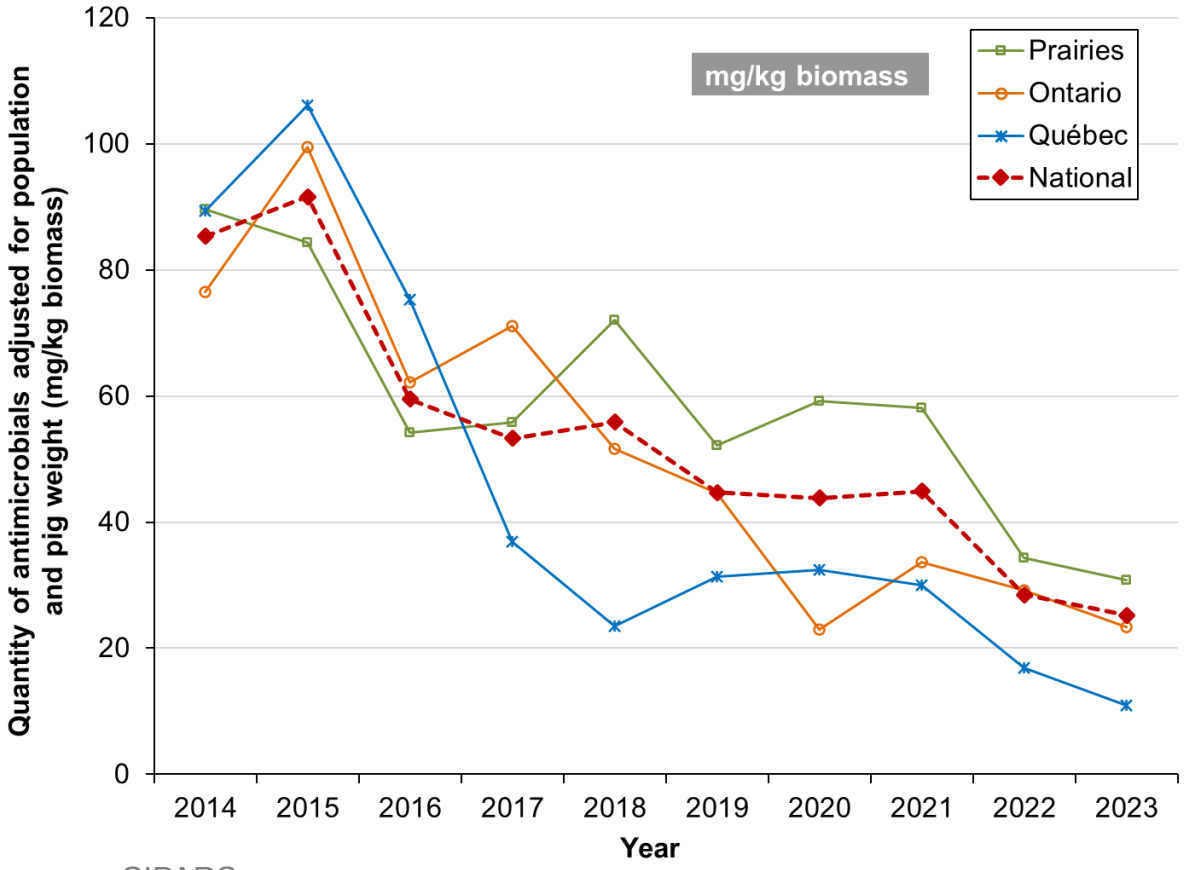
Since 2022:
- 8% **increase** in kg used
- 4% **decrease** in mg/kg biomass
- 4% **decrease** in defined daily doses

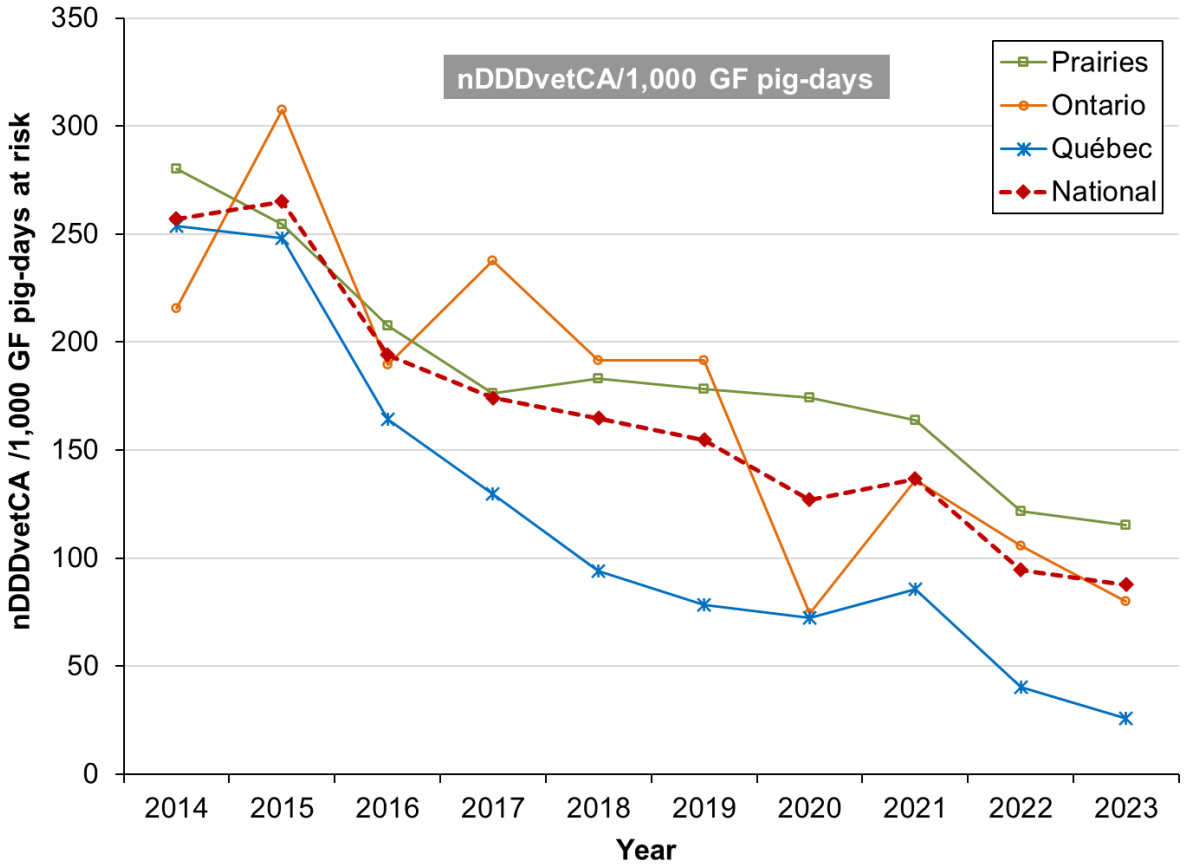
Since 2017:
- 15% **decrease** in kg used
- 40% **decrease** in mg/kg biomass
- 44% **decrease** in defined daily doses



*Category IV antimicrobials not included

Quantity of use in feed





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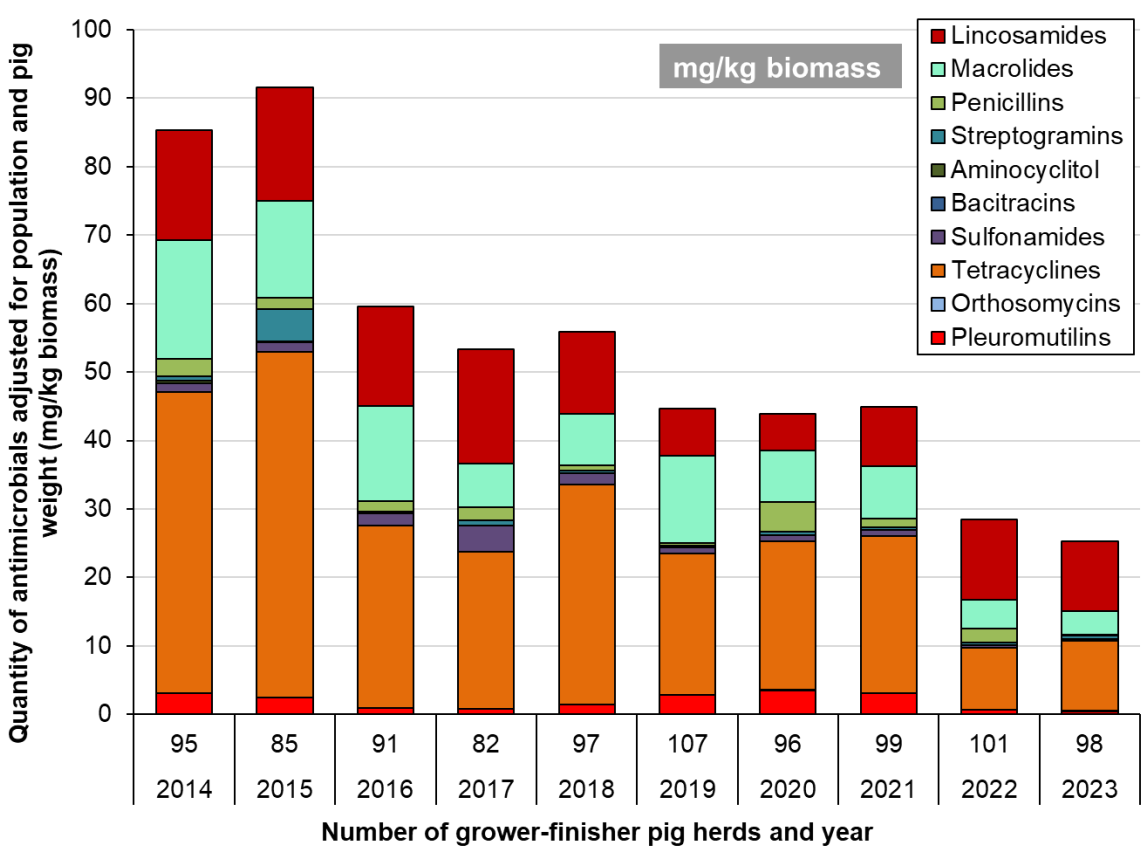
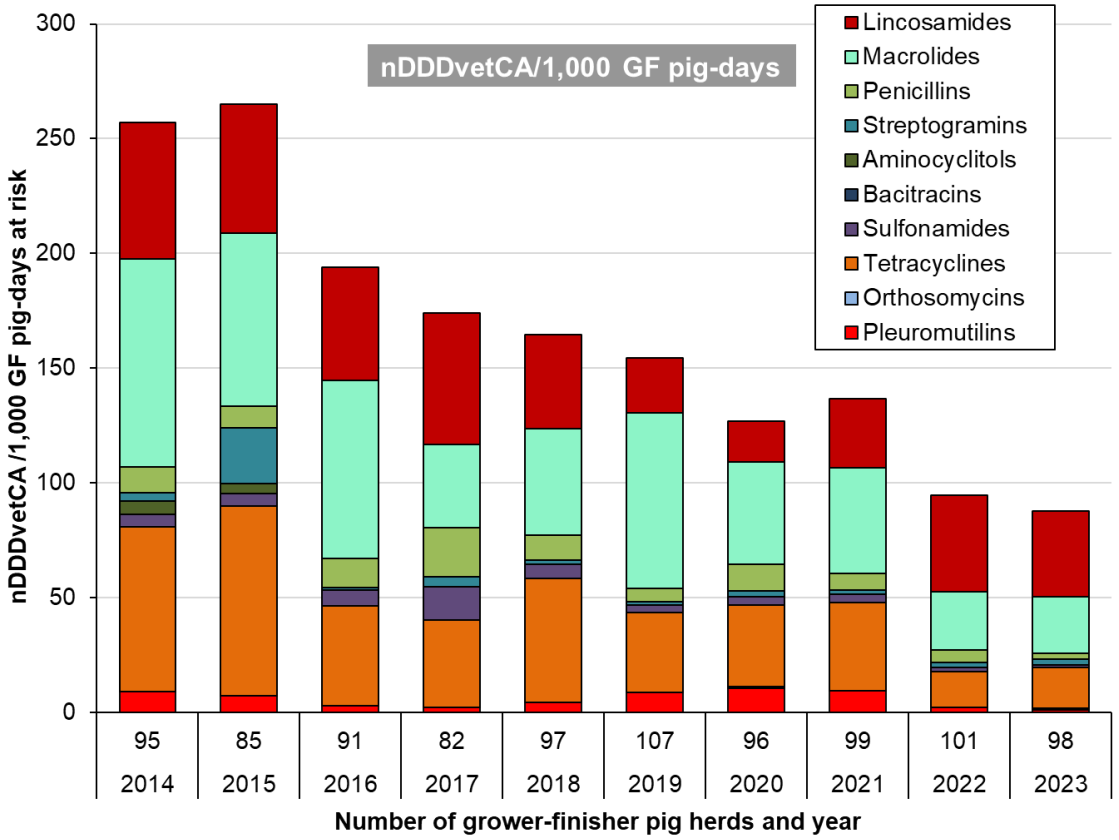
Between 2022 and 2023, use (measured in mg/kg biomass and defined daily doses) has decreased in all regions.

Overall decreasing trend in use since 2014 (-66% nDDDvetCA/1000 pig days, -70% mg/kg biomass)

Use is highest in the Prairies, followed by Ontario, and lowest in Québec.

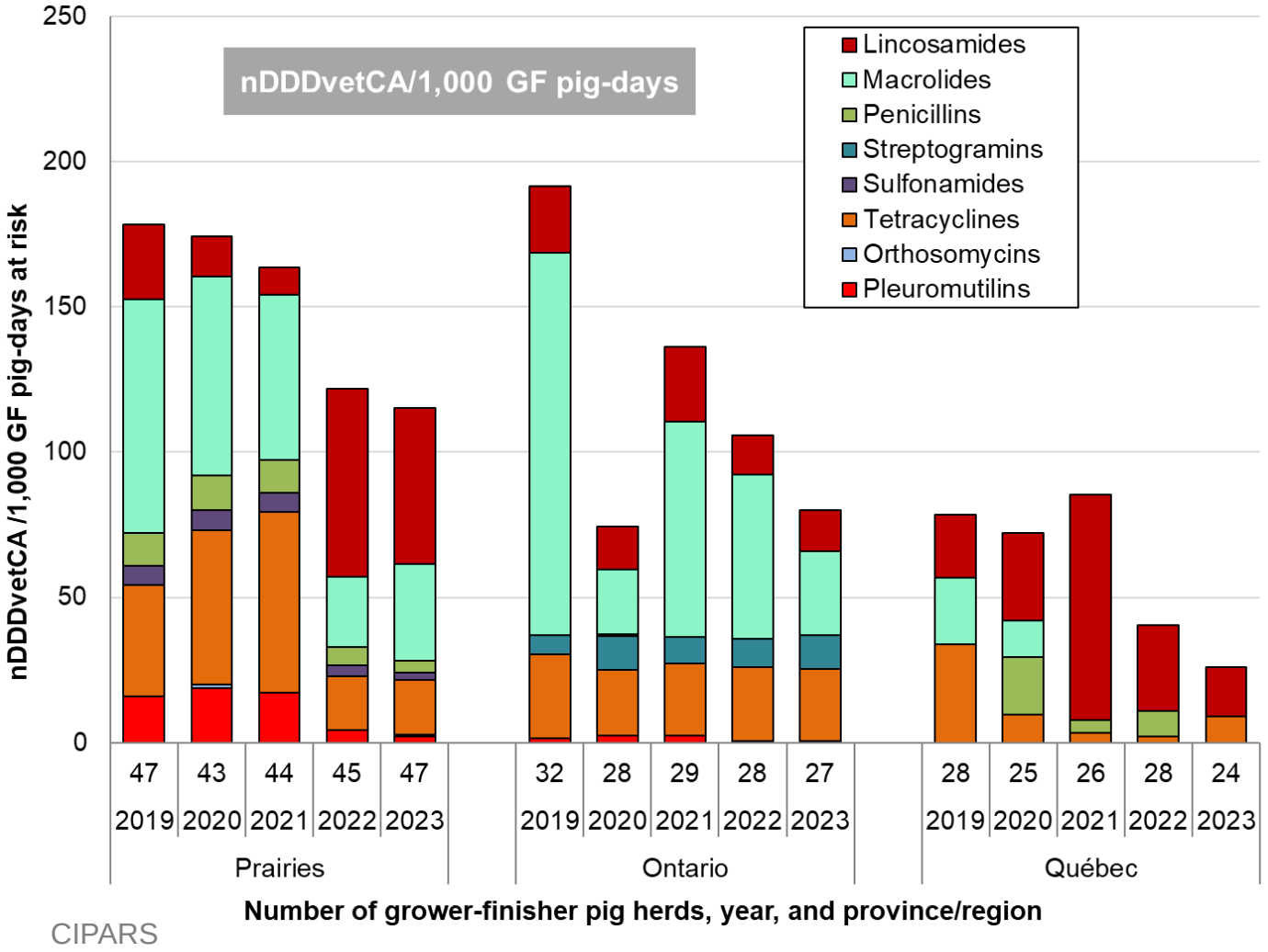
Quantity of use in feed





In defined daily doses:
MIAs: decreased by 66% since 2014**, decreased** by 7% since 2022
Tetracyclines: **decreased** by 75% since 2014, **increased** by 15% since 2022
Macrolides: decreased by 73% since 2014, **decreased** by 2% since 2022
Lincosamides: decreased by 38% since 2014, **decreased** by 12% since 2022

Quantity of use in feed



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Prairies

- Decrease of 35% in MIA use in feed since 2019, due to decreases in tetracycline and macrolide use
- Notable 109% increase in use of lincosamides
- Sulfonamides only used in the Prairies
- Little change in use between 2022 - 2023

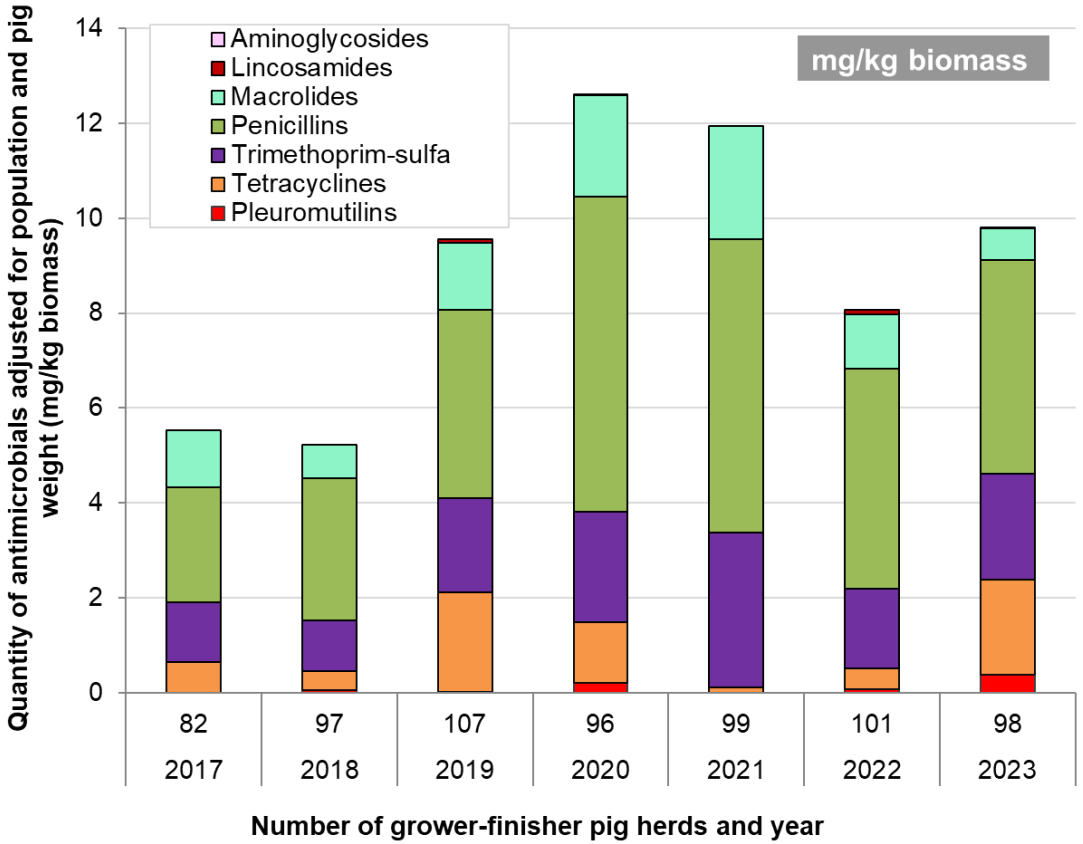
Ontario

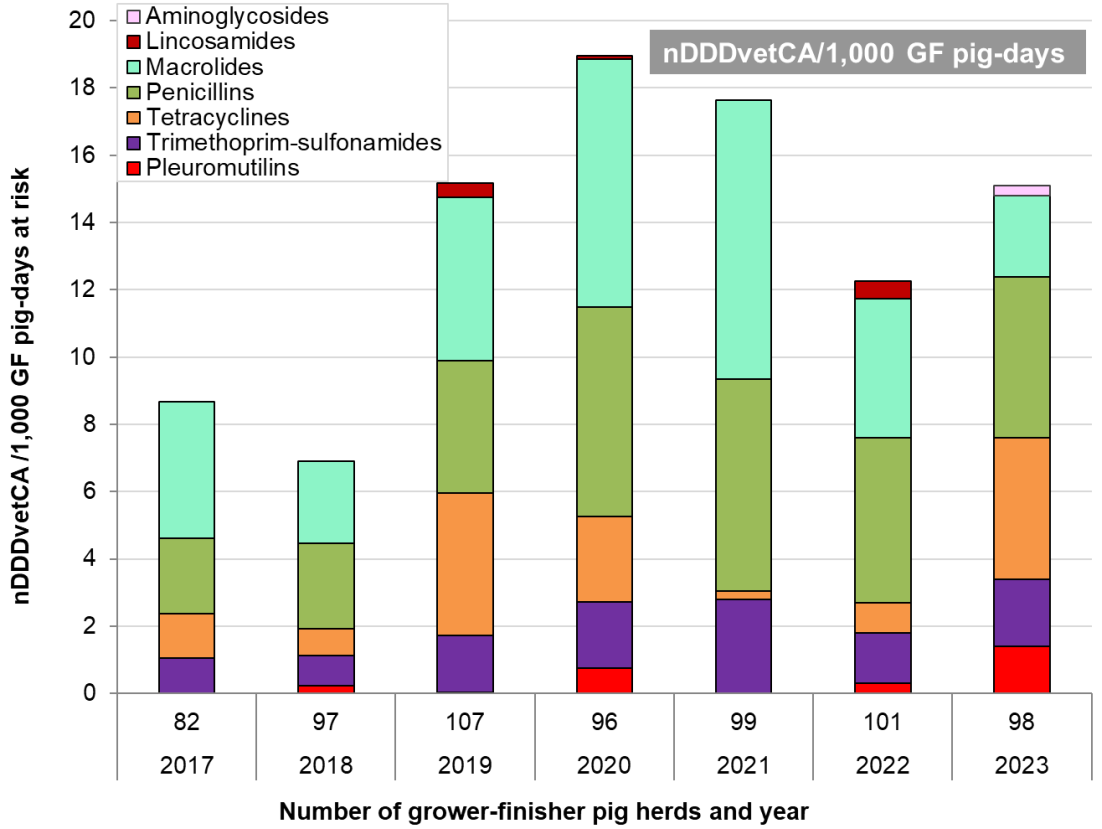
- Decrease of 58% in MIA use in feed since 2019, due to decreases in macrolide use
- Streptogramins only used in Ontario
- Decrease between 2022-2023 due to decrease in macrolide use

Québec

- Decrease of 67% in MIA use in feed since 2019, due to decreases in tetracycline, macrolide and penicillin use
- Decrease between 2022-2023 due to decreases in penicillin and lincosamide use

Quantity of use in water





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In defined daily doses:

MIAs: increased by 73% since 2017**, increased** by 23% since 2022

Penicillins: **increased** by 112% since 2017, **decreased** by 3% since 2022

Macrolides: decreased by 40%% since 2017, **decreased** by 42% since 2022

TMS: increased by 87% since 2017, **increased** by 33% since 2023

Tetracyclines: increased by 222% since 2017, **increased** by 370% since 2022

Quantity of use in water

Prairies

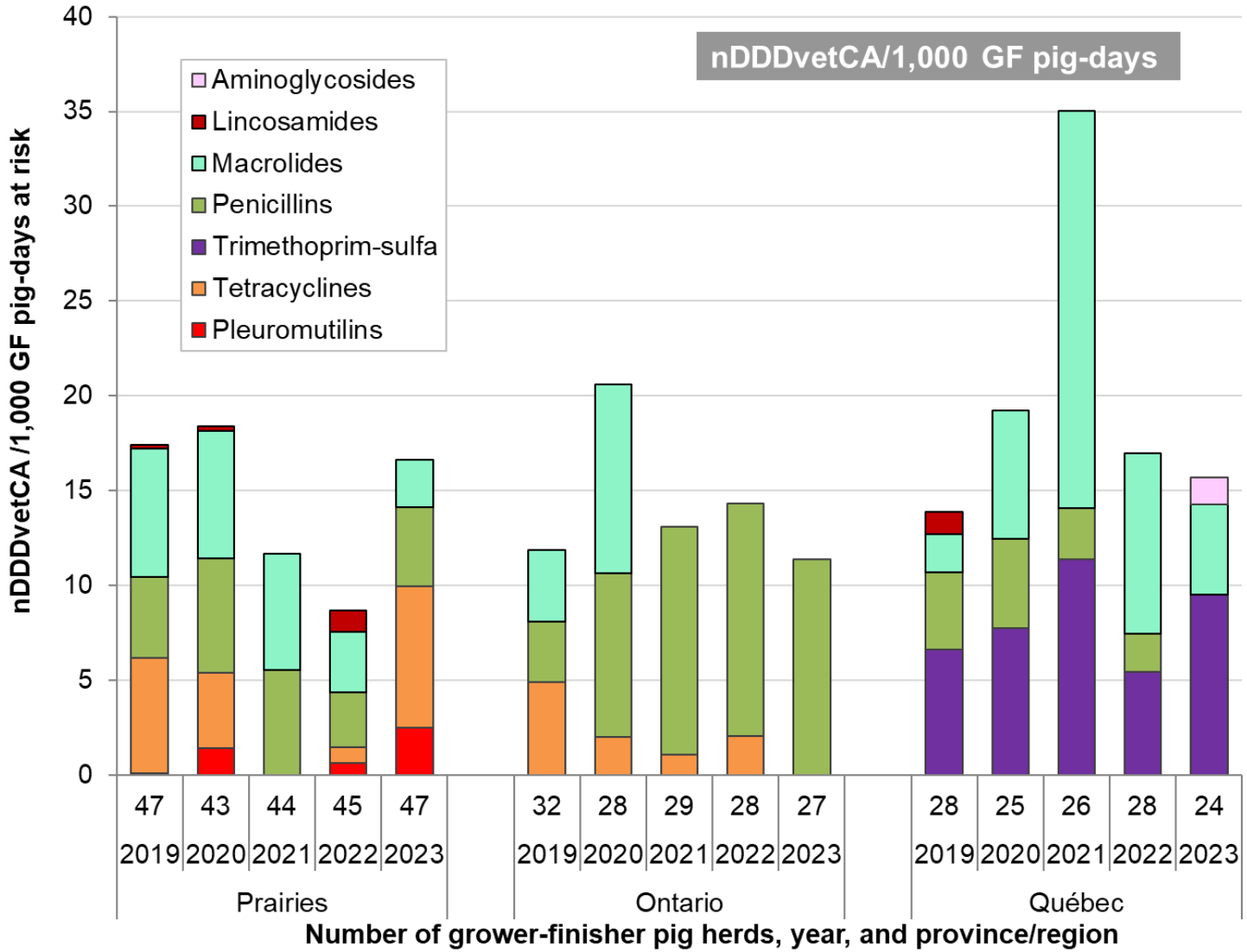
- Decrease of 5% in MIA use since 2019, due to decreases in macrolide use
- Increase of 92% in MIA use in water since 2022, due to increases in tetracycline, penicillin, and pleuromutilin use

Ontario

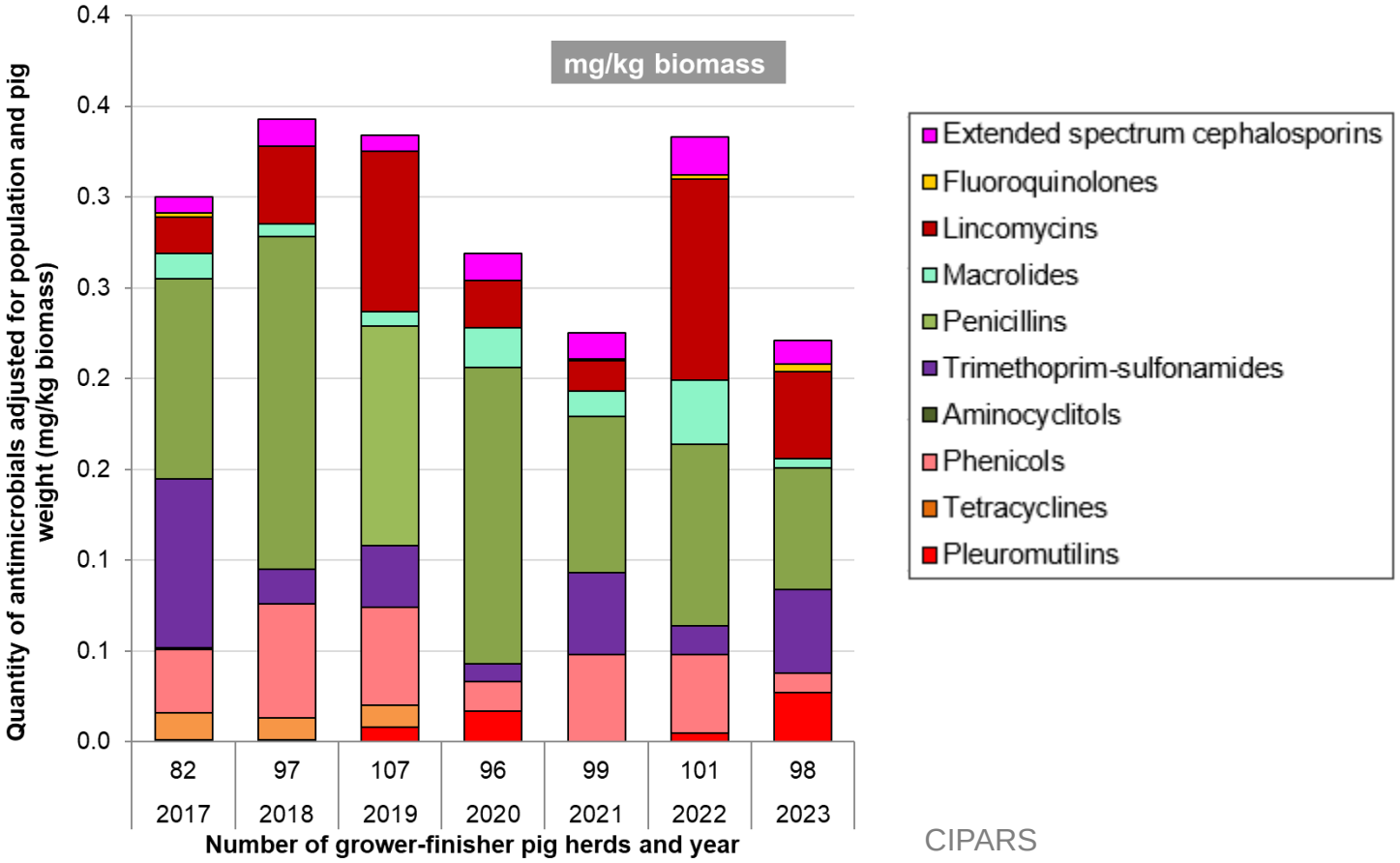
- Decrease of 4% in MIA use since 2019, due to decreases in macrolide and tetracycline use
- Decrease of 21% in MIA use since 2022 due to decreases in tetracycline and penicillin use
- Note: in 2023 only penicillins were used

Québec

- Increase of 13% in MIA use since 2019, due to increased macrolide, TMS and gentamicin use
- Decrease of 8% in MIA use since 2022, increases TMS and gentamicin use, decreased macrolide use



Quantity of use by injection



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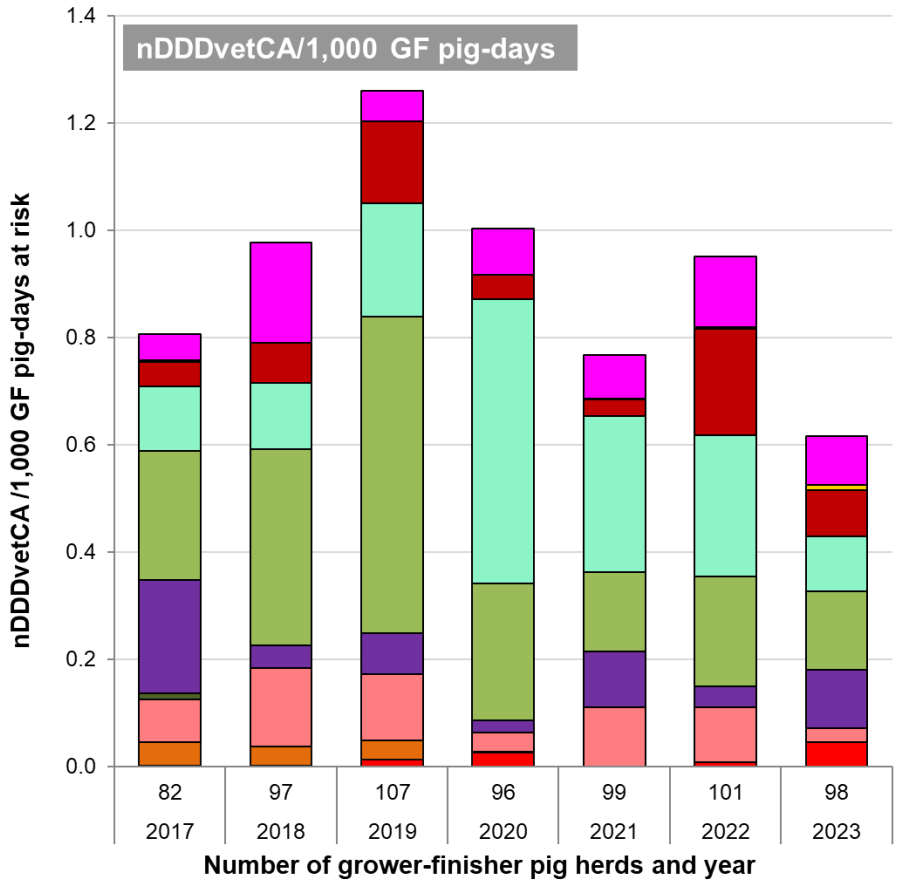


In defined daily doses:

MIAs: decreased by 24% since 2017, **decreased** by 35% since 2022

Penicillins: decreased by 39% since 2017, **decreased** by 29% since 2022

Macrolides: decreased by 16% since 2017, **decreased** by 61% since 2022

Lincosamides: increased by 91% since 2017, **decreased** by 57% since 2022

3rd gen cephalosporins: increased by 86% since 2017, **decreased** by 31% since 2022

Quantity of use by injection

Prairies

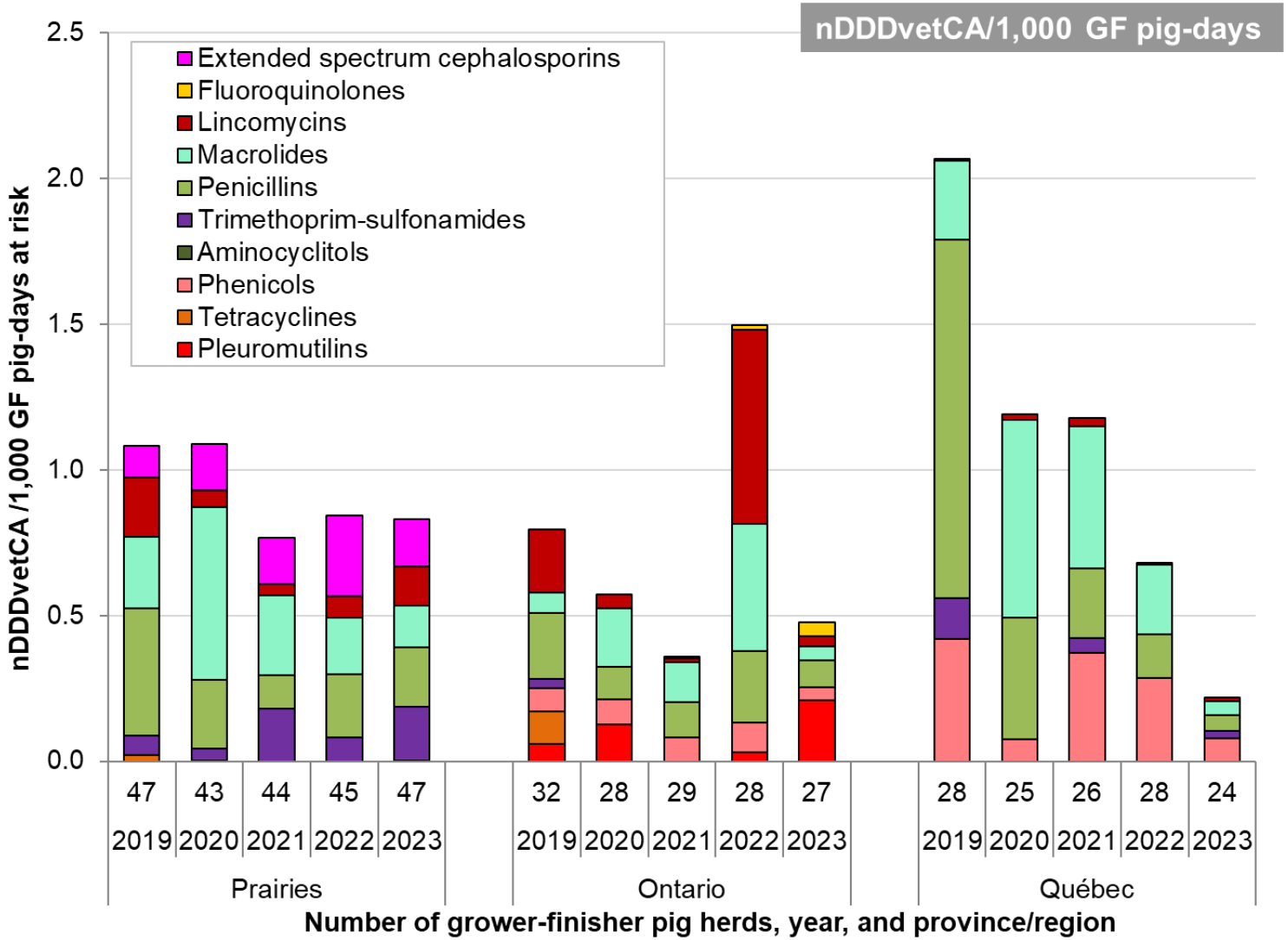
- Decrease of 23% in MIA use since 2019, due to decreases in penicillin, macrolide, and lincosamide use
- Decrease of 2% in MIA use since 2022
- 3rd generation cephalosporin use only in the Prairies

Ontario

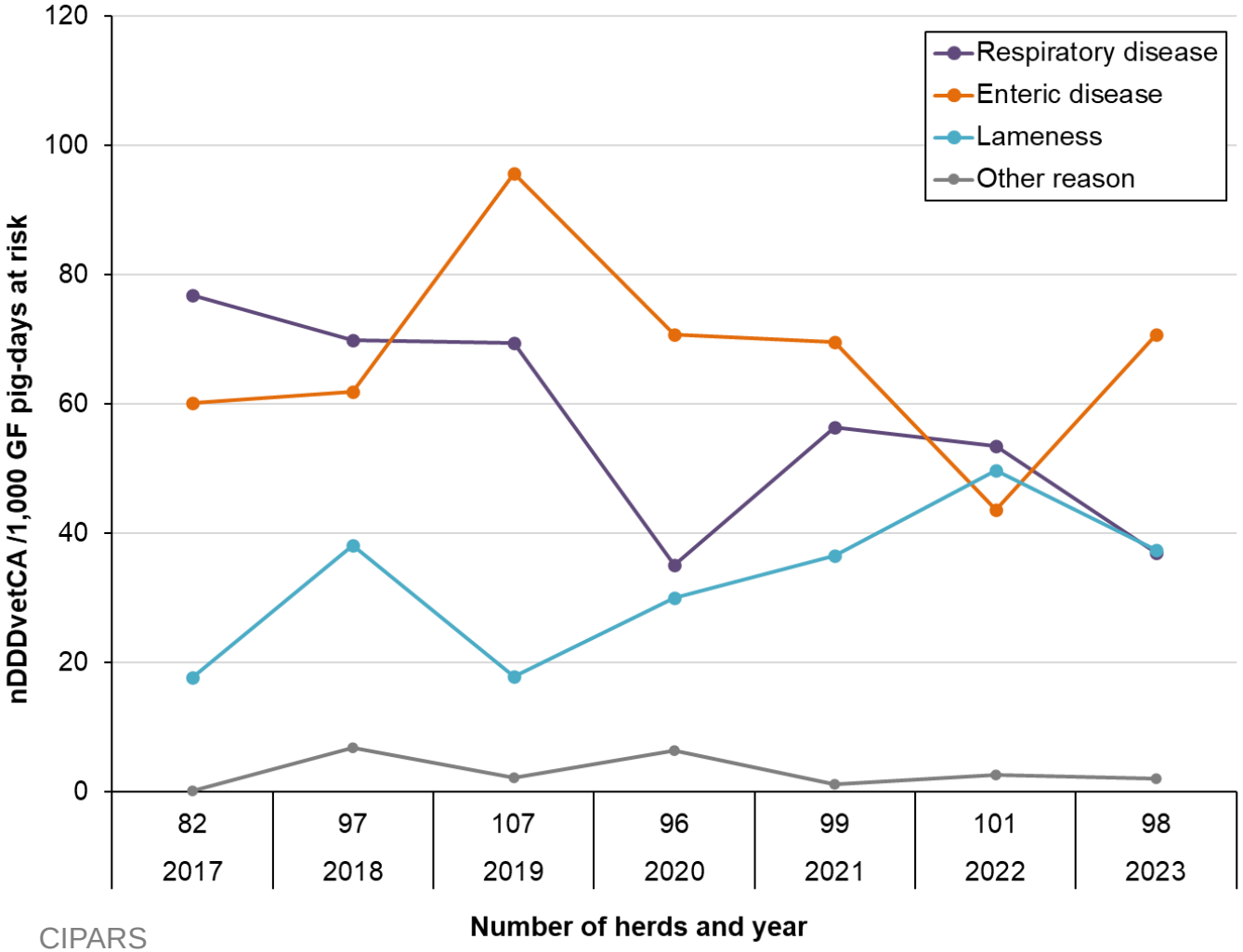
- Decrease of 40% in MIA use since 2019 due to decreases in lincosamide, penicillin and macrolide use
- Large increase in use of lincosamides and macrolides in 2022
- Decrease of 68% in MIA use since 2022
- Increase of 109% in fluoroquinolone use since 2022

Québec

- Decrease of 89% in MIA use since 2019 due to decreases in all classes used
- Decrease of 68% in MIA use since 2022 due to decreases in all classes used
- No Category I use



Reasons for use



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Since 2017:

- Respiratory disease – 51% decrease
- Enteric disease – 18% increase
- Lameness – 112% increase

Since 2022:

- Respiratory disease – 31% decrease
- Enteric disease – 62% increase
- Lameness – 25% decrease
- Other reasons – 24% decrease

Use for lameness is now similar to use for respiratory disease.

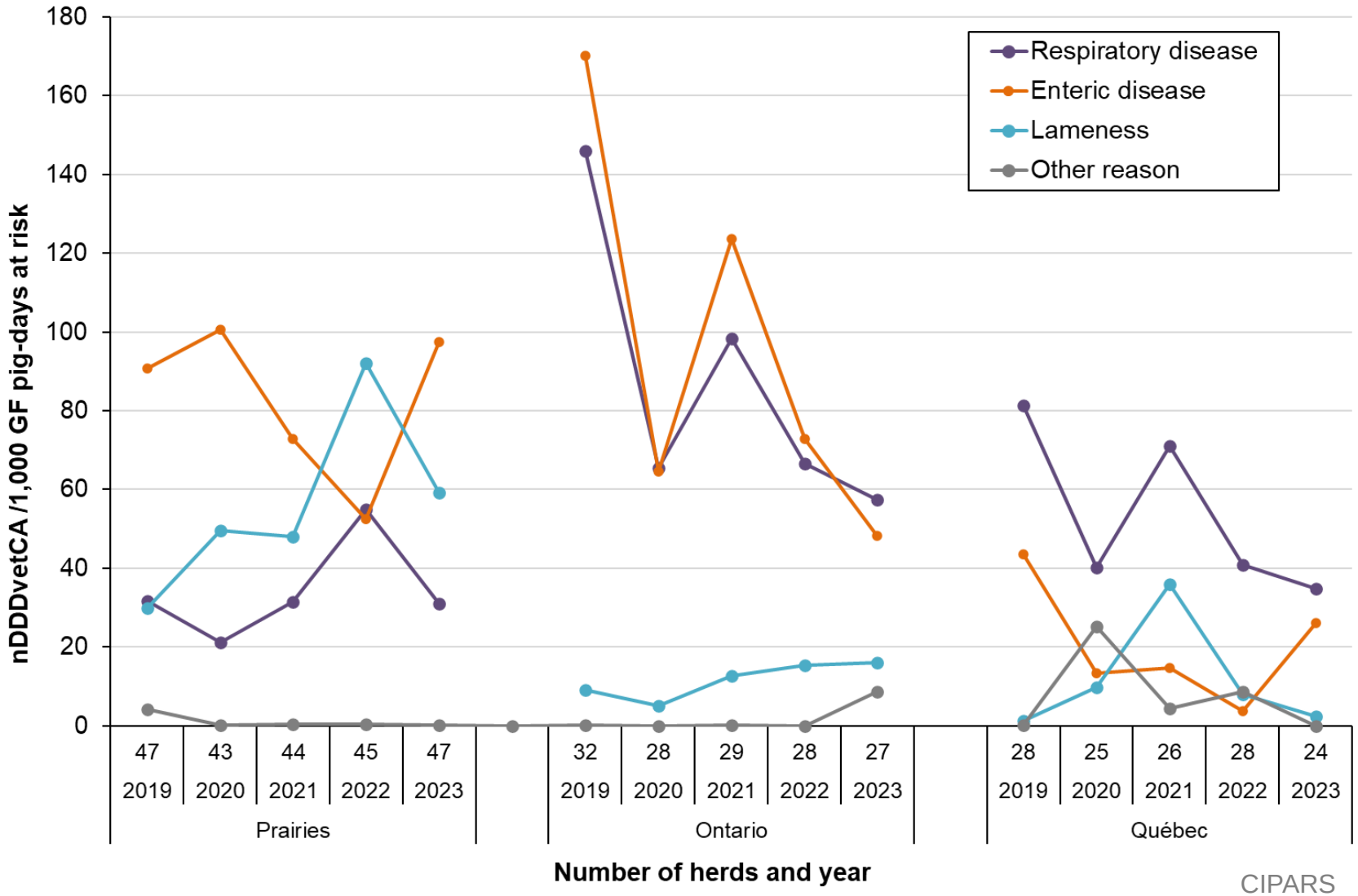
Reasons for use

Since 2019:

- Use for respiratory disease decreasing in Ontario and Quebec, stable in Prairies
- Use for lameness increasing in all regions

Since 2022:

- Increase in use for enteric disease in Prairies and Quebec
- Decrease in use for respiratory disease in all regions
- Decrease in use for lameness in Prairies and Quebec, increase in Ontario



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Sales data (VASR)

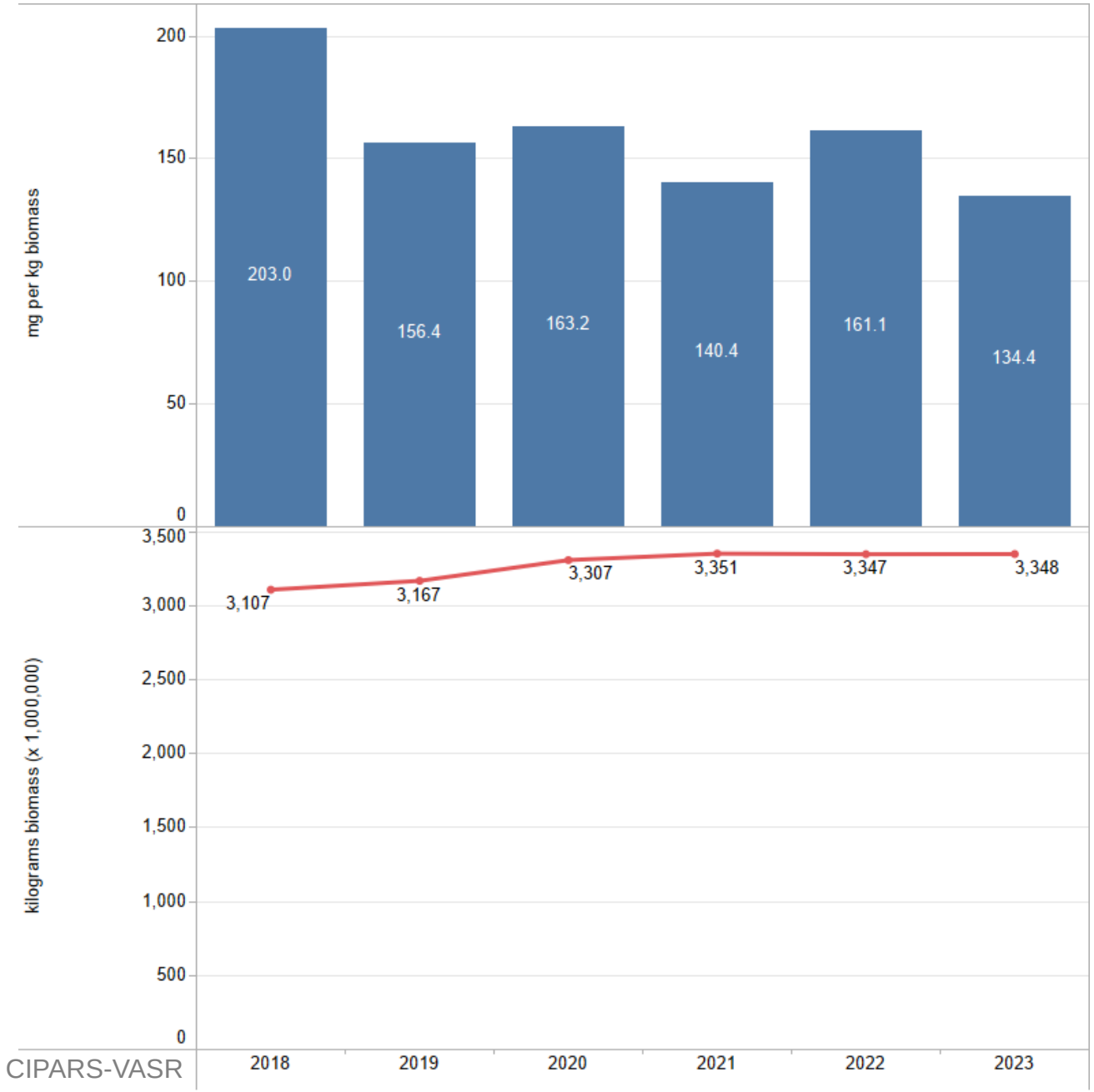
Manufacturers and importers

The highest quantity of sales of medically important antimicrobials continues to be for pigs.

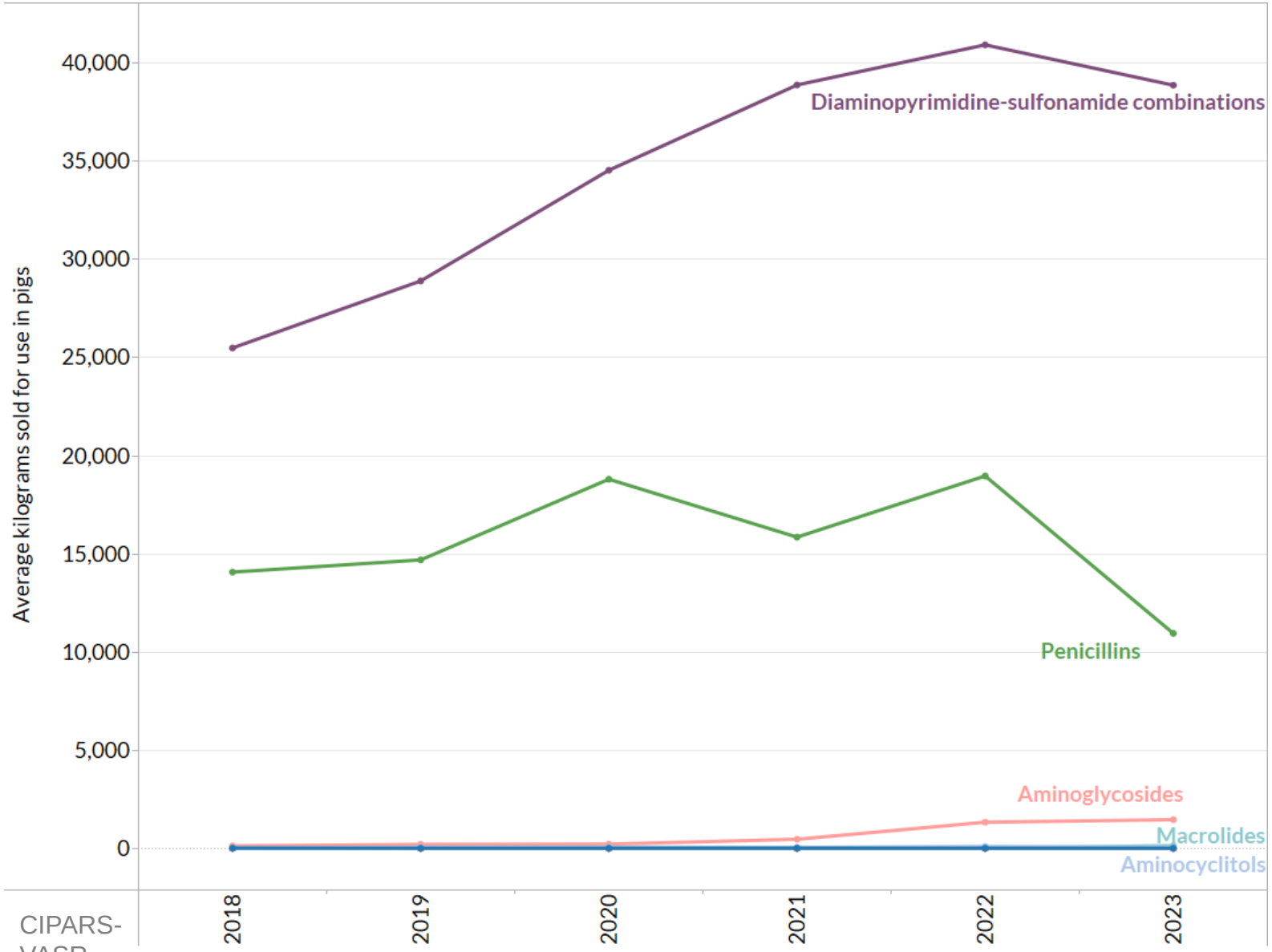
In 2023, approximately 450,000 kg of medically important antimicrobials were reported sold for use in pigs.

- primarily Category II and III antimicrobials (58% of sales for pigs are tetracyclines)
- primarily for use in feed

The biomass of pigs increased between 2018 and 2021 and has been stable since.



Sales data (VASR)



Approximately **85%** of medically important antimicrobials reported by compounders were intended for use in pigs.

- ~ 51,000 kgs sold for use in pigs in 2023
- primarily for use in water
- primarily sold in Québec, followed by Ontario

Antimicrobial resistance

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

Canada

AMR (Farm)

Recovery

E. coli

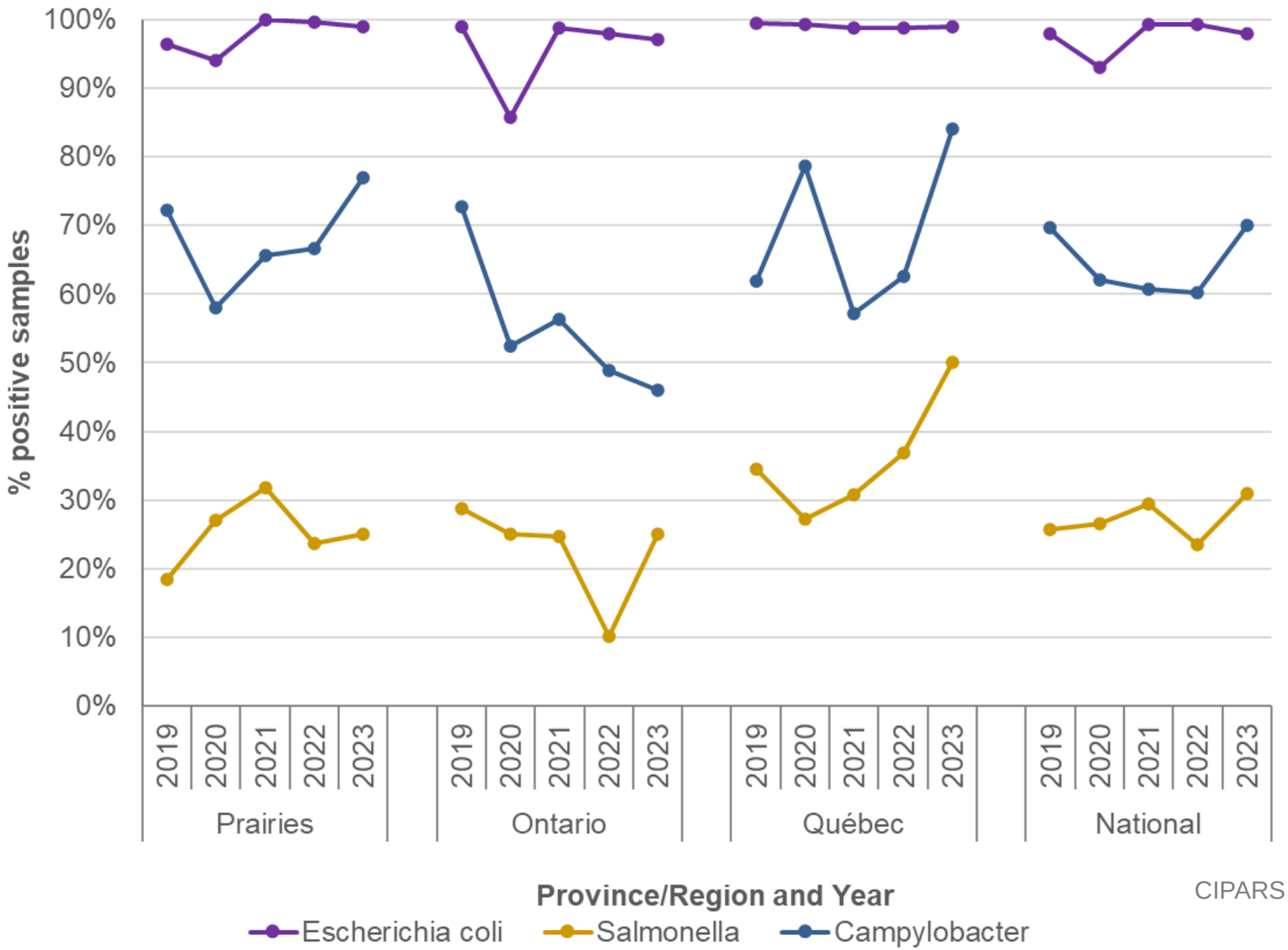
- stable across all regions

Salmonella

- increasing trend in Québec
- one year decrease in Ontario in 2022

Campylobacter

- decreasing trend in Ontario



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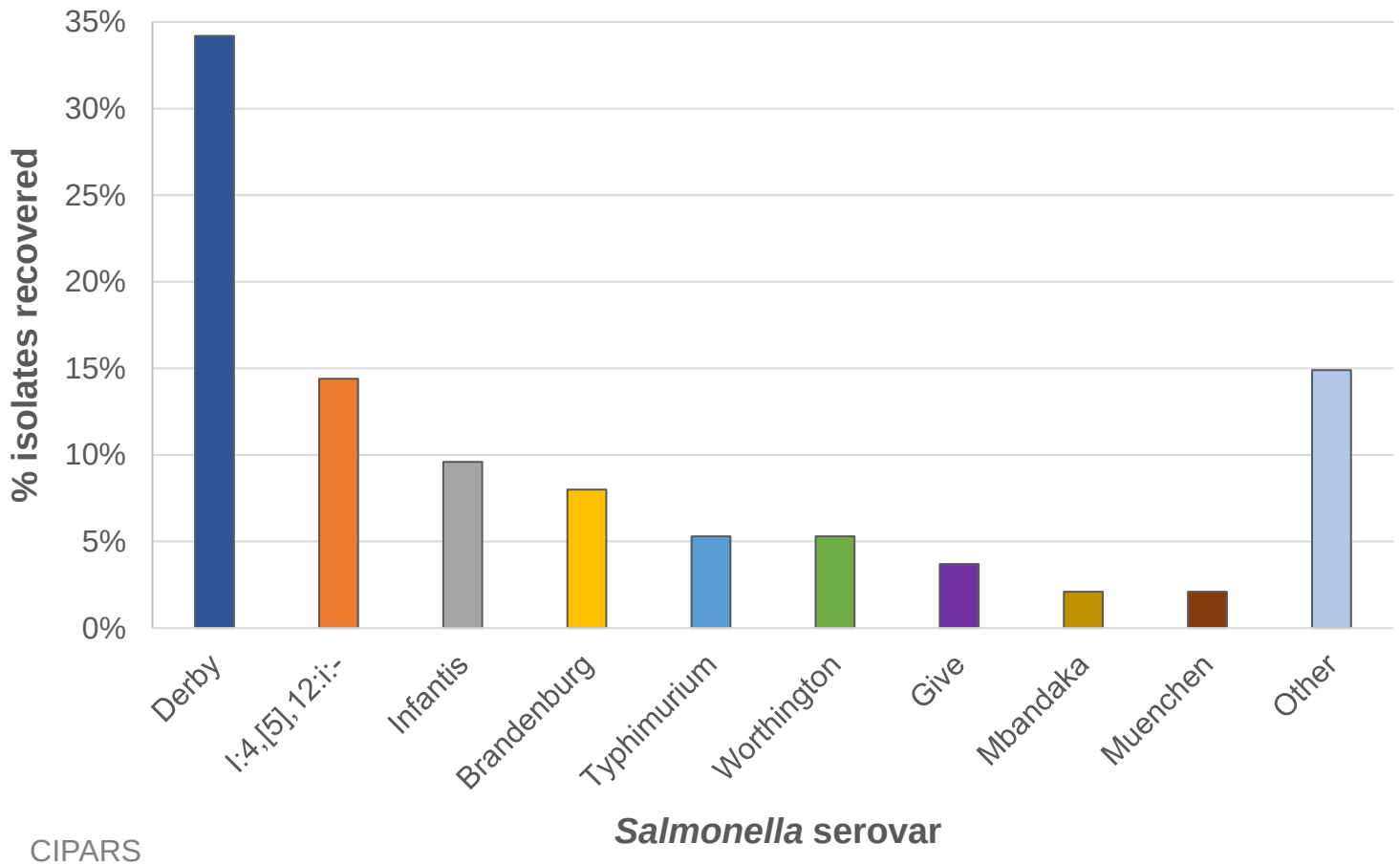
AMR (Farm) – *Salmonella*

Serovar distribution



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In 2023, the majority of the isolates recovered were Derby.

The frequency of recovery of Typhimurium has been decreasing each year since 2019.

There are regional differences in the spectrum of serovars recovered.

AMR (Farm) - *Salmonella*

While tetracycline resistance remains very high, it has decreased since 2014.

Significant decrease in ampicillin resistance since 2014 and since 2022.

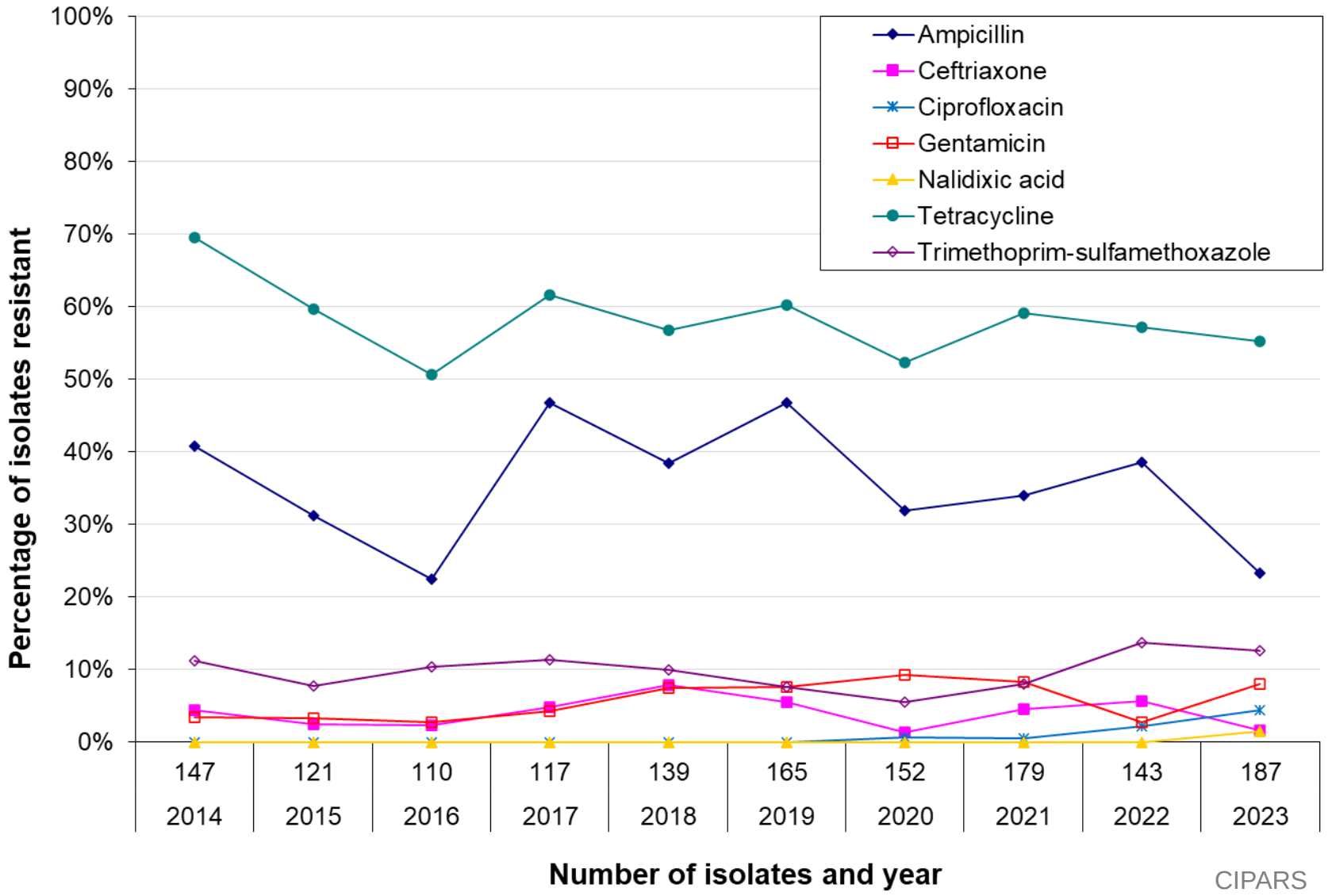
Increase in ciprofloxacin resistance from 0% in 2019 to 4% in 2023.

One isolate was resistant to 10 antimicrobials.

37% were susceptible to all tested antimicrobials.

28% resistant to 3 or more antimicrobials.

No resistance to meropenem or colistin.



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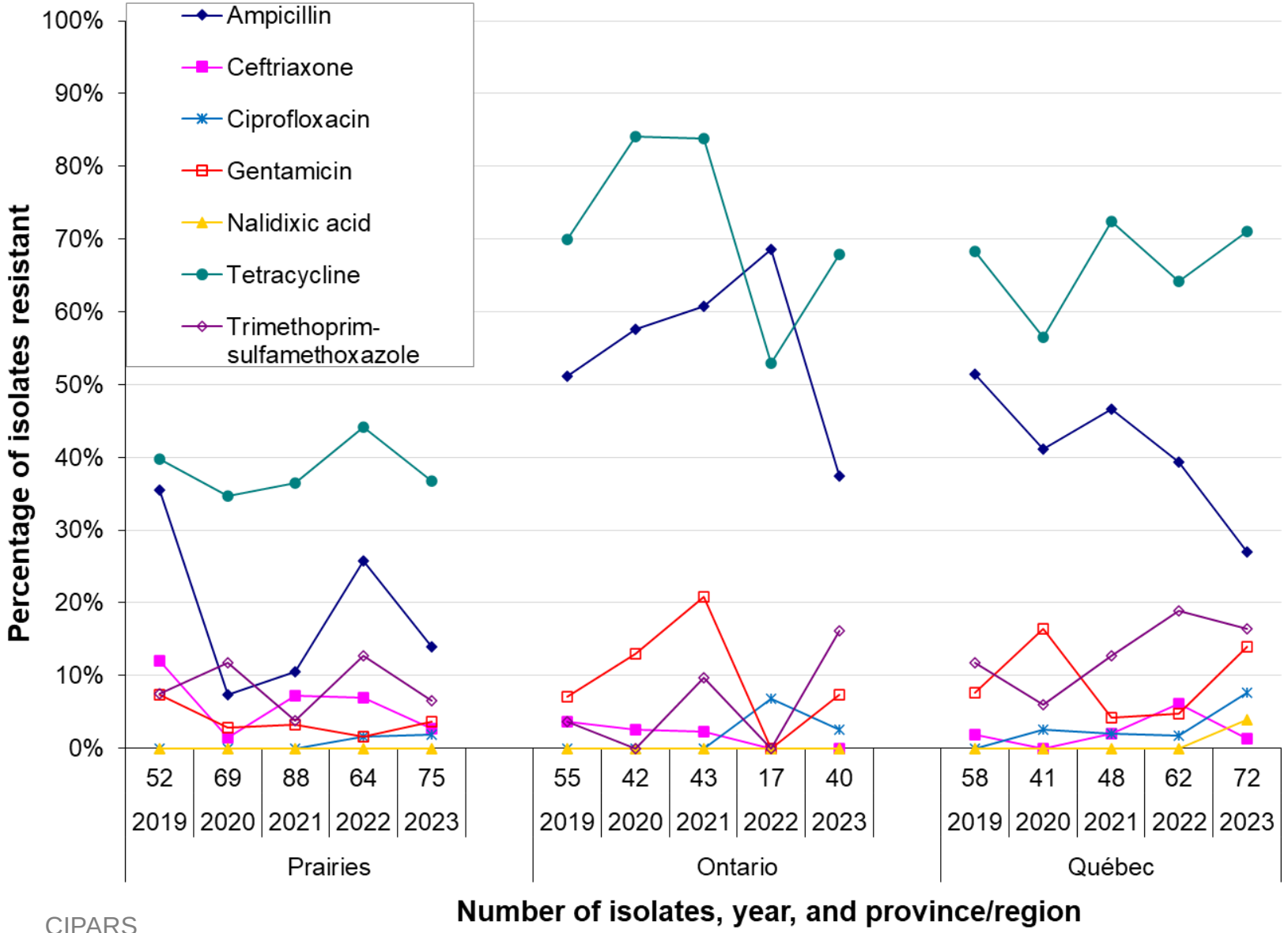
AMR (farm) - *Salmonella*

Prairies
- significant decrease in ampicillin resistance since 2019

Ontario
- significant decrease in ampicillin resistance since 2022
- significant increase in TMS resistance since 2019

Québec
- significant decrease in ampicillin resistance since 2019 and between 2022 and 2023
- significant increase in gentamicin resistance since 2022

Note: ciprofloxacin resistance increased in Ontario and the Prairies starting in 2022, and in Québec starting in 2020 (up to 7% in 2023).



CIPARS

AMR (Farm) – *E. coli*

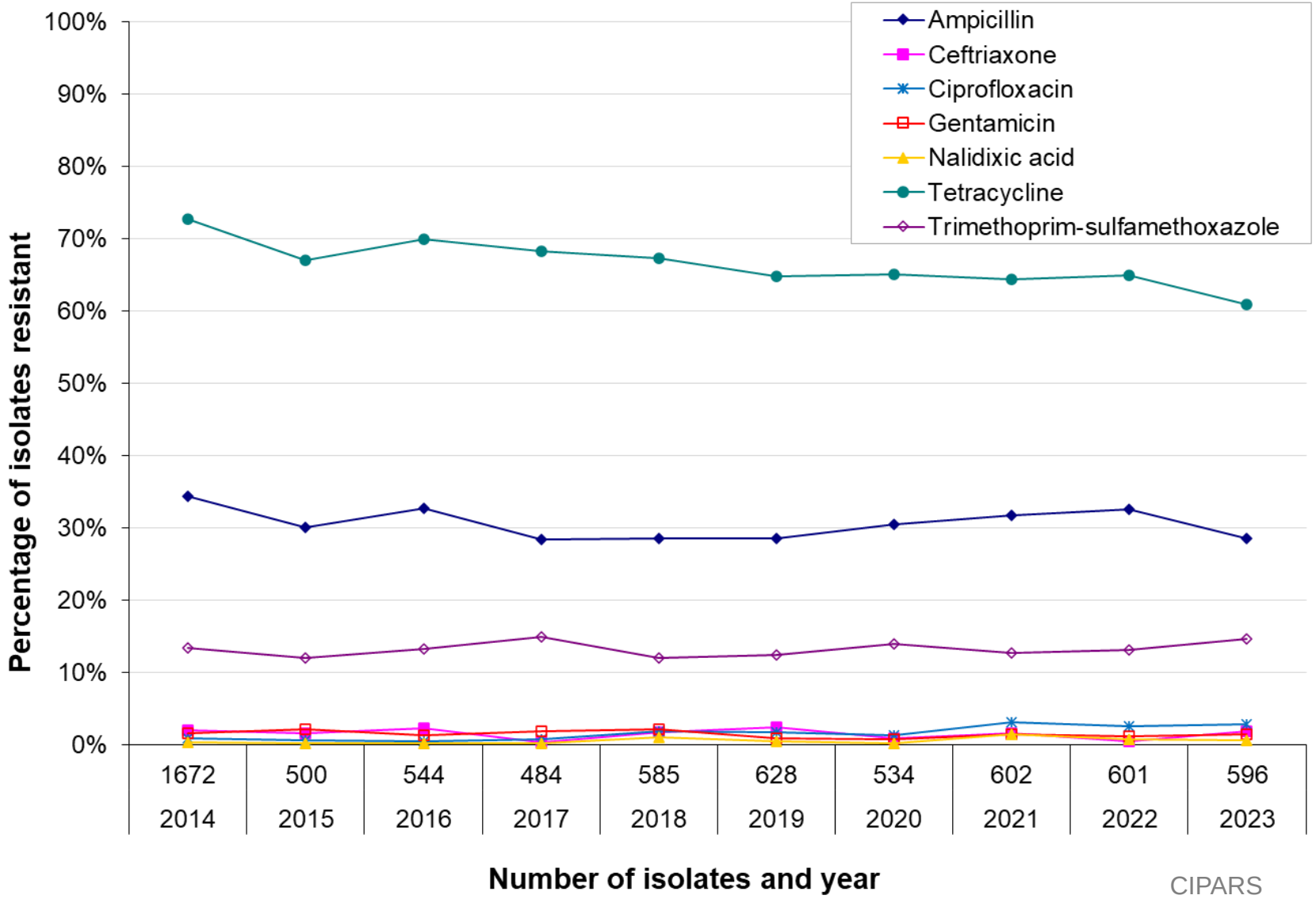
Significant decrease in tetracycline resistance since 2014.

Significant increase in ciprofloxacin resistance since 2014 (from 1% to 3%).

36% isolates susceptible to all tested antimicrobials.

19% resistant to 3 or more antimicrobials.

No resistance to meropenem or colistin in 2023.



CIPARS

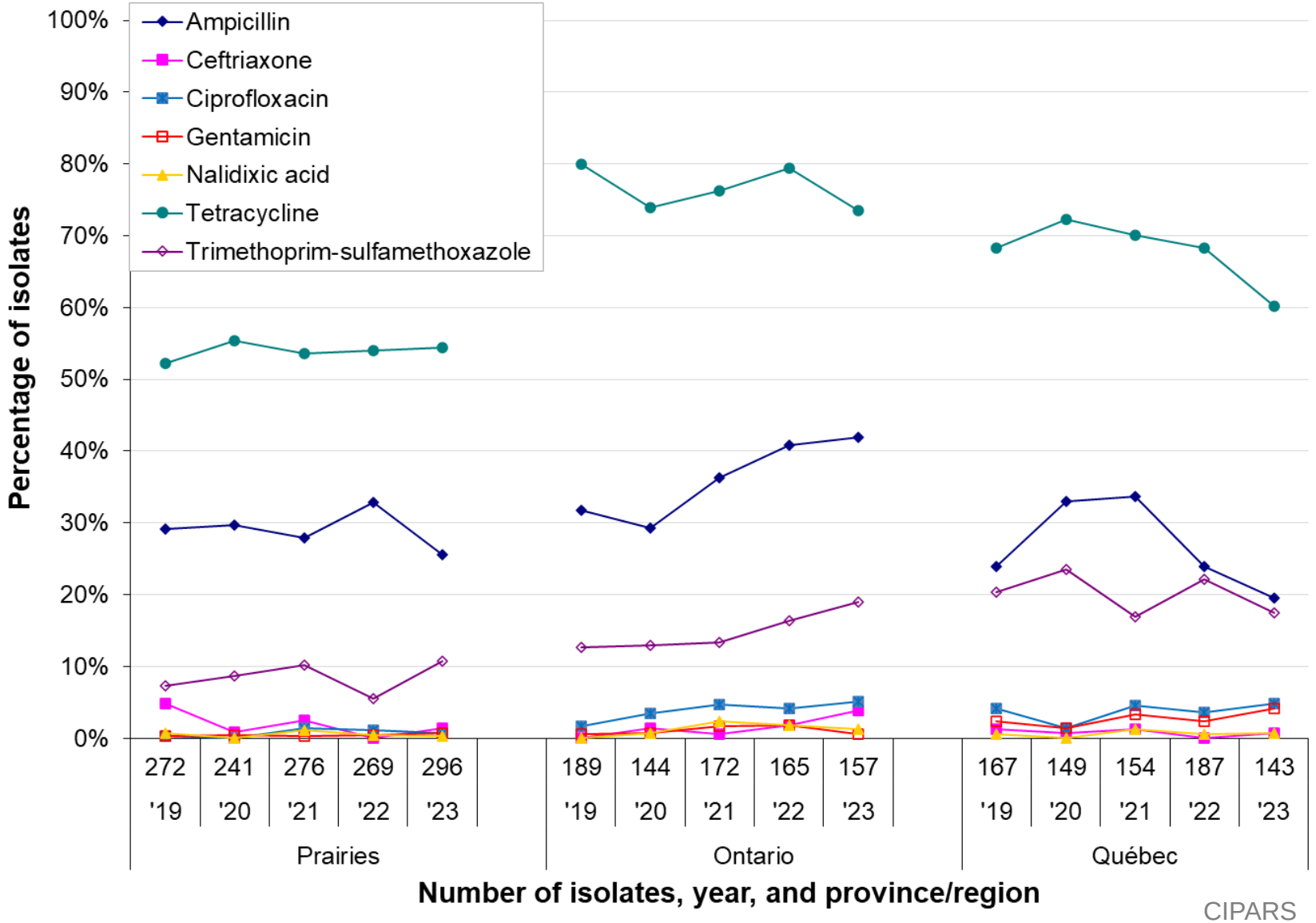
AMR (Farm) – *E. coli*

Prairies
- No significant changes in resistance since 2019 or since 2022.

Ontario
- Significant increase in ampicillin and TMS resistance since 2019

Québec
- No significant changes in resistance since 2019 or 2022.

Ciprofloxacin resistance low, higher in Ontario and Québec (both 5% in 2023) than the Prairies (1% in 2023)



CIPARS

AMR (farm) - *Campylobacter*

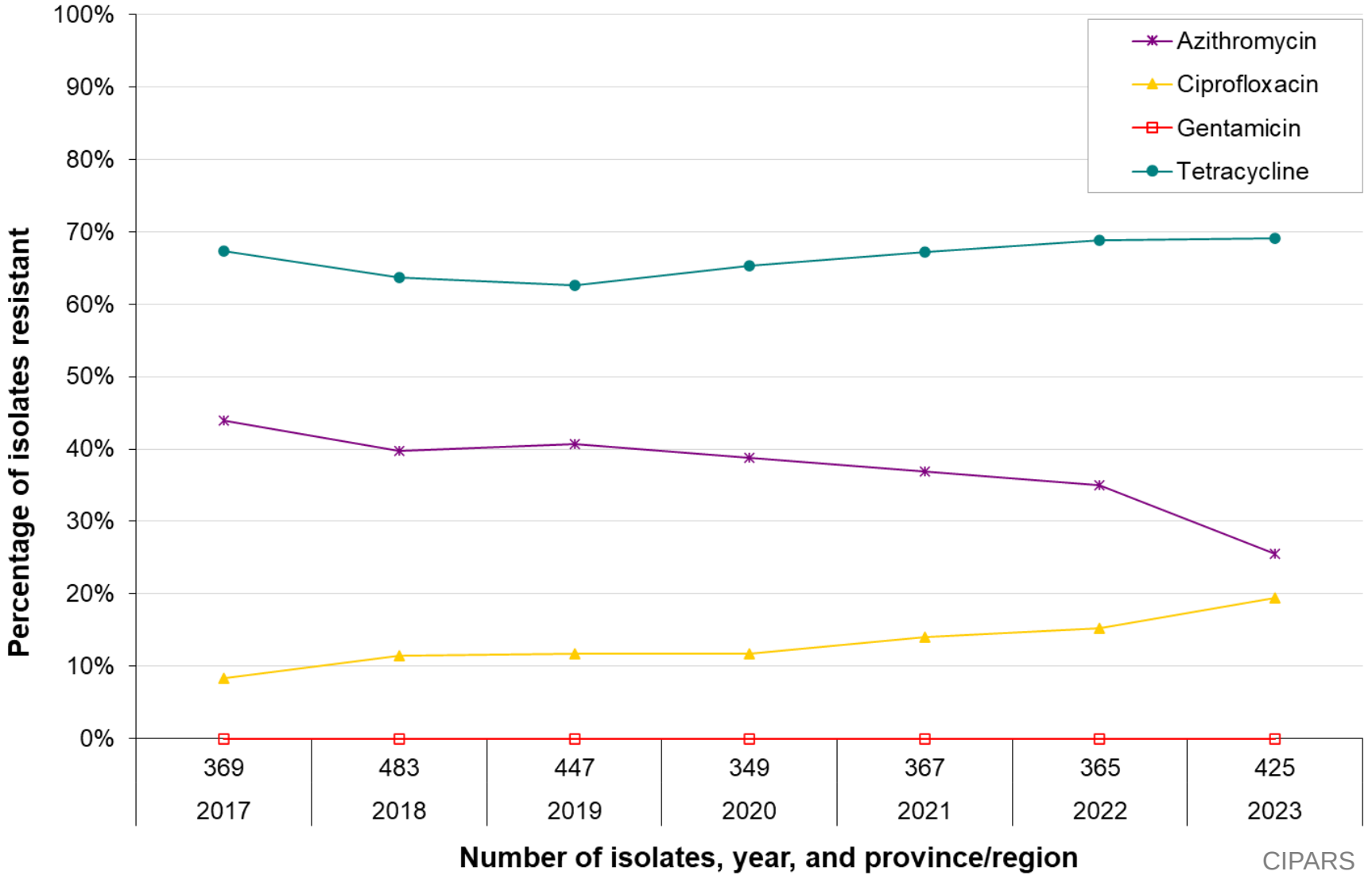
98% isolates were *C. coli*

Significant decrease in azithromycin resistance since 2017 and since 2022.

Significant increase in ciprofloxacin resistance since 2017 (from 8% to 20%).

20% of isolates were susceptible to all tested antimicrobials.

20% were resistant to 3 or more classes.



AMR (farm) - *Campylobacter*

Prairies

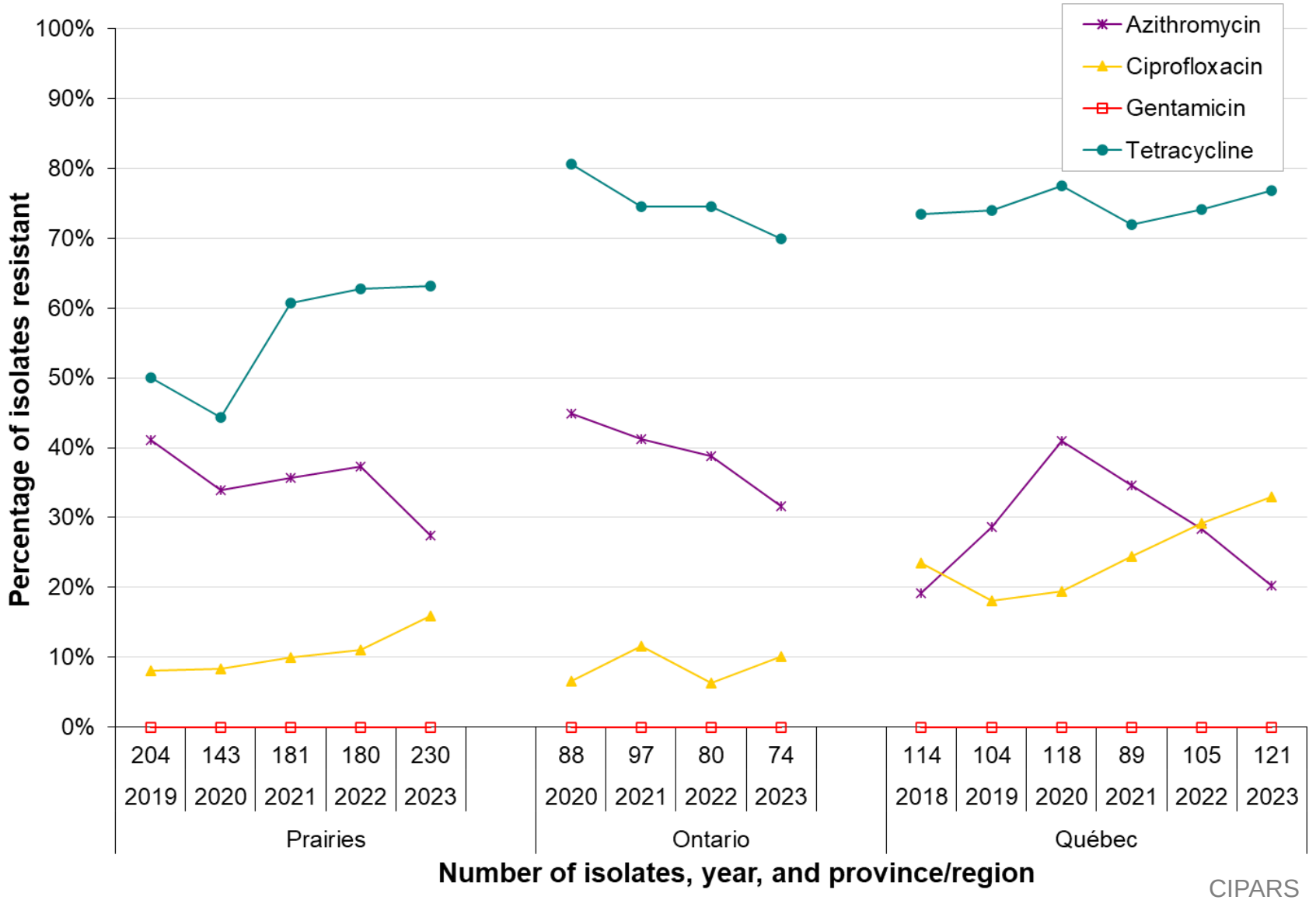
- Significant decrease in azithromycin resistance since 2019 and 2022.
- Significant increase in ciprofloxacin (to 16%) and tetracycline resistance since 2019.

Ontario

- Significant decrease in azithromycin resistance since 2019
- Ciprofloxacin resistance at 10% in 2023

Québec

- Significant increase in ciprofloxacin resistance since 2019 (from 17% to 33%).



CIPARS

AMR (Abattoir) – 2023 findings

Salmonella (n=160 pig isolates)

- Most common serovars: *Salmonella* Derby (n=27), I 4,[5],12:i:- (n=21), Infantis (n=15), Typhimurium (n=13) and Uganda (n=13).
- The national trend in increasing resistance to tetracycline, and ampicillin continued in 2023.
- Ciprofloxacin resistance has been detected intermittently since 2019 (around 1%).
- Two isolates from Quebec, I:4,[5],12:i:- (n=1) and Ohio (n=1) were resistant to 6 classes of antimicrobials.

E. coli (n=270 pig isolates)

- In 2023, 4 isolates were resistant to 5 classes of antimicrobials.
- There was a slight increase in resistance to ampicillin (35%), ceftriaxone (3%), and ciprofloxacin (3%) in 2023, compared to 2022. However, the proportion of isolates resistant to tetracycline continues to decrease nationally.

Campylobacter (n=192 pig isolates)

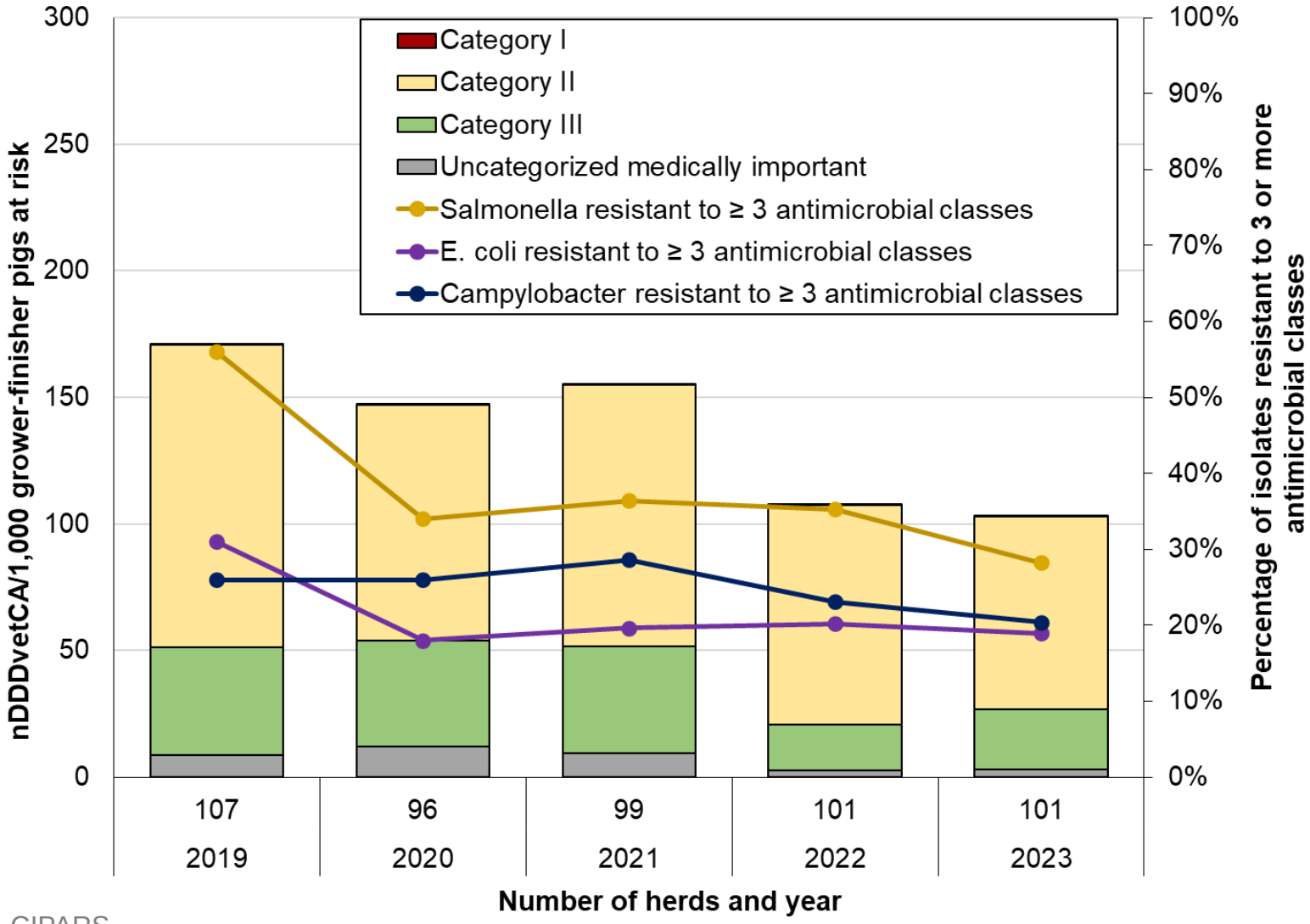
- Nearly all *Campylobacter* isolates were *Campylobacter* coli (n=190), except for two isolates that could not be speciated using PCR methodologies. No *C. jejuni* isolates were recovered.
- Azithromycin resistance increased slightly compared to 2022 (21% to 25%), with most azithromycin resistant isolates originating from samples from the Prairies.
- Ciprofloxacin resistance fluctuates between 6% and 14%.

Integrated AMU and AMR

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

Canada

Integrated AMU and resistance to 3 or more classes



CIPARS

Since 2019, there has been a decrease in the quantity of medically important antimicrobials used, and in the percentage of isolates resistant to 3 or more classes, or *Salmonella, E. coli* and *Campylobacter*.

However, for *E. coli*, resistance to 3 or more classes has been stable since 2020 (18% in 2020, 19% in 2023).

Key messages

Key messages

Antimicrobial use

- The percentage of medicated rations has decreased, especially in Québec
- The frequency of use in feed, water and by injection has not changed much Nationally in the last 5 years, although there are regional differences
- By all routes, use in kg has increased since 2022, when accounting for biomass and dose there was a small decrease
- The quantity of use (adjusted) in feed has decreased, especially in Québec
- Overall trending decrease in use for respiratory disease, ongoing regional differences in reason for use
- Approximately 85% of MIAs reported by compounders are sold for use in pigs (primarily in Québec and Ontario)

Key messages

Antimicrobial resistance*

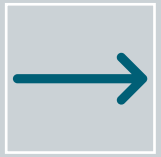
- Tetracycline resistance has decreased in *Salmonella (*on-farm*)* and *E. coli (*on-farm and abattoir)
- Ampicillin resistance decreased in *Salmonella,* and azithromycin resistance decreased in *Campylobacter*
- Ciprofloxacin resistance is increasing in all bacteria, and there are regional differences in resistance
- On farm: one Salmonella isolate was resistant to ten antimicrobials
- Abattoir: two *Salmonella* isolates resistant to six classes, four *E. coli* isolates resistant to five classes

*Results pertain to farm data unless otherwise noted

Key messages

Integrated use and resistance

On farm: Since 2019 there has been a decreasing trend in the quantity of MIAs used and in resistance to 3 or more classes of antimicrobials for *Salmonella, Campylobacter and E. coli*



However, for *E. coli*, resistance to 3 or more classes has been stable since 2020

Where can I find more information?

CIPARS Interactive data visualizations

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

CARSS Interactive data visualizations

Farm: https://health-infobase.canada.ca/carss/amu/results.html?ind=06

Sales: https://health-infobase.canada.ca/carss/amu/results.html?ind=05

CIPARS website

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

Acknowledgements

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Human (AMR)

- Provincial Public Health Laboratories, FoodNet Canada (Campylobacter), National Enteric Surveillance Program (NESP), NML Dept of Enteric Diseases and PulseNet Canada

Farm (AMR and AMU):

- The veterinarians, producers and commodity groups who participate in the farm program, Alberta Agriculture and Saskatchewan Agriculture, Ontario Ministry of Agriculture, Food and Rural Affairs, Canadian Poultry Research Council, Fisheries and Oceans Canada (DFO)

Abattoir:

- The CFIA, abattoir operators, samplers and personnel

Retail:

- All the participating health units and institutions
- FoodNet Canada

Clinical Animal Isolates:

- Provincial Animal Health Laboratories

Antimicrobial Sales - distribution in animals:

- Health Canada's Veterinary Drugs Directorate

Antimicrobial Use - distribution in humans:

- AMR Task Force and IQVIA

Antimicrobials Sold as Pesticides for use in Crops

- Health Canada's Pest Management Regulatory Agency

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Mentimeter

CIPARS Grower-finisher Pig Component Presentation 2023

World Antimicrobial Resistance Awareness Week

November 19, 2023