

Background:

- Alberta (AB) is a province of ~4 million people in western Canada.
- Public health care services administered by 5 zones with provincial oversight.
- 2 urban zones; Calgary and Edmonton (~2.6 million, or 68% of the population) and 3 rural zones; rural populations and small urban centres.

Socioeconomic indicators:¹

- Median family income (AB: \$76, 642 vs CAN: \$66,452).
- University program completion (AB 26.6% vs CAN 27.9%) .
- Within AB: Median income; Calgary>Edmonton>North>Central>South. University completion; Calgary>Edmonton>South>Central>North.

Health Indicators:¹

- Age standardized, all cause death rates and non-birth & non-pregnancy related hospitalization rates: North>Central>South>Edmonton>Calgary zones (2007-2009)
- Most common causes of death; circulatory disorders, cancer and respiratory disorders
- HATi score (Healthy Alberta Trends index, a composite of health risks), highest (poorest health) in the Central>North,>South=Edmonton>Calgary
- Licensed physicians per capita; Edmonton>Calgary>South>Central>North

Methods:

We obtained data from the IMS Brogan Xponent[®] database to estimate the use of systemic antibacterials (Abx) for 8 quarters for period of Jul 2010 - Jun 2012. Population data were obtained from the Alberta Health Care Insurance Plan (AHCIP) for each year and end of quarter populations were estimated using a linear model.

Number of prescriptions per 1000 inhabitant-days (PrID) and defined daily doses per 1000 inhabitant-days (DID) were calculated for the zones, stratified by ages 0-17 (pediatrics), 18-64 (adults) and ≥65 years (seniors).

Statistical comparisons of DID and PrID were conducted using tests for person-time data. Data were benchmarked against Canadian National data,² US national IMS Xponent^{®3} and European Surveillance of Antimicrobial Consumption (ESAC) data.^{3,4,5} We further characterized our results by benchmarking against the quality indicators used by ESAC.⁴



Fig. 1 Alberta Health Services Zone Map

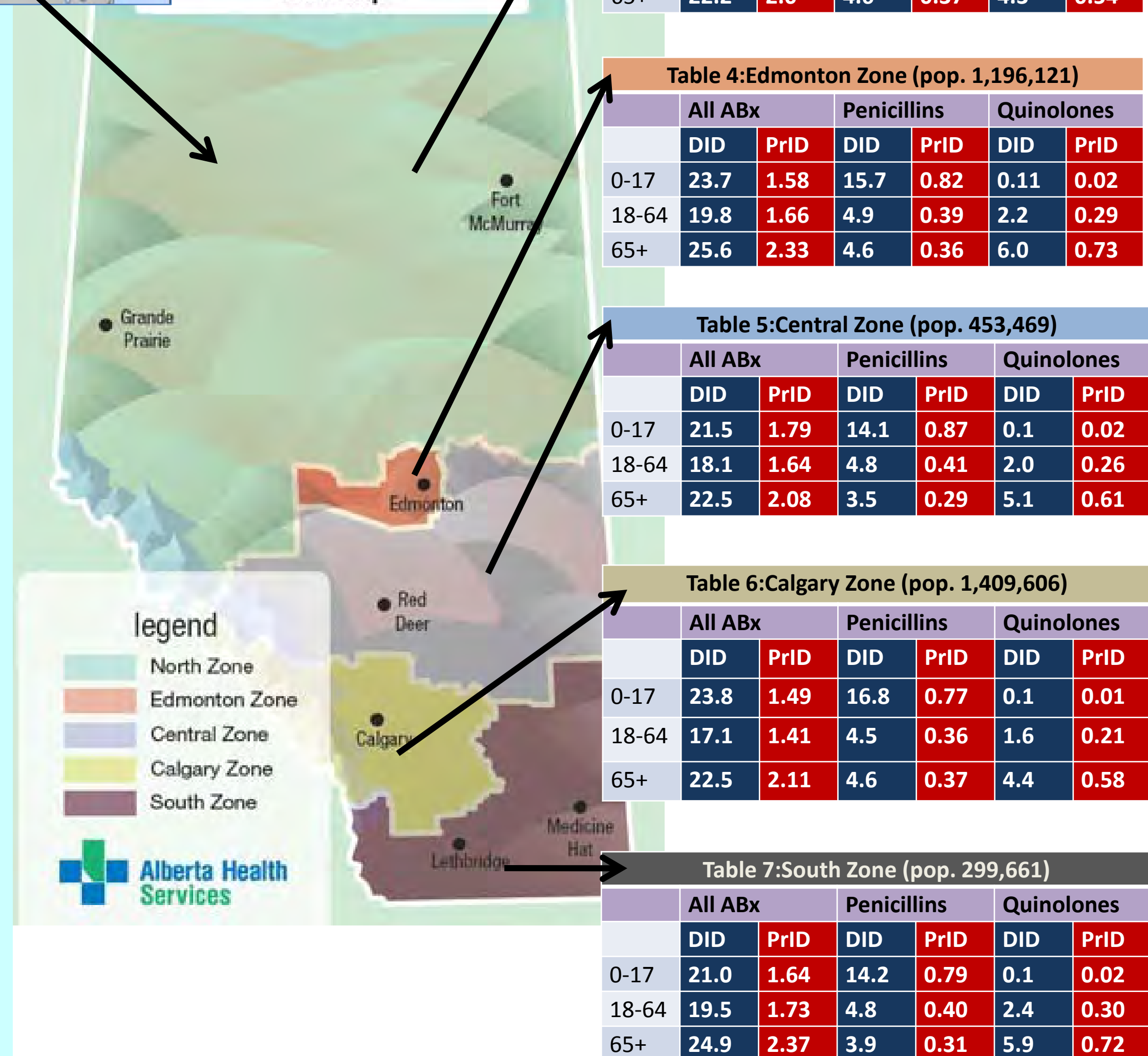


Fig 3. Zonal Antibiotic Use - ages 0-17, PrID, %

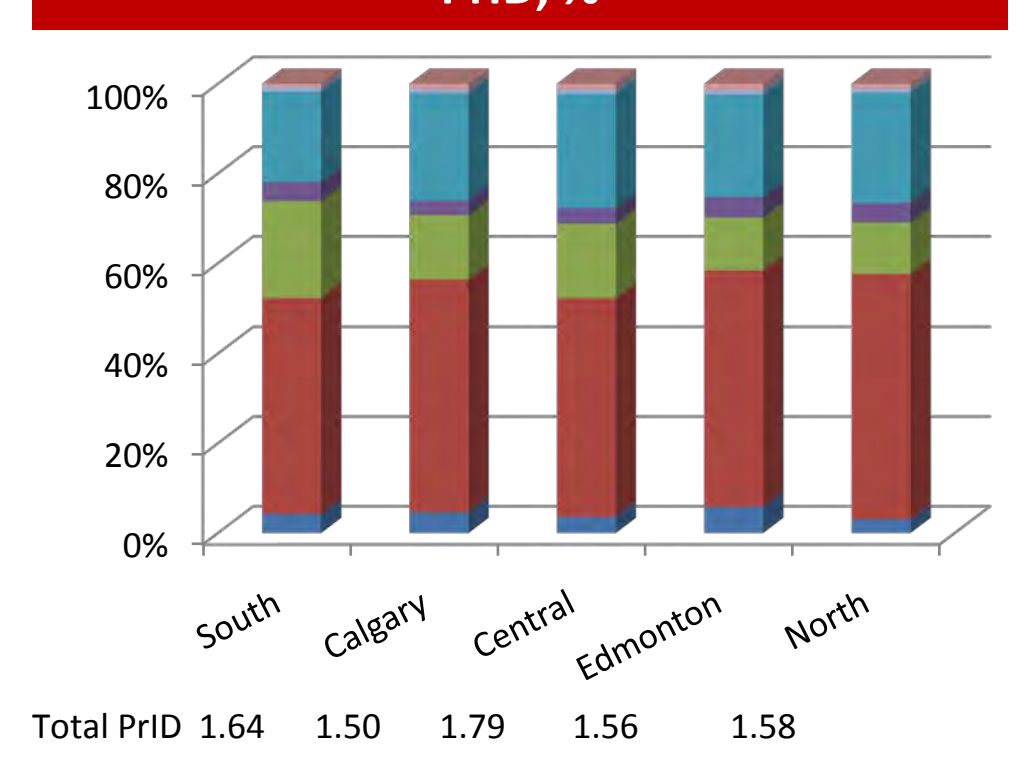


Fig 3. Pediatric Antibiotic Use. The majority of prescriptions per inhabitant day in pediatric age group are for J01C – Penicillins. J01D – Total prescriptions and cephalosporins specifically were prescribed at a higher rate in South and Central zones versus others.

Fig 4. Zonal Antibiotic Use, ages 18-64, DID, %

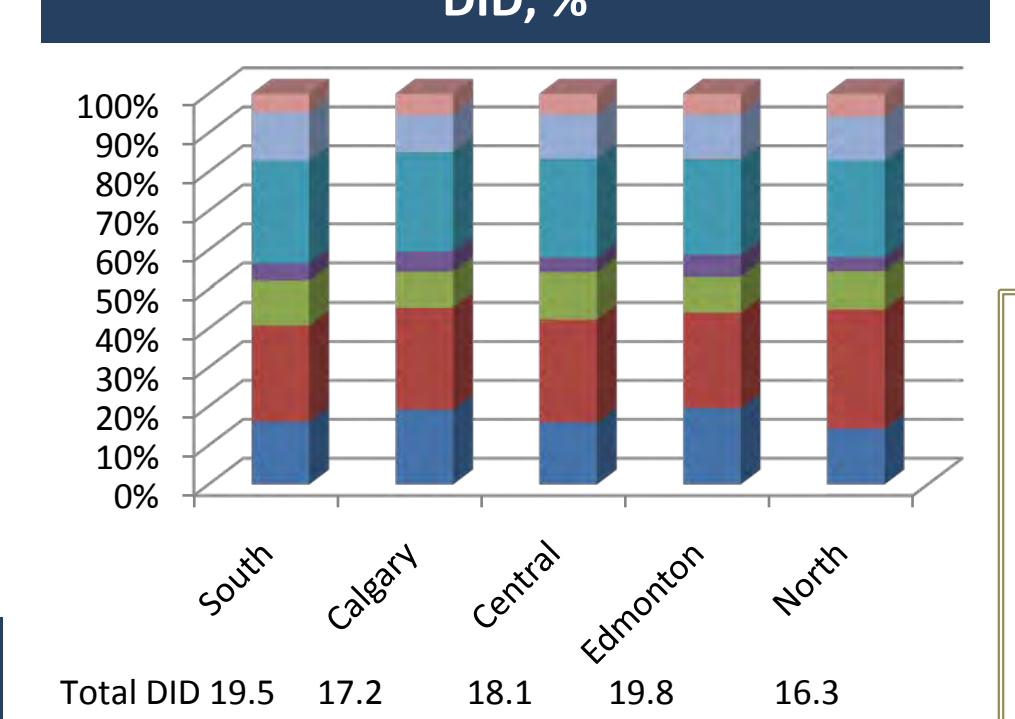


Fig 4. Adult Antibiotic Use. Higher rates of systemic antibacterials prescriptions were observed in the adult population in Edmonton, South and North zones versus Calgary and North zones. Explanation for this observation is not yet determined.

Fig 5. Zonal Antibiotic Use, ages 65+, DID, %

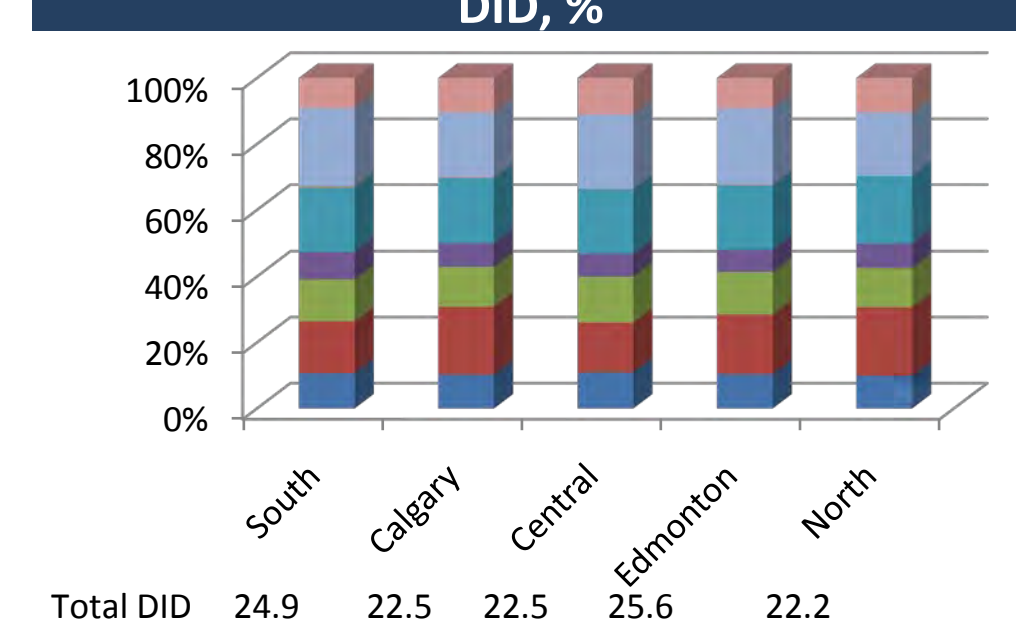


Fig 5. Some zones prescribed more fluoroquinolones and macrolides in the elderly as percentage of total. Those zones also had higher rates of consumption of all systemic antibacterials in this age group.

Legend; Figures 3-5

- J01A Tetracyclines
- J01C Penicillins
- J01D Cephalosporins
- J01E Sulfonamides
- J01F Macrolides & Clindamycin
- J01G Aminoglycosides
- J01M Fluoroquinolones
- J01X Misc. Systemic antibacterials

References:

1. How Healthy Are We? Alberta; Population, Socioeconomics and Health Summary. Alberta Health. Feb 2011. <http://www.albertahealthservices.ca/poph/hi-poph-surr-hsa-report-2011-alberta.pdf>
2. Canadian Antimicrobial Resistance Alliance. <http://www.can-r.com/> Accessed Apr 30, 2013.
3. Hicks LA, Taylor TH & Hunkler RJ. US Outpatient Antibiotic Prescribing, 2010. NEJM 2013. 368(15):1461-1462
4. Adrianssens N, Coenen S, Versporten A et al. European Surveillance of Antimicrobial Consumption (ESAC): outpatient antibiotic use in Europe (1997-2009). J Antimicrob Chemo 2011; 66 suppl 6:vi3-vi12
5. Adrianssens N, Coenen S, Versporten A et al. European Surveillance of Antimicrobial Consumption (ESAC): quality appraisal of antibiotic use in Europe. J Antimicrob Chemo 2011; 66 suppl 6:vi71-vi77
6. Antimicrobial consumption rates by country. European surveillance of antimicrobial consumption (ESAC-Net) interactive database. European centre for disease prevention and control. <http://ecdc.europa.eu/en/activities/surveillance/ESAC-Net/database/Pages/consumption-rates-by-country.aspx> Accessed Aug 26, 2013

Zone	DID	PrID
Alberta	19.8	1.6
South	20.6	1.8
Calgary	19.2	1.5
Central	19.5	1.7
Edmonton	21.3	1.7
North	17.7	1.5
Canada (2011) ²	17.6	NA
United States (2010) ³	NA	2.28
Europe (ESAC, 2010) ⁶	20.1	NA

	25th% percentile (Very low)		25th-50th percentile (Low)		50th-75th percentile (Above average)		75th to 100th percentile (High)					
	J01_DID	J01C_DID	J01D_DID	J01F_DID	J01M_DID	% J01CE	% J01CR	% J01DD&DE	% J01MA	J01B/N	J01_SV	J01M_SV
South	20.6	7.0	2.2	4.5	2.3	1.6	3.7	0.71	11.3	4.3	17.4	13.9
Calgary	19.2	7.2	1.6	4.0	1.6	1.2	3.0	0.57	8.2	3.8	19.1	11.1
Central	19.5	6.8	2.2	4.3	2.0	1.3	4.7	0.90	10.2	4.2	16.2	8.2
Edmonton	21.3	7.2	1.9	4.5	2.2	1.5	3.9	1.3	10.3	3.6	14.1	9.4
North	17.73	7.2	1.6	3.8	1.6	1.3	7.4	1.4	9.0	5.3	15.1	5.8
All AB	19.8	7.1	1.83	4.2	1.9	1.4	4.0	0.95	9.5	3.9	16.5	9.8

J01DID: Systemic antibacterials defined daily doses per inhabitant day (DID)
 J01C_DID: Penicillins per DID
 J01D_DID: Cephalosporins DID
 J01F_DID: Macrolides DID
 J01M_DID: Fluoroquinolones DID
 %J01CE: Percentage of beta-lactamase sensitive penicillins (of total J01)
 %J01CR: Percentage of beta-lactam/beta-lactamase inhibitor combo
 %J01DD+DE: Percentage of 3rd and 4th gen cephalosporins
 %J01MA: Percentage of fluoroquinolones
 J01B/N: ratio of broad to narrow
 J01_SV: seasonal variation of J01 drugs - percent
 J01M_SV: seasonal variation of fluoroquinolones

Results:

- The average DID/PrID were 19.8/1.6 (Table 1; range: 16.0/1.37 [Q2 2012] to 22.7/1.85 [Q1 2011])
- All inter-zone comparisons were statistically significant Edmonton>South>Central>Calgary>North by DID [Table 1].
- Close to the median nation (Iceland, 16th of 33) in the European survey.⁴
- Seasonal variation was observed in use of all systemic Abx (14-19%) which was less than that of the median European nation (25.7% [Table 2]). However seasonal variation of fluoroquinolones in Alberta (6-14%) was similar to the median European country (7.6%).⁵
- Seniors highest in prescriptions and DDD consumption; 2.2 PrID and 23.7 DID, respectively, followed by pediatrics (1.57/22.8) and adults [(1.54/18.4), Tables 3-7]

Discussion: Abx consumption is difficult to measure. We calculated appropriate measures for various populations and found Abx consumption differences, in some ways consistent with differences in health and socioeconomic indicators. Compared to data available for Canada, consumption of Abx drugs is similar (Table 1). The ESAC survey in 2009 of 33 developed countries provide valuable benchmarks and quality indicators for comparison purposes. This has led to the identification of macrolides in almost all zones and fluoroquinolones in some zones as priority areas for antimicrobial stewardship initiatives. We recognize the limitation that figures from Europe in 2009 may not be perfectly suited to comparison to our provincial data from 2010-2012 .