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Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS)

Human Antimicrobial Use Short Report

2000–2009

...working towards the preservation of effective antimicrobials for humans and animals...

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For further information or to provide comments please contact:

Jennifer Baker
Public Health Agency
160 Research Lane, Suite 103
Guelph, ON
N1G 5B2
Canada

or send an e-mail to cipars-picra@phac-aspc.gc.ca.

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CIPARS Coordinators

Rita Finley,[1] Rebecca Irwin,[2] Michael Mulvey,[3] and Lai-King Ng[3]

Human Antimicrobial Use Surveillance Component Lead

Rita Finley

Authors/Analyst

Rita Finley

Report Coordinator

Michelle Tessier

Report Production

Michelle Tessier
Virginia Young

External Reviewers

Dr. Jim Hutchinson, Victoria, British Columbia
Dr. David Patrick, University of British Columbia
Dr. Lynora Saxinger, University of Alberta
Joan Pollari, Brantford, Ontario

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[1] Centre for Foodborne, Environmental and Zoonotic Infectious Diseases
[2] Laboratory for Foodborne Zoonoses
[3] National Microbiology Laboratory

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Preamble

The Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) is pleased to present for the first time an independent short report on antimicrobial use (AMU) in humans. This 2011 release contains final data of AMU surveillance in humans from 2000 to 2009 inclusive.

CIPARS Objectives

- Provide a unified approach to monitor trends in antimicrobial resistance and antimicrobial use in humans and animals.
- Disseminate timely surveillance data.
- Facilitate assessment of the public health impact of antimicrobials used in humans and agricultural sectors.
- Allow accurate comparisons with data from other countries that use similar surveillance systems.

Surveillance of Antimicrobial Use

Antimicrobial use surveillance in humans includes data obtained from the Canadian CompuScript dataset purchased from IMS Brogan for the years 2000 through 2009. This dataset contains information on prescriptions for oral antimicrobials dispensed by a representative sample of Canadian retail pharmacies, approximately 5,092. A projection factor was used by IMS Brogan to extrapolate the number of prescriptions dispensed in the stores actually sampled to that of the "universe" (7,980 pharmacies).

Defined daily doses (DDD) were based on the WHO Collaborating Centre for Drug Statistics Methodology guidelines. The DDD is the assumed average maintenance dose per day for a drug used for its main indication in adults. This statistical measure is used to standardize antimicrobial usage and allow international comparisons to be made.

What's new in the 2009 Report

- More detailed tables and figures are provided for antimicrobial classes whose consumption consisted of more than 10% of the total number of DDD per 1,000 inhabitant-days of oral antimicrobials dispensed by retail pharmacies in Canada.
- Provincial level comparisons are presented for antimicrobials used for treatment of respiratory illness and urinary tract infections.

Important Notes

Antimicrobial Groupings

- ATC class: Antimicrobials have been classified by the WHO Anatomic Therapeutic Chemical (ATC) classification system[4] (see Table A.1 in Appendix)

[4] World Health Organization Collaborating Center for Drug Statistics Methodology. See: www.whocc.no/atc_ddd_index/. Accessed March 2011.

- Category of importance in human medicine: Antimicrobials have been categorized on the basis of importance in human medicine in accordance with the classification system of the Veterinary Drugs Directorate Health Canada (categories revised in April 2009, see table A.2 in Appendix).

Abbreviations of Canadian Provinces from West to East

- **BC** British Columbia
- **AB** Alberta
- **SK** Saskatchewan
- **MB** Manitoba
- **ON** Ontario
- **QC** Québec
- **NB** New Brunswick
- **NS** Nova Scotia
- **PEI** Prince Edward Island
- **NL** Newfoundland and Labrador

Antimicrobial Use

Canada Overall

Figure 1. Total number of prescriptions and total cost per 1,000 inhabitants for oral antimicrobials dispensed by retail pharmacies in Canada, 2000–2009.

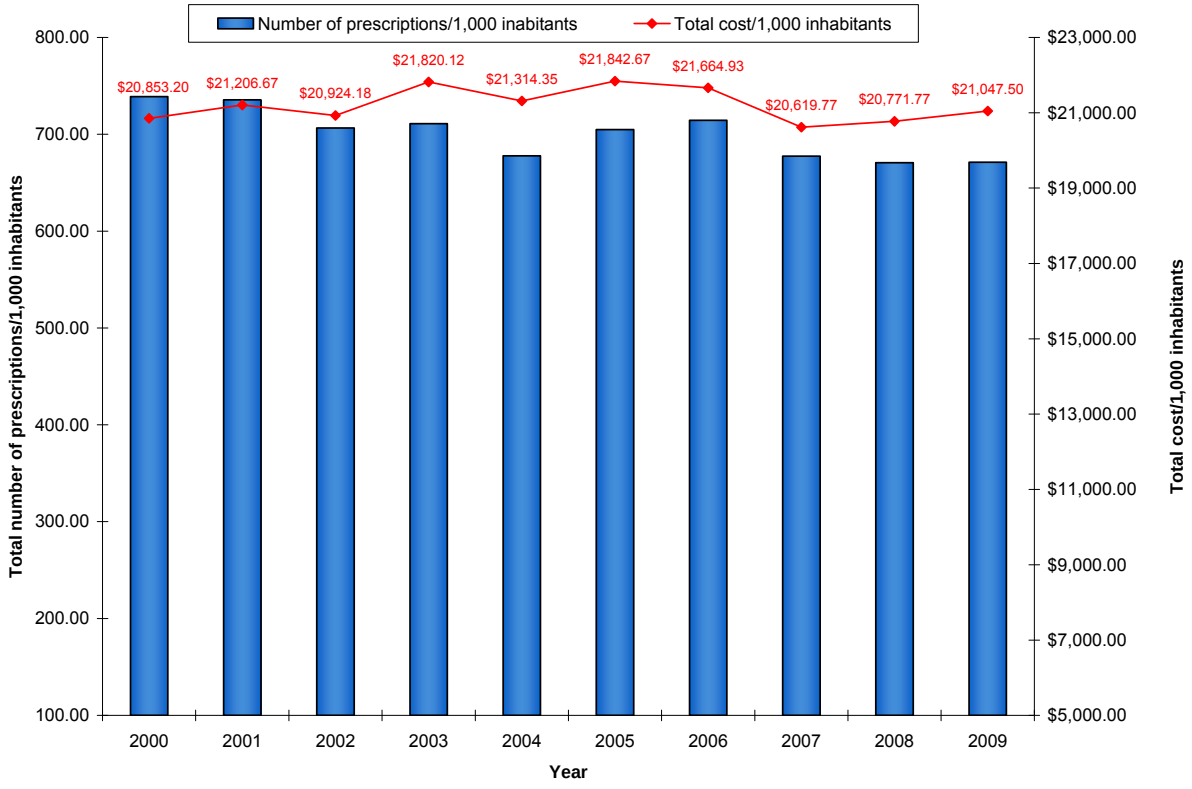


Table 1. Total number of prescriptions of oral antimicrobials dispensed by retail pharmacies per 1,000 inhabitants, 2000–2009.

	Antimicrobial	ATC Class	Number of prescriptions/1,000 inhabitants									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
I	Amoxicillin and enzyme inhibitor	Combinations of penicillins, including β-lactamase inhibitors (J01CR)	18.66	18.41	17.54	17.69	16.98	18.66	19.35	19.67	20.54	21.02
I	Cefixime	Third-generation cephalosporins (J01DD)	5.66	5.28	4.83	4.23	3.68	3.74	3.77	3.98	4.23	4.46
I	Ofloxacin, ciprofloxacin, norfloxacin, levofloxacin, moxifloxacin	Fluoroquinolones (J01MA)	76.23	81.03	85.73	91.74	94.22	95.30	98.66	97.58	97.42	96.40
I	Vancomycin	Glycopeptides (J01XA)	0.14	0.14	0.16	0.19	0.34	0.39	0.37	0.40	0.42	0.48
I	Metronidazole	Imidazole (J01XD)	NPD	16.65	16.71	17.09	17.25	17.41	18.50	17.70	18.06	18.60
I	Linezolid	Linezolid (J01XX)	NPD	< 0.01	0.01	0.02	0.04	0.04	0.04	0.05	0.05	0.07
II	Ampicillin, amoxicillin, pivampicillin	Penicillins with extended spectrum (J01CA)	193.18	183.54	171.05	169.81	156.08	168.34	168.93	158.51	155.79	157.44
II	Penicillin G, penicillin V	β-lactamase sensitive penicillins (J01CE)	45.42	42.10	39.85	39.62	36.59	36.89	37.25	34.87	32.93	32.09
II	Cloxacillin	β-lactamase resistant penicillins (J01CF)	19.78	18.38	16.78	15.61	14.17	12.49	11.87	10.34	9.30	8.35
II	Cephalexin, cefadroxil	First-generation cephalosporins (J01DB)	41.03	41.70	43.07	45.23	45.65	48.36	51.48	49.95	50.17	50.09
II	Cefaclor, cefprozil, cefuroxime axetil	Second-generation cephalosporins (J01DC)	55.09	48.95	43.06	41.41	39.37	39.65	37.39	32.64	30.78	29.74
II	Sulfamethoxazole and trimethoprim, sulfadiazine and trimethoprim	Combinations of sulfonamides and trimethoprim, including derivatives (J01EE)	56.52	50.62	44.56	41.05	37.12	35.15	35.45	33.67	33.57	33.11
II	Azithromycin, clarithromycin, erythromycin	Macrolides (J01FA)	146.55	149.72	145.48	149.00	138.51	149.25	146.93	134.69	132.75	131.97
II	Clindamycin	Lincosamides (J01FF)	15.92	16.74	17.63	18.48	18.85	19.73	21.86	21.94	22.11	22.33
II	Tobramycin	Aminoglycosides (J01GB)	0.06	< 0.01	< 0.01	< 0.01	< 0.01	NPD	0.05	0.06	0.06	0.08
II	Nalidixic acid	Other quinolones, excluding fluoroquinolones (J01MB)	0.08	0.06	0.05	0.04	0.05	< 0.01	< 0.01	< 0.01	NPD	< 0.01
II	Erythromycin-sulfisoxazole	Sulfonamide combinations, excluding trimethoprim (J01RA)	3.50	2.43	1.58	1.05	0.67	0.60	0.52	0.36	0.12	< 0.01
II	Fusidic acid	Steroid antibacterials (J01XC)	0.06	0.06	0.05	0.05	0.05	0.06	0.07	0.05	0.04	0.02

Roman numerals I to III indicate the ranking of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate.
ATC = Anatomical Therapeutic Chemical. NPD = No prescriptions dispensed.

Table 1 (continued). Total number of prescriptions of oral antimicrobials dispensed by retail pharmacies per 1,000 inhabitants, 2000–2009.

	Antimicrobial	ATC Class	Number of prescriptions/1,000 inhabitants									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	Doxycycline, minocycline, tetracycline	Tetracyclines (J01AA)	43.47	41.16	39.31	38.41	36.71	36.33	37.07	35.55	35.52	35.63
	Chloramphenicol	Amphenicols (J01BA)	< 0.01	< 0.01	< 0.01	NPD	< 0.01	< 0.01	NPD	NPD	NPD	NPD
	Trimethoprim	Trimethoprim and derivatives (J01EA)	2.22	2.12	2.13	2.16	2.02	1.85	1.95	1.93	1.87	1.91
III	Sulfamethizole, sulfapyridine, sulfisoxazole	Short-acting sulfonamides (J01EB)	0.07	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NPD
	Sulfadiazine, sulfamethoxazole	Intermediate-acting sulfonamides (J01EC)	0.02	< 0.01	< 0.01	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Nitrofurantoin	Nitrofuran derivatives (J01XE)	14.61	15.76	16.41	17.48	19.13	20.35	22.67	23.20	24.89	27.05
	Fosfomycin	Fosfomycin (J01XX)	0.44	0.47	0.29	0.21	0.14	0.11	0.09	0.05	0.01	0.02
NC	Methenamine	Methenamine (J01XX)	0.27	0.28	0.29	0.28	0.25	0.23	0.23	0.23	0.16	0.24
		Total (J01)	**738.98**	**735.62**	**706.57**	**710.89**	**677.86**	**704.95**	**714.52**	**677.44**	**670.79**	**671.10**

Roman numerals I to III indicate the ranking of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate.
ATC = Anatomical Therapeutic Chemical. NPD = No prescriptions dispensed. NC: Not classified.

Table 2. Total cost per 1,000 inhabitants for oral antimicrobials dispensed by retail pharmacies in Canada, 2000–2009.

	Antimicrobial	ATC Class	Total cost/1,000 inhabitants ($)									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
I	Amoxicillin and enzyme inhibitor	Combinations of penicillins, including β-lactamase inhibitors (J01CR)	758.68	741.82	644.84	632.84	584.65	631.09	663.15	670.70	690.52	717.44
	Cefixime	Third-generation cephalosporins (J01DD)	212.26	196.78	179.57	155.33	133.22	137.49	136.28	147.65	158.87	169.24
	Ofloxacin, ciprofloxacin, norfloxacin, levofloxacin, moxifloxacin	Fluoroquinolones (J01MA)	4,285.71	4,555.96	4,758.29	5,078.69	4,859.20	4,280.24	4,176.93	4,197.10	4,195.61	4,127.83
	Vancomycin	Glycopeptides (J01XA)	51.03	54.88	62.08	76.38	131.23	148.95	145.53	159.23	160.72	184.91
	Metronidazole	Imidazole (J01XD)	NPD	198.89	224.55	243.26	261.21	268.74	295.80	282.08	290.78	302.53
	Linezolid	Linezolid (J01XX)	NPD	6.36	19.53	43.61	71.59	95.82	91.62	98.97	99.08	117.86
II	Ampicillin, amoxicillin, pivampicillin	Penicillins with extended spectrum (J01CA)	2,662.57	2,559.11	2,416.25	2,456.31	2,295.16	2,452.44	2,471.71	2,388.37	2,886.96	3,025.90
	Penicillin G, penicillin V	β-lactamase sensitive penicillins (J01CE)	497.32	467.30	452.74	463.27	435.95	432.11	438.39	420.97	448.81	449.93
	Cloxacillin	β-lactamase resistant penicillins (J01CF)	287.70	272.68	251.58	242.19	226.14	197.11	189.03	168.99	199.32	186.62
	Cephalexin, cefadroxil	First-generation cephalosporins (J01DB)	736.71	756.44	798.94	863.21	890.36	933.03	1,000.26	980.32	1,214.80	1,250.52
	Cefaclor, cefprozil, cefuroxime axetil	Second-generation cephalosporins (J01DC)	2,335.89	2,134.36	1,820.11	1,807.37	1,797.76	1,851.94	1,815.33	1,540.95	1,288.65	1,240.21
	Sulfamethoxazole and trimethoprim, sulfadiazine and trimethoprim	Combinations of sulfonamides and trimethoprim, including derivatives (J01EE)	632.11	571.05	511.01	481.11	438.79	407.76	412.08	398.39	398.02	393.95
	Azithromycin, clarithromycin, erythromycin	Macrolides (J01FA)	5,800.28	6,177.44	6,219.24	6,639.65	6,521.81	7,292.34	6,782.47	6,103.52	5,714.90	5,731.94
	Clindamycin	Lincosamides (J01FF)	666.80	605.60	635.04	654.75	675.26	698.80	773.50	781.53	781.11	801.07
	Tobramycin	Aminoglycosides (J01GB)	0.93	0.02	< 0.01	< 0.01	< 0.01	NPD	155.86	191.11	200.41	262.94
	Nalidixic acid	Other quinolones, excluding fluoroquinolones (J01MB)	3.62	3.01	2.53	2.27	2.16	0.07	0.02	< 0.01	NPD	< 0.01
	Erythromycin-sulfisoxazole	Sulfonamide combinations, excluding trimethoprim (J01RA)	95.14	66.22	43.47	29.38	19.60	18.21	15.81	11.31	3.80	0.00
	Fusidic acid	Steroid antibacterials (J01XC)	6.14	6.74	6.04	6.30	6.24	6.94	7.21	5.58	4.78	2.23
III	Doxycycline, minocycline, tetracycline	Tetracyclines (J01AA)	1,456.11	1,451.83	1,485.89	1,524.95	1,512.46	1,516.34	1,566.65	1,528.94	1,455.03	1,443.62
	Chloramphenicol	Amphenicols (J01BA)	0.02	0.05	0.01	NPD	< 0.01	< 0.01	NPD	NPD	NPD	NPD
	Trimethoprim	Trimethoprim and derivatives (J01EA)	47.67	43.68	41.75	39.62	35.03	31.60	32.45	31.48	29.34	33.13
	Sulfamethizole, sulfapyridine, sulfisoxazole	Short-acting sulfonamides (J01EB)	2.79	0.35	0.03	0.02	0.02	< 0.01	0.01	< 0.01	< 0.01	NPD
	Sulfadiazine, sulfamethoxazole	Intermediate-acting sulfonamides (J01EC)	0.45	0.40	0.32	0.48	0.22	0.17	0.16	0.18	0.14	< 0.01
	Nitrofurantoin	Nitrofuran derivatives (J01XE)	290.94	312.33	332.83	364.93	404.48	431.71	485.87	504.68	545.99	599.38
	Fosfomycin	Fosfomycin (J01XX)	14.71	16.06	10.39	7.60	5.52	4.43	3.59	2.11	0.39	0.90
NC	Methenamine	Methenamine (J01XX)	7.64	7.27	7.14	6.59	6.31	5.34	5.23	5.59	3.76	5.34
		Total (J01)	**20,853.20**	**21,206.67**	**20,924.18**	**21,820.12**	**21,314.35**	**21,842.67**	**21,664.93**	**20,619.77**	**20,771.77**	**21,047.50**

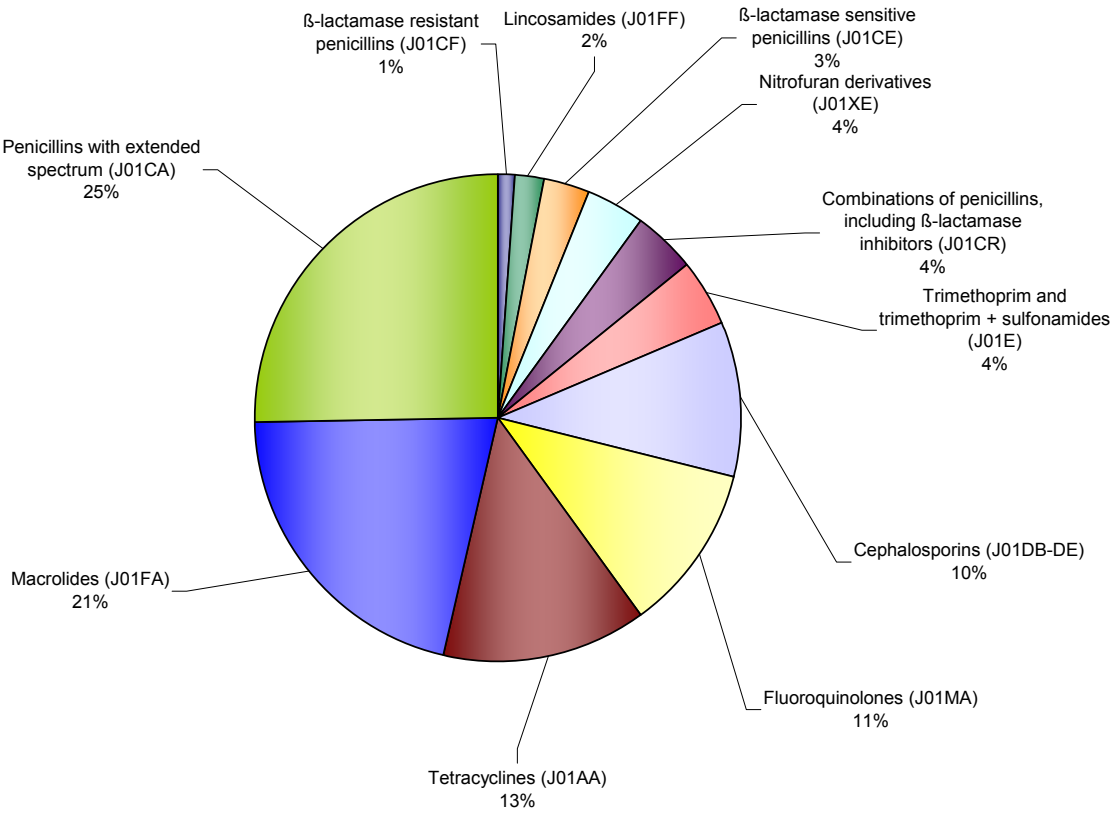
Roman numerals I to III indicate the ranking of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate.
ATC = Anatomical Therapeutic Chemical. NPD = No prescriptions dispensed. NC = Not classified.

Table 3. Defined daily doses per 1,000 inhabitant-days for oral antimicrobials dispensed by retail pharmacies in Canada, 2000–2009.

	Antimicrobial	ATC Class	DDD/1,000 inhabitant-days									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	Amoxicillin and enzyme inhibitor	Combinations of penicillins, including β-lactamase inhibitors (J01CR)	0.51	0.52	0.50	0.52	0.52	0.59	0.64	0.67	0.71	0.75
	Cefixime	Third-generation cephalosporins (J01DD)	0.10	0.09	0.08	0.07	0.06	0.06	0.06	0.06	0.07	0.07
I	Ofloxacin, ciprofloxacin, norfloxacin, levofloxacin, moxifloxacin	Fluoroquinolones (J01MA)	1.83	1.93	1.99	2.08	2.09	2.08	2.14	2.09	2.06	2.03
	Vancomycin	Glycopeptides (J01XA)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Metronidazole	Imidazole (J01XD)	NPD	0.21	0.22	0.22	0.22	0.23	0.24	0.23	0.24	0.24
	Linezolid	Linezolid (J01XX)	NPD	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Ampicillin, amoxicillin, pivampicillin	Penicillins with extended spectrum (J01CA)	5.07	4.90	4.63	4.57	4.38	4.52	4.61	4.43	4.43	4.54
	Penicillin G, penicillin V	β-lactamase sensitive penicillins (J01CE)	0.67	0.63	0.60	0.60	0.55	0.56	0.62	0.58	0.58	0.56
	Cloxacillin	β-lactamase resistant penicillins (J01CF)	0.37	0.35	0.32	0.31	0.28	0.25	0.24	0.21	0.19	0.18
	Cephalexin, cefadroxil	First-generation cephalosporins (J01DB)	0.75	0.77	0.80	0.85	0.87	0.92	1.00	0.97	0.98	0.98
	Cefaclor, cefprozil, cefuroxime axetil	Second-generation cephalosporins (J01DC)	1.39	1.22	1.05	1.00	0.94	0.96	0.91	0.83	0.80	0.78
	Sulfamethoxazole and trimethoprim, sulfadiazine and trimethoprim	Combinations of sulfonamides and trimethoprim, including derivatives (J01EE)	1.39	1.25	1.12	1.04	0.92	0.84	0.84	0.78	0.77	0.76
II	Azithromycin, clarithromycin, erythromycin	Macrolides (J01FA)	3.64	3.62	3.42	3.57	3.43	3.77	3.86	3.75	3.73	3.79
	Clindamycin	Lincosamides (J01FF)	0.24	0.27	0.28	0.31	0.32	0.32	0.36	0.37	0.38	0.39
	Tobramycin	Aminoglycosides (J01GB)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NPD	< 0.01	0.01	0.01	0.01
	Nalidixic acid	Other quinolones, excluding fluoroquinolones (J01MB)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NPD	< 0.01
	Erythromycin-sulfisoxazole	Sulfonamide combinations, excluding trimethoprim (J01RA)	0.03	0.02	0.01	0.01	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Fusidic acid	Steroid antibacterials (J01XC)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Doxycycline, minocycline, tetracycline	Tetracyclines (J01AA)	2.72	2.62	2.54	2.50	2.40	2.42	2.47	2.39	2.39	2.41
	Chloramphenicol	Amphenicols (J01BA)	< 0.01	< 0.01	< 0.01	NPD	< 0.01	< 0.01	NPD	NPD	NPD	NPD
	Trimethoprim	Trimethoprim and derivatives (J01EA)	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.05	0.05	0.05
III	Sulfamethizole, sulfapyridine, sulfisoxazole	Short-acting sulfonamides (J01EB)	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NPD
	Sulfadiazine, sulfamethoxazole	Intermediate-acting sulfonamides (J01EC)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Nitrofurantoin	Nitrofuran derivatives (J01XE)	0.42	0.44	0.45	0.47	0.49	0.52	0.57	0.58	0.61	0.66
	Fosfomycin	Fosfomycin (J01XX)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
NC	Methenamine	Methenamine (J01XX)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01
		Total (J01)	**19.23**	**18.93**	**18.11**	**18.21**	**17.58**	**18.13**	**18.64**	**18.03**	**18.00**	**18.20**

Roman numerals I to III indicate the ranking of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate.
ATC = Anatomical Therapeutic Chemical. DDD = Defined daily dose. NPD = No prescriptions dispensed. NC = Not classified.

Figure 2. Percentages of total number of defined daily doses per 1,000 inhabitant-days for oral antimicrobials dispensed by retail pharmacies in Canada, 2009.



Alphanumeric codes in parentheses represent Anatomical Therapeutic Chemical classes of antimicrobials.

Table 4. Total number of prescriptions for all oral antimicrobials dispensed by retail pharmacies per 1,000 inhabitants, 2000–2009.

	ATC Class	Antimicrobial	Number of prescriptions/1,000 inhabitants									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
II	Combinations of penicillins, including β-lactamase inhibitors (J01CR)	Amoxicillin and enzyme inhibitor (J01CR02)	18.66	18.41	17.54	17.69	16.98	18.66	19.35	19.67	20.54	21.02
II	Third-generation cephalosporins (J01DD)	Cefixime (J01DD08)	5.66	5.28	4.83	4.23	3.68	3.74	3.77	3.98	4.23	4.46
I	Fluoroquinolones (J01MA)	Ofloxacin (J01MA01)	1.78	1.47	1.22	1.09	0.98	0.84	0.85	0.74	0.64	0.55
I		Ciprofloxacin (J01MA02)	51.25	47.70	48.32	51.35	53.46	55.90	61.06	61.76	62.56	62.54
I		Norfloxacin (J01MA06)	12.49	12.06	11.43	10.71	10.06	9.30	8.83	7.58	6.96	6.42
I		Levofloxacin (J01MA12)	10.35	14.32	13.11	13.36	13.10	11.48	10.51	9.68	9.68	9.21
I		Moxifloxacin (J01MA14)	0.36	4.68	7.89	10.23	11.07	13.35	16.55	17.66	17.48	17.68
I	Glycopeptides (J01XA)	Vancomycin (J01XA01)	0.14	0.14	0.16	0.19	0.34	0.39	0.37	0.40	0.42	0.48
II	Imidazole (J01XD)	Metronidazole (J01XD01)	NPD	16.65	16.71	17.09	17.25	17.41	18.50	17.70	18.06	18.60
I	Linezolid (J01XX)	Linezolid (J01XX08)	NPD	< 0.01	0.01	0.02	0.04	0.04	0.04	0.05	0.05	0.07
II	Penicillins with extended spectrum (J01CA)	Ampicillin (J01CA01)	3.28	2.77	2.22	1.98	1.68	1.36	1.19	0.98	0.86	0.78
II		Amoxicillin (J01CA04)	179.87	172.09	162.04	162.10	149.79	163.86	165.55	155.76	154.31	156.66
II		Pivampicillin (J01CA02)	9.75	8.48	6.64	5.70	4.60	3.12	2.19	1.78	0.63	0.01
II	β-lactamase sensitive penicillins (J01CE)	Penicillin G (J01CE01)	0.13	0.08	0.02	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
II		Penicillin V (J01CE02)	45.29	42.02	39.83	39.62	36.59	36.89	37.25	34.87	32.93	32.09
II	β-lactamase resistant penicillins (J01CF)	Cloxacillin (J01CF02)	19.78	18.38	16.78	15.61	14.17	12.49	11.87	10.34	9.30	8.35
II	First-generation cephalosporins (J01DB)	Cephalexin (J01DB01)	39.09	39.63	40.87	42.88	43.28	45.93	48.70	47.15	47.25	47.07
II		Cefadroxil (J01DB05)	1.94	2.07	2.20	2.36	2.38	2.42	2.77	2.80	2.92	3.02
II	Second-generation cephalosporins (J01DC)	Cefaclor (J01DC04)	18.62	13.78	9.73	7.19	4.98	4.36	3.23	2.54	2.06	1.65
II		Cefprozil (J01DC10)	14.59	16.47	18.50	21.20	22.98	23.82	23.44	20.01	18.95	18.53
II		Cefuroxime axetil (J01DC02)	21.89	18.71	14.83	13.03	11.40	11.47	10.73	10.10	9.76	9.55
II	Combinations of sulfonamides and trimethoprim, including derivatives (J01EE)	Sulfamethoxazole and trimethoprim (J01EE01)	56.27	50.43	44.41	40.95	37.07	35.14	35.45	33.67	33.57	33.11
II		Sulfadiazine and trimethoprim (J01EE02)	0.25	0.20	0.15	0.11	0.05	0.01	< 0.01	NPD	< 0.01	< 0.01
II	Macrolides (J01FA)	Azithromycin (J01FA10)	42.49	52.86	59.62	66.16	61.02	66.06	65.36	59.71	58.99	58.39
II		Clarithromycin (J01FA09)	69.20	69.22	64.72	63.47	59.11	65.01	67.07	65.07	65.01	66.64
II		Erythromycin (J01FA01)	34.14	26.99	20.63	18.69	15.06	12.65	11.14	9.09	8.56	6.82
II	Lincosamides (J01FF)	Clindamycin (J01FF01)	15.92	16.74	17.63	18.48	18.85	19.73	21.86	21.94	22.11	22.33
II	Aminoglycosides (J01GB)	Tobramycin (J01GB01)	NPD	NPD	NPD	NPD	NPD	NPD	0.05	0.06	0.06	0.08
II	Other quinolones, excluding fluoroquinolones (J01MB)	Nalidixic acid (J01MB02)	0.08	0.06	0.05	0.04	0.05	< 0.01	< 0.01	< 0.01	NPD	< 0.01
II	Sulfonamide combinations, excluding trimethoprim (J01RA)	Erythromycin-sulfisoxazole (J01RA02)	3.50	2.43	1.58	1.05	0.67	0.60	0.52	0.36	0.12	< 0.01
II	Steroid antimicrobials (J01XC)	Fusidic acid (J01XC01)	0.06	0.06	0.05	0.05	0.05	0.06	0.07	0.05	0.04	0.02

Roman numerals I to III indicate the ranking of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate.
ATC = Anatomical Therapeutic Chemical. NPD = No prescriptions dispensed.

Table 4 (continued). Total number of prescriptions for all oral antimicrobials dispensed by retail pharmacies per 1,000 inhabitants, 2000–2009.

	ATC Class	Antimicrobial	Number of prescriptions/1,000 inhabitants									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
III	Tetracyclines (J01AA)	Doxycycline (J01AA02)	11.79	11.00	10.17	10.07	9.55	10.07	10.92	11.43	12.03	12.58
		Minocycline (J01AA08)	16.76	16.90	17.01	17.23	17.11	16.97	17.45	16.49	16.34	16.17
		Tetracycline (J01AA07)	14.91	13.23	12.08	11.07	10.01	9.26	8.66	7.61	7.14	6.88
	Amphenicols (J01BA)	Chloramphenicol (J01BA01)	< 0.01	< 0.01	< 0.01	NPD	< 0.01	< 0.01	NPD	NPD	NPD	NPD
	Trimethoprim and derivatives (J01EA)	Trimethoprim (J01EA01)	2.22	2.12	2.13	2.16	2.02	1.85	1.95	1.93	1.87	1.91
	Short-acting sulfonamides (J01EB)	Sulfamethizole (J01EB02), sulfapyridine (J01EB04), sulfisoxazole (J01EB05)	0.07	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NPD
	Intermediate-acting sulfonamides (J01EC)	Sulfadiazine (J01EC02), sulfamethoxazole (J01EC04)	0.02	< 0.01	< 0.01	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Nitrofuran derivatives (J01XE)	Nitrofurantoin (J01XE01)	14.61	15.76	16.41	17.48	19.13	20.35	22.67	23.20	24.89	27.05
	Fosfomycin (J01XX)	Fosfomycin (J01XX01)	0.44	0.47	0.29	0.21	0.14	0.11	0.09	0.05	0.01	0.02
NC	Methenamine (J01XX)	Methenamine (J01XX05)	0.27	0.28	0.29	0.28	0.25	0.23	0.23	0.23	0.16	0.24
	Total (J01)		**738.98**	**735.62**	**706.57**	**710.89**	**677.86**	**704.95**	**714.52**	**677.44**	**670.79**	**671.10**

Roman numerals I to III indicate the ranking of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate.
ATC = Anatomical Therapeutic Chemical. NPD = No prescriptions dispensed. NC = Not classified.

Table 5. Total defined daily doses per 1,000 inhabitant-days for all oral antimicrobials dispensed by retail pharmacies in Canada, 2000–2009.

	ATC Class	Antimicrobial	DDD/1,000 inhabitant-days									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	Combinations of penicillins, including β-lactamase inhibitors (J01CR)	Amoxicillin and enzyme inhibitor (J01CR02)	0.51	0.52	0.50	0.52	0.52	0.59	0.64	0.67	0.71	0.75
	Third-generation cephalosporins (J01DD)	Cefixime (J01DD08)	0.10	0.09	0.08	0.07	0.06	0.06	0.06	0.06	0.07	0.07
I	Fluoroquinolones (J01MA)	Ofloxacin (J01MA01)	0.13	0.11	0.09	0.08	0.07	0.06	0.06	0.05	0.05	0.04
		Ciprofloxacin (J01MA02)	1.14	1.06	1.04	1.07	1.08	1.11	1.20	1.20	1.20	1.20
		Norfloxacin (J01MA06)	0.28	0.27	0.26	0.24	0.22	0.21	0.19	0.17	0.15	0.14
		Levofloxacin (J01MA12)	0.27	0.36	0.32	0.33	0.32	0.29	0.27	0.25	0.24	0.23
		Moxifloxacin (J01MA14)	0.01	0.11	0.19	0.24	0.26	0.32	0.40	0.43	0.42	0.42
	Glycopeptides (J01XA)	Vancomycin (J01XA01)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Imidazole (J01XD)	Metronidazole (J01XD01)	NPD	0.21	0.22	0.22	0.22	0.23	0.24	0.23	0.24	0.24
	Linezolid (J01XX)	Linezolid (J01XX08)	NPD	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Penicillins with extended spectrum (J01CA)	Ampicillin (J01CA01)	0.06	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02
		Amoxicillin (J01CA04)	4.79	4.66	4.43	4.40	4.24	4.42	4.53	4.36	4.39	4.52
		Pivampicillin (J01CA02)	0.21	0.19	0.15	0.13	0.11	0.08	0.06	0.05	0.02	< 0.01
	β-lactamase sensitive penicillins (J01CE)	Penicillin G (J01CE01)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
		Penicillin V (J01CE02)	0.67	0.63	0.60	0.60	0.55	0.56	0.62	0.58	0.58	0.56
	β-lactamase resistant penicillins (J01CF)	Cloxacillin (J01CF02)	0.37	0.35	0.32	0.31	0.28	0.25	0.24	0.21	0.19	0.18
	First-generation cephalosporins (J01DB)	Cephalexin (J01DB01)	0.72	0.74	0.78	0.82	0.84	0.89	0.96	0.94	0.94	0.94
		Cefadroxil (J01DB05)	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04
	Second-generation cephalosporins (J01DC)	Cefaclor (J01DC04)	0.37	0.27	0.19	0.15	0.11	0.09	0.07	0.05	0.04	0.04
		Cefprozil (J01DC10)	0.22	0.25	0.29	0.34	0.38	0.39	0.39	0.35	0.34	0.33
		Cefuroxime axetil (J01DC02)	0.80	0.69	0.56	0.51	0.46	0.47	0.45	0.43	0.42	0.41
II	Combinations of sulfonamides and trimethoprim, including derivatives (J01EE)	Sulfamethoxazole and trimethoprim (J01EE01)	1.38	1.25	1.12	1.04	0.92	0.84	0.84	0.78	0.77	0.76
		Sulfadiazine and trimethoprim (J01EE02)	0.01	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	NPD	< 0.01	< 0.01
	Macrolides (J01FA)	Azithromycin (J01FA10)	0.53	0.65	0.73	0.82	0.76	0.83	0.83	0.78	0.78	0.79
		Clarithromycin (J01FA09)	2.22	2.25	2.11	2.23	2.18	2.48	2.64	2.68	2.70	2.79
		Erythromycin (J01FA01)	0.88	0.72	0.57	0.52	0.43	0.36	0.33	0.28	0.25	0.21
	Lincosamides (J01FF)	Clindamycin (J01FF01)	0.24	0.27	0.28	0.31	0.32	0.32	0.36	0.37	0.38	0.39
	Aminoglycosides (J01GB)	Tobramycin (J01GB01)	NPD	NPD	NPD	NPD	NPD	NPD	< 0.01	0.01	0.01	0.01
	Other quinolones, excluding fluoroquinolones (J01MB)	Nalidixic acid (J01MB02)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NPD	< 0.01
	Sulfonamide combinations, excluding trimethoprim (J01RA)	Erythromycin-sulfisoxazole (J01RA02)	0.03	0.02	0.01	0.01	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Steroid antimicrobials (j01XC)	Fusidic acid (J01XC01)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

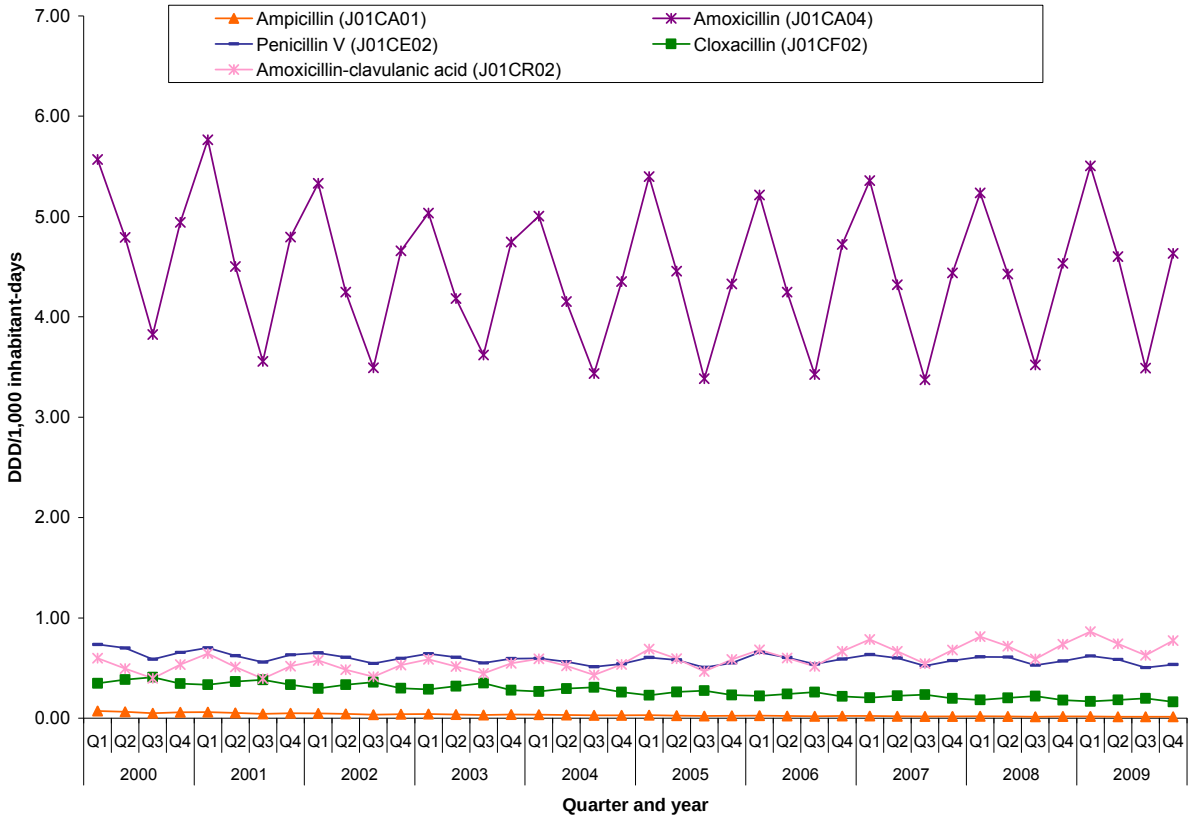
Roman numerals I to III indicate the ranking of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate.
ATC = Anatomical Therapeutic Chemical. DDD = Defined daily dose. NPD = No prescriptions dispensed.

Table 5 (continued). Total defined daily doses per 1,000 inhabitant-days for all oral antimicrobials dispensed by retail pharmacies in Canada, 2000–2009.

	ATC Class	Antimicrobial	DDD/1,000 inhabitant-days									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
III	Tetracyclines (J01AA)	Doxycycline (J01AA02)	0.75	0.73	0.70	0.71	0.70	0.74	0.81	0.85	0.91	0.96
		Minocycline (J01AA08)	0.97	1.00	1.01	1.04	1.03	1.04	1.07	1.02	1.00	0.99
		Tetracycline (J01AA07)	0.99	0.89	0.83	0.75	0.67	0.63	0.60	0.52	0.48	0.46
	Amphenicols (J01BA)	Chloramphenicol (J01BA01)	< 0.01	< 0.01	< 0.01	NPD	< 0.01	< 0.01	NPD	NPD	NPD	NPD
	Trimethoprim and derivatives (J01EA)	Trimethoprim (J01EA01)	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.05	0.05	0.05
	Short-acting sulfonamides (J01EB)	Sulfamethizole (J01EB02), sulfapyridine (J01EB04), sulfisoxazole (J01EB05)	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NPD
	Intermediate-acting sulfonamides (J01EC)	Sulfadiazine (J01EC02), sulfamethoxazole (J01EC04)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Nitrofuran derivatives (J01XE)	Nitrofurantoin (J01XE01)	0.42	0.44	0.45	0.47	0.49	0.52	0.57	0.58	0.61	0.66
	Fosfomycin (J01XX)	Fosfomycin (J01XX01)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
NC	Methenamine (J01XX)	Methenamine (J01XX05)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01
	Total (J01)		**19.23**	**18.93**	**18.11**	**18.21**	**17.58**	**18.13**	**18.64**	**18.03**	**18.00**	**18.20**

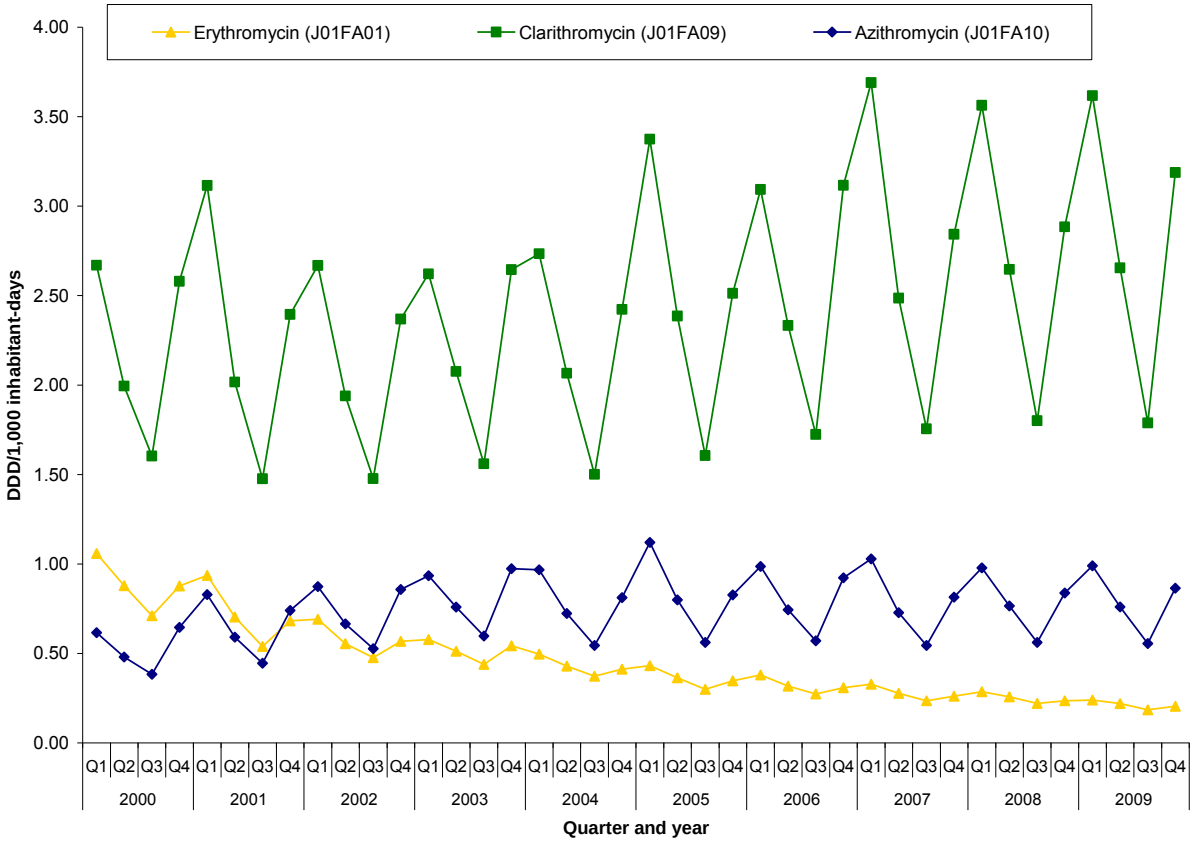
Roman numerals I to III indicate the ranking of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate.
ATC = Anatomical Therapeutic Chemical. DDD = Defined daily dose. NPD = No prescriptions dispensed. NC = Not classified.

Figure 3. Total consumption (DDD/1,000 inhabitant-days) by quarter of oral penicillins (J01C) dispensed by retail pharmacies in Canada, 2000–2009.



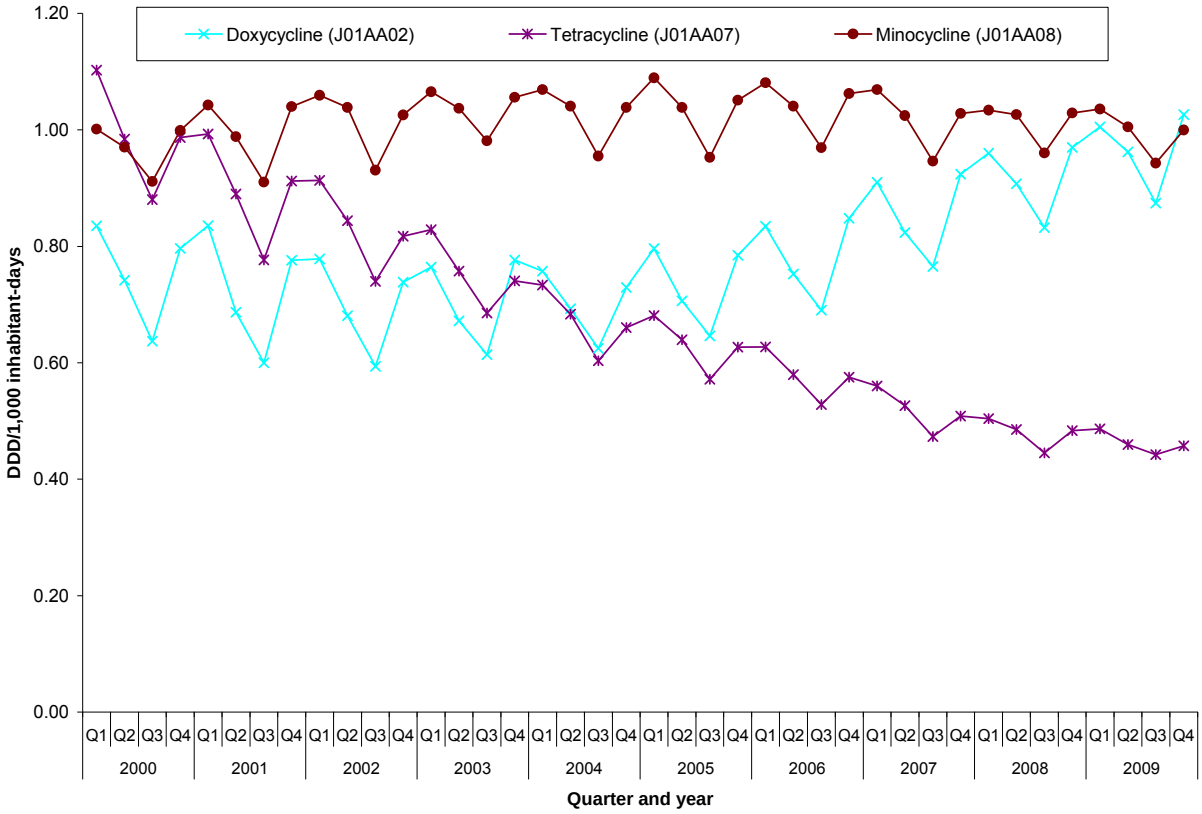
Alphanumeric codes represent Anatomical Therapeutic Chemical classes of antimicrobials.
DDD = Defined daily dose.

Figure 4. Total consumption (DDD/1,000 inhabitant-days) by quarter of oral macrolides (J01FA) dispensed by retail pharmacies in Canada, 2000–2009.



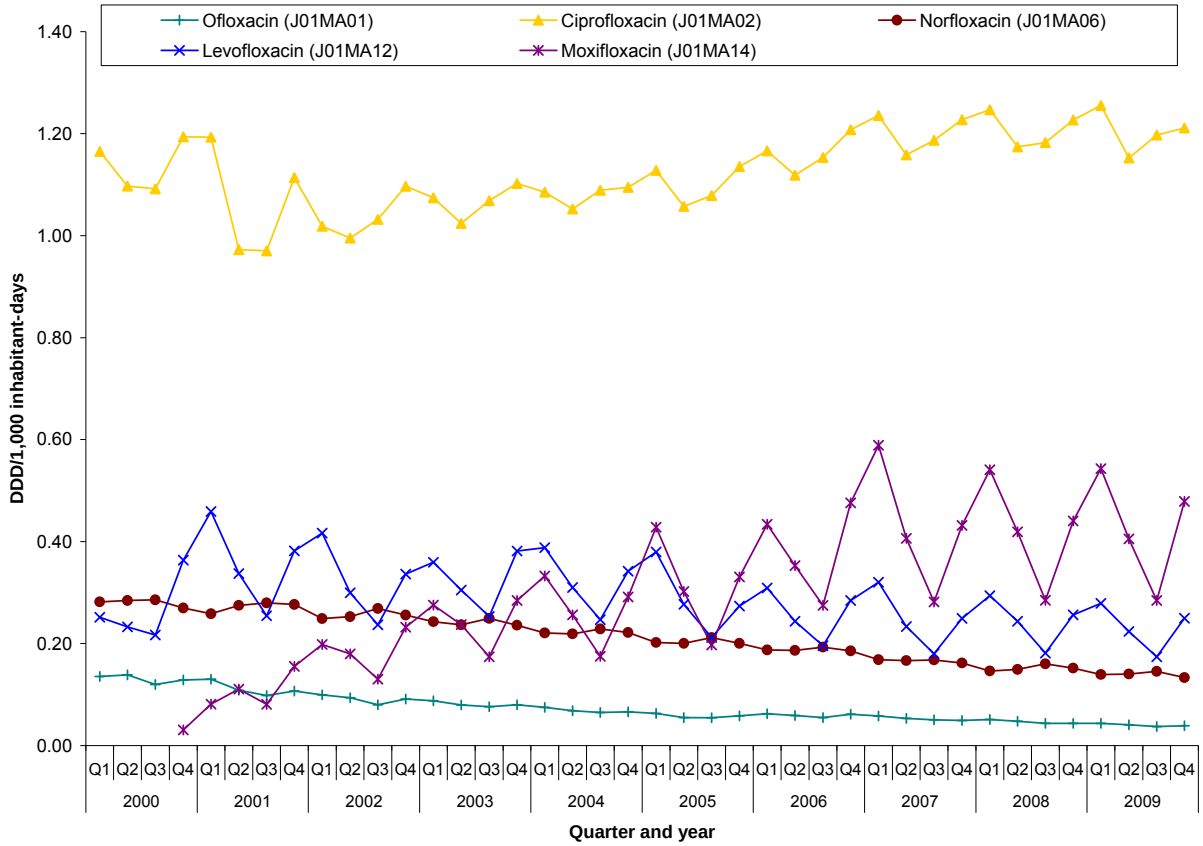
Alphanumeric codes represent Anatomical Therapeutic Chemical classes of antimicrobials.
DDD = Defined daily dose.

Figure 5. Total consumption (DDD/1,000 inhabitant-days) by quarter of oral tetracyclines (J01AA) dispensed by retail pharmacies in Canada, 2000–2009.



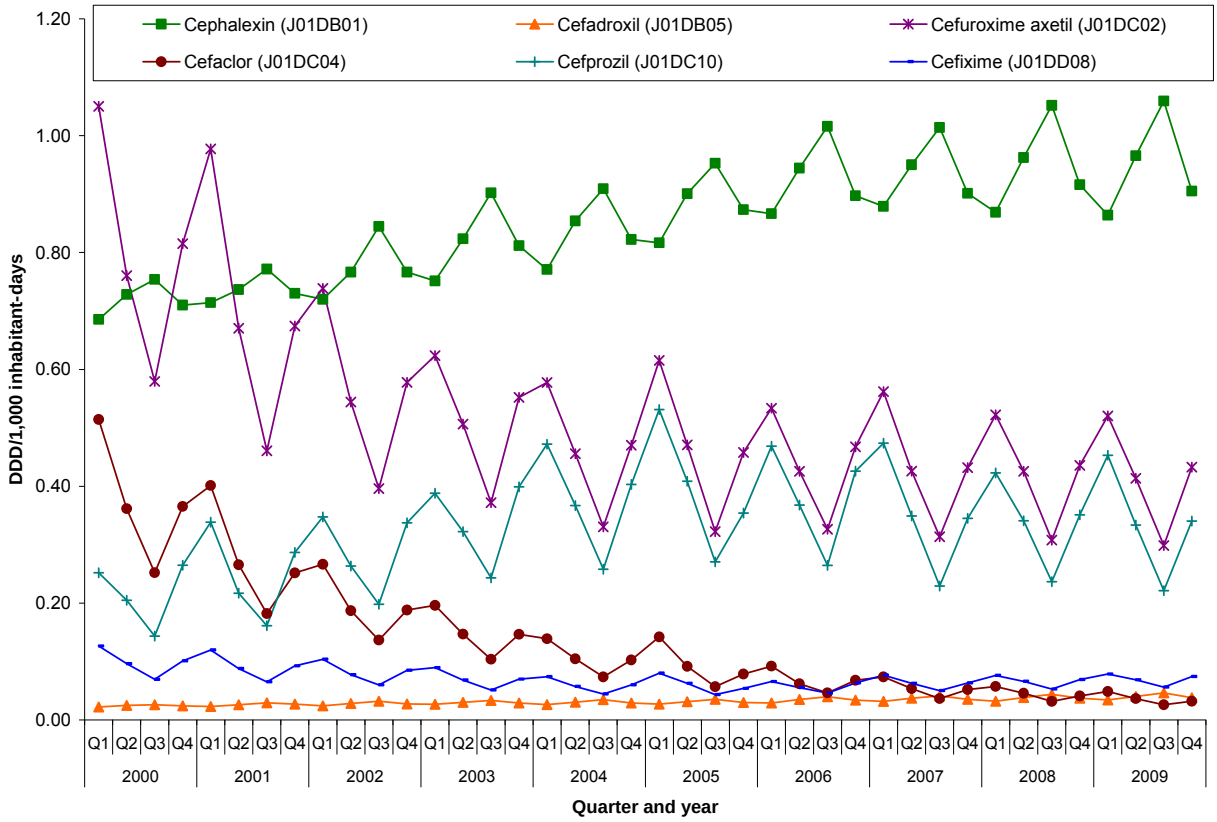
Alphanumeric codes represent Anatomical Therapeutic Chemical classes of antimicrobials.
DDD = Defined daily dose.

Figure 6. Total consumption (DDD/1,000 inhabitant-days) by quarter of oral fluoroquinolones (J01MA) dispensed by retail pharmacies in Canada, 2000–2009.



Alphanumeric codes represent Anatomical Therapeutic Chemical classes of antimicrobials.
DDD = Defined daily dose.

Figure 7. Total consumption (DDD/1,000 inhabitant-days) by quarter of oral cephalosporins (J01DB-DD) dispensed by retail pharmacies in Canada, 2000–2009.



Alphanumeric codes represent Anatomical Therapeutic Chemical classes of antimicrobials.
DDD = Defined daily dose.

Provincial Variations

Table 6. Total number of prescriptions of oral antimicrobials dispensed by retail pharmacies per 1,000 inhabitants in Canadian provinces, 2009.

	Antimicrobial	ATC Class	Number of prescriptions/1,000 inhabitants									
			BC	AB	SK	MB	ON	QC	NB	NS	PEI	NL
I	Amoxicillin and enzyme inhibitor	Combinations of penicillins, including β-lactamase inhibitors (J01CR)	19.97	23.69	18.21	19.05	16.49	26.01	20.82	24.75	46.14	51.87
	Cefixime	Third-generation cephalosporins (J01DD)	4.02	4.05	1.75	2.92	4.94	4.46	2.80	4.92	14.01	7.67
	Ofloxacin, ciprofloxacin, norfloxacin, levofloxacin, moxifloxacin	Fluoroquinolones (J01MA)	87.10	93.47	68.38	90.15	93.48	111.37	92.44	83.23	110.04	162.80
	Vancomycin	Glycopeptides (J01XA)	0.44	0.22	0.07	0.13	0.22	1.25	0.15	0.25	0.16	0.21
	Metronidazole	Imidazole (J01XD)	18.68	20.83	24.01	20.48	19.17	15.13	18.10	20.80	17.49	25.95
	Linezolid	Linezolid (J01XX)	0.07	0.04	0.05	0.01	0.04	0.14	0.01	0.04	0.01	0.08
II	Ampicillin, amoxicillin, pivampicillin	Penicillins with extended spectrum (J01CA)	142.36	165.03	250.45	187.22	186.19	88.76	160.59	165.37	176.87	302.22
	Penicillin G, penicillin V	β-lactamase sensitive penicillins (J01CE)	32.13	34.57	26.07	37.50	25.91	40.20	39.46	33.40	33.90	39.83
	Cloxacillin	β-lactamase resistant penicillins (J01CF)	8.37	7.59	17.36	20.94	7.70	6.17	6.72	9.39	9.36	17.74
	Cephalexin, cefadroxil	First-generation cephalosporins (J01DB)	62.86	60.86	94.53	61.77	50.83	25.95	56.19	57.84	57.51	79.98
	Cefaclor, cefprozil, cefuroxime axetil	Second-generation cephalosporins (J01DC)	14.86	24.08	13.06	18.01	36.59	31.98	41.56	36.85	13.64	32.94
	Sulfamethoxazole and trimethoprim, sulfadiazine and trimethoprim	Combinations of sulfonamides and trimethoprim, including derivatives (J01EE)	35.46	35.64	59.76	45.63	32.20	21.51	44.45	52.93	57.61	59.10
	Azithromycin, clarithromycin, erythromycin	Macrolides (J01FA)	103.09	127.78	130.78	140.60	150.77	113.35	146.50	139.12	174.18	183.38
	Clindamycin	Lincosamides (J01FF)	22.80	27.15	30.41	16.61	22.78	19.70	21.85	21.57	15.95	18.50
	Tobramycin	Aminoglycosides (J01GB)	0.06	0.06	0.16	0.08	0.07	0.12	0.20	< 0.01	NPD	< 0.01
	Fusidic acid	Steroid antibacterials (J01XC)	0.02	0.01	< 0.01	0.01	0.01	0.04	0.01	0.01	0.04	NPD
III	Doxycycline, minocycline, tetracycline	Tetracyclines (J01AA)	38.80	43.65	60.53	35.28	29.98	35.72	30.53	44.47	47.77	39.27
	Trimethoprim	Trimethoprim and derivatives (J01EA)	0.97	1.11	2.83	0.43	1.74	3.42	1.75	0.83	0.46	2.13
	Nitrofurantoin	Nitrofuran derivatives (J01XE)	28.39	22.70	40.92	17.52	34.59	15.19	26.69	36.56	25.16	19.76
	Fosfomycin	Fosfomycin (J01XX)	0.05	0.03	0.03	< 0.01	0.01	0.01	0.02	0.08	NPD	0.01
NC	Methenamine	Methenamine (J01XX)	0.23	0.14	0.10	< 0.01	0.11	0.59	0.15	0.05	NPD	0.02
		Total (J01)	**620.73**	**692.70**	**839.47**	**714.34**	**713.82**	**561.08**	**711.02**	**732.46**	**800.31**	**1,043.47**

Roman numerals I to III indicate the ranking of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate.
ATC = Anatomical Therapeutic Chemical. NPD = No prescriptions dispensed. NC = Not classified.
Certain antimicrobials were removed from this table due to low (< 0.01 prescriptions/1,000 inhabitants) to no sales reported among the provinces. These are: nalidixic acid, sulfonamides, combinations with other antimicrobials excluding trimethoprim, sulfadiazine, sulfamethoxazole, chloramphenicol, sulfamethizole, sulfapyridine, and sulfisoxazole.

Table 7. Total consumption (DDDs/1,000 inhabitant-days) of oral antimicrobials dispensed by retail pharmacies in Canadian provinces, 2009.

	Antimicrobial	ATC Class	DDD/1,000 inhabitant-days									
			BC	AB	SK	MB	ON	QC	NB	NS	PEI	NL
I	Amoxicillin and enzyme inhibitor	Combinations of penicillins, including β-lactamase inhibitors (J01CR)	0.70	0.82	0.58	0.69	0.58	0.96	0.81	0.89	1.48	1.70
I	Cefixime	Third-generation cephalosporins (J01DD)	0.08	0.06	0.02	0.04	0.08	0.05	0.05	0.08	0.30	0.17
I	Ofloxacin, ciprofloxacin, norfloxacin, levofloxacin, moxifloxacin	Fluoroquinolones (J01MA)	1.68	1.98	1.40	1.93	2.16	2.02	2.03	1.95	2.40	4.44
I	Vancomycin	Glycopeptides (J01XA)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
I	Metronidazole	Imidazole (J01XD)	0.24	0.27	0.29	0.28	0.26	0.20	0.24	0.27	0.23	0.33
I	Linezolid	Linezolid (J01XX)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
II	Ampicillin, amoxicillin, pivampicillin	Penicillins with extended spectrum (J01CA)	4.01	4.69	6.94	5.59	5.21	2.85	5.06	4.87	4.94	9.09
II	Penicillin G, penicillin V	β-lactamase sensitive penicillins (J01CE)	0.55	0.60	0.47	0.60	0.45	0.70	0.67	0.58	0.68	0.71
II	Cloxacillin	β-lactamase resistant penicillins (J01CF)	0.17	0.16	0.35	0.45	0.16	0.13	0.15	0.20	0.19	0.38
II	Cephalexin, cefadroxil	First-generation cephalosporins (J01DB)	1.21	1.21	1.92	1.22	1.03	0.42	1.24	1.22	1.20	1.71
II	Cefaclor, cefprozil, cefuroxime axetil	Second-generation cephalosporins (J01DC)	0.56	0.62	0.38	0.49	0.87	0.78	1.68	1.15	0.43	1.43
II	Sulfamethoxazole and trimethoprim, sulfadiazine and trimethoprim	Combinations of sulfonamides and trimethoprim, including derivatives (J01EE)	0.91	0.96	1.41	1.05	0.73	0.38	1.03	1.17	1.34	1.71
II	Azithromycin, clarithromycin, erythromycin	Macrolides (J01FA)	3.35	3.90	3.09	3.32	4.13	3.40	4.20	3.95	4.66	6.22
II	Clindamycin	Lincosamides (J01FF)	0.40	0.49	0.57	0.32	0.38	0.35	0.42	0.40	0.32	0.32
II	Tobramycin	Aminoglycosides (J01GB)	0.01	0.01	0.01	0.01	0.01	< 0.01	0.03	< 0.01	NPD	< 0.01
II	Nalidixic acid	Other quinolones, excluding fluoroquinolones (J01MB)	NPD	NPD	NPD	NPD	< 0.01	NPD	NPD	NPD	NPD	NPD
II	Erythromycin-sulfisoxazole	Sulfonamide combinations, excluding trimethoprim (J01RA)	NPD	NPD	NPD	NPD	NPD	< 0.01	NPD	NPD	NPD	NPD
II	Fusidic acid	Steroid antibacterials (J01XC)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	NPD
III	Doxycycline, minocycline, tetracycline	Tetracyclines (J01AA)	2.87	3.02	4.28	2.59	2.36	1.68	1.86	2.84	3.33	2.50
III	Trimethoprim	Trimethoprim and derivatives (J01EA)	0.04	0.03	0.11	0.01	0.06	0.05	0.05	0.02	0.01	0.11
III	Sulfadiazine, sulfamethoxazole	Intermediate-acting sulfonamides (J01EC)	NPD	< 0.01	NPD	NPD	< 0.01	NPD	NPD	NPD	NPD	NPD
III	Nitrofurantoin	Nitrofuran derivatives (J01XE)	0.68	0.61	1.04	0.47	0.83	0.32	0.74	0.97	0.75	0.60
III	Fosfomycin	Fosfomycin (J01XX)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NPD	< 0.01
NC	Methenamine	Methenamine (J01XX)	0.01	0.01	0.01	< 0.01	< 0.01	0.01	0.01	< 0.01	NPD	< 0.01
		Total (J01)	**17.46**	**19.42**	**22.86**	**19.06**	**19.30**	**14.30**	**20.28**	**20.56**	**22.27**	**31.44**

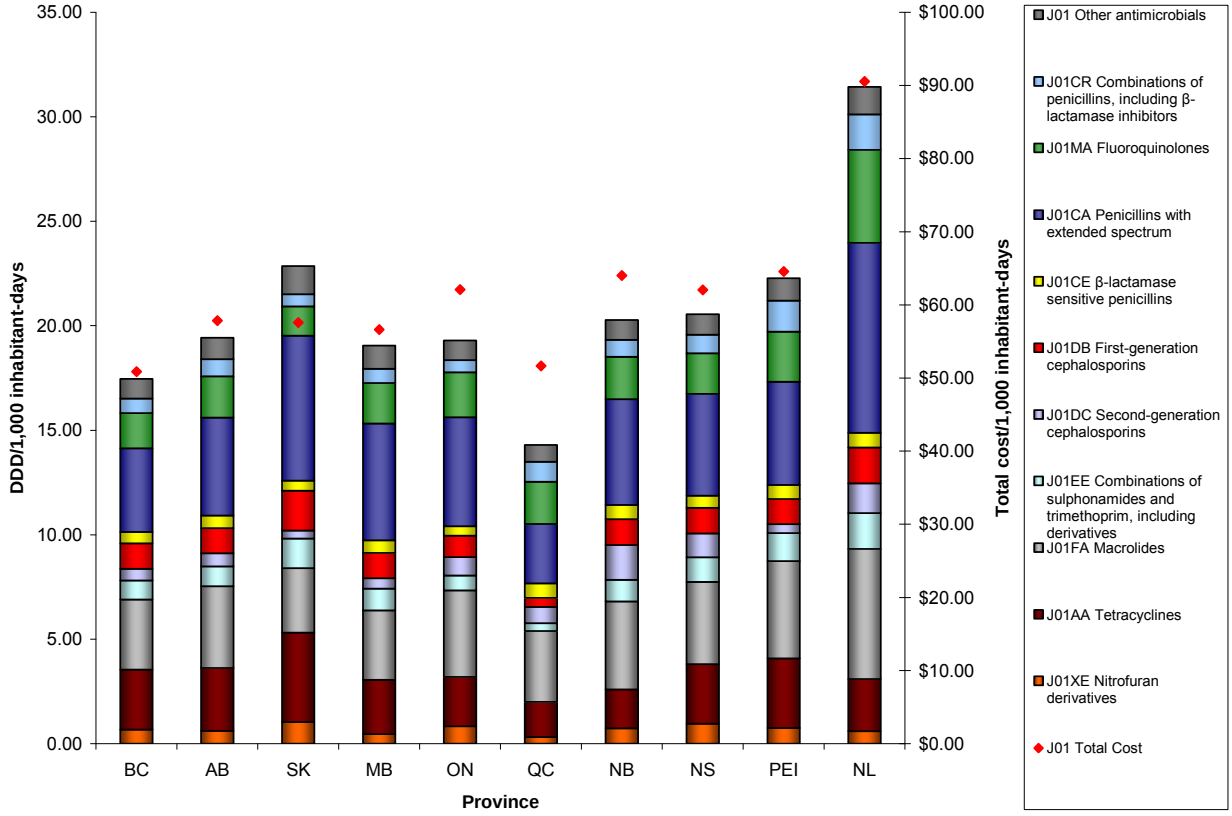
Roman numerals I to III indicate the ranking of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate.
ATC = Anatomical Therapeutic Chemical. DDD = Defined daily dose. NPD = No prescriptions dispensed. NC = Not classified.

Table 8. Total cost per 1,000 inhabitant-days for oral antimicrobials dispensed by retail pharmacies in Canadian provinces, 2009.

	Antimicrobial	ATC Class	Total cost/1,000 inhabitant-days ($)									
			BC	AB	SK	MB	ON	QC	NB	NS	PEI	NL
I	Amoxicillin and enzyme inhibitor	Combinations of penicillins, including β-lactamase inhibitors (J01CR)	1.88	2.14	1.63	1.99	1.56	2.36	2.14	2.42	4.26	4.98
	Cefixime	Third-generation cephalosporins (J01DD)	0.46	0.43	0.14	0.31	0.53	0.38	0.34	0.56	1.98	0.97
	Ofloxacin, ciprofloxacin, norfloxacin, levofloxacin, moxifloxacin	Fluoroquinolones (J01MA)	9.64	10.78	7.98	10.73	11.75	11.78	11.53	10.83	14.34	21.63
	Vancomycin	Glycopeptides (J01XA)	0.52	0.27	0.10	0.21	0.32	1.10	0.18	0.30	0.19	0.41
	Metronidazole	Imidazole (J01XD)	0.68	0.82	0.74	0.81	1.01	0.61	0.83	0.93	0.69	1.18
	Linezolid	Linezolid (J01XX)	0.41	0.20	0.21	0.04	0.24	0.55	0.05	0.31	0.05	0.53
II	Ampicillin, amoxicillin, pivampicillin	Penicillins with extended spectrum (J01CA)	7.15	8.33	11.58	9.98	9.79	5.31	8.68	8.72	8.29	15.07
	Penicillin G, penicillin V	β-lactamase sensitive penicillins (J01CE)	1.20	1.31	0.93	1.50	0.99	1.60	1.41	1.24	1.14	1.36
	Cloxacillin	β-lactamase resistant penicillins (J01CF)	0.50	0.45	1.02	1.32	0.47	0.38	0.42	0.59	0.53	1.06
	Cephalexin, cefadroxil	First-generation cephalosporins (J01DB)	4.16	3.99	5.83	4.25	3.56	1.84	4.07	4.12	3.75	5.52
	Cefaclor, cefprozil, cefuroxime axetil	Second-generation cephalosporins (J01DC)	1.73	2.60	1.36	2.08	4.03	3.82	5.55	4.48	1.67	4.42
	Sulfamethoxazole and trimethoprim, sulfadiazine and trimethoprim	Combinations of sulfonamides and trimethoprim, including derivatives (J01EE)	1.21	1.23	1.81	1.63	1.05	0.63	1.43	1.77	1.69	1.86
	Azithromycin, clarithromycin, erythromycin	Macrolides (J01FA)	12.39	15.23	12.72	14.25	17.76	14.43	17.75	16.12	18.37	23.58
	Clindamycin	Lincosamides (J01FF)	2.29	2.74	3.21	1.78	2.19	1.84	2.47	2.34	1.83	1.92
	Tobramycin	Aminoglycosides (J01GB)	0.58	0.52	1.17	0.90	0.62	1.00	1.98	0.03	NPD	0.04
	Nalidixic acid	Other quinolones, excluding fluoroquinolones (J01MB)	NPD	NPD	NPD	NPD	< 0.01	NPD	NPD	NPD	NPD	NPD
	Erythromycin-sulfisoxazole	Sulfonamide combinations, excluding trimethoprim (J01RA)	NPD	NPD	NPD	NPD	NPD	< 0.01	NPD	NPD	NPD	NPD
	Fusidic acid	Steroid antibacterials (J01XC)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	0.10	NPD
III	Doxycycline, minocycline, tetracycline	Tetracyclines (J01AA)	4.21	5.28	4.29	3.75	3.96	3.14	3.32	4.81	4.17	4.58
	Trimethoprim	Trimethoprim and derivatives (J01EA)	0.06	0.06	0.18	0.02	0.10	0.11	0.09	0.05	0.02	0.15
	Sulfadiazine, sulfamethoxazole	Intermediate-acting sulfonamides (J01EC)	NPD	< 0.01	NPD	NPD	< 0.01	NPD	NPD	NPD	NPD	NPD
	Nitrofurantoin	Nitrofuran derivatives (J01XE)	1.75	1.46	2.64	1.07	2.14	0.74	1.75	2.42	1.51	1.29
	Fosfomycin	Fosfomycin (J01XX)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	NPD	< 0.01
NC	Methenamine	Methenamine (J01XX)	0.02	0.01	0.01	< 0.01	0.01	0.03	0.02	< 0.01	NPD	0.01
		Total (J01)	**50.88**	**57.85**	**57.57**	**56.62**	**62.08**	**51.66**	**64.01**	**62.04**	**64.57**	**90.56**

Roman numerals I to III indicate the ranking of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate.
ATC = Anatomical Therapeutic Chemical. NPD = No prescriptions dispensed. NC = Not classified.

Figure 8. Total consumption (DDD/1,000 inhabitant-days) and total cost of oral antimicrobials dispensed by retail pharmacies in Canadian provinces, 2009.



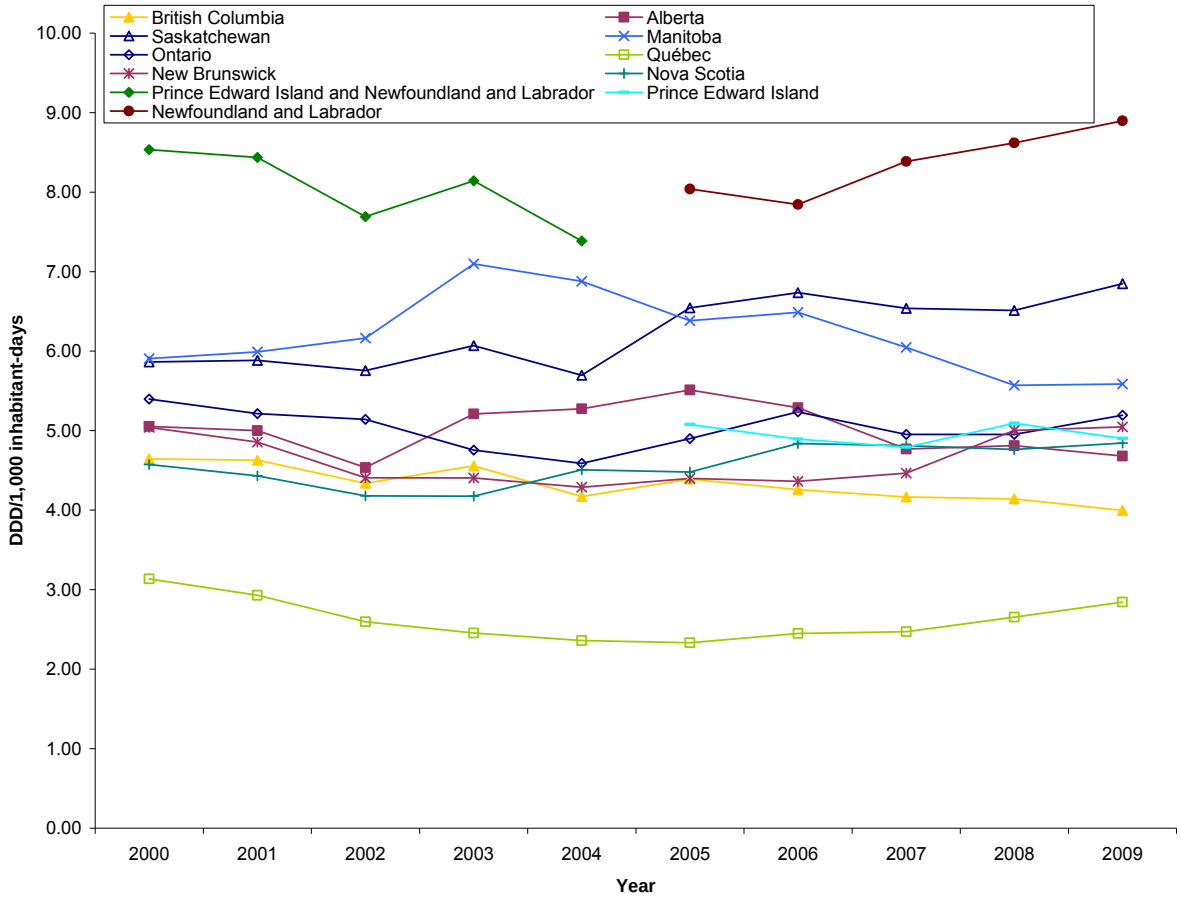
Alphanumeric codes represent Anatomical Therapeutic Chemical classes of antimicrobials.
DDD = Defined daily dose.

Table 9. Defined daily doses per 1,000 inhabitant-days for oral tetracyclines (J01AA) dispensed by retail pharmacies in Canadian provinces, 2000–2009.

ATC Class	Antimicrobial	Province	DDD/1,000 inhabitant-days									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Tetracyclines (J01AA)	Doxycycline (J01AA02)	British Columbia	1.38	1.31	1.20	1.25	1.18	1.27	1.34	1.39	1.42	1.43
		Alberta	1.04	0.99	0.90	0.95	0.98	1.03	1.07	1.12	1.18	1.21
		Saskatchewan	2.29	2.17	2.36	2.41	2.37	2.98	3.29	3.31	3.29	3.44
		Manitoba	0.85	1.05	1.09	1.19	1.29	0.92	1.01	1.04	1.13	1.12
		Ontario	0.49	0.47	0.48	0.46	0.47	0.51	0.58	0.64	0.73	0.80
		Québec	0.48	0.46	0.42	0.42	0.40	0.39	0.44	0.46	0.47	0.50
		New Brunswick	0.59	0.54	0.57	0.59	0.61	0.60	0.60	0.69	0.73	0.78
		Nova Scotia	0.85	0.76	0.71	0.72	0.73	0.90	0.95	0.99	1.07	1.20
		Prince Edward Island and Newfoundland and Labrador	0.85	0.83	0.69	0.68	0.65	NA	NA	NA	NA	NA
		Prince Edward Island	NA	NA	NA	NA	NA	0.71	0.75	0.86	0.96	1.26
		Newfoundland and Labrador	NA	NA	NA	NA	NA	0.54	0.59	0.74	0.82	0.94
	Tetracycline (J01AA07)	British Columbia	1.42	1.23	1.08	0.99	0.84	0.78	0.71	0.60	0.54	0.51
		Alberta	1.04	0.93	0.87	0.78	0.65	0.58	0.47	0.37	0.34	0.31
		Saskatchewan	1.56	1.41	1.27	0.99	0.87	0.81	0.71	0.64	0.57	0.51
		Manitoba	1.24	1.15	1.12	1.18	1.11	0.94	0.87	0.74	0.64	0.61
		Ontario	1.15	1.06	1.01	0.93	0.83	0.83	0.83	0.72	0.68	0.66
		Québec	0.43	0.38	0.34	0.30	0.26	0.22	0.19	0.17	0.15	0.15
		New Brunswick	0.37	0.36	0.37	0.35	0.34	0.26	0.29	0.28	0.24	0.26
		Nova Scotia	0.80	0.76	0.70	0.62	0.62	0.57	0.55	0.50	0.47	0.47
		Prince Edward Island and Newfoundland and Labrador	1.14	0.94	0.70	0.64	0.72	NA	NA	NA	NA	NA
		Prince Edward Island	NA	NA	NA	NA	NA	1.40	1.29	1.35	1.22	1.28
		Newfoundland and Labrador	NA	NA	NA	NA	NA	0.54	0.45	0.42	0.40	0.38
	Minocycline (J01AA08)	British Columbia	0.81	0.81	0.87	0.90	0.90	0.92	0.95	0.91	0.92	0.93
		Alberta	1.49	1.57	1.64	1.76	1.82	1.83	1.73	1.61	1.57	1.51
		Saskatchewan	0.42	0.43	0.38	0.32	0.34	0.40	0.42	0.37	0.37	0.34
		Manitoba	0.80	0.85	0.88	0.96	1.02	0.90	0.94	0.92	0.87	0.86
		Ontario	1.02	1.01	1.00	0.98	0.94	1.00	1.04	0.96	0.94	0.91
		Québec	0.88	0.95	0.98	1.00	0.97	0.93	0.99	0.98	1.00	1.03
		New Brunswick	0.73	0.77	0.86	0.88	0.90	0.87	0.89	0.84	0.80	0.82
		Nova Scotia	1.03	1.10	1.12	1.25	1.33	1.35	1.41	1.35	1.36	1.17
		Prince Edward Island and Newfoundland and Labrador	1.10	1.06	0.93	0.96	0.98	NA	NA	NA	NA	NA
		Prince Edward Island	NA	NA	NA	NA	NA	0.62	0.74	0.61	0.73	0.79
		Newfoundland and Labrador	NA	NA	NA	NA	NA	0.99	1.16	1.11	1.11	1.18

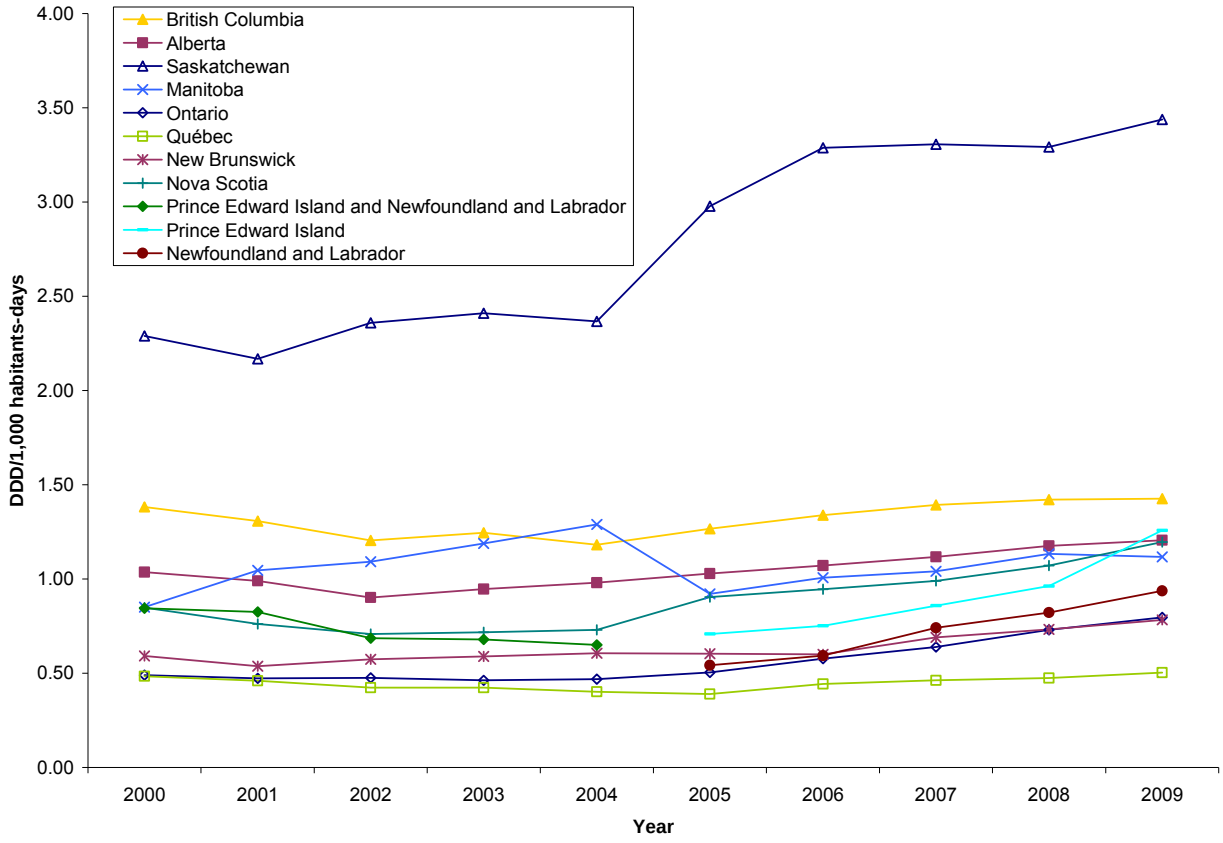
ATC = Anatomical Therapeutic Chemical. DDD = Defined daily dose. NA = Not available.
Prior to 2005, data for the provinces of Prince Edward Island and Newfoundland and Labrador were provided in a combined format. As of 2005, data is available at the individual provincial level.

Figure 9. Total consumption (DDD/1,000 inhabitant-days) of oral amoxicillin (J01CA04) dispensed by retail pharmacies in Canadian provinces, 2000–2009.



DDD = Defined daily dose.
Prior to 2005, data for the provinces of Prince Edward Island and Newfoundland and Labrador were provided in a combined format.
As of 2005, data is available at the individual provincial level.

Figure 10. Total consumption (DDD/1,000 inhabitant-days) of oral doxycycline (J01AA02) dispensed by retail pharmacies in Canadian provinces, 2000–2009.



DDD = Defined daily dose.
Prior to 2005, data for the provinces of Prince Edward Island and Newfoundland and Labrador were provided in a combined format. As of 2005, data is available at the individual provincial level.

Table 10. Total consumption (DDD/1,000 inhabitant-days) of oral macrolide (J01FA) and fluoroquinolone (J01MA) antimicrobials, generally prescribed for treatment of respiratory diseases, dispensed by retail pharmacies in Canadian provinces, 2000–2009.

ATC Class	Antimicrobial	Province	DDD/1,000 inhabitant-days									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Macrolide (J01FA)	Azithromycin (J01FA10)	British Columbia	0.20	0.22	0.36	0.49	0.49	0.55	0.54	0.53	0.50	0.44
		Alberta	0.45	0.53	0.56	0.69	0.67	0.79	0.80	0.69	0.69	0.65
		Saskatchewan	0.42	0.49	0.51	0.61	0.54	0.64	0.71	0.71	0.77	0.80
		Manitoba	0.45	0.55	0.60	0.75	0.72	0.76	0.84	0.86	0.96	1.19
		Ontario	0.58	0.70	0.82	0.92	0.86	1.01	1.03	0.95	0.97	0.98
		Québec	0.69	0.81	0.83	0.81	0.73	0.66	0.64	0.61	0.62	0.64
		New Brunswick	0.55	1.08	1.40	1.64	1.56	1.41	1.34	1.08	0.98	0.94
		Nova Scotia	0.76	1.07	1.06	1.16	1.06	1.13	1.08	1.02	0.94	0.90
		Prince Edward Island and Newfoundland and Labrador	0.30	0.50	0.50	0.64	0.62	NA	NA	NA	NA	NA
		Prince Edward Island	NA	NA	NA	NA	NA	0.82	0.86	0.82	0.88	0.80
		Newfoundland and Labrador	NA	NA	NA	NA	NA	0.72	0.66	0.62	0.70	0.76
	Clarithromycin (J01FA09)	British Columbia	1.41	1.80	1.80	2.17	2.07	2.64	2.62	2.68	2.77	2.59
		Alberta	2.56	2.39	2.19	2.64	2.63	3.08	3.00	2.92	3.08	3.03
		Saskatchewan	1.19	1.10	1.09	1.16	0.97	1.25	1.33	1.19	1.31	1.48
		Manitoba	0.95	1.13	1.31	1.53	1.53	1.60	1.67	1.60	1.57	1.72
		Ontario	2.55	2.46	2.30	2.29	2.21	2.66	2.91	2.90	2.88	2.98
		Québec	2.57	2.62	2.38	2.34	2.32	2.20	2.43	2.55	2.50	2.69
		New Brunswick	1.69	1.63	1.47	1.73	1.92	2.05	2.41	2.62	2.86	3.04
		Nova Scotia	1.15	1.11	1.08	1.25	1.49	1.68	2.11	2.38	2.44	2.68
		Prince Edward Island and Newfoundland and Labrador	1.56	2.37	2.42	3.06	3.05	NA	NA	NA	NA	NA
		Prince Edward Island	NA	NA	NA	NA	NA	1.47	1.85	2.35	2.58	2.78
		Newfoundland and Labrador	NA	NA	NA	NA	NA	4.01	4.03	4.52	4.54	5.07

The numbers presented in this table represent all respective antimicrobial treatments, not those dispensed solely for the treatment of respiratory disease.
ATC = Anatomical Therapeutic Chemical. DDD = Defined daily dose. NA = Not available.
Prior to 2005, data for the provinces of Prince Edward Island and Newfoundland and Labrador were provided in a combined format. As of 2005, data is available at the individual provincial level.

Table 10 (continued). Total consumption (DDD/1,000 inhabitant-days) of oral macrolide (J01FA) and fluoroquinolone (J01MA) antimicrobials, generally prescribed for treatment of respiratory diseases, dispensed by retail pharmacies in Canadian provinces, 2000–2009.

ATC Class	Antimicrobial	Province	DDD/1,000 inhabitant-days									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Fluoroquinolones (J01MA)	Levofloxacin (J01MA12)	British Columbia	0.09	0.12	0.11	0.12	0.11	0.10	0.09	0.08	0.07	0.06
		Alberta	0.27	0.48	0.53	0.60	0.71	0.64	0.43	0.39	0.38	0.34
		Saskatchewan	0.15	0.17	0.19	0.20	0.18	0.15	0.12	0.10	0.10	0.07
		Manitoba	0.24	0.33	0.39	0.38	0.31	0.27	0.34	0.37	0.39	0.39
		Ontario	0.27	0.35	0.32	0.35	0.35	0.32	0.34	0.31	0.31	0.30
		Québec	0.40	0.52	0.39	0.33	0.29	0.24	0.21	0.19	0.18	0.18
		New Brunswick	0.18	0.24	0.22	0.20	0.16	0.10	0.08	0.07	0.05	0.04
		Nova Scotia	0.21	0.24	0.20	0.19	0.19	0.21	0.20	0.20	0.24	0.24
		Prince Edward Island and Newfoundland and Labrador	0.15	0.24	0.20	0.23	0.23	NA	NA	NA	NA	NA
		Prince Edward Island	NA	NA	NA	NA	NA	0.42	0.33	0.26	0.25	0.20
		Newfoundland and Labrador	NA	NA	NA	NA	NA	0.15	0.11	0.10	0.10	0.08
	Moxifloxacin (J01MA14)	British Columbia	0.01	0.06	0.09	0.13	0.16	0.23	0.26	0.27	0.29	0.34
		Alberta	0.01	0.05	0.08	0.10	0.12	0.14	0.22	0.27	0.28	0.25
		Saskatchewan	< 0.01	0.06	0.14	0.16	0.18	0.27	0.30	0.32	0.34	0.30
		Manitoba	0.01	0.07	0.10	0.12	0.13	0.16	0.22	0.24	0.24	0.22
		Ontario	0.01	0.09	0.18	0.24	0.25	0.31	0.42	0.44	0.43	0.42
		Québec	0.01	0.20	0.32	0.41	0.45	0.47	0.56	0.61	0.58	0.61
		New Brunswick	< 0.01	0.13	0.17	0.21	0.33	0.46	0.51	0.54	0.54	0.52
		Nova Scotia	< 0.01	0.07	0.13	0.17	0.23	0.25	0.31	0.32	0.34	0.35
		Prince Edward Island and Newfoundland and Labrador	< 0.01	0.09	0.13	0.19	0.19	NA	NA	NA	NA	NA
		Prince Edward Island	NA	NA	NA	NA	NA	0.31	0.43	0.55	0.66	0.69
		Newfoundland and Labrador	NA	NA	NA	NA	NA	0.28	0.31	0.38	0.42	0.42

The numbers presented in this table represent all respective antimicrobial treatments, not those dispensed solely for the treatment of respiratory disease.
ATC = Anatomical Therapeutic Chemical. DDD = Defined daily dose. NA = Not available.
Prior to 2005, data for the provinces of Prince Edward Island and Newfoundland and Labrador were provided in a combined format. As of 2005, data is available at the individual provincial level.

Table 11. Total consumption (DDD/1,000 inhabitant-days) of oral sulfamethoxazole-trimethoprim (J01EE01), ciprofloxacin (J01MA02) and nitrofurantoin (J01XE01), generally prescribed for treatment of urinary tract infections, dispensed by retail pharmacies in Canadian provinces, 2000–2009.

ATC Class	Antimicrobial	Province	DDD/1,000 inhabitant-days									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Combinations of sulfonamides and trimethoprim, including derivatives (J01EE)	Sulfamethoxazole trimethoprim (J01EE01)	British Columbia	1.61	1.47	1.31	1.23	1.06	0.97	0.97	0.96	0.95	0.91
		Alberta	1.68	1.44	1.30	1.29	1.15	1.11	1.08	0.98	0.98	0.96
		Saskatchewan	2.23	1.91	1.74	1.63	1.37	1.41	1.52	1.44	1.38	1.41
		Manitoba	1.65	1.60	1.56	1.64	1.45	1.06	1.14	1.07	1.05	1.05
		Ontario	1.21	1.16	1.07	0.97	0.86	0.82	0.82	0.75	0.73	0.73
		Québec	0.96	0.82	0.67	0.59	0.50	0.42	0.41	0.39	0.39	0.38
		New Brunswick	2.20	1.78	1.64	1.45	1.26	1.13	1.16	1.09	1.05	1.03
		Nova Scotia	1.76	1.52	1.34	1.27	1.23	1.19	1.21	1.16	1.16	1.17
		Prince Edward Island and Newfoundland and Labrador	3.11	2.70	2.26	2.37	2.15	NA	NA	NA	NA	NA
		Prince Edward Island	NA	NA	NA	NA	NA	1.61	1.52	1.45	1.29	1.34
		Newfoundland and Labrador	NA	NA	NA	NA	NA	1.88	1.77	1.69	1.66	1.71
Fluoroquinolones (J01MA)	Ciprofloxacin (J01MA02)	British Columbia	1.08	1.16	1.19	1.23	1.23	1.25	1.31	1.31	1.29	1.23
		Alberta	0.98	1.00	1.03	1.14	1.21	1.26	1.23	1.25	1.27	1.25
		Saskatchewan	0.69	0.77	0.80	0.72	0.68	0.78	0.88	0.98	0.94	1.01
		Manitoba	0.80	0.88	0.94	1.15	1.25	1.08	1.20	1.26	1.23	1.27
		Ontario	1.38	1.05	0.98	0.97	0.98	1.05	1.19	1.16	1.15	1.13
		Québec	0.96	1.04	1.03	1.07	1.05	1.01	1.09	1.11	1.12	1.16
		New Brunswick	1.19	1.39	0.84	0.75	0.77	0.77	0.88	0.91	0.97	0.99
		Nova Scotia	0.71	0.80	0.89	0.98	1.02	1.03	1.09	1.09	1.13	1.18
		Prince Edward Island and Newfoundland and Labrador	1.79	2.06	2.35	2.37	2.45	NA	NA	NA	NA	NA
		Prince Edward Island	NA	NA	NA	NA	NA	0.85	0.91	1.05	1.14	1.14
		Newfoundland and Labrador	NA	NA	NA	NA	NA	3.24	3.45	3.51	3.52	3.49

The numbers presented in this table represent all respective antimicrobial treatments, not those dispensed solely for the treatment of urinary tract infections.
ATC = Anatomical Therapeutic Chemical. DDD = Defined daily dose. NA = Not available.
Prior to 2005, data for the provinces of Prince Edward Island and Newfoundland and Labrador were provided in a combined format. As of 2005, data is available at the individual provincial level.

Table 11 (continued). Total consumption (DDD/1,000 inhabitant-days) of oral sulfamethoxazole-trimethoprim (J01EE02), ciprofloxacin (J01MA02) and nitrofurantoin (J01XE01), generally prescribed for treatment of urinary tract infections, dispensed by retail pharmacies in Canadian provinces, 2000–2009.

ATC Class	Antimicrobial	Province	DDD/1,000 inhabitant-days									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Nitrofuran derivatives (J01XE)	Nitrofurantoin (J01XE01)	British Columbia	0.40	0.39	0.40	0.44	0.49	0.51	0.56	0.58	0.63	0.68
		Alberta	0.41	0.42	0.42	0.44	0.48	0.50	0.56	0.55	0.59	0.61
		Saskatchewan	0.91	0.95	0.87	0.87	0.88	0.90	0.97	0.98	0.99	1.04
		Manitoba	0.35	0.37	0.36	0.43	0.46	0.34	0.39	0.41	0.44	0.47
		Ontario	0.48	0.52	0.55	0.57	0.59	0.66	0.73	0.72	0.77	0.83
		Québec	0.22	0.24	0.24	0.25	0.26	0.25	0.27	0.28	0.29	0.32
		New Brunswick	0.47	0.47	0.55	0.58	0.61	0.59	0.68	0.69	0.73	0.74
		Nova Scotia	0.74	0.70	0.67	0.68	0.69	0.76	0.89	0.92	0.95	0.97
		Prince Edward Island and Newfoundland and Labrador	0.42	0.38	0.38	0.39	0.39	NA	NA	NA	NA	NA
		Prince Edward Island	NA	NA	NA	NA	NA	0.44	0.53	0.64	0.74	0.75
		Newfoundland and Labrador	NA	NA	NA	NA	NA	0.38	0.45	0.52	0.59	0.60

The numbers presented in this table represent all respective antimicrobial treatments, not those dispensed solely for the treatment of urinary tract infections.
ATC = Anatomical Therapeutic Chemical. DDD = Defined daily dose. NA = Not available.
Prior to 2005, data for the provinces of Prince Edward Island and Newfoundland and Labrador were provided in a combined format. As of 2005, data is available at the individual provincial level.

Appendix A – Additional Tables

Anatomical Therapeutic Chemical Classification System

Table A.1. List of antimicrobials from the CompuScript database for each ATC[1] class.

	Antimicrobial	ATC Class
I	Amoxicillin and enzyme inhibitor (J01CR02)	Combinations of penicillins, including β-lactamase inhibitors (J01CR)
	Cefixime (J01DD08)	Third-generation cephalosporins (J01DD)
	Ofloxacin (J01MA01), ciprofloxacin (J01MA02), norfloxacin (J01MA06), levofloxacin (J01MA12), moxifloxacin (J01MA14)	Fluoroquinolones (J01MA)
	Vancomycin (J01XA01)	Glycopeptides (J01XA)
	Metronidazole (J01XD01)	Imidazole (J01XD)
	Linezolid (J01XX08)	Linezolid (J01XX)
II	Ampicillin (J01CA01), amoxicillin (J01CA04), pivampicillin (J01CA02)	Penicillins with extended spectrum (J01CA)
	Penicillin G (J01CE01), penicillin V (J01CE02)	β-lactamase sensitive penicillins (J01CE)
	Cloxacillin (J01CF02)	β-lactamase resistant penicillins (J01CF)
	Cephalexin (J01DB01), cefadroxil (J01DB05)	First-generation cephalosporins (J01DB)
	Cefaclor (J01DC04), cefprozil (J01DC10), cefuroxime axetil (J01DC02)	Second-generation cephalosporins (J01DC)
	Sulfamethoxazole and trimethoprim (J01EE01), sulfadiazine and trimethoprim (J01EE02)	Combinations of sulfonamides and trimethoprim, including derivatives (J01EE)
	Azithromycin (J01FA10), clarithromycin (J01FA09), erythromycin (J01FA01)	Macrolides (J01FA)
	Clindamycin (J01FF01)	Lincosamides (J01FF)
	Tobramycin (J01GB01)	Aminoglycosides (J01GB)
	Nalidixic acid (J01MB02)	Other quinolones, excluding fluoroquinolones (J01MB)
	Erythromycin-sulfisoxazole (J01RA02)	Sulfonamide combinations, excluding trimethoprim (J01RA)
	Fusidic acid (J01XC01)	Steroid antibacterials (J01XC)
III	Doxycycline (J01AA02), minocycline (J01AA08), tetracycline (J01AA07)	Tetracyclines (J01AA)
	Chloramphenicol (J01BA01)	Amphenicols (J01BA)
	Trimethoprim (J01EA01)	Trimethoprim and derivatives (J01EA)
	Sulfamethizole (J01EB02), sulfapyridine (J01EB04), sulfisoxazole (J01EB05)	Short-acting sulfonamides (J01EB)
	Sulfadiazine (J01EC02), sulfamethoxazole (J01EC04)	Intermediate-acting sulfonamides (J01EC)
	Nitrofurantoin (J01XE01)	Nitrofuran derivatives (J01XE)
	Fosfomycin (J01XX01)	Fosfomycin (J01XX)
NC	Methenamine (J01XX05)	Methenamine (J01XX)

Roman numerals I to III indicate the ranking of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate.
ATC = Anatomical Therapeutic Chemical. NC = Not classified.

[1] World Health Organization Collaborating Center for Drug Statistics Methodology. See: www.whocc.no/atc_ddd_index/. Accessed March 2011.

Categorization of Antimicrobials Based on Importance in Human Medicine

Categories of antimicrobials used in this report were taken from the document Categorization of Antimicrobial Drugs Based on Importance in Human Medicine[1] by Health Canada's Veterinary Drugs Directorate (Table A.2).

Antimicrobials are considered to be of Very High Importance in Human Medicine (Category I) when they are essential for the treatment of serious bacterial infections and there is no or limited availability of alternative antimicrobials for effective treatment. Antimicrobials of High Importance in Human Medicine (Category II) consist of those that can be used to treat a variety of infections, including serious infections, and for which alternatives are generally available. Bacteria resistant to antimicrobials of this category are generally susceptible to Category I antimicrobials, which could be used as alternatives. Antimicrobials of Medium Importance in Human Medicine (Category III) are used in the treatment of bacterial infections for which alternatives are generally available. Infections caused by bacteria resistant to these antimicrobials can, in general, be treated with Category II or I antimicrobials. Antimicrobials of Low Importance in Human Medicine (Category IV) are currently not used in human medicine.

Table A.2. Categorization of antimicrobials based on importance in human medicine.

Category of importance in human medicine		Antimicrobial class
I	Very High Importance	Carbapenems
		Cephalosporins – the 3rd and 4th generations
		Fluoroquinolones
		Glycopeptides
		Glycylcyclines
		Ketolides
		Lipopeptides
		Monobactams
		Nitroimidazoles (metronidazole)
		Oxazolidinones
		Penicillin-β-lactamase inhibitor combinations
		Polymyxins (colistin)
		Therapeutic agents for tuberculosis (e.g. ethambutol, isoniazid, pyrazinamide, and rifampin)
II	High Importance	Aminoglycosides (except topical agents)
		Cephalosporins – the first and second generations (including cephamycins)
		Fusidic acid
		Lincosamides
		Macrolides
		Penicillins
		Quinolones (except fluoroquinolones)
		Streptogramins
		Trimethoprim-sulfamethoxazole

[1] Version April, 2009. See: www.hc-sc.gc.ca/dhp-mps/consultation/vet/consultations/amr_ram_hum-med-rev-eng.php. Accessed March 2011.

Table A.2 (continued). Categorization of antimicrobials based on importance in human medicine.

Category of importance in human medicine		Antimicrobial class
III	Medium Importance	Aminocyclitols
		Aminoglycosides (topical agents)
		Bacitracins
		Fosfomycin
		Nitrofurans
		Phenicols
		Sulfonamides
		Tetracyclines
		Trimethoprim
IV	Low Importance	Flavophospholipols
		Ionophores

Antimicrobial Use

Table A.3. Quantity of active ingredients of oral antimicrobials dispensed by retail pharmacies in Canada, 2000–2009.

	Antimicrobial	ATC Class	Total active ingredients (kg)									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	Amoxicillin and enzyme inhibitor	Combinations of penicillins, including β-lactamase inhibitors (J01CR)	7,148.28	7,295.71	7,114.06	7,492.67	7,491.56	8,414.31	7,327.38	8,021.73	8,693.64	9,226.06
	Cefixime	Third-generation cephalosporins (J01DD)	441.47	412.56	372.50	321.45	275.37	282.37	274.85	303.43	322.03	341.62
I	Ofloxacin, ciprofloxacin, norfloxacin, levofloxacin, moxifloxacin	Fluoroquinolones (J01MA)	17,387.35	17,569.37	17,718.15	18,469.28	18,738.69	18,781.31	19,348.63	19,806.00	19,946.58	19,887.45
	Vancomycin	Glycopeptides (J01XA)	25.90	28.25	32.23	40.56	70.36	79.17	75.77	83.99	83.73	92.64
	Metronidazole	Imidazole (J01XD)	NPD	4,808.34	4,927.11	5,126.54	5,237.51	5,311.07	5,563.92	5,587.82	5,791.00	6,029.97
	Linezolid	Linezolid (J01XX)	NPD	1.55	4.91	10.82	17.29	23.26	22.44	25.34	26.11	31.40
	Ampicillin, amoxicillin, pivampicillin	Penicillins with extended spectrum (J01CA)	57,566.37	56,004.37	53,404.23	53,132.75	51,471.46	53,138.73	53,534.52	53,445.93	54,514.38	56,323.55
	Penicillin G, penicillin V	β-lactamase sensitive penicillins (J01CE)	15,079.86	14,253.92	13,722.26	13,802.13	12,916.80	13,174.53	14,201.96	13,987.12	14,106.88	13,770.75
	Cloxacillin	β-lactamase resistant penicillins (J01CF)	8,351.00	8,004.27	7,376.34	7,135.18	6,596.38	5,861.06	5,604.72	5,159.24	4,777.53	4,358.02
	Cephalexin, cefadroxil	First-generation cephalosporins (J01DB)	16,693.30	17,295.99	18,358.43	19,683.24	20,312.94	21,585.02	22,980.75	23,353.79	24,059.39	24,305.64
	Cefaclor, cefprozil, cefuroxime axetil	Second-generation cephalosporins (J01DC)	11,099.40	9,857.59	8,712.26	8,570.41	8,277.23	8,410.81	7,937.34	7,424.93	7,216.85	7,129.01
II	Sulfamethoxazole and trimethoprim, sulfadiazine and trimethoprim	Combinations of sulfonamides and trimethoprim, including derivatives (J01EE)	26,196.41	23,815.65	21,549.97	20,179.30	19,226.17	18,858.59	15,433.23	15,085.01	15,137.72	15,065.30
	Azithromycin, clarithromycin, erythromycin	Macrolides (J01FA)	25,163.98	23,844.04	21,665.44	22,138.28	21,168.11	22,746.49	22,653.74	22,523.94	22,791.17	22,912.47
	Clindamycin	Lincosamides (J01FF)	3,289.35	3,590.12	3,896.00	4,272.26	4,441.95	4,499.59	4,976.64	5,303.74	5,553.15	5,746.53
	Tobramycin	Aminoglycosides (J01GB)	29.66	0.36	0.04	< 0.01	0.01	NPD	15.03	20.21	20.16	22.91
	Nalidixic acid	Other quinolones, excluding fluoroquinolones (J01MB)	76.31	62.19	52.12	45.35	41.87	1.05	0.26	0.01	NPD	0.01
	Erythromycin-sulfisoxazole	Sulfonamide combinations, excluding trimethoprim (J01RA)	2,745.17	1,910.05	1,251.28	843.14	548.87	494.05	104.71	76.33	25.67	0.02
	Fusidic acid	Steroid antibacterials (J01XC)	34.79	39.06	35.54	37.27	36.64	41.91	42.73	34.22	30.08	14.26

Roman numerals I to III indicate the ranking of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate.
NPD = No prescriptions dispensed.

Table A.3 (continued). Quantity of active ingredients of oral antimicrobials dispensed by retail pharmacies in Canada, 2000–2009.

	Antimicrobial	ATC Class	Total active ingredients (kg)									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	Doxycycline, minocycline, tetracycline	Tetracyclines (J01AA)	14,112.37	13,169.24	12,595.12	11,902.77	11,050.90	10,709.61	10,280.96	9,678.89	9,419.51	9,305.23
	Chloramphenicol	Amphenicols (J01BA)	0.78	0.99	0.20	NPD	0.06	0.01	NPD	NPD	NPD	NPD
	Trimethoprim	Trimethoprim and derivatives (J01EA)	315.71	297.29	310.34	307.34	288.32	265.98	265.88	261.01	242.58	247.57
III	Sulfamethizole, sulfapyridine, sulfisoxazole	Short-acting sulfonamides (J01EB)	105.38	13.45	0.88	1.04	1.02	0.26	0.13	0.03	0.03	NPD
	Sulfadiazine, sulfamethoxazole	Intermediate-acting sulfonamides (J01EC)	28.08	4.48	4.77	5.55	4.51	2.93	2.27	2.36	1.33	0.04
	Nitrofurantoin	Nitrofuran derivatives (J01XE)	935.24	981.97	1,019.51	1,073.19	1,152.40	1,210.89	1,323.74	1,390.41	1,503.67	1,622.82
	Fosfomycin	Fosfomycin (J01XX)	64.76	74.26	48.00	35.71	26.28	20.78	17.78	11.00	1.97	5.04
NC	Methenamine	Methenamine (J01XX)	389.51	356.69	350.35	296.88	282.20	253.34	249.14	261.99	163.43	210.98
		Total (J01)	**207,280.44**	**203,691.77**	**194,522.04**	**194,923.13**	**189,674.87**	**194,167.12**	**192,238.56**	**191,848.71**	**194,428.77**	**196,649.29**

Roman numerals I to III indicate the ranking of antimicrobials based on importance in human medicine as outlined by the Veterinary Drugs Directorate.
NPD = No prescriptions dispensed. NC = Not classified.