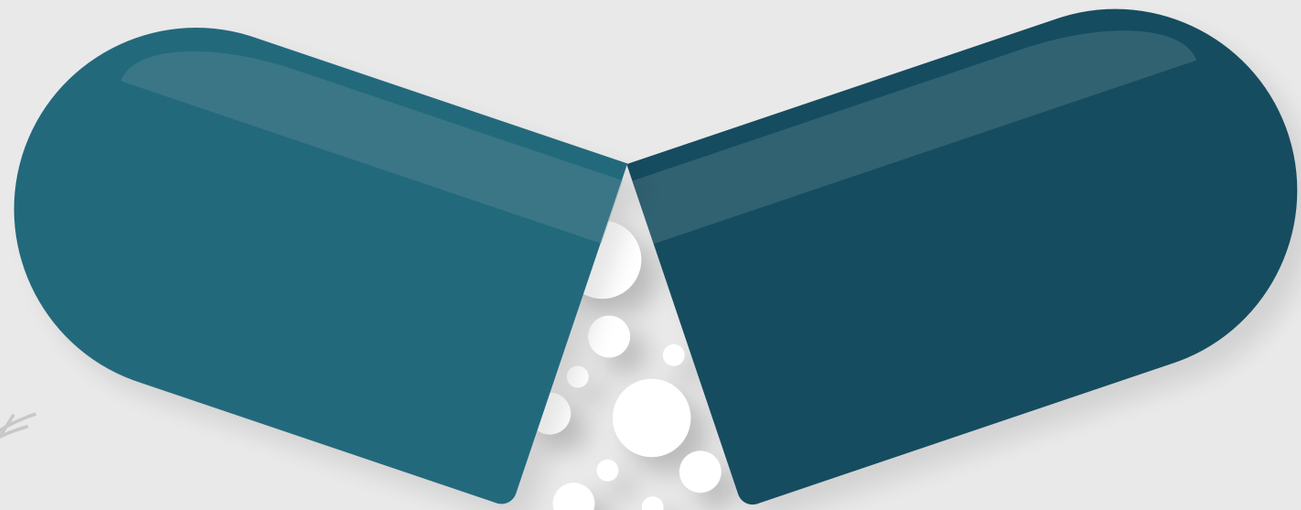

TPP Alberta

Antibiotic Prescription Atlas

2018

TPP Alberta

TPP Alberta (Triplicate Prescription Program) was established in 1986 to monitor the use of certain medications prone to misuse and abuse.

The mandate of TPP Alberta is:

- To monitor prescribing, dispensing and utilization practices regarding targeted medications;
- To provide timely and relevant information on targeted medications to prescribers, dispensers, consumers, regulatory bodies and stakeholders;
- To work with stakeholders to enable system level change to ensure appropriate use of targeted medications;
- To ensure efficient and effective functioning of TPP Alberta program.

Funded primarily by the Province of Alberta, TPP Alberta is a partnership administered by the College of Physicians & Surgeons of Alberta. The complete list of partners includes:

Alberta College of Pharmacy
Alberta Dental Association and College
Alberta Health
Alberta Health Services
Alberta Medical Association
Alberta Pharmacists' Association
Alberta Veterinary Medical Association
College and Association of Registered Nurses of Alberta
College of Physicians & Surgeons of Alberta
College of Podiatric Physicians of Alberta
Yukon Medical Council

This work was produced by OKAKI™ for TPP Alberta.

Suggested Citation:

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Table of Contents

List of Tables and Figures

Tables

Figures

Preface

Colleagues,

TPP Alberta has a new element of reporting which marks a significant and exciting addition to the Program: TPP Alberta Antibiotic Prescription Atlas 2018. TPP Alberta is focused on using data to help stage our defense against Antimicrobial Resistance (AMR), one of the most pressing public health threats of our time. The current antibiotic era was foundational for many modern medical advances in surgery, chemotherapy, and immunomodulation. Subsequent decades of stellar success in antibiotic therapy has always been shadowed by the evolution of resistance, although the real acceleration of AMR has occurred during the last 10-20 years. Now we face difficult times in hospitals and the community with MRSA and ESBL gram negative infections being commonplace and, increasingly, we have reduced options for first line therapy for many more infections.

The Canadian Federal AMR framework highlights the pillars of Surveillance, Stewardship, Infection Prevention and Control, and Research and Innovation in addressing this threat. Surveillance is a crucial early step; it provides data for action, informing both awareness and stewardship interventions.

TPP Alberta has the infrastructure to provide community antibiotic data reporting. No other comparable program is in a current position to fill these gaps in knowledge and to start delineating the complex picture of antibiotic use in clinical care.

TPP Alberta antibiotic prescription reporting is supported by Alberta Health, who is providing access to Pharmaceutical Information Network (PIN) antimicrobial dispensing data, and a multi-stakeholder group that has been involved in mapping an approach to reporting that is illuminating but not punitive. Importantly, these data are intended to inform stakeholders, describe baseline use and contribute to data standards development, complement other surveillance data, and support development of stewardship initiatives. The existing literature shows us that antibiotic prescribing is driven by many factors, and of course the clinician-patient dyad relationship is central. Ultimately, antibiotics must be used in order to benefit people with bacterial infections. However, clinicians should be supported with evidence-based diagnostics, algorithms, and guidelines to be able to curtail ingrained patterns of antibiotic use that present risks of resistance and adverse effects without likely benefit. We need to understand our patterns to start this important work, and this Antibiotic Prescription Atlas represents a first step.

Our group is committed to a supportive approach and is aware of the wide variation in medical practices across our province. Eventually, allowing clinicians to contextualize their own antibiotic prescribing practices through reviewing their own data is a goal, to help all prescribers develop a shared understanding of how new stewardship practices and evidence may apply in our various practices.

We look forward to this journey with Alberta's prescribers as well as patients, as we work together to preserve antimicrobial effectiveness for future generations.

Dr. Lynora Saxinger MD FRCPC CTropMed

Co-Chair, Antimicrobial Stewardship Committee, Alberta Health Services

Co-Chair, Antimicrobial Working Group, College of Physician & Surgeons of Alberta

Background and Methods

About the Atlas

The purpose of this TPP Alberta Antibiotic Prescription Atlas 2018 is to provide an overview of provincial antibiotic medication utilization for the years 2017 and 2018. Alberta's Pharmaceutical Information Network (PIN) is the source of medication utilization information.

Crude rates are used throughout the Atlas. Data and measures are related to antibiotic products typically intended for administration by the oral route. Compounded, parenteral, topical, ophthalmic, otic, and other non-oral antibiotic products were excluded from the analyses.

Data Source Used for Analyses

2017 and 2018 PIN data were used for the analyses. PIN data consist of dispense records from community pharmacies in Alberta. Ongoing gaps within PIN data include dispensing information from in-hospital pharmacies and facilities such as hospices. As PIN records consist of dispenses (not prescriptions), unique prescriptions were identified using the combination of pharmacy license and prescription numbers.

PIN data do not discriminate between medications actually dispensed and those awaiting release to the patient. As pharmacy records may be modified or reversed before the actual dispense, PIN data are dynamic. In an effort to capture actual dispensing as closely as possible, data were extracted from PIN on November 15, 2019, by which time most modifications and reversals would have occurred.

Out of 3.14 million prescriptions in 2018, 0.67 million non-oral formulations were excluded from the analyses because of challenges with consistently and accurately calculating dose. A single compounded antibiotic prescription in 2018 was also excluded. Liquid formulations, which have the same issues with dose calculations, made up 13.3% of all oral prescriptions in 2018. After excluding the population under 15 years of age to calculate consumption in terms of DDDs per 1,000 population (see next section), liquid formulations dropped to 1.8% of all oral prescriptions.

Oral products with the same active ingredients but different salts (e.g., azithromycin) were grouped as the same antibiotic for analytic purposes. Products with multiple ingredients, e.g., sulfamethoxazole/trimethoprim were treated as a single antibiotic for the analyses. These combination products were also considered a different antibiotic than products with one of the same ingredients. For example, amoxicillin-clarithromycin-lansoprazole was considered a different antibiotic than either amoxicillin or clarithromycin on its own.

All prescriber types are included in the analyses. The vast majority of prescriptions in PIN with dentist, optician, dietician, and dental hygienist prescriber types do not identify the actual prescriber. 20,615 (0.8%) of prescriptions have unknown prescriber type and unknown individual prescribers.

Pharmacy Local Aggregated Geography

Alberta's 132 local geographies are the smallest unit of geographic analysis used by Alberta Health and Alberta Health Services. A local geography has a minimum of 5,000 residents. Pharmacy local aggregated geographies (PhLAGs) were created for the Atlas to eliminate inaccurately low or high medication utilization rates that arise when residents of a local geography are dispensed medications in a neighboring geography. The 106 PhLAGs merge neighboring local geographies where this issue is common. The merging of geographies has primarily occurred in smaller cities such as Red Deer, Lethbridge, Medicine Hat, Grande Prairie, Fort McMurray, Spruce Grove, etc. Rural PhLAG names include various municipality types, such as County, Planning and Special Area, and Municipal District.

Antibiotic Population Utilization Measures*

In this Atlas, ***prescriptions*** refer to the number of oral antibiotic prescriptions. The term ***patients*** refers to the number of patients who were dispensed an oral antibiotic.

Antibiotic utilization is presented in this Atlas using population-based counts and crude rates. The 2017 and 2018 Alberta population estimates were received from Alberta Health. Patient age was calculated at July 1, 2017 for 2017 data and July 1, 2018 for 2018 data.

Measures

Patients per 1,000 Population per Year

$$= \frac{\text{Total number of patients dispensed at least one antibiotic prescription in a year}}{\text{Total Alberta population for that year}} \times 1{,}000$$

Prescriptions per 1,000 Population per Year

$$= \frac{\text{Total number of prescriptions in a year}}{\text{Total Alberta population for that year}} \times 1{,}000$$

The defined daily dose (DDD), as defined by the World Health Organization (WHO), is the assumed average daily maintenance dose for a drug used for its main indication in adults. [1] Drug DDD values were obtained from the WHO DDD/ATC Index. [2] The DDD for a prescription is calculated by multiplying the drug strength and quantity, and dividing by the DDD for the particular drug.

The measure used in this Atlas has been adopted from the WHO. [3] DDDs (vs DDD) provide a standardized estimate of population drug consumption that can be used to monitor trends over time or to compare to other jurisdictions. It is not an exact measure of actual use, but it allows for comparison in time, or between places or drugs.

DDDs per 1,000 Population 15 Years and Older per Year

$$= \frac{\text{Total DDDs from all prescriptions for those 15 years and older in a year}}{\text{Total Alberta population 15 years and older for that year}} \times 1{,}000$$

DDDs per 1,000 population provides an estimate of the number of days of antibiotic treatment, on average per patient (15 years of age and older), per year. Patients less than 15 years of age were excluded from the DDDs calculations as DDD does not apply to paediatric patients. As a result, a high percentage of liquid formulations (which have issues with calculation of dose) were eliminated.

Average and Distribution of Number of Prescriptions per Patient by Antibiotic

Average and Distribution of Number of Treatment Days per Patient by Antibiotic

Average and Distribution of Number of Treatment Days per Prescription by Antibiotic

Figures showing averages and distributions are presented by antibiotic, as large differences may exist in standard days of treatment for commonly-prescribed antibiotics.

*Non-oral formulations were excluded from the analyses

1. Norwegian Institute of Public Health. WHOCC - Definition and General Considerations [internet]. WHO Collaborating Centre for Drug Statistics Methodology, 2009 [cited 2014 October 7]. Available from http://www.whocc.no/ddd/definition_and_general_considera/
2. http://www.whocc.no/atc_ddd_index/
3. https://www.who.int/medicines/regulation/medicines-safety/toolkit_indicators/en/

Antibiotic Utilization

During 2017 and 2018, nearly 2.5 million prescriptions for antibiotics occurred among approximately 1.4 million unique patients (Table 1). As expected, notable seasonal trends were observed in the dispensation of antibiotics in 2017 and 2018 (Figure 1 and Figure 2). Differences were observed according to both age and sex (Table 2 and Table 3).

Table 1. **Utilization of Prescription Antibiotics in Alberta, 2017 - 2018**

Year	Patients	Prescriptions	Prescribers	Pharmacies
2017	1,398,186	2,494,147	16,990	1,386
2018	1,392,678	2,474,043	17,334	1,495

Year	Population	Patients/ 1,000pop	Prescriptions/ 1,000pop	DDDs/ 1,000pop*
2017	4,285,997	326	582	6,385
2018	4,306,822	323	574	6,327

*See Background and Methods. DDDs per 1,000 population includes patients 15 years and older.

Figure 1. **Patients by Quarter, 2017 - 2018**

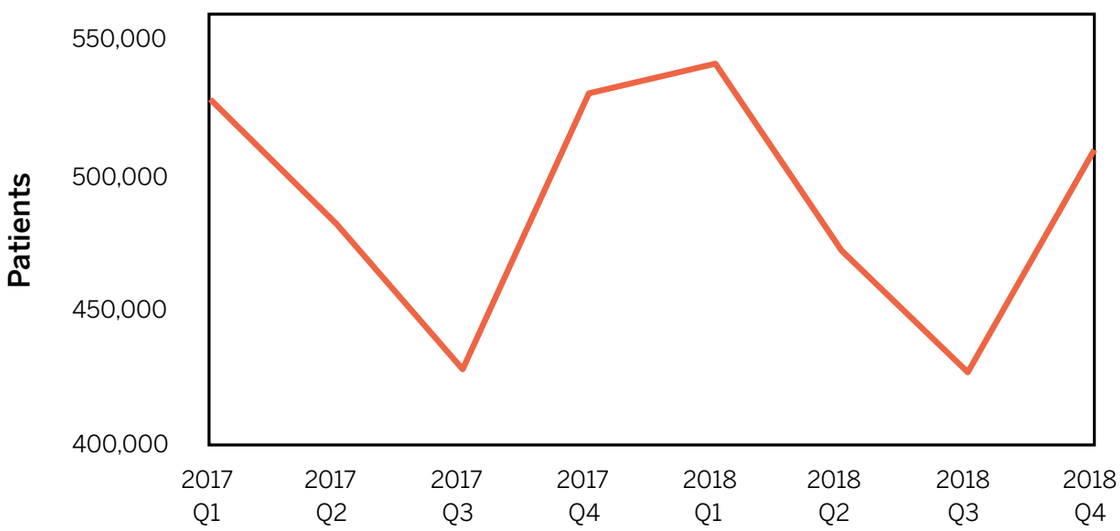


Figure 2. **Prescriptions by Quarter, 2017 - 2018**

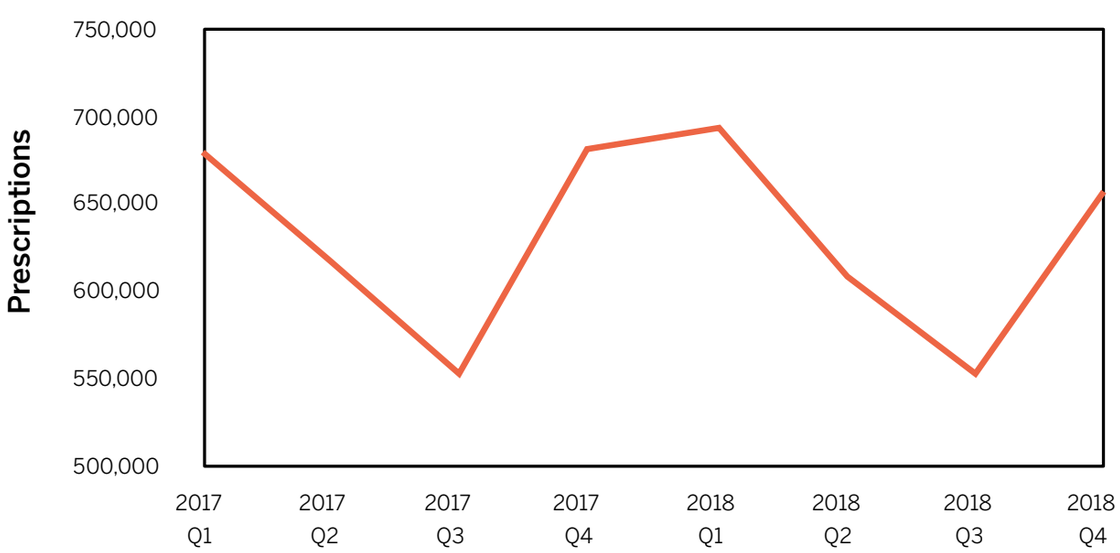
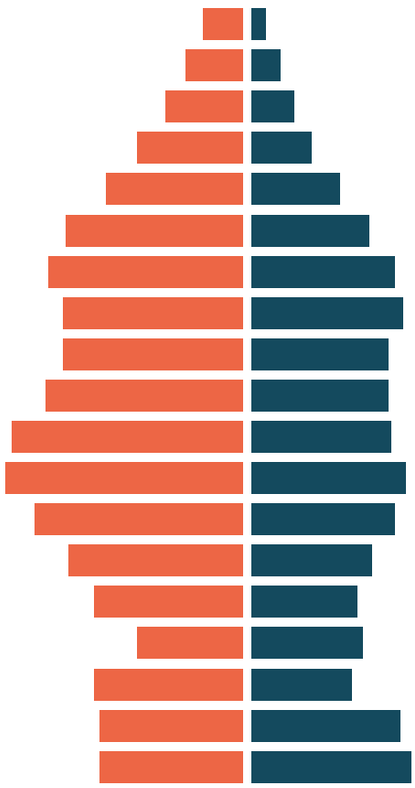


Table 2. Patients by Age and Sex, 2018

Age	Females*	Males*
90+	8,928	4,083
85-89	11,546	7,869
80-84	15,985	12,027
75-79	21,722	17,474
70-74	30,601	25,549
65-69	39,514	33,118
60-64	50,731	41,144
55-59	55,819	43,484
50-54	51,038	38,781
45-49	51,467	39,183
40-44	56,362	40,119
35-39	66,413	43,860
30-34	67,587	40,526
25-29	59,890	33,979
20-24	49,679	29,927
15-19	42,232	32,085
10-14	29,834	28,396
5-9	42,505	42,483
0-4	40,786	45,504
Total	792,639	599,951



*17 female patients of unknown age, 37 male patients of unknown age, 32 patients of unknown sex, 2 patients of unknown age and sex

Table 3. Antibiotic Utilization Rates by Age and Sex, 2018

Age	Female Patients/ 1,000pop	Male Patients/ 1,000pop	Female Prescriptions/ 1,000pop	Male Prescriptions/ 1,000pop	Female DDDs/ 1,000pop†	Male DDDs/ 1,000pop†
90+	507	499	1,134	1,100	9,238	10,516
85-89	460	457	1,033	973	9,037	10,174
80-84	447	422	990	889	9,123	9,846
75-79	438	404	955	837	9,049	9,962
70-74	425	383	891	754	8,907	8,856
65-69	415	357	845	681	8,572	7,824
60-64	408	328	819	605	8,388	6,913
55-59	394	304	765	546	7,623	6,105
50-54	380	280	724	484	7,213	5,346
45-49	374	272	703	456	6,960	4,902
40-44	377	262	696	425	6,775	4,475
35-39	390	255	710	403	6,647	4,142
30-34	386	224	692	346	6,291	3,558
25-29	378	203	667	303	6,209	3,197
20-24	376	210	663	310	6,532	3,640
15-19	345	249	590	374	7,047	5,489
10-14	234	214	341	301		
5-9	315	300	483	458		
0-4	299	322	490	548		

† DDDs per 1,000 population 15 years and older

Of more than 17,000 unique prescribers, physicians prescribed 82.8% of all oral antibiotic prescriptions. The vast majority of prescriptions in PIN with a dentist, optician, dietician, and dental hygienist prescriber type have unknown prescribers. 13% of total prescriptions have missing data, either unknown prescriber type or unknown individual prescriber, or both (Table 4). Most patients were dispensed antibiotics from one or two unique prescribers in a year. More than 6.8% of patients were dispensed antibiotics from three or more prescribers (Table 5). Over 10% of patients were dispensed three or more antibiotics in a year (Table 6).

Table 4. Patients by Prescriber Type, 2018

Prescriber Type	Prescriptions	Patients	Prescribers*	Pharmacies
Physician	2,048,876	1,194,443	12,446	1,493
Dentist	281,643	215,944	-	1,448
Pharmacist	102,833	88,903	3,777	1,409
Unknown	20,615	16,358	-	1,038
Nurse Practitioner	17,572	13,751	448	925
Optician	2,054	1,813	-	448
Dental Hygienist	343	311	-	193
Dietician	121	104	-	72

*12% of prescriptions from a nurse practitioner prescriber type, three percent from a physician prescriber type, and less than one percent from a pharmacist prescriber type do not identify the individual prescribers.

Table 5. Patients by Number of Unique Prescribers* per Year, 2017 - 2018

	2017		2018	
	Patients	Percent	Patients	Percent
1+ Prescribers	1,398,186	100.0	1,392,678	100.0
2+ Prescribers	336,812	24.1	330,629	23.7
3+ Prescribers	96,780	6.9	95,169	6.8
4+ Prescribers	29,969	2.1	29,622	2.1
5+ Prescribers	10,254	0.7	10,101	0.7
6+ Prescribers	3,656	0.3	3,693	0.3
7+ Prescribers	1,412	0.1	1,443	0.1
8+ Prescribers	603	0.0	605	0.0
9+ Prescribers	248	0.0	251	0.0
10+ Prescribers	103	0.0	114	0.0

*The individual prescriber is not known for the majority of prescriptions with a prescriber type other than physicians, pharmacists, and nurse practitioners.

Table 6. Patients by Number of Unique Antibiotics per Year, 2017 - 2018

	2017		2018	
	Patients	Percent	Patients	Percent
1+ Antibiotics	1,398,186	100.0	1,392,678	100.0
2+ Antibiotics	445,897	31.9	438,232	31.5
3+ Antibiotics	143,373	10.3	140,677	10.1
4+ Antibiotics	46,060	3.3	45,256	3.2
5+ Antibiotics	14,949	1.1	14,711	1.1
6+ Antibiotics	4,772	0.3	4,590	0.3
7+ Antibiotics	1,448	0.1	1,383	0.1
8+ Antibiotics	436	0.0	400	0.0
9+ Antibiotics	105	0.0	126	0.0
10+ Antibiotics	35	0.0	37	0.0

Figure 3 and Figure 4 show the number of unique patients and number of prescriptions by antibiotic in each year for the most commonly-prescribed antibiotics. Overall, amoxicillin was the most commonly used antibiotic in 2017 and 2018.

Figure 3. Patients by Antibiotic per Year*, 2017 - 2018

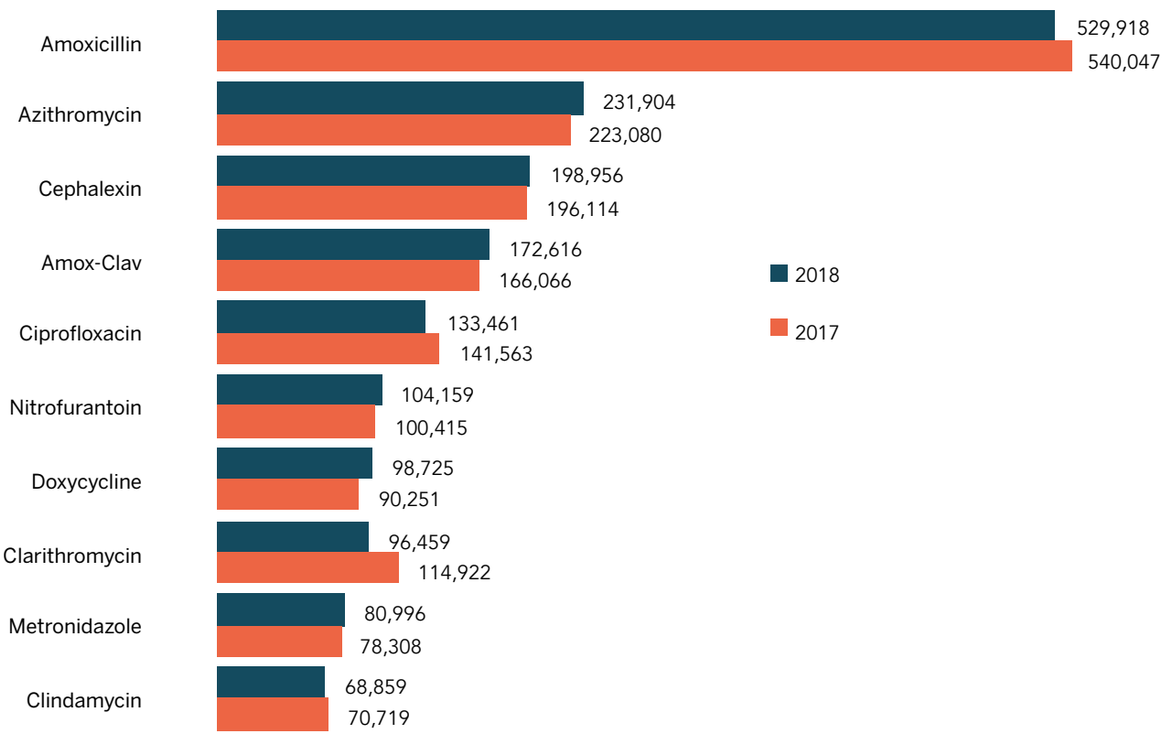
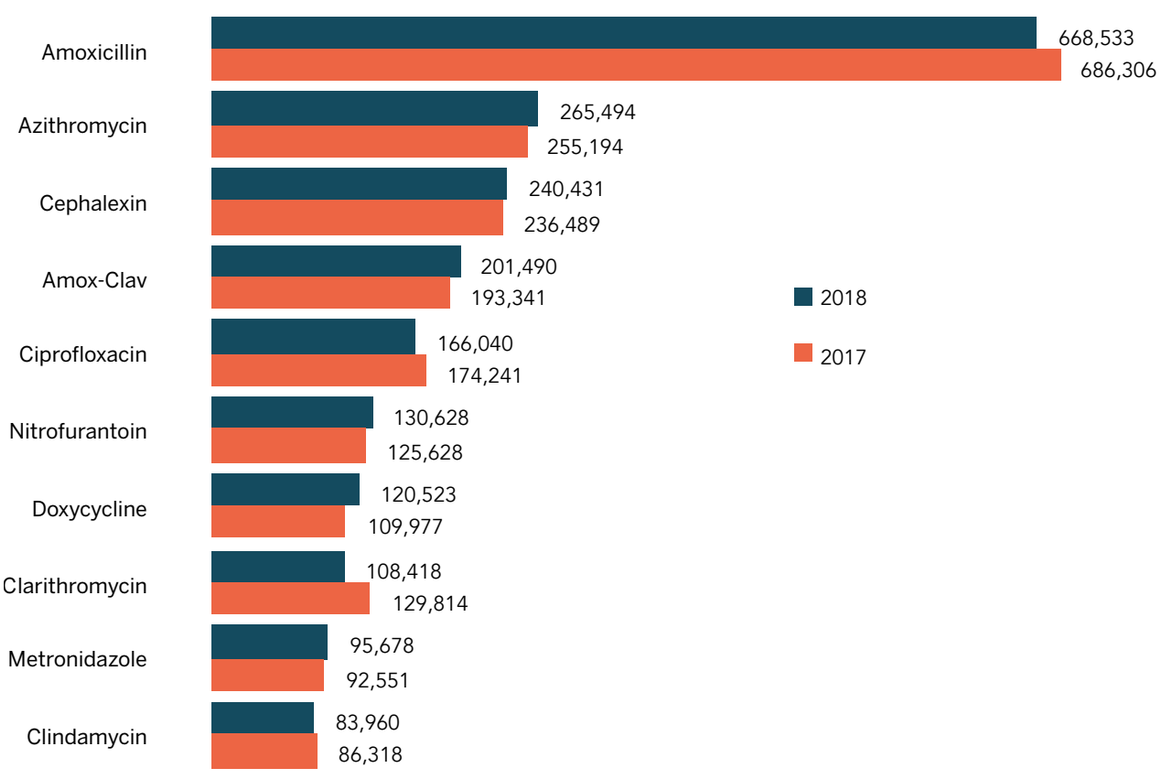


Figure 4. Prescriptions by Antibiotic per Year*, 2017 - 2018

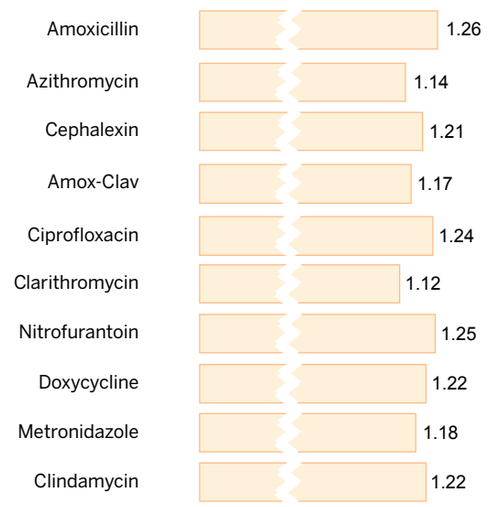


*Only the most commonly-prescribed antibiotics are shown, representing over 84% of all oral antibiotics dispensed. Appendix A shows other commonly prescribed antibiotics in Alberta.

The ***average*** number of prescriptions ***per patient*** by the most common antibiotics in 2018 are shown in Figure 5. Figure 6 shows the ***distribution*** of the number of prescriptions ***per patient*** per year for the same antibiotics. Overall, most patients were dispensed only one to two prescriptions for the same antibiotic. However, depending on antibiotic, one to four percent of patients were dispensed three or more prescriptions in 2018 for the same antibiotic.

For example, just over 80% of patients who received amoxicillin in 2018 had one prescription, about 15% of patients had two prescriptions, 3.5% had three to five prescriptions, 0.05% had six to 10 prescriptions and approximately 0.1% had 11 or more prescriptions (Figure 6).

Figure 5. Average Prescriptions† per Patient by Antibiotic*, 2018



† See Figure 4 for prescription counts by antibiotic

Figure 7 shows the ***average*** number of treatment days ***per patient*** by antibiotic in 2018. It accompanies Figure 8 which displays the ***distribution*** of the number of treatment days ***per patient*** by antibiotic.

A substantial number of patients were dispensed antibiotics for greater than 10 treatment days in the year regardless of antibiotic. Doxycycline averaged nearly 27 treatment days ***per patient*** (Figure 8).

Figure 7. Average Treatment Days per Patient by Antibiotic*, 2018

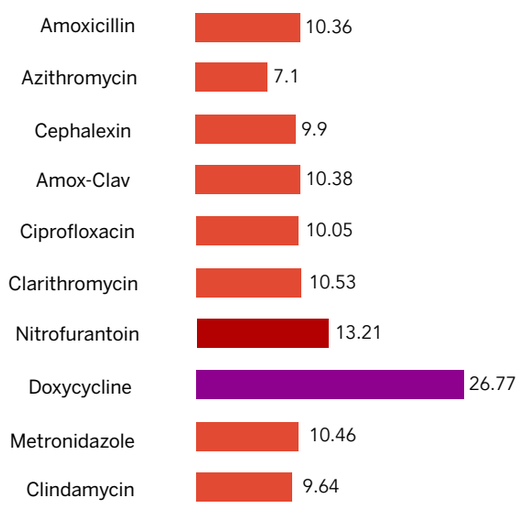


Figure 9 shows the ***average*** number of treatment days ***per prescription*** by antibiotic in 2018. It accompanies Figure 10 which displays the ***distribution*** of the number of treatment days ***per prescription*** by antibiotic.

Treatment days per prescription of more than seven days was common for most antibiotics other than azithromycin (Figure 10).

Figure 9. Average Treatment Days per Prescription by Antibiotic*, 2018

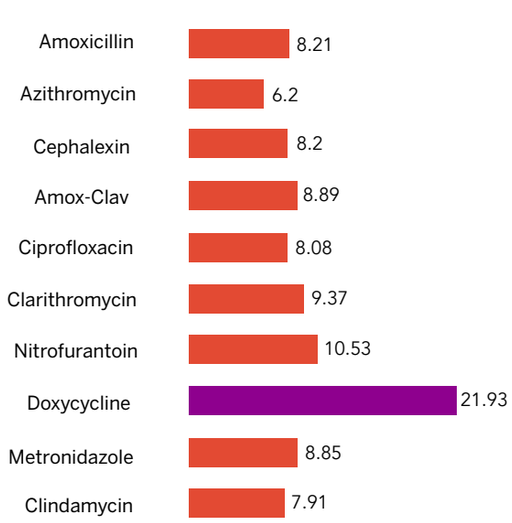


Figure 6. Distribution of Prescriptions per Patient by Antibiotic*, 2018

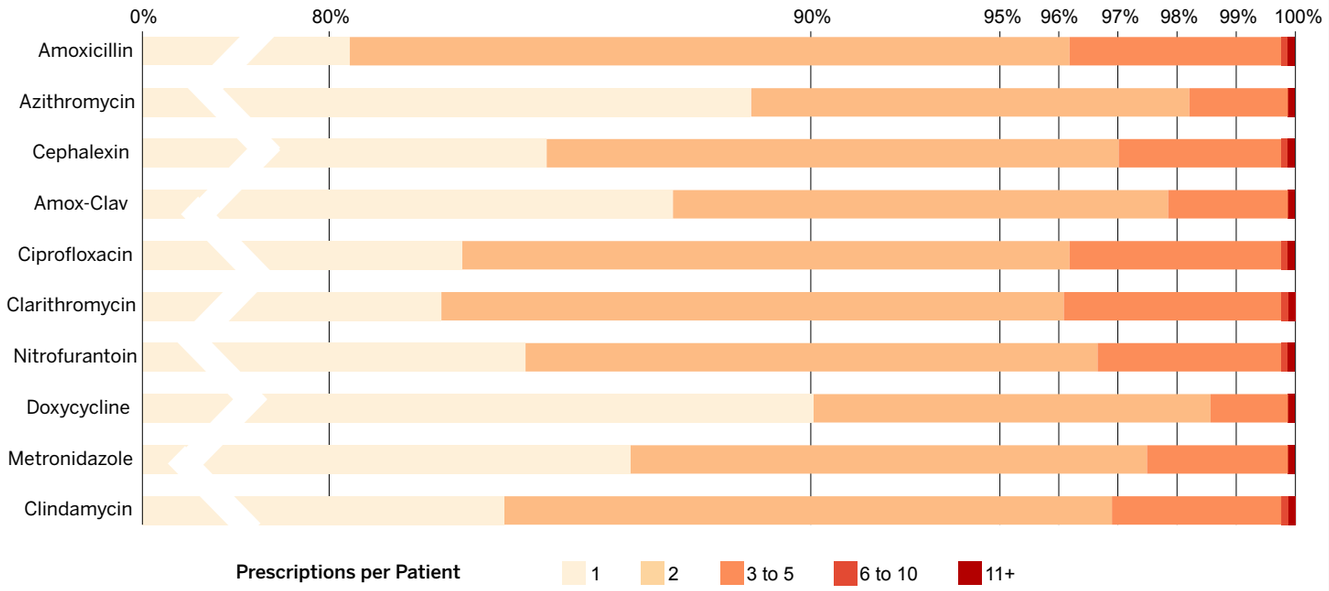


Figure 8. Distribution of Treatment Days per Patient by Antibiotic*, 2018

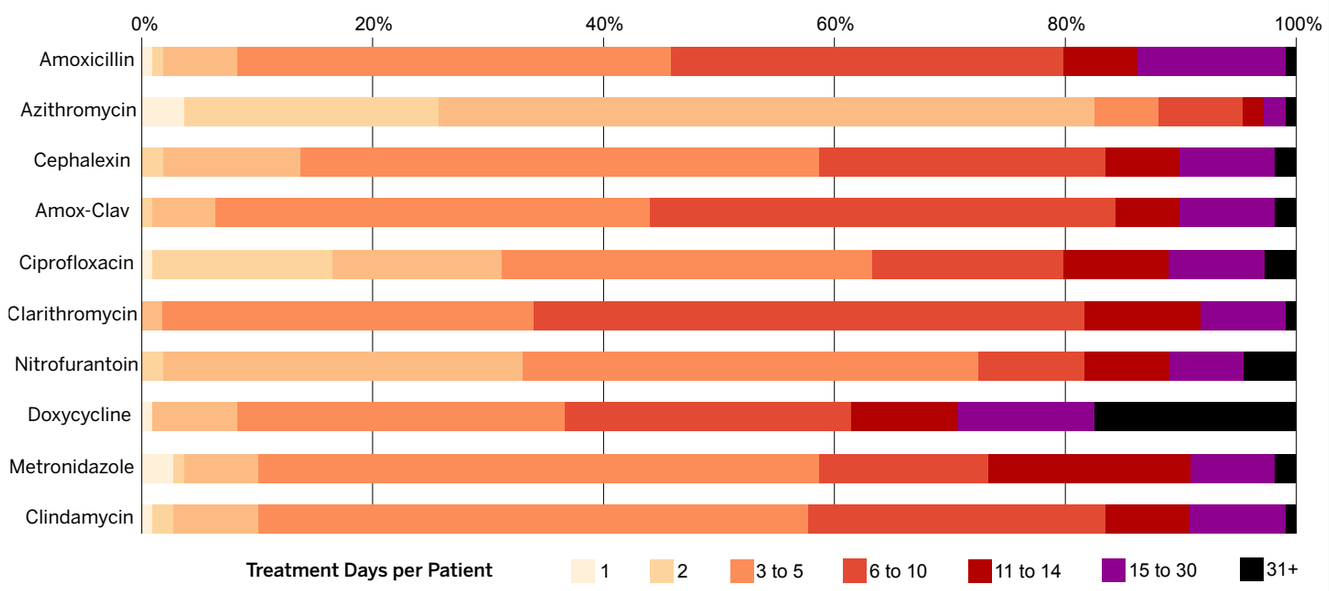
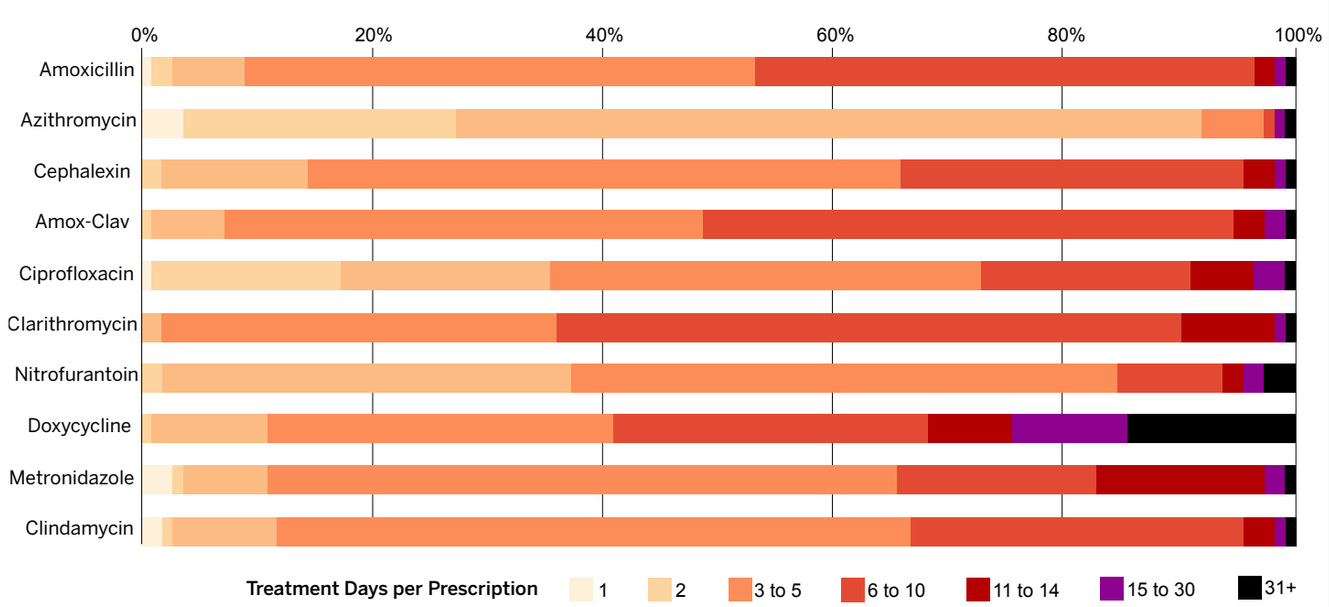
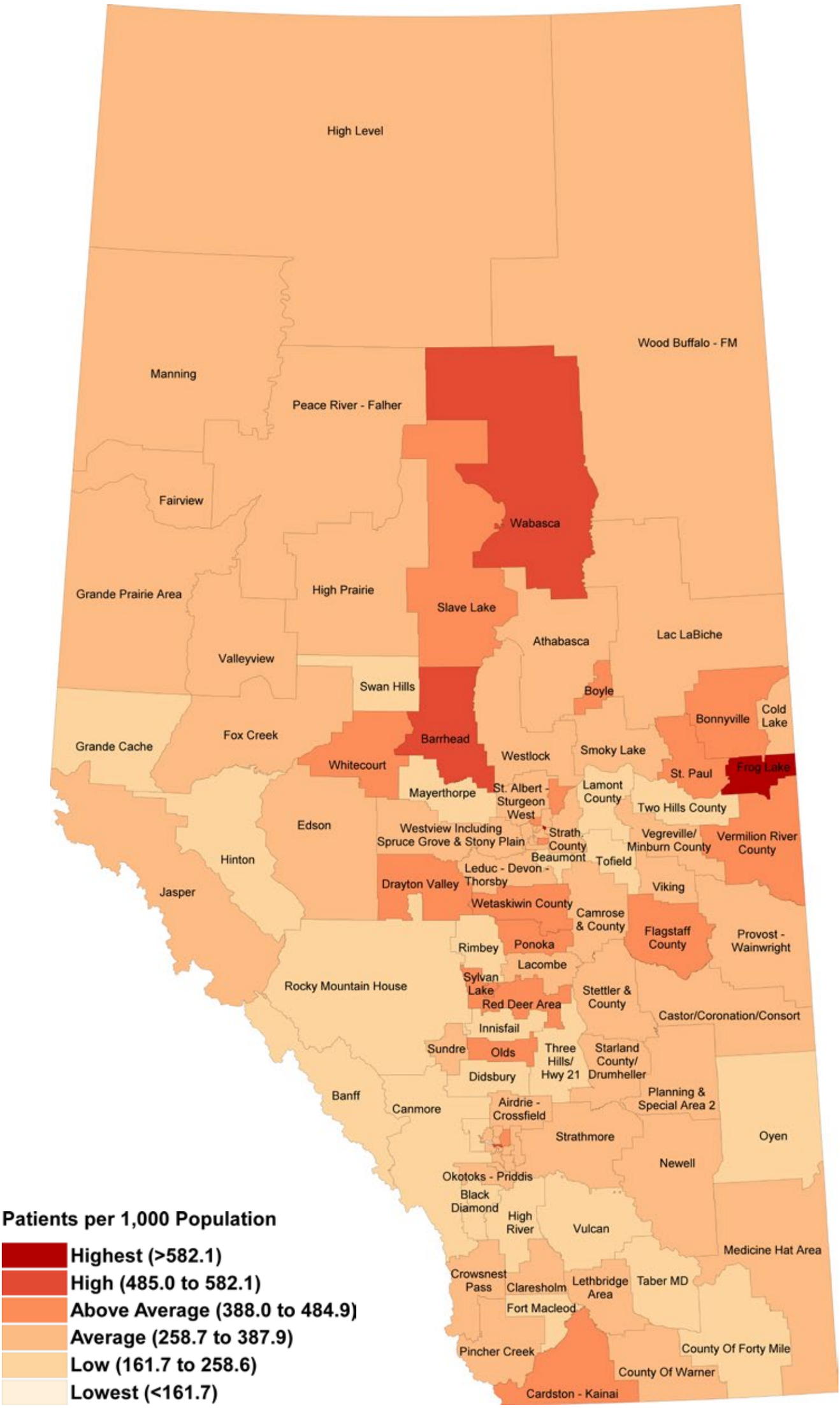


Figure 10. Distribution of Treatment Days per Prescription by Antibiotic*, 2018

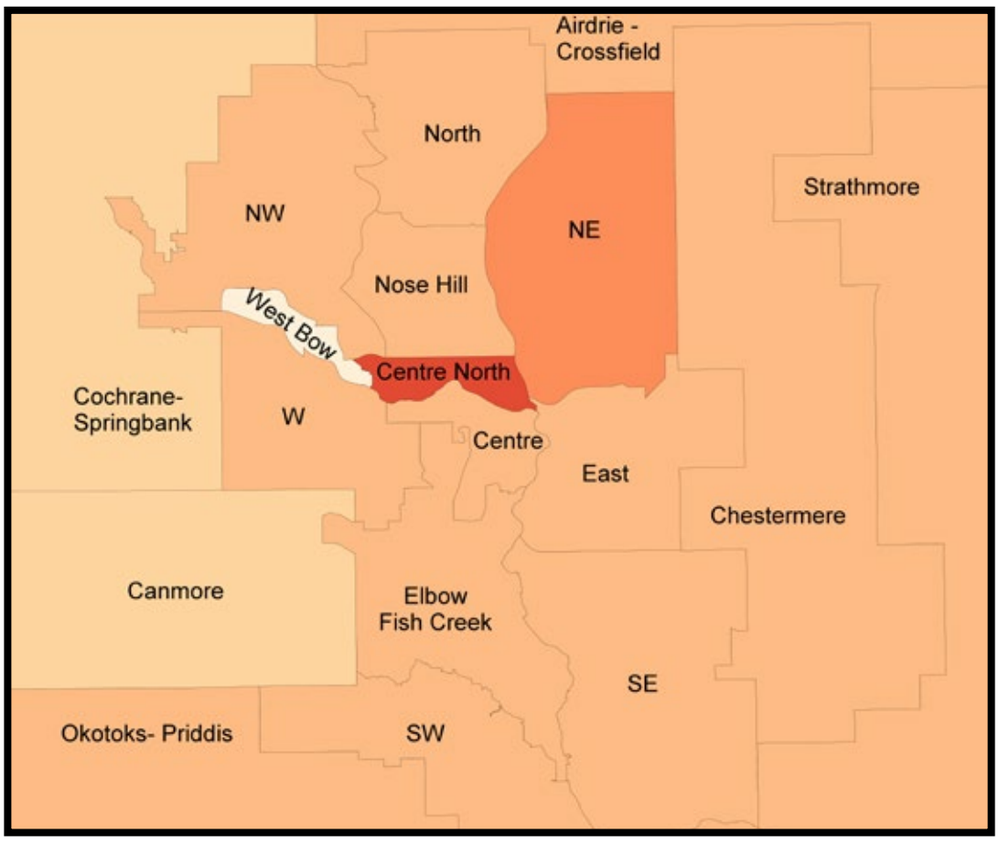


*Order is ranked by the most common antibiotics.

Figure 11. Patients per 1,000 Population per Year, 2018



Calgary



Edmonton

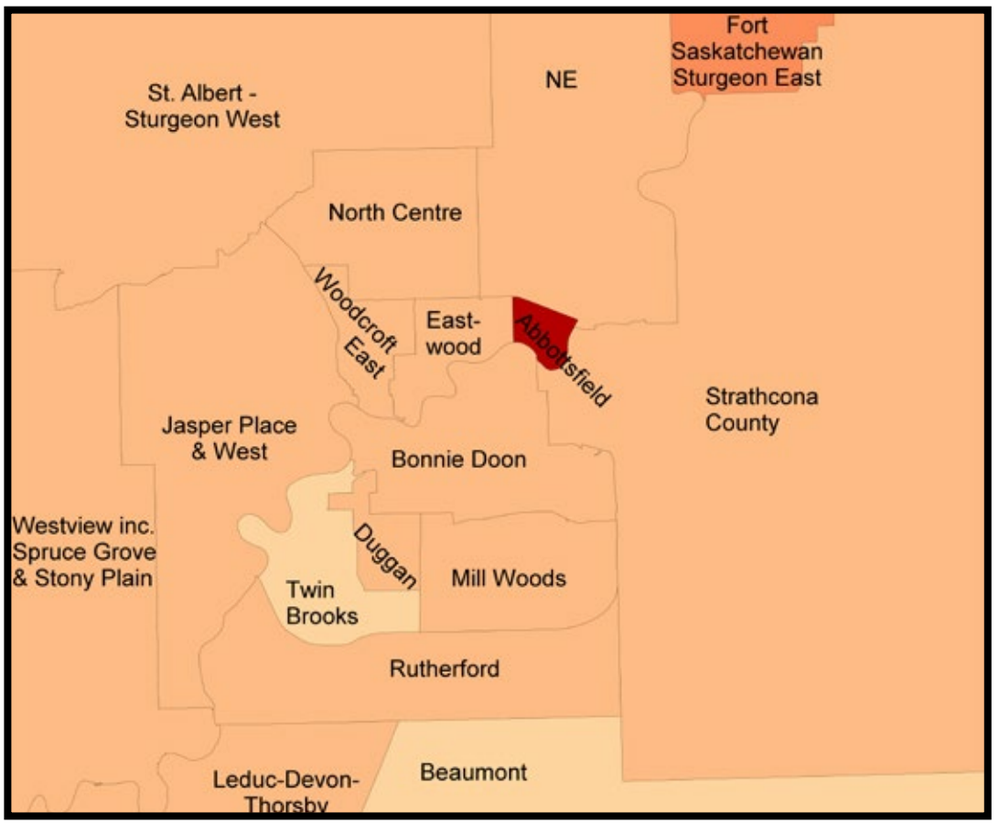
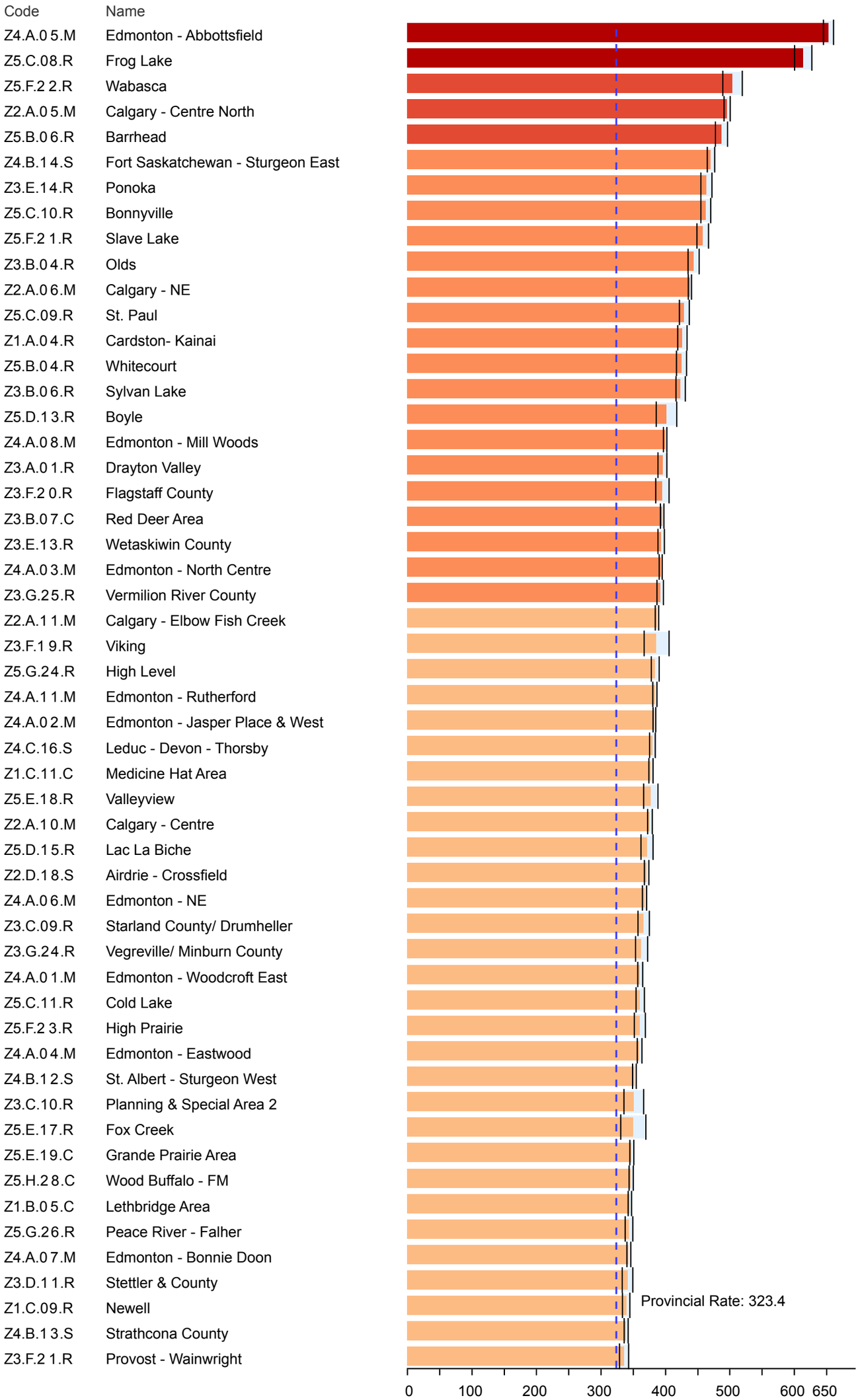


Figure 11a. Patients per 1,000 Population per Year, 2018



Code	Name
Z5.D.12.R	Smoky Lake
Z3.A.03.R	Sundre
Z4.A.09.M	Edmonton - Duggan
Z2.A.08.M	Calgary - SE
Z2.A.01.M	Calgary - NW
Z3.F.17.R	Camrose & County
Z1.B.07.R	County Of Warner
Z2.A.07.M	Calgary - East
Z2.D.19.S	Chestermere
Z2.A.09.M	Calgary - W
Z5.B.07.R	Westlock
Z3.D.12.R	Castor/ Coronation/ Consort
Z5.D.14.R	Athabasca
Z2.C.16.R	Claresholm
Z2.D.20.S	Strathmore
Z1.A.02.R	Pincher Creek
Z2.A.12.M	Calgary - SW
Z3.E.16.R	Lacombe
Z4.A.10.M	Edmonton - Twin Brooks
Z2.A.02.M	Calgary - North
Z2.A.03.M	Calgary - Nose Hill
Z1.A.01.R	Crowsnest Pass
Z2.B.13.S	Okotoks- Priddis
Z4.C.17.S	Westview Inc. Spruce Grove Stony Plain
Z5.G.25.R	Manning
Z5.A.01.R	Jasper
Z5.G.27.R	Fairview
Z5.A.03.R	Edson
Z2.B.14.S	Black Diamond
Z1.C.10.R	Oyen
Z2.E.22.S	Cochrane- Springbank
Z3.A.02.R	Rocky Mountain House
Z2.B.15.S	High River
Z3.B.05.R	Innisfail
Z4.C.15.S	Beaumont
Z1.B.06.R	Taber MD
Z5.F.20.R	Swan Hills
Z3.G.22.R	Lamont County
Z2.D.21.R	Didsbury
Z3.E.15.R	Rimbey
Z2.E.23.S	Canmore
Z5.A.02.R	Hinton
Z3.F.18.R	Tofield
Z3.G.23.R	Two Hills County
Z5.E.16.R	Grande Cache
Z1.A.03.R	Fort Macleod
Z2.C.17.R	Vulcan
Z1.C.08.R	County Of Forty Mile
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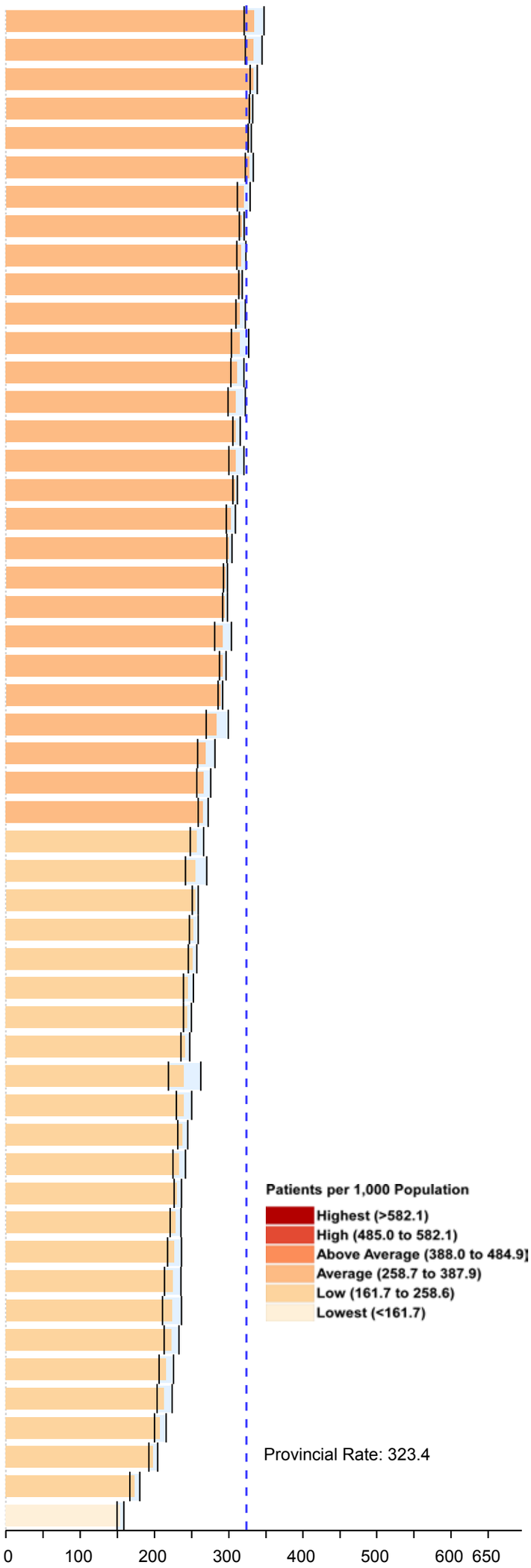
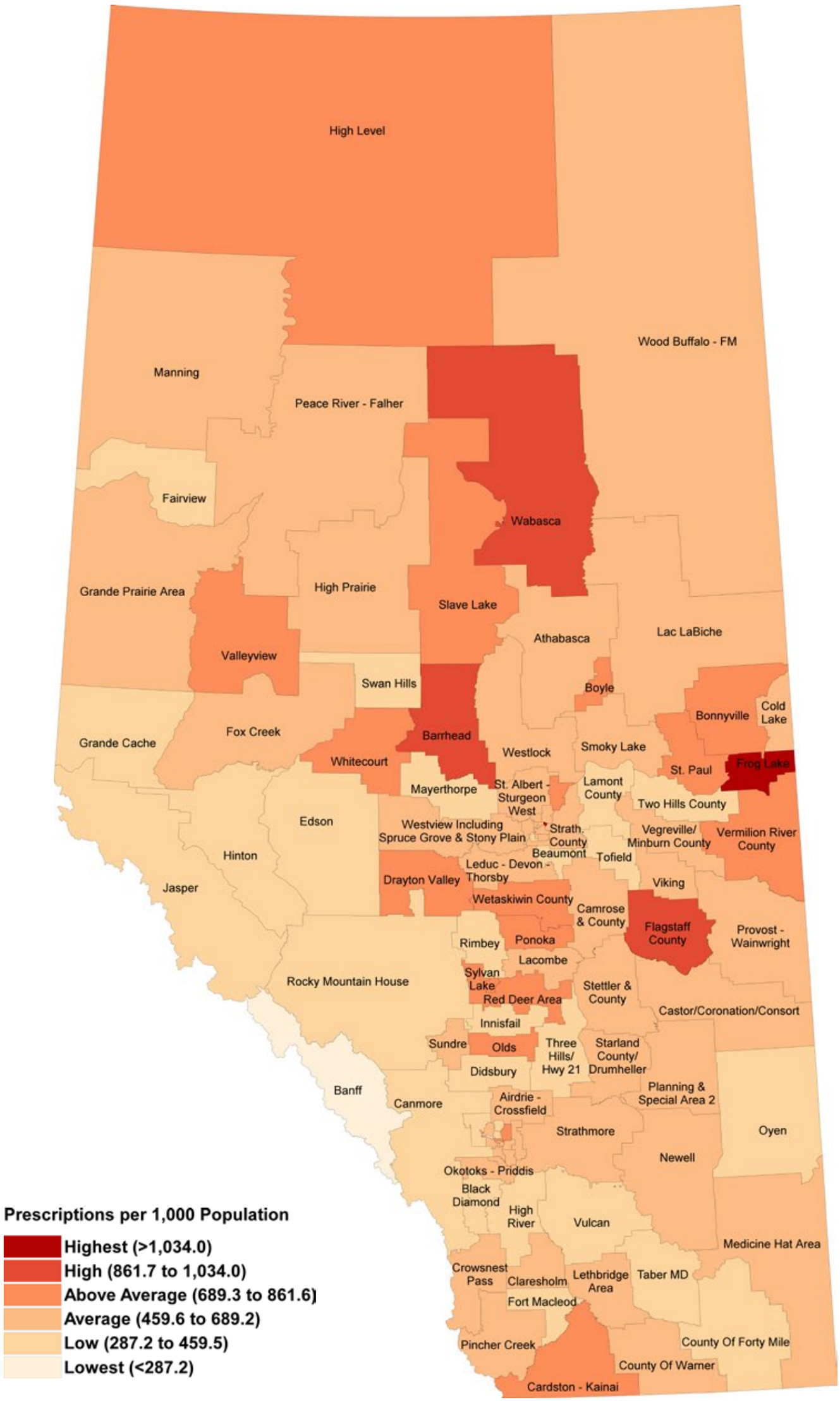
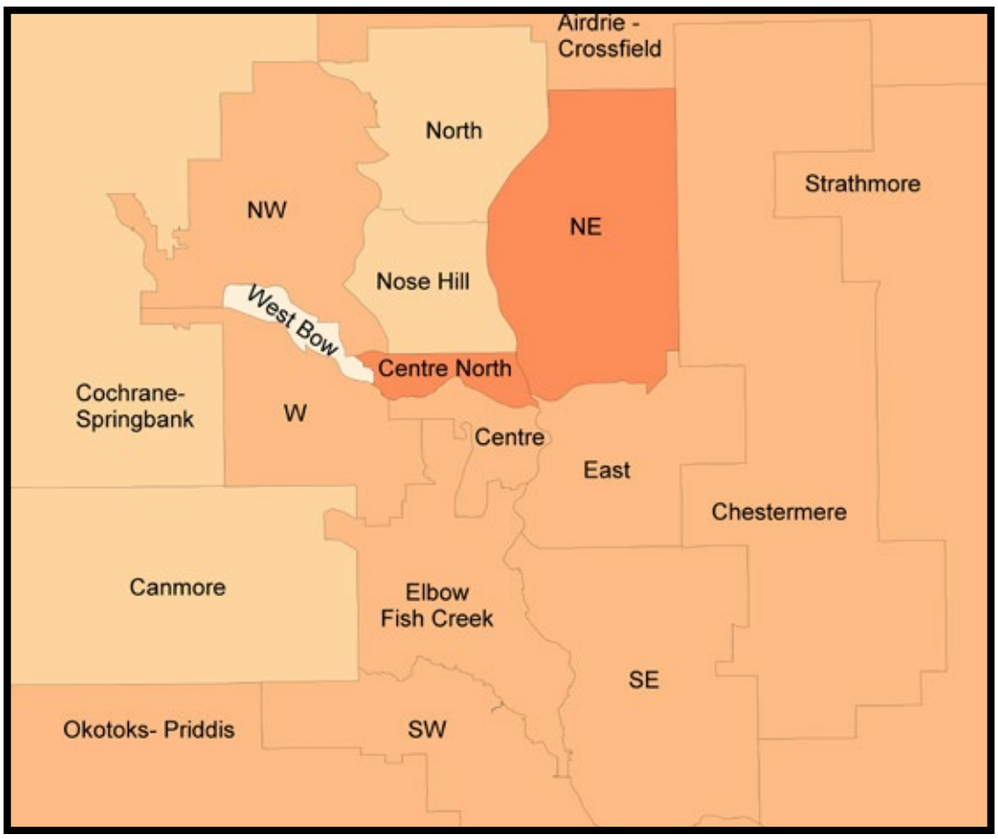


Figure 12. Prescriptions per 1,000 Population per Year, 2018



Calgary



Edmonton

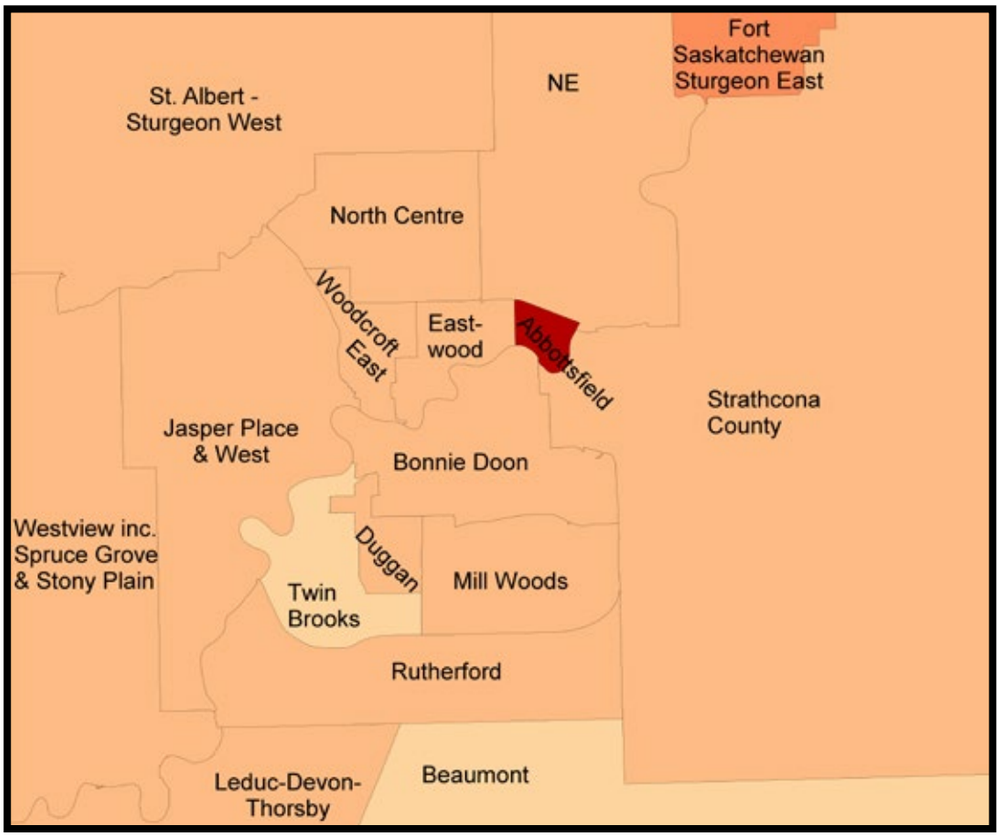
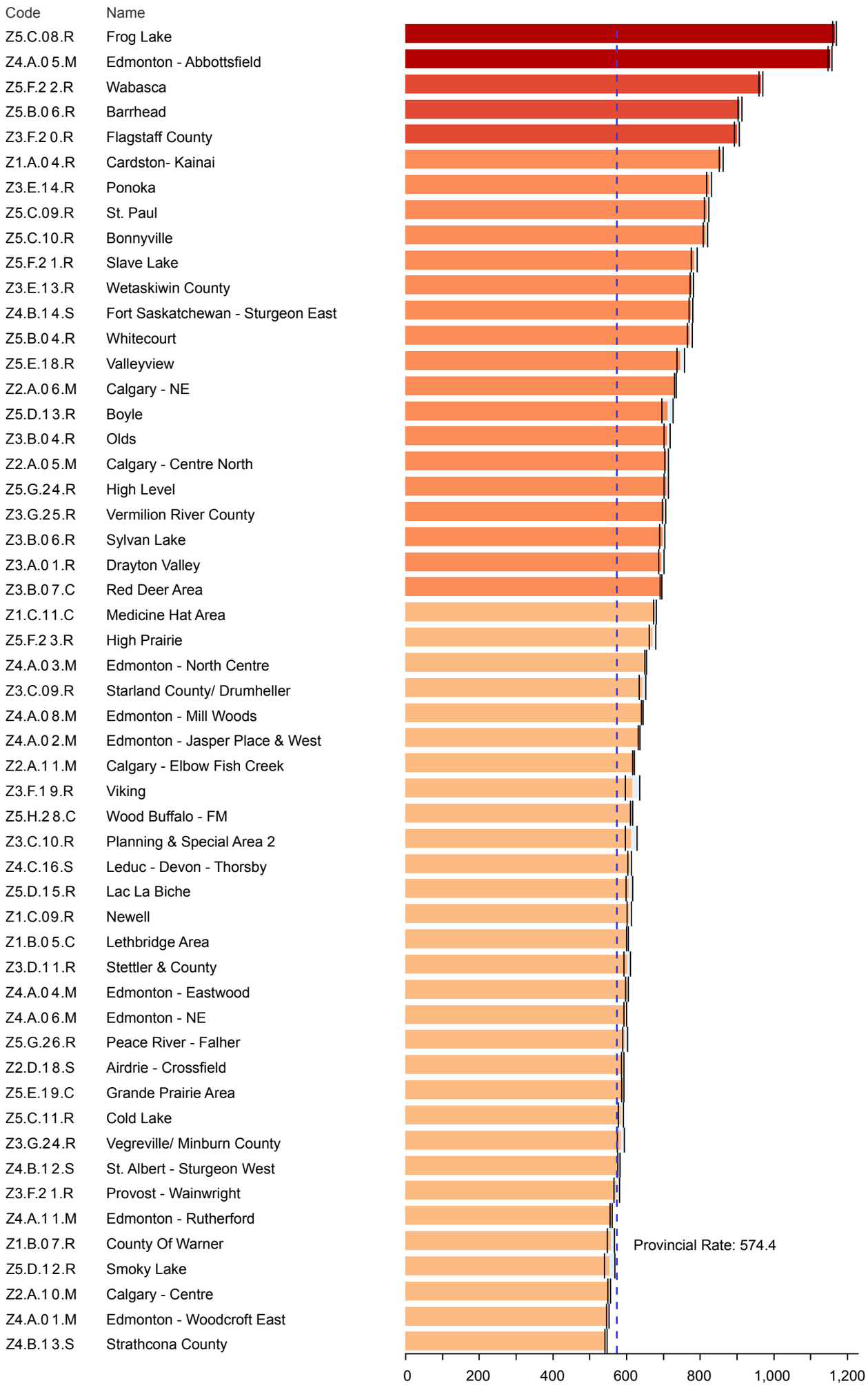


Figure 12a. Prescriptions per 1,000 Population per Year, 2018



Code	Name
Z3.D.12.R	Castor/ Coronation/ Consort
Z2.D.20.S	Strathmore
Z3.F.17.R	Camrose & County
Z3.A.03.R	Sundre
Z5.B.07.R	Westlock
Z5.D.14.R	Athabasca
Z4.A.07.M	Edmonton - Bonnie Doon
Z2.A.07.M	Calgary - East
Z1.A.02.R	Pincher Creek
Z2.A.08.M	Calgary - SE
Z2.C.16.R	Claresholm
Z5.E.17.R	Fox Creek
Z2.D.19.S	Chestermere
Z5.G.25.R	Manning
Z1.A.01.R	Crowsnest Pass
Z2.A.01.M	Calgary - NW
Z2.A.09.M	Calgary - W
Z4.A.09.M	Edmonton - Duggan
Z3.E.16.R	Lacombe
Z4.C.17.S	Westview Inc. Spruce Grove & Stony Plain
Z2.A.12.M	Calgary - SW
Z2.B.13.S	Okotoks- Priddis
Z1.C.10.R	Oyen
Z4.A.10.M	Edmonton - Twin Brooks
Z5.G.27.R	Fairview
Z2.A.02.M	Calgary - North
Z2.A.03.M	Calgary - Nose Hill
Z2.B.14.S	Black Diamond
Z5.A.03.R	Edson
Z3.A.02.R	Rocky Mountain House
Z2.B.15.S	High River
Z2.E.22.S	Cochrane- Springbank
Z5.F.20.R	Swan Hills
Z2.D.21.R	Didsbury
Z3.B.05.R	Innisfail
Z3.G.22.R	Lamont County
Z5.A.01.R	Jasper
Z1.B.06.R	Taber MD
Z3.F.18.R	Tofield
Z3.E.15.R	Rimbey
Z2.C.17.R	Vulcan
Z4.C.15.S	Beaumont
Z3.G.23.R	Two Hills County
Z5.A.02.R	Hinton
Z2.E.23.S	Canmore
Z5.E.16.R	Grande Cache
Z1.C.08.R	County Of Forty Mile
Z3.C.08.R	Three Hills/ Highway 21
Z1.A.03.R	Fort Macleod
Z5.B.05.R	Mayerthorpe
Z2.E.24.R	Banff
Z2.A.04.M	Calgary - West Bow

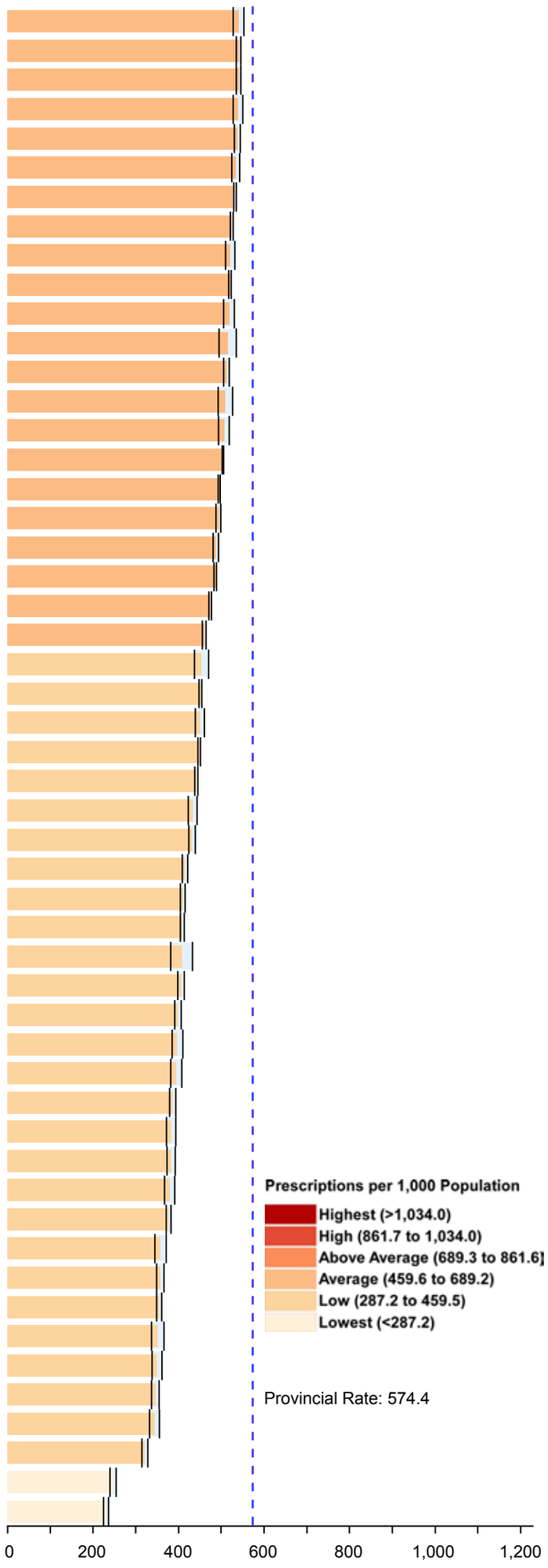
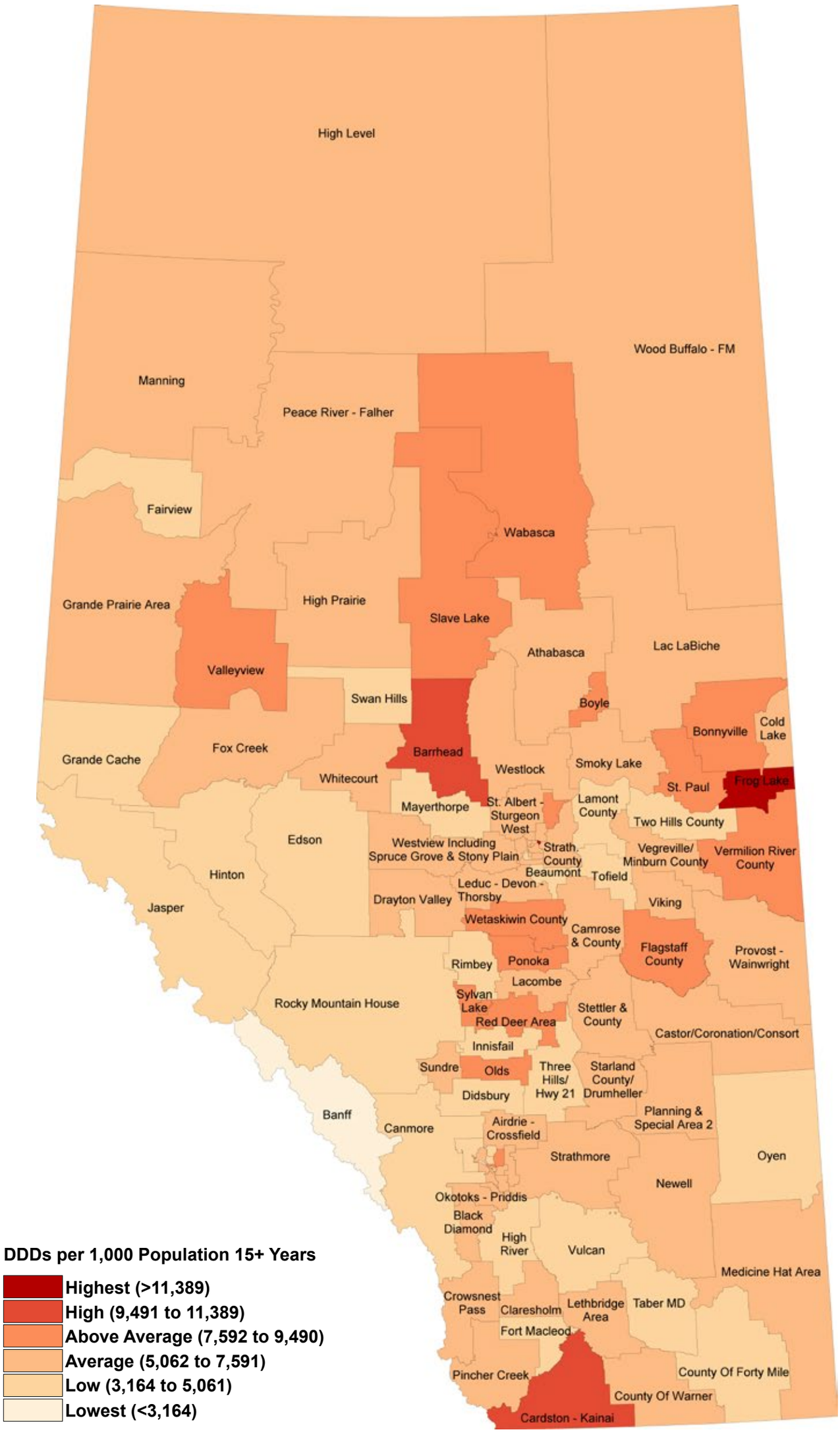
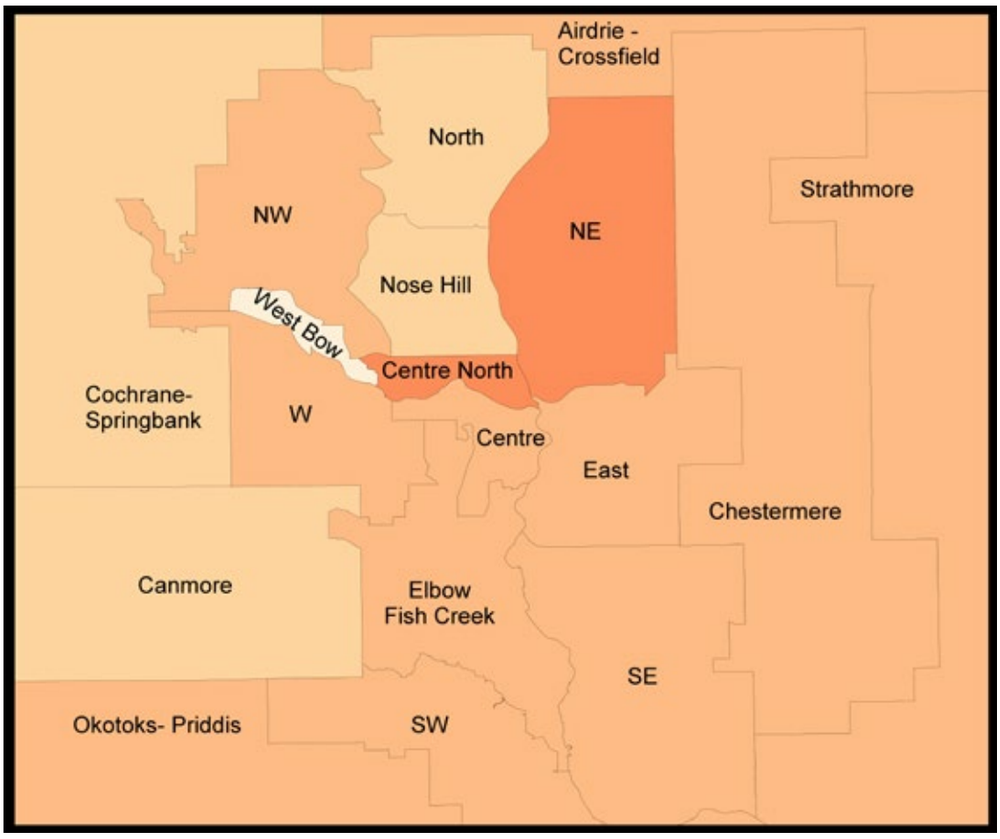


Figure 13. DDDs per 1,000 Population 15 Years and Older per Year, 2018



Calgary



Edmonton

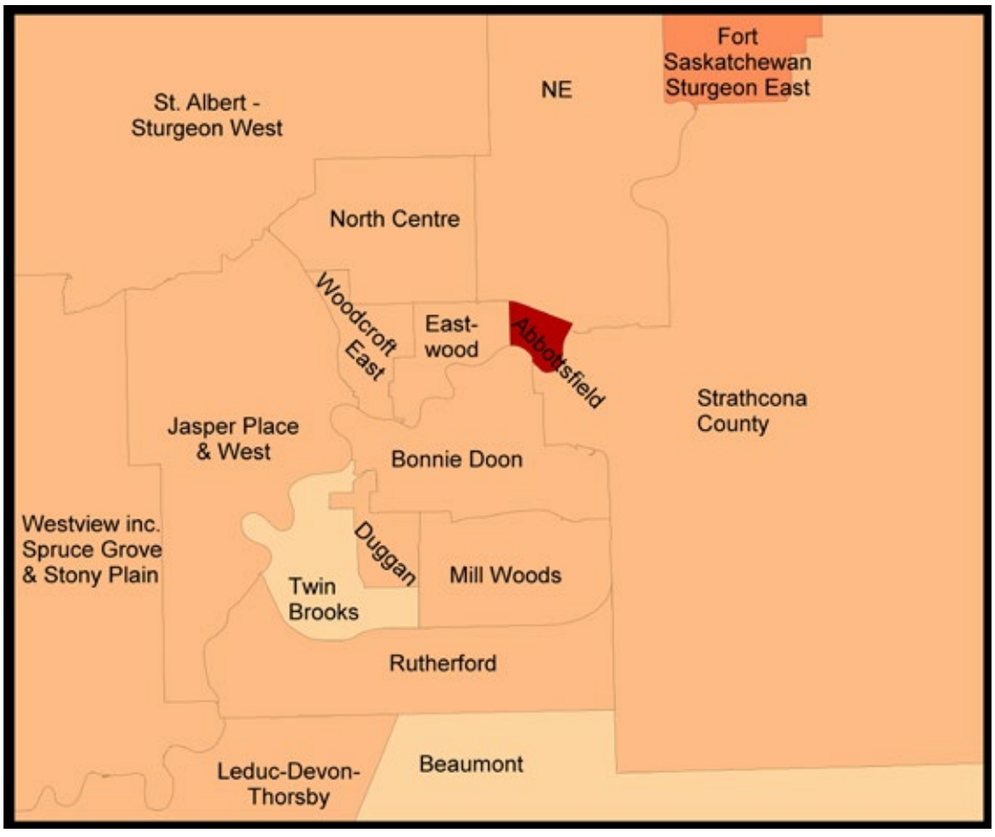
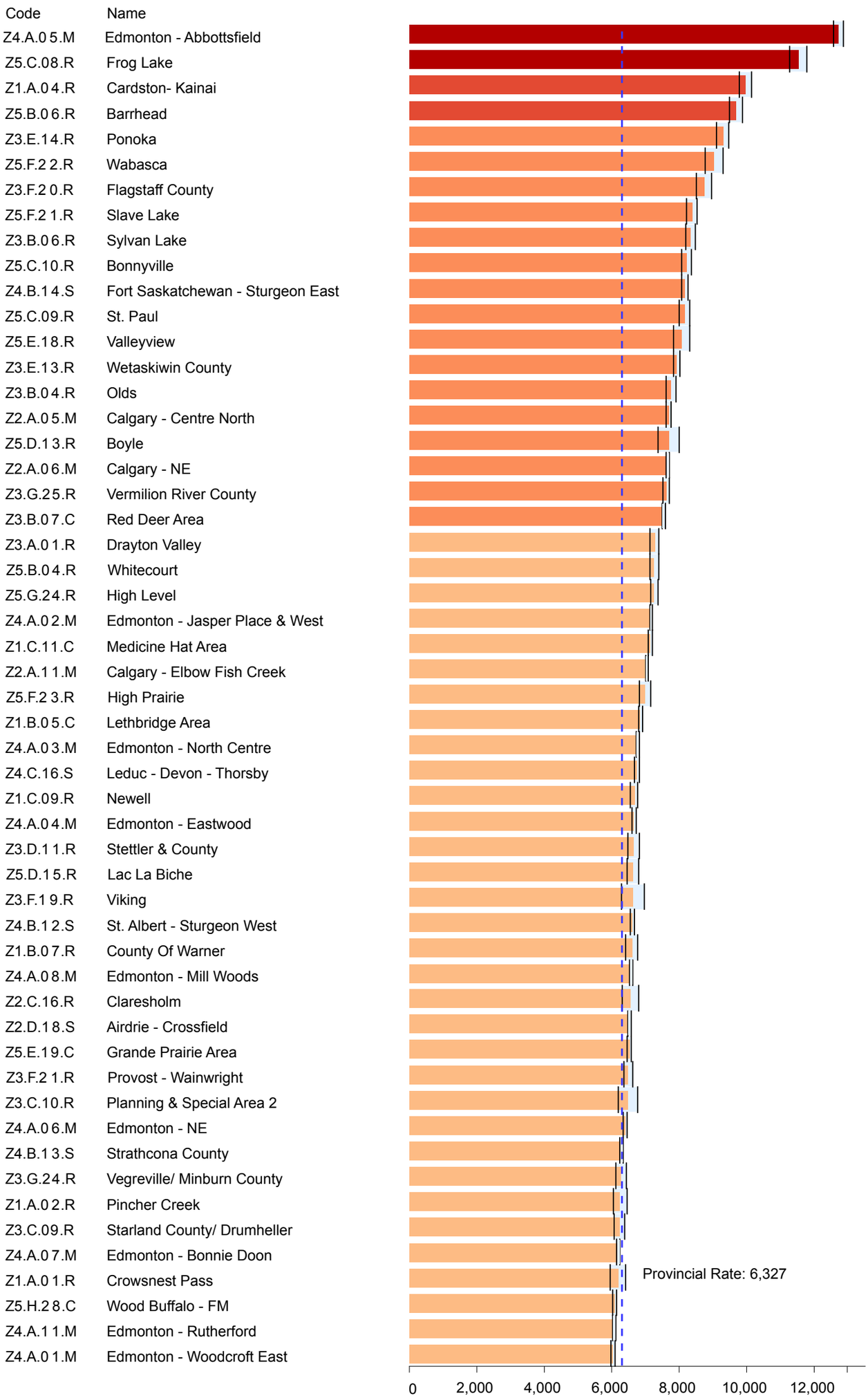
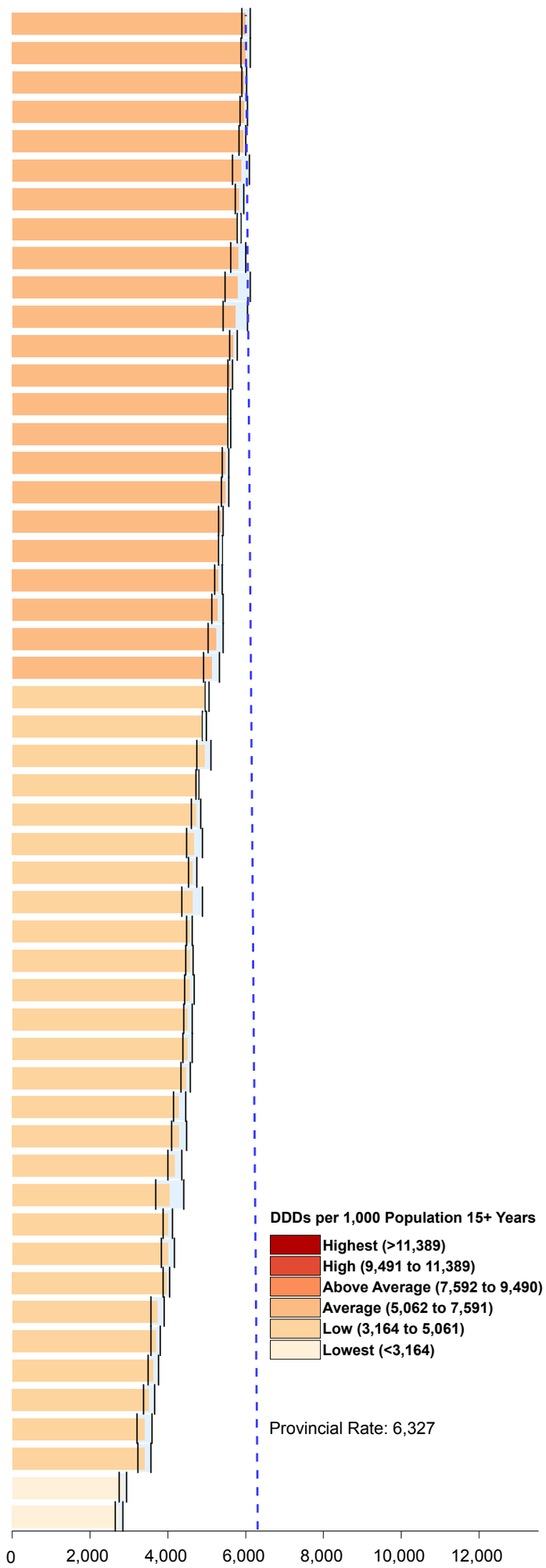


Figure 13a. DDDs per 1,000 Population 15 Years and Older per Year, 2018



Code	Name
Z5.G.26.R	Peace River - Falher
Z5.B.07.R	Westlock
Z2.A.10.M	Calgary - Centre
Z2.D.20.S	Strathmore
Z4.A.09.M	Edmonton - Duggan
Z3.D.12.R	Castor/ Coronation/ Consort
Z3.E.16.R	Lacombe
Z2.A.08.M	Calgary - SE
Z3.A.03.R	Sundre
Z5.E.17.R	Fox Creek
Z5.G.25.R	Manning
Z3.F.17.R	Camrose & County
Z2.A.07.M	Calgary - East
Z2.A.01.M	Calgary - NW
Z2.A.09.M	Calgary - W
Z2.B.13.S	Okotoks- Priddis
Z5.C.11.R	Cold Lake
Z4.C.17.S	Westview Inc. Spruce Grove & Stony Plain
Z2.A.12.M	Calgary - SW
Z2.D.19.S	Chestermere
Z5.D.14.R	Athabasca
Z2.B.14.S	Black Diamond
Z5.D.12.R	Smoky Lake
Z2.A.03.M	Calgary - Nose Hill
Z4.A.10.M	Edmonton - Twin Brooks
Z5.G.27.R	Fairview
Z2.A.02.M	Calgary - North
Z5.A.03.R	Edson
Z3.G.22.R	Lamont County
Z3.A.02.R	Rocky Mountain House
Z1.C.10.R	Oyen
Z2.E.22.S	Cochrane- Springbank
Z2.B.15.S	High River
Z3.B.05.R	Innisfail
Z4.C.15.S	Beaumont
Z2.D.21.R	Didsbury
Z1.B.06.R	Taber MD
Z3.E.15.R	Rimbey
Z2.C.17.R	Vulcan
Z1.A.03.R	Fort Macleod
Z5.F.20.R	Swan Hills
Z5.B.05.R	Mayerthorpe
Z5.A.01.R	Jasper
Z2.E.23.S	Canmore
Z1.C.08.R	County Of Forty Mile
Z5.A.02.R	Hinton
Z3.C.08.R	Three Hills/ Highway 21
Z3.F.18.R	Tofield
Z5.E.16.R	Grande Cache
Z3.G.23.R	Two Hills County
Z2.A.04.M	Calgary - West Bow
Z2.E.24.R	Banff



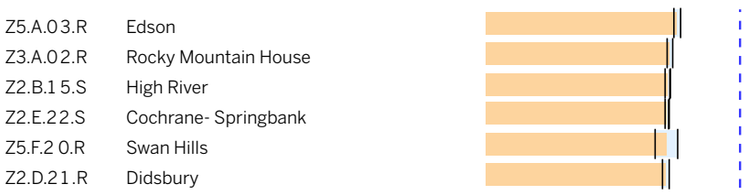
Appendix A. Patients, Prescriptions, Prescribers and Pharmacies by Antibiotic and ATC Code, 2018*

Antibiotic	ATC Code	Patients	Prescriptions	Prescribers	Pharmacies
Amoxicillin	J01CA04	529,918	668,533	11,531	1,478
Azithromycin	J01FA10	231,904	265,494	9,065	1,467
Cephalexin	J01DB01	198,956	240,431	10,686	1,457
Amox-Clav	J01CR02	172,616	201,490	9,793	1,450
Ciprofloxacin	J01MA02	133,461	166,040	9,828	1,451
Nitrofurantoin	J01XE01	104,159	130,628	7,772	1,444
Doxycycline	J01AA02	98,438	120,092	8,093	1,449
Clarithromycin	J01FA09	96,459	108,418	6,152	1,430
Metronidazole	P01AB01	80,971	95,648	8,155	1,433
Clindamycin	J01FF01	68,859	83,960	6,650	1,419
Penicillin	J01CE02	62,477	69,296	5,392	1,397
SMX-TMP	J01EE01	53,699	70,600	7,857	1,417
Cefixime	J01DD08	50,072	59,130	5,960	1,350
Levofloxacin	J01MA12	32,900	39,548	5,805	1,376
Minocycline	J01AA08	27,653	40,631	4,829	1,358
Cefuroxime	J01DC02	17,364	19,583	2,983	1,216
Fosfomycin	J01XX01	16,362	19,522	3,289	1,227
Cefprozil	J01DC10	14,513	16,685	1,040	919
Cloxacillin	J01CF02	13,219	14,993	2,515	1,200
Moxifloxacin	J01MA14	11,940	13,940	1,777	1,156

*Only the 20 most commonly-prescribed antibiotics are shown

Appendix B. Graph Legend

Example section of the graph showing individual pharmacy local aggregated geography rates with 95% confidence intervals.



Blue bar represents the 95% confidence limits
Blue line represents the provincial rate
Length of bar represents observed rate

Map Legend

The mapping categories are consistent in all maps. Categories are based on rate ratios between the observed geographic area and the corresponding rate for the province. Definitions of rate ratios are shown below.

Rate Ratio	Prescriptions per 1,000 Population
1.8+	Highest (>1,034.0)
1.5 to < 1.8	High (861.7 to 1,034.0)
1.2 to < 1.5	Above Average (689.3 to 861.6)
0.8 to < 1.2	Average (459.6 to 689.2)
0.5 to < 0.8	Low (287.2 to 459.5)
<0.5	Lowest (<287.2)

TPP Alberta Antibiotic Prescription Atlas 2018