Prescription Medications in Manitoba Children

Are There Regional Differences?

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ABSTRACT

Background: Population-based studies of pharmaceutical use in children provide information on disease prevalence, physician practice and adherence to treatment. We undertook an evaluation of regional differences in prescription drug use by Manitoba children.

Methods: Using Manitoba's population-based prescription data for 1998/99, the prevalence of children receiving prescriptions for antibiotics, analgesics, iron supplements, and four classes of psychotropic drugs was reported for Regional Health Authorities and Winnipeg Community Areas, ranked by a measure of population healthiness, the premature mortality rate (PMR). Prevalence rates were also reported by census-based neighbourhood income areas.

Results: 60% of children received at least one prescription in 1998/99. Antibiotics, antiasthmatics, analgesics, antidepressants, and psychostimulants were the most commonly dispensed drugs. Prescription use of antibiotics, iron supplements, analgesics, antidepressants, antipsychotics and anxiolytics was highest in low income, urban neighbourhoods. Few associations between a region's PMR and prescription utilization were observed, but children living in regions with the least healthy populations were more likely to use antibiotics, non-steroidal anti-inflammatory drugs and anxiolytics. Psychostimulant use was unrelated to neighbourhood income, but highest rates were documented in some of the healthiest Winnipeg neighbourhoods.

Conclusion: We documented regional variation in prescription use which may be related to differences in health, physician practice or child use.

La traduction du résumé se trouve à la fin de l'article.

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The full report "Assessing the Health of Children in Manitoba: A Population-Based Study" on which this article is based is available from the Manitoba Centre for Health Policy at the above address or online at: <http://www.umanitoba.ca/centres/mchp/reports.htm>

Sources of support: This work was supported as part of a project on Child Health in Manitoba, one of several projects undertaken each year by the Manitoba Centre for Health Policy under contract to Manitoba Health. The results and conclusions are those of the authors and no official endorsement by Manitoba Health was intended or should be inferred.

Population-based studies of pharmaceutical use in children are valuable in filling gaps in knowledge about the effectiveness and safety of drugs in children,^{1,2} and also provide information on the type of health care children receive. Despite the need for this information, few population-based studies of prescription drug use in children have been conducted.³⁻⁵ Even more rare are studies that examine geographic area differences in prescription utilization among children.⁶ Geographic area variations in prescription drug use provide evidence for regional differences in disease prevalence, physician practice style and adherence to prescribed treatment. We undertook an evaluation of regional differences in prescription drug use by children in Manitoba, showcasing drugs that are being used increasingly more often in this age group. The drugs selected for examination were: 1) antibiotics, 2) pain-relief drugs (narcotic analgesics and non-steroidal anti-inflammatory drugs (NSAIDs), 3) iron supplements, and 4) psychotropics (psychostimulants, antidepressants, antipsychotics, and anxiolytics).

METHODS

Study design

This was a cross-sectional study of prescription drug use in Manitoba children in 1998/99, reported by geographic area and neighbourhood income. The geographic areas included 12 Regional Health Authorities (RHAs), and 12 subregions of Winnipeg, Manitoba's largest city, called Winnipeg Community Areas (Winnipeg CAs).

Study population

Data were obtained on children aged 0 to 19 years from two population-based, electronic databases that are part of the Population Health Research Data Repository at the University of Manitoba: 1) registration files and 2) records of prescriptions dispensed in retail pharmacies. These data are anonymized, encounter-based records of Manitobans' interactions with the health care system. The registration file contains a record for every individual eligible to receive insured health services, and includes birth date, gender and geographic location. Prescriptions records are submitted by retail pharmacies for

reimbursement by provincial drug insurance plans and for drug utilization review purposes. These records contain the drug's name, identification number, dosage form, and quantity dispensed, as well as the date the drug was dispensed. The reliability and validity of this prescription database has been found to be high for describing population use of prescription drugs.⁷ While the prescription database is complete for prescriptions dispensed in community pharmacies, medications dispensed in northern nursing stations to First Nations children are not entirely captured.

Study measures and analyses

The prevalence rate of children receiving at least one prescription was determined for the following categories of drugs: oral antibiotics (excluding tuberculosis drugs), iron supplements, analgesics and psychotropic drugs. The prevalence of children receiving multiple courses of antibiotics was also reported.⁸ The denominator was the population of children residing in Manitoba as of December 31, 1998. Age-standardized and age-specific prevalence rates of prescription use were reported by RHA and Winnipeg CA, ranked by the premature mortality rate, the best single measure to represent the healthiness of a population.^{9,10} Comparisons were also made to the total Manitoba child population, Winnipeg, Non-Winnipeg (all children residing outside of Winnipeg), rural south (children residing in rural regions below the 53rd parallel) and north (children residing in regions above the 53rd parallel). Prevalence rates of children were also reported by the income quintile of their neighbourhood of residence.¹¹⁻¹³

RESULTS

Almost 60% of Manitoba children received at least one prescription for a medication in 1998/99. Prescription use followed a U-shaped curve by age, with lowest rates in children 10-14 years old (52%). Children living in Winnipeg and Brandon were significantly more likely, and children living in the rural south and northern Manitoba were significantly less likely to receive a prescription medication than the average Manitoba child. The most frequently dispensed drugs were oral antibiotics (36% of all prescriptions). Other common prescrip-

Figure 1. Rate of children aged 0-19 years with one or more antibiotic prescriptions by RHA, 1998/99

Figure 2. Rate of children aged 0-19 years with one or more antibiotic prescriptions by Winnipeg CA, 1998/99

tion drugs were antiasthmatics, topical steroids, analgesics, ophthalmic products and anxiolytics.

Antibiotics

Forty-four percent of Manitoba children received one or more prescriptions for an oral antibiotic in 1998/99. The majority of children received 4 prescriptions or less; 3.5% of children received 5 or more

antibiotic prescriptions. Close to 60% of children less than 5 years old had received one or more antibiotic prescriptions; this proportion declined to 40% in adolescence. Young children were three times more likely than adolescents to receive 5 or more antibiotic prescriptions.

Children living in northern RHAs were the least likely to receive antibiotic prescriptions (Figure 1), potentially the out-

Statistical Significance:
 * - Rate significantly different from Manitoba mean at $p < 0.05$
 N - Rate significantly different from mean for Northern Manitoba at $p < 0.05$
 S - Rate significantly different from mean for Rural South Manitoba at $p < 0.05$

Figure 3. Rate of children aged 0-19 years with one or more prescriptions for iron supplements by RHA, 1998/99

Statistical Significance:
 * - Rate significantly different from Manitoba mean at $p < 0.05$
 N - Rate significantly different from mean for Northern Manitoba at $p < 0.05$
 S - Rate significantly different from mean for Rural South Manitoba at $p < 0.05$

Figure 4. Rate of children aged 0-19 years with one or more prescriptions for pain relief drugs by RHA, 1998/99

come of missing prescription data. In comparison to the average utilization of antibiotics in southern rural regions, the regions with less healthy populations (Parkland, Interlake) were the most likely and the regions with the healthiest populations (Central, South Eastman) were the least likely to have children with 5 or more antibiotic prescriptions. In addition, children living in the Winnipeg, Brandon and

Marquette RHAs were more likely to receive 4 or less antibiotic prescriptions than the southern rural average. Within the city of Winnipeg (Figure 2), children living in the areas with the least healthy populations were more likely to receive 5 or more prescriptions for antibiotics, than children in areas where the populations are generally healthier (Spearman correlation=0.832, $p < 0.0008$). A similar trend

was observed for children receiving fewer antibiotics (Spearman correlation=0.734, $p < 0.007$). Close to 5% of children living in the Point Douglas and Downtown areas received more than 5 or more prescriptions for an antibiotic in 1998/99, significantly higher than the overall rate for Winnipeg. In urban areas, antibiotic prescription utilization increased with decreasing neighbourhood income (Cochran-Armitage trend test, $p < 0.0001$). In rural areas, antibiotic prescription use increased with decreasing income level only for children receiving 5 or more prescriptions (Cochran-Armitage, $p < 0.0003$).

Iron supplements

Iron treatment was most frequent among 0-4 year olds and 15-19 year olds. In addition to children living in the northern RHAs, those living in Parkland and North Eastman were at greatest risk of being treated for iron deficiency anemia (Figure 3). Within Winnipeg, iron supplement use in children was highest in the Point Douglas, Downtown and Inkster CAs. As neighbourhood income decreased, the rate of treatment for iron deficiency anemia increased, with the highest treatment rates observed in the lowest income rural areas (Cochran-Armitage trend $p < 0.0001$ for both).

Pain-relief drugs

Narcotic analgesics and NSAIDs, which are prescribed to manage acute and chronic pain, were most often dispensed to older children. Children living in the Brandon, South Westman and Nor-Man RHAs had lower prescription rates for narcotic analgesics than the southern rural average, while Interlake had significantly higher rates (Figure 4). Children from the Point Douglas CA had the highest rate of narcotic analgesic prescription in Winnipeg. The use of NSAIDs was positively associated with the general healthiness of the population within the RHAs (Spearman correlation=0.804, $p < 0.002$). In Winnipeg, the CAs with the least healthy populations – Point Douglas and Downtown – had higher rates of NSAID use than the Winnipeg average, although Assiniboine South, an area with a generally healthier population, also had higher rates of use. Higher use of NSAIDs was found with decreasing income level in both rural and urban areas,

whereas the prescription of narcotic analgesics showed this same significant trend for urban areas only (Cochran-Armitage trend $p < 0.0001$ for all).

Psychotropic drugs

In 1998/99, over 1% of children had received a prescription for a psychostimulant and close to 1% of children had received an antidepressant. Anxiolytics and antipsychotics were dispensed in 0.5% or less of children.

Psychostimulants. Psychostimulants were used most often in male children between the ages of 10 and 14, at a treatment prevalence of 2.7%. The dispensation of psychostimulants was significantly higher in Winnipeg and Brandon than the Manitoba average, and use in northern regions was significantly lower. In addition, children in Marquette and Interlake were also more likely to be exposed to these drugs than the southern rural average. Within Winnipeg, the highest rates of psychostimulant use were observed in the St. James-Assiniboine and Assiniboine South WCA. (Figure 5). Children living in higher income rural neighbourhoods were more likely to receive psychostimulants, but no trend in psychostimulant prescription use was observed across urban neighbourhood incomes.

Antidepressants. Three percent of adolescent females received prescriptions for antidepressants in 1998/99, almost double the prevalent use in adolescent males. However, antidepressant use was higher in 10-14 year old males than females. Aside from lower rates in northern areas, no other variations in the age-standardized use of antidepressants were observed between RHAs. Within the city of Winnipeg, children living in the River Heights CA were more likely than the Winnipeg average to receive antidepressants, while Inkster area children were less likely to be treated with them (Figure 5). There was a trend in increased utilization of antidepressants in lower income levels in urban areas (Cochran-Armitage trend test, $p < 0.05$).

Antipsychotics. The receipt of prescriptions for antipsychotics was highest in adolescents, but children as young as 0 to 4 years old were treated with these agents. Males, aged 10 to 14 years, were more likely to receive prescriptions for antipsychotic drugs than females. The age-standardized

Figure 5. Rate of children aged 0-19 years with one or more prescriptions for psychostimulants and antidepressants by Winnipeg CA, 1998/99

Figure 6. Rate of children aged 0-19 years with one or more prescriptions for antipsychotics and anxiolytics by RHA, 1998/99

prevalence of antipsychotic drug treatment was higher in the Winnipeg, Brandon and Burntwood RHAs than the southern rural average (Figure 6). Within Winnipeg, the utilization of antipsychotics in children living in the Downtown WCA was twice as high as the Winnipeg average. Whereas no significant trend was evident for antipsychotic prescriptions across income quin-

tiles in rural areas, the rate of antipsychotic prescriptions increased with decreasing neighbourhood income level in urban areas (Cochran-Armitage trend test, $p < 0.0001$).

Anxiolytics. Rates of anxiolytic prescription use were highest in adolescent females. RHAs with less healthy populations such as Nor-Man had significantly higher age-standardized prescription rates of anxio-

lytics, while healthier populations such as South Eastman had lower rates (Figure 6). The higher prescription utilization rates of anxiolytics in northern Manitoba was concentrated in children 5-9 years. Winnipeg CAs with generally less healthy populations tended to have a higher rate of prescription for anxiolytics (Spearman correlation=0.6215, $p<0.03$). Although no association was found in rural areas, anxiolytic prescription utilization increased with decreasing income level in urban areas (Cochran-Armitage trend test, $p<0.0001$).

DISCUSSION

Sixty percent of children received at least one prescription medication in 1998/99. Very young children and adolescents were the most likely to receive prescription drugs. Antibiotics, antiasthmatics, analgesics, antidepressants, psychostimulants and anxiolytics were among the most commonly dispensed drugs. Similar patterns of prescription utilization have been reported by others.^{4,14} Numerous differences in the receipt of prescription drugs by children were found among Manitoba's regions. Because we did not link prescription use to a diagnosis, it was not possible to draw any conclusions about reasons for the regional variation in prescription rates, and comparisons involving the North were biased by the incompleteness of prescription data for this region. However, the associations we observed between prescription dispensing rates and socioeconomic status suggested that regional differences reflected differences in health. We reported several inverse relationships between prescription use rates and income quintile, especially in urban neighbourhoods, for antibiotics, iron supplements, NSAIDs and analgesics, antidepressants, antipsychotics and anxiolytics. The most likely indications for use of these drugs are known to have higher prevalence rates in low income areas. On the other hand, prescription rates for the psychostimulants were unrelated to neighbourhood income, suggesting differences in physician practice. We found fewer relationships between the PMR of region and prescription utilization, but for antibiotics, NSAIDs and anxiolytics, this association was positive and consistent with the neighbourhood income findings. For the remainder of the discussion, we draw on

the literature to propose reasons for the geographic variation of individual drugs.

Antibiotics were, by far, the most frequently dispensed drug, accounting for 36% of all prescriptions and 44% of all children. Sixty percent of children under 5 years of age received at least one prescription for an antibiotic. Young children were much more likely to receive multiple courses of antibiotics, which is a risk factor for antibiotic resistance.^{8,15} Close to 5% of children living among the least healthy populations of Winnipeg received five or more prescriptions for an antibiotic in 1998/99, significantly higher than the overall rate for Winnipeg. As reported by others, antibiotic prescription utilization increased with decreasing neighbourhood income in urban areas.¹⁶ Antibiotics are frequently prescribed for respiratory tract and ear infections in preschool children.¹⁷ In our study, antibiotic use was greater in Winnipeg CAs with higher rates of lower respiratory tract infections. Concern has been raised over the inappropriate prescribing of antibiotics in respiratory tract infections of viral etiology, and over long courses of antibiotics in ear infections.^{7,17}

Iron treatment was most frequent among preschool children. Iron prescription rates in northern areas may underestimate the extent of iron deficiency anaemia in First Nations children, which has been estimated to be 50% in some Aboriginal populations.¹⁸ Substantially higher iron supplementation rates were documented in Winnipeg neighbourhoods with a high First Nations and new immigrant Asian population in comparison to other neighbourhoods.¹⁹ Iron deficiency anaemia is reported to be twice as common among children of new immigrant parents from Asia²⁰ and 4-fold as common in low compared with higher income children. Iron deficiency anaemia can be associated with developmental delay if left untreated in early childhood.^{20,21} This outcome may not be fully reversible with treatment, but iron deficiency anaemia can be prevented through nutrition counselling of pregnant women and increased availability of affordable iron-rich foods in low-income areas.²⁰

Physicians have realized over the past decade that children feel pain as keenly as adults do and that their pain should be treated.²² Approximately 3% of children received prescriptions for NSAIDs and nar-

cotic analgesics. Analgesics are frequently prescribed to children presenting to emergency with injury.²³ The pattern of analgesic use paralleled the neighbourhood income association with injury hospitalization reported in this supplement.²⁴ Unlike the male dominance of injury rates, we found that female children were more likely to receive NSAIDs than male children. Two possible explanations for this non-concurrence of findings are that male children with injury are less likely to receive analgesic prescriptions, or analgesics are being prescribed to female children for other reasons. Little is known about the epidemiology of pain in children, but chronic pain is not uncommon in childhood and adolescence. Chronic pain such as headache and abdominal pain is more common in female adolescents, and there are calls for further investigation into the psycho-social causes of this female predominance.²⁵

The dramatic increase in prescribing of psychostimulants such as Ritalin has received public attention.²² Rates of psychostimulant prescription use in Manitoba children have doubled over the past three years.²⁴ Psychostimulant prescriptions were received most often by male children aged 10-14 years. Similar age and gender patterns of psychostimulant use have been reported by others.^{26,27} The receipt of psychostimulant prescriptions was significantly higher in urban RHAs such as Winnipeg and Brandon, and in two Winnipeg CAs. Geographical variations in psychostimulant use, on the order of 5- to 10-fold differences, have been documented by others.^{26,27} This variation has not been explained by socioeconomic or ethnic composition. We also observed no trend in psychostimulant prescription use across urban neighbourhood incomes.

The prescription of antidepressants has increased in children subsequent to the availability of newer agents with fewer side effects.²⁸ While higher use in school-age males probably represented antidepressant treatment of nocturnal enuresis in our study,²⁹ adolescent females were the most likely to receive prescriptions for antidepressants. Geographic variation in the use of psychotropics has been related to the prevalence of mental disorders, drug insurance policies, school referral programs, physician specialty training, parental disclosure of problems and family cultural

values.^{30,31} The latter may explain lower use in the Inkster Winnipeg CA, an area with a high concentration of Asian immigrant households. The trend towards increased utilization of antidepressants in lower income levels in urban areas parallels reports of increased depression/emotional-disorder anxiety among children from lower income households,³² but there are concerns over the long-term safety of antidepressants in children.³³

Antipsychotics have traditionally been used to treat acute psychoses such as schizophrenia, which usually develops after the age of 15.²² In our data, adolescents most often received prescriptions for these agents. The utilization of antipsychotics was highest among children living in the Downtown Winnipeg CA, and increased with decreasing neighbourhood income level in urban areas, which may or not be related to the existence of residential treatment facilities in this area. Children as young as 0-4 years old were treated with antipsychotics, consistent with the trend of increased use of newer antipsychotics for the treatment of aggressive behaviour in preschoolers.^{30,34} Although serious behavioural and emotional problems have been identified in preschoolers,³⁵ the use of antipsychotics in this age group raises concerns about the potential for adverse effects on the developing brain.³⁰

Adolescent females were twice as likely to receive prescriptions for anxiolytics than males, a finding which is compatible with higher rates of anxiety in teenage females than in males.³⁶ However, the over-prescription of anxiolytics, such as benzodiazepines, in women has long been criticized.³⁷ RHAs with less healthy populations had highest rates of use; higher use was concentrated in children 5-9 years, which may be related to benzodiazepine treatment of febrile seizures.³⁸ Anxiolytic prescription utilization increased with decreasing income level in urban areas, as has been reported by others.³⁹ Schoolchildren living in low-income households may be at risk of receiving a benzodiazepine prescription because they are more likely to have emotional-disorder anxiety than children living in higher income households.³² Benzodiazepines are considered safe and effective in short-term therapy, but long-term use is a clear risk factor for abuse and dependency.³⁹

In conclusion, we documented regional variation in prescription use, which may be related to differences in need, physician practice or patient use. Analyses that link prescription and diagnosis data are necessary to make this determination. Further, as high rates of use for drugs such as antibiotics, are associated with negative outcomes, assessments to determine appropriateness of use are necessary.

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RÉSUMÉ

Contexte : Les études représentatives sur la consommation de produits pharmaceutiques par les enfants renseignent sur la prévalence des maladies, la pratique médicale et l'assiduité aux traitements. On examine ici les écarts régionaux dans la consommation de médicaments sur ordonnance par les enfants manitobains.

Méthode : À l'aide des données représentatives du Manitoba concernant les médicaments sur ordonnance (1998-1999), on a déterminé la prévalence des enfants s'étant fait prescrire des antibiotiques, des analgésiques, des suppléments de fer et quatre catégories de psychotropes dans les ORS et les CR de Winnipeg, classés selon une mesure de l'état de santé de la population (le TMP). On présente aussi les taux de prévalence en fonction du niveau de revenu des quartiers (selon le recensement).

Résultats : Soixante p. cent des enfants s'étaient fait prescrire au moins un médicament en 1998-1999. Les plus communément délivrés étaient les antibiotiques, les antiasthmiques, les analgésiques, les antidépresseurs et les psychostimulants. C'est dans les quartiers urbains à faible revenu que la consommation d'antibiotiques, de suppléments de fer, d'analgésiques, d'antidépresseurs, d'antipsychotiques et d'anxiolytiques sur ordonnance était la plus élevée. On observe peu d'associations entre le TMP d'une région donnée et la consommation de médicaments sur ordonnance, mais les enfants vivant dans les régions où l'état de santé de la population était relativement mauvais étaient plus susceptibles de consommer des antibiotiques, des anti-inflammatoires non stéroïdiens et des anxiolytiques. La consommation de psychostimulants n'était pas liée au niveau de revenu des quartiers, mais les taux les plus élevés ont été documentés dans certains des quartiers les plus aisés de Winnipeg.

Conclusion : Les écarts régionaux observés dans la consommation de médicaments sur ordonnance pourraient être liés aux écarts dans l'état de santé, les pratiques des médecins ou la consommation par les enfants.

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