A population-wide profile of prescription drug use in Saskatchewan, 1989

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Objective: To measure the prevalence of prescription drug use in Saskatchewan in 1989.
Design: Retrospective study.
Participants: A total of 961 203 Saskatchewan residents (including those who died or were born during the study year) who were eligible for coverage under the Saskatchewan Prescription Drug Plan. The study population represented 94% of the province's total population; those excluded were mostly status Indians (for whom a federal plan is available).
Main results: At least one prescription was received by 66.0% of the study population in 1989. The mean number of prescriptions per patient was 8.2, and the mean cost of drug material per prescription was $13.95. Females received substantially more prescriptions than males; the difference was particularly notable for cardiovascular agents, antidepressants and benzodiazepines. In the senior population 80.8% received at least one prescription; the mean number of prescriptions per patient was 18.4. The most commonly dispensed drug for the entire study population was amoxicillin (290 prescriptions per 1000 people); triazolam was the most frequently dispensed central nervous system drug (74 prescriptions per 1000 people). Regional variation in overall drug use was remarkably small, although it increased at the drug-class level, especially for tranquillizers. The use of cardiovascular drugs was 27% to 32% higher (depending on how use was measured) per Regina resident than per Saskatoon resident. Benzodiazepines were commonly used on a long-term basis, despite recommendations to the contrary.
Conclusions: The results quantify the prevalence of prescription drug use, underscore the importance of careful management of drug therapy by physicians and pharmacists (especially for seniors), illustrate substantial variation in drug therapy strategies and raise questions about utilization of benzodiazepines and cardiovascular drugs.

Objectif : Mesurer la prévalence de l'utilisation des médicaments sur ordonnance en Saskatchewan en 1989.
Conception : Étude rétrospective.
Participants : Un total de 961 203 résidents de la Saskatchewan (y compris ceux morts ou nés pendant l'année de l'étude) éligibles au remboursement en vertu du régime d'assurance-médicaments de la Saskatchewan. La population étudiée représentait 94 % de la population totale de la province; la population exclue se compose en grande partie d'Indiens inscrits (qui bénéficient d'un régime fédéral).
Principaux résultats : Au moins 66,0 % des membres de la population étudiée ont reçu

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← For prescribing information see page 2264

une ordonnance en 1989. Le nombre moyen d'ordonnances par patient était de 8,2 et le coût moyen de médicament par ordonnance, de 13,95 $. Les femmes recevaient beaucoup plus d'ordonnances que les hommes; la différence était particulièrement évidente dans le cas des agents cardiovasculaires, des antidépresseurs et des benzodiazépines. Dans la population d'aînés, 80,8 % ont reçu au moins une ordonnance; la moyenne d'ordonnances par patient était de 18,4. Le médicament le plus souvent dispensé était l'amoxicilline (290 ordonnances par 1 000 personnes); le triazolame était le médicament du système nerveux central le plus souvent dispensé (74 ordonnances par 1 000 personnes). Les variations régionales sur l'utilisation globale des médicaments étaient remarquablement modestes, bien que les auteurs aient observé un écart plus grand au niveau de la catégorie des drogues, particulièrement celle des tranquillisants. L'utilisation de médicaments cardiovasculaires était de 27 % à 32 % plus élevée (dépendant de la manière dont l'utilisation fut mesurée) par résident de Regina que par résident de Saskatoon. Les benzodiazépines étaient habituellement utilisées à long terme, malgré des recommandations à l'encontre de cette pratique.

Conclusions : Ces résultats quantifient la prévalence de l'utilisation des médicaments sur ordonnance, soulignent l'importance d'une gestion prudente de la thérapie médicamenteuse par les médecins et pharmaciens, particulièrement pour les personnes âgées, illustrent des écarts appréciables dans les stratégies de thérapie médicamenteuse et soulèvent des questions sur l'utilisation des benzodiazépines et des médicaments cardiovasculaires.

Few opportunities exist to analyse the prescription drug use of an entire population. Studies often are limited to particular age groups,[1-4] are based on survey data,[5-9] are restricted to a particular class of drugs[8-14] or can provide no detail beyond a prescription count.[3,10-12,15]

This study used the database of the Saskatchewan Prescription Drug Plan to overcome these limitations. Based on actual prescription drug claims, the database contains information on the number of people receiving a given drug, the number of prescriptions and the cost of each prescription. Moreover, the data were available for 94% of Saskatchewan's 1989 population of 1.02 million and for all age groups.

The objectives of the study were to establish the extent and pattern of drug use by Saskatchewan residents, to identify any unusual patterns of use and to verify findings of an earlier study.[16] That study detailed widespread use of anti-infective drugs, found a surprising difference in cardiovascular drug use between Regina and Saskatoon residents and identified a greater use of psychotropic drugs in the province's smaller cities. The investigators used 1985–86 data; however, in 1987 the structure of the drug plan changed to an extent that their results could no longer be assumed to hold true.

Our work was guided by the Saskatchewan Utilization Management Committee, which comprised representatives of the College of Physicians and Surgeons of Saskatchewan, Saskatchewan Health, the Saskatchewan Health-Care Association, the Saskatchewan Medical Association, the Saskatchewan Pharmaceutical Association and the Saskatchewan Registered Nurses' Association. The conclusions, however, are ours and not necessarily those of these organizations.

Methods

Prescription drug use was examined for 961 203 people who were either full-year Saskatchewan residents in 1989 or were residents who died or were born during the study year. We used the database of the Saskatchewan Prescription Drug Plan, which covered essentially all Saskatchewan residents who were not status Indians (the federal government has a separate plan for status Indians). Since our results are parameters, not estimates, for Saskatchewan's non-Indian population, their significance in a statistical sense is irrelevant.

Through the drug plan 80% of the incremental drug costs were paid once a family reached a deductible of $125 ($75 for senior families and $50 for single seniors). The plan was administered through real-time computer links with every retail pharmacy in the province. Customers did not have to mail in receipts for reimbursement; rather, pharmacists routinely asked customers for their health card, and the computer did the rest. The information extracted from each claim included the patient, physician and pharmacy identifiers, the quantity of drug dispensed, the generic and brand names, the dosage form, the strength and cost per unit of medication, and the date dispensed.[17]

We included 1958 drug products covered by the plan; these products comprised about 490 discrete drug entities.[18,19] Drugs provided in hospital were excluded, as were nonformulary drugs, antineoplastic agents, antituberculosis drugs and prescriptions covered by the Workers' Compensation Board or the Department of Veterans Affairs. Although the total number of excluded prescriptions for ambulatory patients was modest, our results did underestimate total use. In addition, we assumed that the drugs

dispensed were actually consumed — a patient who spends time and money to have a prescription filled is likely to take the medication. However, we did not take into account patient noncompliance or drug wastage.

Use was calculated in three ways. First, we determined the proportion of the population (patients per population) using a given drug at least once in 1989. Second, we calculated the number of prescriptions per patient and per 1000 people, regardless of whether the prescription was new or a renewal. ("Patient" referred to anyone in the study population who received at least one prescription and "people" to any people in the study population.) Third, we calculated the cost of drug material per person and per prescription. We standardized the cost figures using the generic-equivalent costs recognized by the drug plan so that every prescription for a given strength and form of a particular drug showed the same cost, regardless of where or when the prescription was filled or which brand was dispensed. Consequently, the impact of "no substitute" prescriptions, the pharmacist's dispensing fee and variations in actual price was excluded.

The following calculation was repeatedly applied: cost per person = number of patients per population × number of prescriptions per patient × cost per prescription. This calculation was used to compare use between study groups. If the cost per person varied markedly, then the three measures of use were reviewed to explain the difference.

Results were obtained by sex and by age; the 21 age groups (less than 1 year old, 1 to 4 years, 5 to 9, 10 to 14, . . . 95 and over) were chosen so that our data would be comparable with other utilization data available in Saskatchewan. The study population was evenly divided by sex; as for age, 22% of the people were 14 years or less, 14% were 15 to 24, 31% were 25 to 44, 18% were 45 to 64, and 15% were seniors (65 or more). The province was divided into 15 regions by location of patient residence: Regina, Saskatoon, Moose Jaw, Swift Current, North Battleford, Prince Albert and Yorkton, the corresponding seven rural areas, and northern Saskatchewan.

Regional totals, which reflected results by age and sex weighted by the group's proportion of the regional population, were standardized for age and sex with the use of the provincial population as weights. The coefficient of variation (the standard deviation divided by the simple mean of the regional results, excluding those for northern Saskatchewan) was used to measure variation.

Comparisons between males and females were standardized for age, since the female population was slightly older.

Strict confidentiality guidelines were followed. The files used to generate the results contained aggregated data, and none of the results were released if the numbers of residents were small enough to jeopardize confidentiality.

Results

Since our study generated numerous results, we report the most general or those of particular interest (Table 1).

Overall prescription drug use

The 961 203 people in the study population received just over 5.2 million prescriptions (5437 prescriptions per 1000 people) in 1989. Overall, females received more prescriptions than males, and drug use increased with age. At least one prescription had been dispensed to 66.0% of the population. On average each patient received 8.24 prescriptions, at a cost of $13.95 per prescription. The average cost per person was $75.87 (0.66 × 8.24 × $13.95).

The females used more drugs than the males. The average cost per person was $85.26 and $66.45 respectively. The cost per person was higher among the females because of a higher patient:population ratio (0.73 v. 0.59) and a higher number of prescriptions per patient (8.7 v. 7.6), even though the average cost per prescription among the females was lower ($13.47 v. $14.72). Drug use was higher among the females than among the males by all measures for most drug classes; the only notable exceptions were for autonomic drugs, blood formation and coagulation agents, and spasmolytic drugs. The overall cost per person was higher among the females in almost every age group (Fig. 1). One reason for this was the generally higher proportion of females who received at least one prescription (Fig. 2).

In general, drug use increased with age. The cost per person rose steadily with age (Fig. 1). The proportion of patients in the study population was 78% in the group aged 1 to 4 years; it then fell before it increased with age (Fig. 2). The difference in use between men and women aged 15 to 39 years largely reflected oral contraceptive use.

Seniors represented 14.6% of the study population but accounted for 40.1% of the prescriptions and 40.2% of the drug costs. At least one prescription was received by 80.8% of the seniors, as compared with 63.4% of those under 65 years of age. The mean number of prescriptions per patient was 18.4 and 6.0 respectively; it was 24.7 for women aged 85 to 94 years.

The drugs most frequently used by people of all ages are ranked in Table 2 by the patient:population ratio, the number of prescriptions per 1000 people and the cost per person.

Anti-infective drugs dominated the patient:population list, accounting for 7 of the top 10 drugs. Amoxicillin was by far the most widely used agent, having been dispensed at least once to almost one in five people.

The list ranked by prescriptions per 1000 people was quite different; this measure reflected both the patient:population ratio and the number of prescriptions per patient. The list contained only three anti-infective drugs plus drugs such as salbutamol and furosemide, which are used more often in long-term therapy. Triazolam was the most frequently dispensed central nervous system (CNS) drug (74 prescriptions per 1000 people). The top 10 drugs

Table 1: Use of selected types of drugs* in Saskatchewan in 1989

Drug	% of patients†	Mean no. of prescriptions		Mean cost of drug material, $	
		Per patient	Per 1000 people	Per prescription	Per person
Anti-infective drug	43.6	2.2	946	6.92	6.54
Antibiotic	39.7	1.9	766	6.64	5.09
Cephalosporin	9.2	1.4	124	11.84	1.47
Erythromycin	7.7	1.3	103	8.83	0.91
Penicillin	28.3	1.6	452	3.93	1.78
Tetracycline	4.2	1.7	72	11.46	0.83
Miscellaneous	8.9	1.5	130	4.36	0.57
Autonomic drug	4.8	4.4	215	18.71	4.03
Sympathomimetic	3.4	4.6	156	20.15	3.14
Cardiovascular drug	11.4	10.0	1142	18.81	21.47
Cardiac	5.5	7.2	397	22.04	8.75
Hypotensive	7.8	8.0	621	16.37	10.16
Vasodilator	1.8	4.5	80	4.35	0.35
Central nervous system (CNS) drug	23.3	4.9	1141	12.26	13.99
Analgesic or antipyretic	17.3	3.0	516	16.97	8.75
NSAID‡	14.4	3.0	425	19.15	8.14
Opiate agonist	4.5	1.9	84	5.67	0.47
Anticonvulsant	1.2	6.1	72	12.80	0.93
Psychotherapeutic	4.3	5.7	247	12.54	3.10
Antidepressant	3.4	5.1	175	14.10	2.47
Tranquillizer	1.3	5.7	72	8.79	0.64
Anxiolytic, sedative or hypnotic	6.7	4.4	292	3.82	1.12
Benzodiazepine	5.5	4.7	255	3.82	0.97
Electrolytic, caloric and water balance drugs	3.6	7.8	281	2.85	0.80
Replacement agent	1.5	5.7	85	6.05	0.51
Diuretic	2.9	6.1	178	1.00	0.18
Eye, ear, nose and throat drugs	9.9	2.1	212	12.72	2.69
Anti-inflammatory alone and combined with anti-infective	5.7	1.7	99	13.12	1.29
Gastrointestinal drug	6.7	3.7	246	25.34	6.24
Miscellaneous§	5.7	3.9	222	25.50	5.67
Hormones and substitutes	12.6	5.2	652	15.04	9.81
Adrenal corticosteroid	2.4	3.5	84	8.72	0.73
Oral contraceptive	4.8	4.5	219	20.83	4.57
Estrogen	2.0	4.0	81	11.73	0.95
Antidiabetic drug	1.9	9.0	174	16.74	2.91
Insulin	0.9	13.1	114	16.72	1.91
Skin and mucous membrane preparations	14.3	1.9	267	12.71	3.39
Anti-infective	7.0	1.6	109	12.62	1.38
Anti-inflammatory	7.8	1.7	134	13.27	1.78
Unclassified	4.9	3.3	160	21.50	3.45
All	66.0	8.2	5437	13.95	75.87

*Classes and subclasses of drugs with fewer than 70 prescriptions per 1000 people were excluded.
†The term "patients" refers to people in the study population who received one or more prescriptions during 1989.
‡NSAID = nonsteroidal anti-inflammatory drug.
§H_2 antagonists (cimetidine, famotidine, nizatidine and ranitidine) accounted for 149 prescriptions per 1000 people.

accounted for 24% of all prescriptions; the top 20 accounted for 36%.

The third list, of cost per person, reflects the cost per prescription as well as the number of prescriptions. Not surprisingly, 6 of the top 10 drugs were cardiovascular agents.

We also looked at regional variation in use using data adjusted for age and sex to remove the effect of different demographic profiles. There was remarkably little variation in terms of overall drug use; for example, the coefficient of variation for the cost-per-person values was just 7%. Variation increased for specific drug classes, however. In most cases the coefficient of variation for the cost per person was 10% to 30%; the exception was 49% (for tranquillizers).

Use of cardiovascular drugs

We made three observations about this group of drugs: more women than men received them, a relatively small group of agents accounted for most of the use, and Regina residents had substantially higher use than Saskatoon residents.

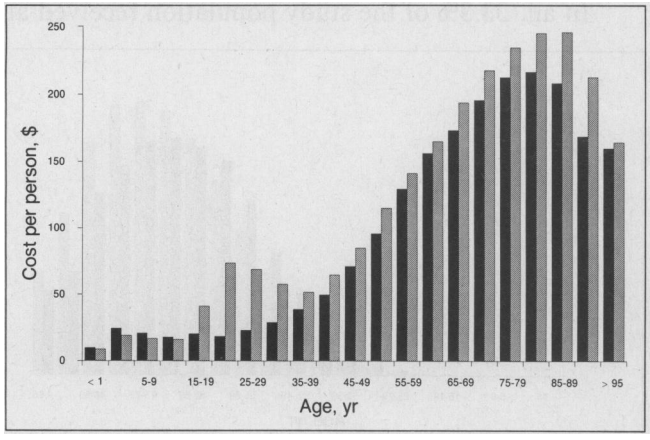

Fig. 1: Cost of prescription drugs per person by age in Saskatchewan, 1989. Black bars represent males, and striped bars represent females.

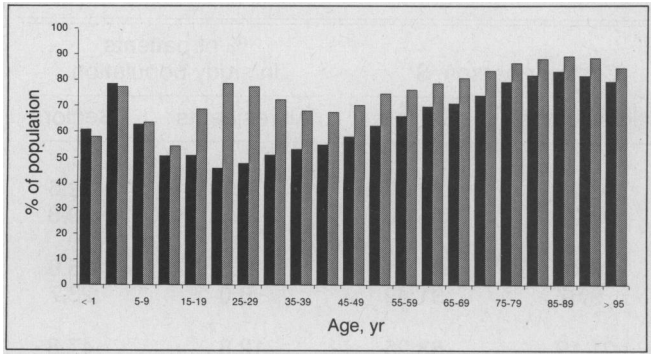

Fig. 2: Proportion of study population that received at least one prescription in 1989, by age. Bar designations as in Fig. 1.

In all, 11.4% of the population received at least one prescription for a cardiovascular drug in 1989. Of the four subclasses, cardiac drugs and hypotensives were by far the most widely dispensed (to 5.5% and 7.8% of the population respectively); the next most widely dispensed drugs were vasodilators (to 1.8%) and antilipemics (to 0.8%).

Perhaps surprisingly, in every group of people 15 years of age or older women were more likely than men to receive at least one cardiovascular drug (Fig. 3). Overall, 12.8% of the females used such a drug, as compared with 9.8% of the males; the corresponding figures among the seniors were 47.8% and 37.4% (Table 3).

The cost per person, however, was slightly higher among the males than among the females ($21.55 v. $21.19). The males tended to have a higher number of prescriptions per patient (10.3 v. 9.8) and a higher mean cost per prescription ($21.30 v. $16.94). The net effect of the differences in the patient:population ratios, the number of prescrip-

Table 2: Top 10 drugs according to the proportion of patients in the study population, the number of prescriptions per 1000 people and the cost per person

Measure; drug	Value
% of patients in the population	
Amoxicillin	19.2
Trimethoprim–sulfamethoxazole	7.7
Cephalexin monohydrate	7.5
Ampicillin	4.7
Erythromycin base	4.6
Penicillin V	4.6
Ibuprofen	4.0
Acetaminophen with caffeine and codeine	3.7
Triamterene with hydrochlorothiazide	3.3
Tetracycline	3.2
No. of prescriptions per 1000 people	
Amoxicillin	290
Triamterene with hydrochlorothiazide	202
Salbutamol	140
Trimethoprim–sulfamethoxazole	111
Furosemide	104
Amiloride hydrochloride with hydrochlorothiazide	100
Cephalexin monohydrate	97
Potassium chloride	84
Cimetidine	81
Triazolam	74
Cost per person, $	
Diltiazem	3.32
Salbutamol	2.84
Captopril	2.70
Diclofenac sodium	2.53
Nifedipine	1.89
Ranitidine	1.89
Enalapril maleate	1.79
Ethinyl estradiol with norgestrel	1.51
Verapamil	1.38
Atenolol	1.33

tions per patient and the cost per prescription was that the cost per person was higher among males until age 60 to 64 years, after which the cost per person was higher among the women (Fig. 4).

Twenty drugs were covered in the cardiac subclass, the top six accounting for 76% of all cardiac prescriptions: atenolol (72 prescriptions per 1000 people), propranolol (71), diltiazem (58), digoxin (57), metoprolol (24) and nifedipine (22). Three of these were β-blockers and two calcium-channel blockers. Six of the 25 hypotensive drugs covered accounted for 77% of the prescriptions: triamterene–hydrochlorothiazide (202 prescriptions per 1000 people), amiloride hydrochloride–hydrochlorothiazide (100), captopril (65), enalapril (52), methyldopa (32) and nifedipine (27). (The division of particular agents into the cardiac and hypotensive subclasses did not always correspond to clinical practice. For example, despite similar indications for use sustained-release dosage forms of the calcium-channel blockers diltiazem, nifedipine and verapamil were listed in the Saskatchewan Formulary as hypotensive drugs, whereas the regular-release dosage forms were listed in the cardiac subclass. Also, single-entity diuretics were listed in the electrolytic, caloric and water balance class and were therefore excluded from the review of the cardiovascular drugs.)

Residents of the province's two major cities, Regina and Saskatoon, were among the highest and lowest users of cardiovascular drugs. The cost per person was 32% higher for Regina residents than for Saskatoon residents ($24.87 v. $18.88), even though the two cities are similar in size and demographic distribution. Regina residents were more likely than Saskatoon residents to receive prescriptions (11.7% v. 10.3%) and received more prescriptions per patient (10.5 v. 9.4). This pattern held true for the cardiac, hypotensive and vasodilator subclasses, although there were differences at the specific-drug level.

Use of CNS drugs

We found the following: the use of CNS drugs was widespread (especially among women), on average benzodiazepines were used in long-term therapy despite recommendations to the contrary, and regional variation in the use of major tranquillizers was pronounced.

In all, 23.3% of the study population received at

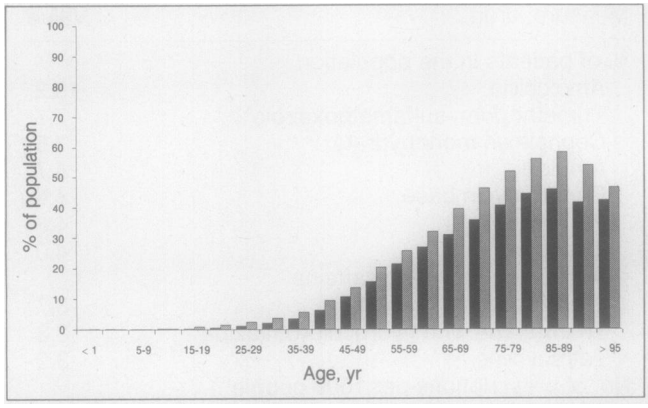

Fig. 3: Proportion of study population that received at least one prescription for a cardiovascular drug in 1989, by age. Bar designations as in Fig. 1.

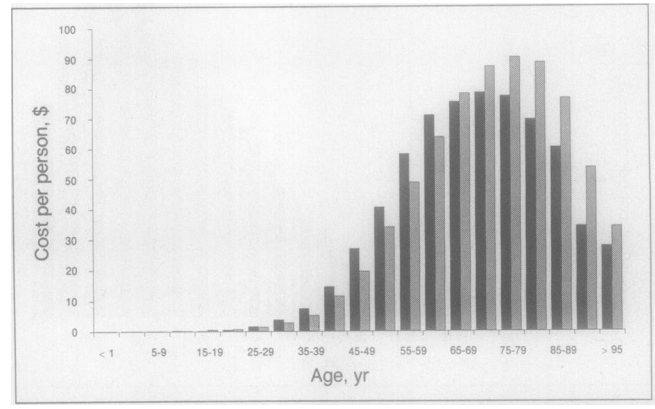

Fig. 4: Cost of cardiovascular drugs per person in 1989, by age. Bar designations as in Fig. 1.

Table 3: Use of cardiovascular drugs by sex*

Drug; sex	No. of prescriptions per 1000 people		Cost per person, $		% of patients in study population	
	All residents	Seniors	All residents	Seniors	All residents	Seniors
Cardiac						
Female	405	1671	8.26	33.87	5.7	22.6
Male	385	1505	9.24	35.66	5.3	20.8
Hypotensive						
Female	735	3025	10.46	41.11	9.3	35.6
Male	488	1882	9.67	31.49	6.0	23.7
All cardiovascular						
Female	1251	5223	21.19	83.25	12.8	47.8
Male	1012	3967	21.55	73.22	9.8	37.4

*The results are age-adjusted because the mean age was higher for the females than for the males.

least one prescription for a CNS drug: 17.3% received an analgesic or antipyretic, 6.7% an anxiolytic, sedative or hypnotic, 4.3% a psychotherapeutic agent (i.e., an antidepressant or a major tranquillizer) and 1.2% an anticonvulsant. (The percentages do not add up to 23.3% because some people received drugs from more than one subclass.)

Of the analgesics and antipyretics, a nonsteroidal anti-inflammatory drug (NSAID) was dispensed to 16.0% of the females and 12.7% of the males, whereas a narcotic was dispensed to 4.8% and 4.2% respectively. The use of these two types of drug increased steadily with age by any measure.

No specific drug dominated the NSAIDs: 425 prescriptions were filled per 1000 people, the leading drugs being acetylsalicylic acid (71 prescriptions), ibuprofen (66), diclofenac sodium (65), indomethacin (52) and naproxen (50). Acetaminophen with caffeine and codeine accounted for 74% of all narcotic analgesic prescriptions.

The females showed markedly higher use than the males of antidepressants (e.g., amitriptyline, trimipramine and doxepin) and of the benzodiazepines included in the anxiolytic–sedative–hypnotic subclass (e.g., triazolam, lorazepam and diazepam). The cost per person was 106% higher for antidepressants and 72% higher for benzodiazepines among the females than among the males (Table 4). These higher costs were due almost entirely to larger proportions of the female population receiving prescriptions for these drugs; the number of prescriptions per patient and the cost per prescription were much more similar. Of the senior women 9.7% received at least one antidepressant prescription and 20.3% at least one benzodiazepine prescription, as compared with 5.0% and 12.0% of the senior men respectively. In contrast, the cost per person of the major tranquillizers (e.g., thioridazine, trifluoperazine and haloperidol) was almost identical for males and females.

Although benzodiazepines are generally recommended for short-term therapy only, the average number of prescriptions per patient was 4.7 and 4.6 among the females and males respectively. Among the senior patients the figures were 5.5 and 5.3 respectively. Separate drug plan data on prescription counts by dosage were used to calculate the average number of milligrams of benzodiazepines received during 1989. The average duration of therapy was then estimated on the basis of standard daily doses. Table 5 shows that long-term use was prevalent for these agents. Patients using triazolam, for example, received 37 mg on average over the course of the year. Although the physician's instructions for daily use were unavailable 37 mg per year equals 0.25 mg/d for about 5 months or 0.125 mg/d for about 10 months.

As noted earlier, the regional variation in use was much greater for major tranquillizers than for other drugs. In particular, the five smaller cities (Moose Jaw, Swift Current, North Battleford, Prince Albert and Yorkton) each showed a cost per person, adjusted for age and sex, that was at least 55% above the provincial average. North Battleford residents were the highest users, at 132% above the average. The high costs per person in these centres were due mainly to a high patient:population ratio; there was relatively little variation in the number of prescriptions per patient, and there was no pattern in the cost per prescription.

Use of other drug classes

With regard to anti-infectives, 43.6% of the

Table 4: Use of selected CNS drugs by sex*

	No. of prescriptions per 1000 people		Cost per person, $		% of patients in study population	
Drug; sex	All residents	Seniors	All residents	Seniors	All residents	Seniors
NSAID						
Female	488	1579	9.84	33.52	16.0	34.0
Male	356	1127	6.25	20.36	12.7	26.9
Antidepressant						
Female	240	594	3.29	7.50	4.6	9.7
Male	107	263	1.60	3.50	2.2	5.0
Tranquillizer						
Female	78	255	0.63	1.43	1.4	4.4
Male	65	184	0.63	1.05	1.1	3.3
Benzodiazepine anxiolytic, sedative or hypnotic						
Female	320	1122	1.22	3.98	6.9	20.3
Male	182	641	0.71	2.43	4.0	12.0

*The results are age-adjusted because the mean age was higher for the females than for the males.

study population received at least one prescription; the figure was 72.9% among children aged 1 to 4 years. Unlike most drug classes, for which use by any measure increased with age, the rate of use of anti-infective drugs remained relatively steady across the age groups after the peak among those 1 to 4 years old.

The cost per person of anti-infective drugs was 19% higher among the females than among the males ($7.13 v. $5.98). The proportion of people who received at least one prescription was 47.6% among the females and 39.7% among the males. The mean number of prescriptions was slightly over 2 during the year for both sexes, and the females and males had similar costs per prescription ($6.80 and $7.06 respectively).

Antibiotics represented the largest anti-infective subclass, accounting for 81% of all anti-infective prescriptions (766 prescriptions per 1000 people). Of the eight different groups of antibiotics the penicillins were the most frequently dispensed (452 prescriptions per 1000 people); the next most frequently dispensed antibiotics were the cephalosporins (124), the erythromycins (103) and the tetracyclines (72). The remaining four groups combined represented only 2% of the antibiotic prescriptions. At the specific-drug level amoxicillin was the most commonly dispensed (290 prescriptions per 1000 people); trimethoprim–sulfamethoxazole, a "miscellaneous" anti-infective, was the fourth most commonly dispensed drug (111 prescriptions per 1000 people) and cephalexin monohydrate the seventh (97 per 1000 people).

Notable use of oral contraceptives began in females aged 15 to 19 years (20.6% of all females in that age group), peaked in the group aged 20 to 24 (48.3%) and then steadily decreased to 4.6%, in the group aged 35 to 39 years. Of the prescriptions 88.9% were for products containing less than 50 μg of estrogen, 10.3% for those containing 50 μg and 0.5% for those containing more than 50 μg.

In the gastrointestinal drug class 7.2% of the females and 6.3% of the males received at least one prescription. Cimetidine and ranitidine were the most widely dispensed agents (received by 2.6% and 1.5% of the population respectively). The mean number of prescriptions of cimetidine per patient was 3.1, as compared with 3.3 for ranitidine.

Discussion

Although the use of medicine is commonplace in society, we nevertheless were struck by just how common it was. Two-thirds of the study population received prescription drugs at least once in 1989, close to half (43.6%) received an anti-infective, and one in five women over 64 years of age used benzodiazepines. Because of substantial differences in the study design, the drugs studied, the categorization of the drugs and the methods used to analyse drug use it is difficult to make specific comparisons with findings from other studies. However, we can make some general comments regarding prescribing trends.

Most studies evaluating general prescribing patterns have identified an increase in prescription drug use with advancing age.[2,3,20] This is consistent with the increased prevalence of chronic illness and multiple disorders in the elderly population.[21,22] In our study seniors using prescription medication received on average three times as many prescriptions as nonsenior patients (18.4 v. 6.0). Averages conceal extremes: for example, for every senior who received 6 prescriptions, another may have received 30. It is

Table 5: Average use of the six most frequently prescribed benzodiazepines*

Drug	Mean no. of prescriptions per patient	Amount used per year, mg	Relation between daily dose and duration of therapy	
			Dose, mg	Duration, d
Triazolam	4.2	37	0.125	296
			0.250	148
Lorazepam	3.9	214	1.0	214
			6.0	36
Diazepam	3.4	949	10	95
			40	24
Alprazolam	3.5	82	0.75	109
			3.0	27
Oxazepam	4.3	4584	30	153
			120	38
Flurazepam	3.9	2910	15	194
			30	97

*Others in this subclass are bromazepam, chlordiazepoxide, temazepam and clorazepate dipotassium. Clonazepam and nitrazepam were classed as anticonvulsants.

well accepted that as the number of medications a patient takes increases, so too does the potential for interactions, side effects and decreased compliance.[23,24] Although our figures included both new and repeat prescriptions they nevertheless underscore the importance of having physicians and pharmacists actively manage their patients' drug therapies.

It is clear, and perhaps surprising in its extent, that the females in our study used more drugs than the males, almost regardless of what measure of use or which drug class was looked at. This was true throughout the adult years, not just in the childbearing period. This was probably due in part to a higher use of physicians by females: in 1989–90, 93% of females in Saskatchewan saw a physician at least once, as compared with 82% of males.[25]

The higher use of antidepressants and benzodiazepines by females than by males is not a new finding.[10,16,26,27] Our study did show, however, that in Saskatchewan the reason for this higher level of use was a greater proportion of females who receive these drugs. Once the females became patients their treatment was generally similar to that of the male patients.

The higher proportion of women using cardiovascular drugs was also notable, since in Saskatchewan the prevalence of cardiovascular risk factors and the rates of death from cardiovascular disease are greater among men.[28] Are cardiovascular drugs overprescribed among women? Are women with cardiovascular symptoms more likely than men to seek medical attention? Are cardiovascular drugs underprescribed among men? Do these utilization patterns help to explain the greater incidence of myocardial infarction among men? These questions may be fruitful areas for future study.

The prevalence and duration of benzodiazepine use have received increasing attention in recent years because of concerns about potential risks of dependence, withdrawal and tolerance with long-term use of these agents.[29,30] In a 1984 study approximately 10% of Canadians reported using a benzodiazepine at least once during the previous year; of these, 1 in 10 reported continued use of these agents for more than 1 year.[31] In comparison, the rate of use of benzodiazepines by the Saskatchewan residents was relatively low, only 5.5% of the population having received a prescription during 1989. This may be due in part to the efforts of the Joint Committee on Drug Utilization, which since 1978 has worked to reduce the inappropriate use of mood-modifying drugs through identification of extreme users to the prescribing physicians and the dispensing pharmacies.[32,33] In 1978 anxiolytics, sedatives and hypnotics (e.g., benzodiazepines, barbiturates and hydroxyzine) accounted for 382 prescriptions per 1000 people,[10] as compared with 292 per 1000 people in 1989.

The prevalence of benzodiazepine use was notably higher among the seniors than among the nonseniors (16.6% v. 3.6%); 20.3% of the senior women and 12.0% of the senior men received at least one benzodiazepine during 1989. Combined with the observation that seniors using benzodiazepines received 5.5 prescriptions on average in 1989, it is clear that these drugs were commonly used on a long-term basis, despite recommendations to the contrary.[34–36] This is an area in which health care professionals need to take further action to improve the appropriateness of drug use.

Remarkably, we found that there was much more regional variation for particular drug classes than for prescription drugs in general, even after we accounted for interregional demographic differences. This means that people in different regions tended to use similar quantities of drugs, but the drugs were different. Whether this was related to different disease patterns or different prescribing practices is unclear. Perhaps other factors related to demographics (e.g., concentration of ethnic groups in certain areas), drug-marketing practices or the ease of accessing drug-information sources (e.g., teaching hospitals and academic centres) were also involved.

Although some regional variation was to be expected we identified two examples in which the variation was substantial. Moreover, these examples were identified first by Gormley and associates[16] using data from 1985–86. The variation in the use of major tranquillizers was surprising because of its degree (by far the most variation among the categories in Table 3) and its pattern (much higher use in the province's smaller cities). Although the difference in the use of cardiovascular drugs between the Regina and Saskatoon residents was less pronounced, it tended to hold true regardless of how the use was measured or which cardiovascular subclass was examined. The variation was unexpected, since Regina and Saskatoon are very similar.

These differences suggest either substantial and important regional variations in health status or different treatment patterns. Evaluation of treatment outcomes on a regional basis would be a useful area for further study.

We hope that our study will offer practitioners and researchers valuable information about how prescription drugs — particularly cardiovascular agents, mood-modifying drugs and anti-infective agents — are used at the population level. We also hope that it will assist further research into how prescription drugs can best be used to improve health status.

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