OVERVIEW	
Category:	Drug Utilization
Subset:	Antimicrobials
Data Sources:	- Pharmaceutical Information Network (PIN) Database - Alberta Health Care Insurance Plan (AHCIP) Adjusted Mid-Year Population Registry Files - Alberta Health Postal Code Translator File (PCTF) - Statistics Canada Census 2011 Population Data
Outcome Definitions:	Drug dispensations for antibiotics are extracted by Anatomical Therapeutic Chemical (ATC) code **J01.** Additional information about antibiotic drug groups under ATC code J01 is available in the Supplementary Information section near the end of this document. Notes: i) outputs stratified by age and geography that are non-zero and have less than or equaled to five (≤5) unique or total dispensations are not reported.

INDICATORS AND ASSOCIATED MEASURES		
Indicator	**Associated Measures**	
Age Standardized Unique Dispensations per 1,000	Total Dispensations	Standard Error
	Unique Dispensations	Standard Score
	Population	Alberta Rate
Age-Sex Unique Dispensations per 1,000	Total Dispensations	Standard Error
	Unique Dispensations	Standard Score
	Population	Alberta Rate

VALID VALUES					
Indicator	**Year**	**Geography**	**Sex**	**Age Group**	**ATC Codes**
Age Standardized Unique Dispensations	2010-2022	AB (1)	BOTH,	N/A	

		Alberta Zone (5)	MALE, FEMALE		J01AA, J01CA, J01CE, J01CF, J01CR, J01DB, J01DC, J01DD, J01DE, J01DF, J01DH, J01DI, J01EA, J01EC, J01EE, J01FA, J01FF, J01GA, J01GB, J01MA, J01XA, J01XB, J01XC, J01XD, J01XE, J01XX
Age-Sex Unique Dispensations	2010-2022	AB (1) Alberta Zone (5)	BOTH, MALE, FEMALE	ALL 00to04 05to09 … 85to89 90+	
Total Dispensations (Age Standardized)	2010-2022	AB (1) Alberta Zone (5)	BOTH, MALE, FEMALE	N/A	
Total Dispensations (Age-Sex)	2010-2022	AB (1) Alberta Zone (5)	BOTH, MALE, FEMALE	ALL 00to04 05to09 … 85to89 90+	

NUMERATOR	
Inclusion:	Unique and total dispensations are estimated based on the definitions below: **Unique Dispensation:** total people with at least one filled prescription of antimicrobials by ATC name (see Supplementary Information) stratified by age and AHS Zones **Total Dispensations:** Sum of all filled prescriptions for antimicrobials by ATC name (see Supplementary Information) stratified by age and AHS Zones.
Geographic Assignment:	The individual's earliest postal code in PIN is used to determine the geographic location of the individual each year. The geographic areas are obtained by linking the postal code with the PCTF.
Age and Sex Assignment:	The date of birth and sex in PIN is used to calculate age and sex of the individual as of June 30th each year.

DENOMINATOR

Inclusion:	Estimated based on the mid-year population file as of June 30 each year. Rates are reported as persons with at least one dispensation event of antimicrobials by ATC Name per 1,000 population.
Geographic Assignment:	The postal code on the mid-year population file is used to determine the geography of the individual as of June 30 each year. The geography of residence is obtained by linking the postal code with the PCTF.
Age and Sex Assignment:	The date of birth and sex on the mid-year population file is used to determine the age and sex of the individual as of June 30 each year.

AGE STANDARDIZATION

Age standardized rates are calculated over j age strata as:

$$\hat{R} = \sum_{j=1}^{J} \frac{w_j e_j}{n_j}$$

where e_j represents the number unique dispensation events in the j[th] stratum, and n_j represents the number of individuals in the j[th] stratum (estimate of person-years). The standardization weights w_j are given by:

$$w_j = n_j{}^* / \sum_{j=1}^{J} n_j{}^*$$

where $n_j{}^*$ represent the number of people in the j[th] age stratum in the standard population. The same weights are applied to the crude rates for males, females, and both sexes combined.

When an indicator is calculated for a subset of all age strata, standardization weights are rescaled so that they still sum to one.

STANDARD ERRORS

Standard errors are calculated differently for each indicator.

Age Standardized Dispensation Rate	The standard error for an age standardized unique dispensation rate is calculated as follows:

	$SE(\hat{R}) = \sqrt{\sum_{j=1}^{J} \frac{(w_j)^2}{(n_j)^2} \times e_j}$ Where n_j is the population in the j[th] age group, w_j represents the proportion of the population in the j[th] age group for the standard population, and e_j represents the number of unique dispensation events in the j[th] stratum. The standard error assumes a Poisson variance.
Age-Sex Dispensation Rate	The standard error for an age-sex estimate is calculated as follows: $SE(\hat{R}) = \frac{\sqrt{e}}{N_R}$ Where e is the number of unique dispensation events and N_R is the number of people at mid-year (estimate of person-years). The standard error assumes a Poisson variance.
Special Cases	When the standard error cannot be calculated using the methods above, it is approximated as follows: $SE(\hat{R}) = (4/(N+4))/2 = 2/(N+4)$ where N is the population.

STANDARD SCORES

Standard scores are calculated for each of the four indicators as follows:

$$SS(\hat{R}) = \frac{\hat{R}_{regional} - \hat{R}_{provincial}}{SE(\hat{R})_{regional}}$$

Standard scores allow for comparisons between regions and the provincial average. Standard Scores are used for colour-coding charts maps, and are coded as follows:

Standard Score	**Interpretation**	**Colour**
> 2	Significantly higher than provincial average	Red
1 to 2	Higher than provincial average	Orange

1 to -1	Average	Yellow
-1 to -2	Lower than provincial average	Light Green
< -2	Significantly lower than provincial average	Dark Green

DATA ISSUES
The population excludes members of the Armed Forces, RCMP, inmates in Federal Penitentiaries, and those who have opted out of the Alberta Health Care Insurance Plan. Because adjusted population estimates are used for the indicator denominators, newly recalculated indicators will differ slightly from prior figures released on the IHDA.

SUPPLEMENTARY INFORMATION	
ATC Code[1]	**ATC Name**
Any J01 Drugs[2]	Any Antimicrobials
J01AA	Tetracyclines
J01CA	Beta-L-Penicillin
J01CE	Beta-L-Sensitive Penicillin
J01CF	Beta-L-Resistant Penicillin
J01CR	Combination Penicillin
J01DB	First-G-Cephalosporins
J01DC	Second-G-Cephalosporins
J01DD	Third-G-Cephalosporins
J01DE	Fourth-G-Cephalosporins
J01DF	Monobactams
J01DH	Carbapenems
J01DI	Other Cephalosporins

J01EA	Trimethoprim and Derivatives
J01EC	Intermediate-Acting Sulfonamides
J01EE	Combinations of Sulfonamides & Trimethoprim
J01FA	Macrolides
J01FF	Lincosamides
J01GA	Streptomycin
J01GB	Other Aminoglycosides
J01MA	Fluoroquinolones
J01XA	Glycopeptides Antibacterials
J01XB	Polymyxins
J01XC	Steroid Antibacterials
J01XD	Imidazole Derivatives
J01XE	Nitrofuran Derivatives
J01XX	Other Antibacterials

[1]Source: World Health Organization, http://www.whocc.no/atc_ddd_index/

[2]Note: **Any Antimicrobials** is defined as unique dispensations and total dispensations of any antibiotic drugs in a given year.