



Evidence

Études

From \*the Department of Community Health and Epidemiology, University of Saskatchewan, Saskatoon, Sask.; †the Department of Medicine, Federal University of Santa Catarina, Florianópolis, Brazil; ‡Emergency Medicine, IWK-Grace Health Centre, Halifax, NS; §the College of Nursing, University of Saskatchewan, Saskatoon, Sask.; and ¶the Firestone Regional Chest and Allergy Unit, St. Joseph's Hospital and McMaster University, Hamilton, Ont.

*This article has been peer reviewed.*

CMAJ 1999;160:1824-8

# Prevalence of asthma, rhinitis and eczema among children in 2 Canadian cities: the International Study of Asthma and Allergies in Childhood

Brian F. Habbick,\* MB ChB; Marcia M.M. Pizzichini,† MD, PhD; Brett Taylor,‡ MD; Donna Rennie,§ MN, PhD; Ambikaipakan Senthilselvan,\* MSc, PhD; Malcolm R. Sears,¶ MB ChB

## Abstract

**Background:** Wide variations in the prevalence of asthma, rhinitis and eczema have been reported between regions within Canada and between different countries. The International Study of Asthma and Allergies in Childhood (ISAAC) was developed to provide a standardized tool and methodology to ascertain the prevalence of asthma and allergies in different regions. Comparisons of prevalence rates across geographic regions and at different times may help to identify factors that contribute to the development of these conditions in individuals.

**Methods:** Two Canadian centres, Hamilton and Saskatoon, participated in the ISAAC. A standard questionnaire was distributed through schools and completed by 13- and 14-year-old children and by the parents of 6- and 7-year-old children. Prevalence rates and 95% confidence intervals were calculated for asthma, wheezing, rhinitis and eczema.

**Results:** The overall response rates were 75.1% among the children 6 and 7 years old and 68.6% among those 13 and 14 years old. Among the younger children, the lifetime prevalence of asthma was 17.2% in Hamilton and 11.2% in Saskatoon; the corresponding rates among the older children were 19.2% and 12.2% respectively. The prevalence of wheezing in the 12 months before the survey in the younger group was 20.1% in Hamilton and 14.1% in Saskatoon; in the older group it was 30.6% and 24.0% respectively. The prevalence of rhinitis in the 12 months before the survey was 28.6% in Hamilton and 22.6% in Saskatoon in the younger group and 45.8% and 33.8% respectively in the older group. The prevalence of eczema was slightly higher in Saskatoon in both age groups.

**Interpretation:** High prevalence rates of asthma, rhinitis and eczema exist among school children in Hamilton and Saskatoon, similar to rates in other Western countries. Further studies are required to determine the factors associated with the high rates in the 2 regions and possible reasons for the higher rates in Hamilton.

Asthma continues to be a major cause of morbidity in childhood.<sup>1</sup> A number of studies suggest that its prevalence is increasing.<sup>2-4</sup> Since the 1970s there have been marked increases in the rates of hospital admissions because of asthma among children in Canada,<sup>5-7</sup> the United States<sup>8</sup> and other countries.<sup>9</sup> Rates of death from asthma among young adults have also increased since the mid-1970s in Canada<sup>5,6,10</sup> and many other countries.<sup>11</sup>

These reports suggest that there have been changes in the causes or severity of asthma or in the effectiveness of treatment in recent years. Comparisons of asthma prevalence rates in different regions may help to identify factors that contribute to these changes. Although studies have reported variations in childhood prevalence



rates between countries<sup>12</sup> and within countries, including Canada,<sup>13</sup> an interpretation of these geographic variations has been hindered by differences in methodology and diagnostic criteria used in the studies.<sup>14</sup> It is therefore important to use a standardized methodology to obtain information about the prevalence of asthma in different regions.

The prevalence of rhinitis and eczema among children has been less well studied. Most of the information available about rhinitis relates to hay fever, and reported rates of this condition have varied widely between countries;<sup>3,12,15–20</sup> reported prevalence rates of eczema have also varied widely.<sup>3,12,17,20–23</sup> An interpretation of studies of rhinitis and eczema has been difficult because of the lack of standardized case definitions.

The International Study of Asthma and Allergies in Childhood (ISAAC) was developed to enable researchers around the world to use the same methodology in studies designed to investigate the prevalence and severity of asthma, rhinitis and eczema among children living in different regions and to compare findings within and between countries. Further objectives of ISAAC were to obtain baseline measures for the assessment of future trends in the prevalence and severity of these diseases and to provide a framework for further etiological research on lifestyle, environmental, genetic and medical care factors affecting these diseases.<sup>14</sup>

In this article we report the prevalence of asthma, rhinitis and eczema in 2 Canadian cities, Hamilton and Saskatoon, using the ISAAC protocol.

## Methods

A full description of the ISAAC study protocol has been published previously.<sup>14</sup> In brief, a number of centres throughout the world agreed to use a standardized questionnaire on asthma,

wheezing, rhinitis and eczema that was developed and promulgated by the ISAAC Steering Committee.<sup>14</sup> The questionnaire included questions on demographic characteristics and current (preceding 12 months) and past history of asthma, wheezing, rhinitis and eczema. The severity of wheezing in the past year was determined by responses to questions on the frequency of wheezing attacks, episodes that disturbed sleep, episodes that limited speech, exercise-induced wheezing and nocturnal cough. The 2 age groups studied corresponded to the ages of children in grades 1 and 8 in Canadian schools, with 3000 children of each age group required from each city. For the younger children (6 and 7 years old) the questionnaire was completed at home by their parents; the older children (13 and 14 years old) completed the questionnaire at school. The ISAAC questionnaire has been validated by respiratory physician assessment, with sensitivity of 85% and specificity of 81%.<sup>24</sup> The choice of the 2 Canadian cities was based on the interests of the investigators in each region and the fact that the cities have significantly different environments. The 2 cities differ in population density and industry, and hence levels of air pollution,<sup>25</sup> and experience different climatic conditions.<sup>26</sup>

In Hamilton we recruited children from an area that included several municipalities and extended approximately 40 km around the western end of Lake Ontario (Oakville to Brantford). This region has a population of approximately 500 000, with heavy industry concentrated mainly in Hamilton, and has a somewhat milder climate than Saskatoon and relatively high ambient humidity levels. There were approximately 10 000 children in each age group in this region, and 3000 were sought from each group through random selection of schools in 7 boards of education. Most of the children were surveyed in May, June, September and October of 1994; a further 791 of the older children were surveyed in March and April of 1995. The study was approved by the Research Committee of St. Joseph's Hospital in Hamilton, Ont.

Saskatoon, with a population of approximately 200 000, has little industry and acts primarily in a service capacity for the surrounding agricultural area. It experiences a typical prairie climate — low humidity and cold winters. The total number of school children in Saskatoon in each of the age groups studied was

**Table 1: Prevalence and severity of asthma and asthma-like symptoms among children 6 and 7 years old and those 13 and 14 years old in Hamilton and Saskatoon**

Disease or symptom	Prevalence, % (and 95% CI)			
	Younger children		Older children	
	Hamilton <i>n</i> = 3337	Saskatoon <i>n</i> = 2418	Hamilton <i>n</i> = 3051	Saskatoon <i>n</i> = 1901
Asthma ever	17.2 (15.9–18.5)	11.2 (10.0–12.5)	19.2 (17.8–20.6)	12.2 (10.7–13.7)
Wheezing ever	33.1 (31.5–34.7)	26.4 (24.6–28.1)	44.4 (42.7–46.2)	36.4 (34.2–38.6)
Wheezing in past year	20.1 (18.8–21.5)	14.1 (12.7–15.4)	30.6 (29.0–32.2)	24.0 (22.1–26.0)
No. of wheezing episodes in past year				
1–3	13.5 (12.3–14.6)	9.2 (8.0–10.3)	19.9 (18.5–21.3)	16.1 (14.4–17.7)
4–12	4.5 (3.8–5.2)	3.2 (4.2–6.5)	6.4 (5.5–7.3)	4.9 (3.9–5.9)
> 12	1.7 (1.3–2.1)	1.3 (0.9–1.8)	3.6 (3.0–4.3)	2.8 (2.0–3.5)
No. of episodes of sleep disturbance from wheezing in past year				
≤ 1 per wk	8.1 (7.1–9.0)	6.3 (5.3–7.3)	9.2 (8.2–10.3)	5.6 (4.5–6.6)
> 1 per wk	2.5 (2.0–3.0)	1.7 (1.2–2.2)	2.2 (1.6–2.7)	2.0 (1.4–2.6)
Speech limited by wheezing in past year	3.3 (3.2–4.7)	2.6 (2.0–3.2)	8.9 (7.9–9.9)	6.7 (5.6–7.9)

Note: CI = confidence interval.



estimated to be between 2500 and 3000; we therefore attempted to recruit all children in these age groups with the help of the local boards of education. The surveys were completed between December 1993 and March 1994. The study was approved by the Advisory Committee on Ethics in Human Experimentation of the University of Saskatchewan.

In both cities, the grade 1 classes included some 5- or 8-year-old children, and the grade 8 classes included some 12- or 15-year-old children. These children were included in the data collection and analysis. Children outside these ages were excluded from the analyses. For the older group, parental informed consent was obtained; for the younger group, the parents themselves completed the questionnaire.

Continuous variables were described by means and standard deviations. Frequencies and proportions were used to describe categorical variables. The significance of differences in proportions between boys and girls was tested using the  $\chi^2$  test.

## Results

In Hamilton 4568 questionnaires were distributed to the younger children, and 3337 (73.1%) were completed; of the 4529 older children invited, completed consent forms and questionnaires were received from 3051 (67.4%). In Saskatoon 3094 questionnaires were distributed to the younger children, and 2418 (78.2%) were completed; of the 2692 older children asked to participate, completed consent forms and questionnaires were received from 1901 (70.6%).

The prevalence rates for asthma and wheezing in each city are shown in Table 1 and those for rhinitis and eczema, in Table 2. The lifetime (ever) prevalence of asthma, wheezing and rhinitis was higher among the older children, whereas the lifetime prevalence of eczema was higher among the younger old children. In both age groups the prevalence rates for all asthma and wheezing categories and for all rhinitis symptoms were substantially higher in Hamilton than in Saskatoon (Tables 1 and 2). However, the prevalence rates for eczema ever were higher in Saskatoon than in Hamilton, particularly in the older age group (Table 2).

The prevalence rates for asthma and allergy symptoms by sex are shown in Table 3. Among the younger children in both Hamilton and Saskatoon, the rates of asthma, wheezing, rhinitis and hay fever symptoms ever were greater among boys than among girls, but in the older

group girls had equal or higher rates for wheezing ever, wheezing in the past year, rhinitis ever, hay fever ever and eczema ever.

## Interpretation

The prevalence rates of asthma in Hamilton and Saskatoon are among the highest reported in the ISAAC study<sup>27</sup> but are comparable with rates reported for other centres, including those in the United Kingdom, Australia, New Zealand, the Americas and the Republic of Ireland. The lowest prevalence rates were found in Eastern Europe and Asia.<sup>27</sup> Some authors<sup>28-31</sup> have argued that asthma is a disease of developed countries and suggested several factors that

**Table 3: Prevalence of asthma and allergy symptoms by sex**

Disease or symptom	Prevalence, %			
	Younger children		Older children	
	Hamilton <i>n</i> = 3337	Saskatoon* <i>n</i> = 2414	Hamilton <i>n</i> = 3051	Saskatoon* <i>n</i> = 1897
<b>Asthma ever</b>				
Boys	20.8	13.0	20.6	14.5
Girls	13.5†	9.5‡	17.9	9.9‡
<b>Wheezing ever</b>				
Boys	38.2	28.7	43.2	36.4
Girls	27.9†	24.0§	45.6	36.3
<b>Wheezing in past year</b>				
Boys	23.0	15.2	28.6	24.0
Girls	17.2†	12.9	32.5§	24.1
<b>Rhinitis ever</b>				
Boys	33.2	27.6	48.3	37.3
Girls	27.7‡	23.5§	53.9‡	41.4
<b>Hay fever ever</b>				
Boys	12.1	8.7	26.2	10.9
Girls	9.3‡	5.6‡	29.1	13.2
<b>Eczema ever</b>				
Boys	21.3	22.1	10.5	13.6
Girls	20.0	22.2	18.3†	20.7†

\*The information on sex was missing for 4 children in both age groups in Saskatoon.

†*p* < 0.001 for comparison between boys and girls.

‡*p* < 0.01 for comparison between boys and girls.

§*p* < 0.05 for comparison between boys and girls.

**Table 2: Prevalence of rhinitis and eczema symptoms**

Disease or symptom	Prevalence, % (and 95% CI)			
	Younger children		Older children	
	Hamilton	Saskatoon	Hamilton	Saskatoon
<b>Rhinitis</b>				
Rhinitis ever	30.5 (28.9–32.0)	25.6 (23.9–27.3)	51.2 (49.5–53.0)	39.5 (37.3–41.7)
Rhinitis in past year	28.6 (27.1–30.2)	22.6 (21.0–24.3)	45.8 (44.1–47.6)	33.8 (31.6–35.9)
Rhinoconjunctivitis in past year	14.4 (13.2–15.6)	8.4 (7.3–9.5)	25.9 (24.3–27.4)	12.8 (11.3–14.3)
Hay fever ever	10.7 (9.7–11.8)	7.2 (6.2–8.2)	27.7 (26.1–29.3)	12.1 (10.6–13.6)
<b>Eczema</b>				
Itchy rash ever	12.3 (11.2–13.4)	12.5 (11.2–13.9)	15.0 (13.7–16.2)	17.1 (15.4–18.8)
Itchy rash in past year	12.3 (11.1–13.4)	11.6 (10.3–12.9)	13.9 (12.7–15.2)	14.4 (12.8–15.9)
Eczema ever	20.6 (19.2–22.0)	22.1 (20.5–23.8)	14.5 (13.3–15.8)	17.3 (15.6–19.0)



may contribute to the increasing prevalence rates in the last 3 decades. These include changes in housing and diet, increased indoor entertainment, increased exposure to indoor allergens and the increased use of broad-spectrum antibiotics. Other factors implicated in allergy development include pet ownership,<sup>12</sup> reduced exposure to viral infections in early childhood<sup>19,32</sup> and damp housing conditions.<sup>33–36</sup> Allergy to house dust mites is generally considered to be a major determinant of asthma,<sup>37</sup> and mite populations are lower in cool, dry environments.<sup>38</sup> Cockroach allergy has recently been identified as a major determinant of asthma, especially in inner-city areas in the United States.<sup>39</sup>

The prevalence rates of rhinitis, rhinoconjunctivitis and eczema among the children in Hamilton and Saskatoon are also among the highest in the world. Taylor and associates<sup>23</sup> suggested that, in the United Kingdom, eczema, like asthma, was increasing in prevalence. They found that among children 5–7 years of age the rates were 5.1% in 1946, 7.3% in 1958 and 12.2% in 1970. Similar to the pattern observed for asthma, the prevalence rates for rhinitis symptoms were greater in Hamilton than in Saskatoon. This pattern was not seen in the rates for eczema, which were slightly higher in Saskatoon. Similar findings were reported in some of the ISAAC studies in which higher prevalence rates for eczema were observed in countries with lower asthma prevalence rates.<sup>27</sup>

We found that the prevalence of asthma was higher among boys than among girls, although the prevalence of wheezing was the same among the older girls and boys. This is consistent with other studies, which usually showed a male:female ratio of about 1.5:1 for children younger than 15 years,<sup>5,7,8,15,40–44</sup> with a female preponderance after this age.<sup>5,7,41,43–45</sup> In our study the sex ratio for wheezing in the year before the survey (current wheezing) changed from a male predominance in the younger group to a female predominance in the older group. The sex ratios for rhinitis, hay fever and eczema in our study were similar to those for current wheezing, with a shift to higher rates among girls in the older age group.

The first phase of the ISAAC study was designed to examine the similarities and differences in prevalence rates; information on important risk factors, such as smoking, was not obtained in our study. The next phase of the ISAAC study will explore possible reasons for the observed differences.

The reasons for higher rates of asthma symptoms and slightly lower rates of eczema symptoms in Hamilton than in Saskatoon were not determined in this study. Dales and colleagues<sup>13</sup> surveyed children 5–8 years of age in 30 communities in various regions of Canada and found a strong association between wheezing and regional humidity. Factors that should be included in future investigations of regional variations of prevalence rates are differences in humidity, climatic conditions, air quality, and exposure to house dust mites, mold and cockroaches.

We thank the school boards, principals, teachers, parents and

children whose cooperation made this study possible.

This study was funded by The Asthma Society of Canada and Fisons Canada (Hamilton) and The Saskatchewan Lung Association (Saskatoon).

Competing interests: None declared.

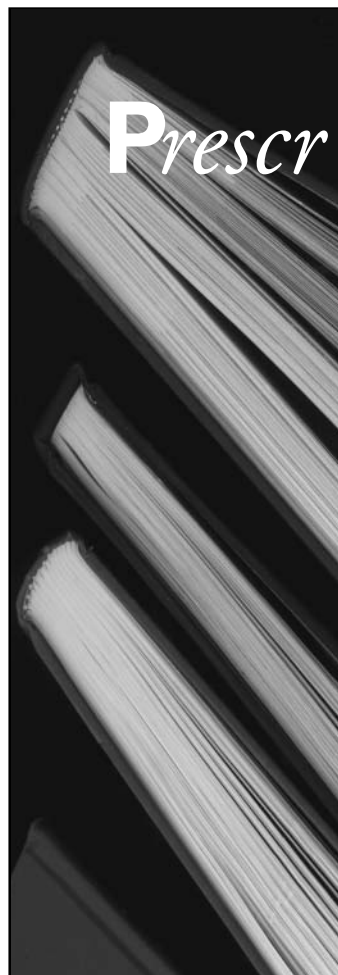
## References

1. Anderson HR, Bailey PA, Cooper JS, Palmer JC, West S. Morbidity and school absence caused by asthma and wheezing illness. *Arch Dis Child* 1983;58:777–84.
2. Burney PGJ, Chinn S, Rona RJ. Has the prevalence of asthma increased in children? Evidence from the National Study of Health and Growth. 1973–86. *BMJ* 1990;300:1306–10.
3. Ninan TK, Russell G. Respiratory symptoms and atopy in Aberdeen schoolchildren: evidence from two surveys 25 years apart. *BMJ* 1992;304:857–8.
4. Butland BK, Strachan DP, Anderson HR. The home environment and asthma symptoms in childhood: two population based case-control studies 13 years apart. *Thorax* 1997;52:618–24.
5. Mao Y, Semenciv R, Morrison H, MacWilliam L, Davies J, Wigle D. Increased rates of illness and death from asthma in Canada. *CMAJ* 1987;137:620–4.
6. Wilkins K, Mao Y. Trends in rates of admission to hospital and death from asthma among children and young adults in Canada during the 1980s. *CMAJ* 1993;148:185–90.
7. Senthilselvan A. Trends and rural-urban differences in asthma hospitalizations in Saskatchewan 1970–1989. *Can Respir J* 1994;1:229–34.
8. Gergen PJ, Weiss KB. Changing patterns of asthma hospitalization among children: 1979 to 1987. *JAMA* 1990;264:1688–92.
9. Mitchell EA. International trends in hospital admission rates for asthma. *Arch Dis Child* 1985;60:376–8.
10. Hogg RS, Schechter MT, Montaner JSG, Hogg JC. Asthma mortality in Canada, 1946–1990. *Can Respir J* 1995;2:61–6.
11. Jackson R, Sears MR, Beaglehole R, Rea HH. International trends in asthma mortality: 1970–1985. *Chest* 1988;94:914–9.
12. Burr ML, Limb ES, Andrae S, Barry DMJ, Nagel F. Childhood asthma in four countries: a comparative survey. *Int J Epidemiol* 1994;23:341–7.
13. Dales RE, Raizenne M, El-Saadany S, Brook J, Burnett R. Prevalence of childhood asthma across Canada. *Int J Epidemiol* 1994;23:775–81.
14. Asher MI, Keil U, Anderson HR, Beasley R, Crane J, Martinez F, et al. International Study of Asthma and Allergies in Childhood (ISAAC): rationale and methods. *Eur Respir J* 1995;8:483–91.
15. Kuehr J, Frischer T, Karmaus W, Meinert R, Barth R, Urbanek R. Clinical atopy and associated factors in primary-school pupils. *Allergy* 1992;47:650–5.
16. Von Mutius E, Martinez FD, Fritzsche C, Nicolai T, Roell G, Thiemann HH. Prevalence of asthma and atopy in two areas of West and East Germany. *Am J Respir Crit Care Med* 1994;149:358–64.
17. Saval P, Fuglsang G, Madsen C, Osterballe O. Prevalence of atopic disease among Danish school children. *Pediatr Allergy Immunol* 1993;4:117–22.
18. Strachan DP, Golding J, Anderson HR. Regional variations in wheezing illness in British children: effect of migration during early childhood. *J Epidemiol Community Health* 1990;44:231–6.
19. Strachan DP, Harkins LS, Johnston ID, Anderson HR. Childhood antecedents of allergic sensitization in young British adults. *J Allergy Clin Immunol* 1997;99:6–12.
20. Williams HC, Strachan DP, Hay RJ. Childhood eczema: Disease of the disadvantaged? *BMJ* 1994;308:1132–5.
21. Kay J, Gawkrödger DJ, Mortimer MJ, Jaron AG. The prevalence of childhood atopic eczema in a general population. *J Am Acad Dermatol* 1994;30:35–9.
22. Peters TJ, Golding J. The epidemiology of childhood eczema: II. Statistical analyses to identify independent early predictors. *Paediatr Perinat Epidemiol* 1987;1:80–94.
23. Taylor B, Wadsworth J, Wadsworth M, Peckham C. Changes in the reported prevalence of childhood eczema since the 1939–1945 war. *Lancet* 1984;2:1255–7.
24. Jenkins MA, Clarke JR, Carlin JB, Robertson CF, Hopper JL, Dalton MF, et al. Validation of questionnaire and bronchial hyperresponsiveness against respiratory physician assessment in the diagnosis of asthma. *Int J Epidemiol* 1996;25:609–16.
25. *Air quality trends in Canadian cities*. Ottawa: Environment Canada; 1996.
26. *Canadian climate normals 1961–1990*. Ottawa: Atmospheric Environment Service, Environment Canada; 1993.
27. International Study of Asthma and Allergies in Childhood (ISAAC) Steering Committee. Worldwide variation in prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and atopic eczema: ISAAC. *Lancet* 1998;351:1225–32.
28. Platts-Mills TAE, Carter MC. Asthma and indoor exposure to allergens [editorial]. *N Engl J Med* 1997;336:1382–4.




29. Woolcock AJ. Worldwide trends in asthma morbidity and mortality. Explanation of trends. *Bull Int Union Tuberc Lung Dis* 1991;66:85-9.
30. Waite DA, Eyles EF, Tonkin SL, O'Donnell TV. Asthma prevalence in Tokelauan children in two environments. *Clin Allergy* 1980;10:71-5.
31. Van Niekerk CH, Weinberg EG, Shore SC, Heese H de V, van Schalkwyk DJ. Prevalence of asthma: a comparative study of urban and rural Xhosa children. *Clin Allergy* 1979;9:319-24.
32. Strachan DP. Hay fever, hygiene, and household size. *BMJ* 1989;299:1259-60.
33. Dekker C, Dales R, Bartlett S, Brunekreef B, Zwanenburg H. Childhood asthma and the indoor environment. *Chest* 1991;100:922-6.
34. Strachan DP. Damp housing and childhood asthma: validation of reporting of symptoms. *BMJ* 1988;297:1223-6.
35. Platt S, Martin CJ, Hunt SM, Lewis CW. Damp housing, mold growth, and symptomatic health state. *BMJ* 1989;298:1673-8.
36. Yang CY, Chiu JF, Chiu HF, Kao WY. Damp housing conditions and respiratory symptoms in primary school children. *Pediatr Pulmonol* 1997;24:73-7.
37. Wieringa MH, Weyler JJ, Van-Bastelaer FJ, Nelen VJ, Van-Sprundel MP, Vermeire PA. Higher asthma occurrence in an urban than a suburban area: role of house dust mite skin allergy. *Eur Respir J* 1997;19:1460-6.
38. Charpin D, Kleisbauer JP, Lanteaume A, Razzouk H, Vervloet D, Toumi M, et al. Asthma and allergy to house dust mites in populations living in high altitudes. *Chest* 1988;93:758-61.
39. Rosenstreich DL, Eggleston P, Kattan M, Baker D, Slavin RG, Gergen P, et al. The role of cockroach allergy and exposure to cockroach allergen in causing morbidity among inner-city children with asthma. *N Engl J Med* 1997;336:1356-63.
40. Bates DV, Baker-Anderson M. Asthma mortality and morbidity in Canada. *J Allergy Clin Immunol* 1987;80:395-7.
41. Mitchell EA, Borman B. Demographic characteristics of asthma admissions to hospitals. *N Z Med J* 1986;99:576-9.
42. Lau YL, Karlberg J, Yeung CY. Prevalence of and factors associated with childhood asthma in Hong Kong. *Acta Paediatr* 1995;84:820-2.
43. Strachan DP. Wheezing presenting in general practice. *Arch Dis Child* 1985;60:457-60.
44. Anderson HR, Pottier AC, Strachan DP. Asthma from birth to age 23: incidence and relation to prior and concurrent atopic disease. *Thorax* 1992;47:537-42.
45. Skobeloff EM, Spivey WH, St. Clair SS, Schoffstall JM. The influence of age and sex on asthma admissions. *JAMA* 1992;268:3437-40.

**Reprint requests to:** Dr. Ambikaipakan Senthilselvan, Department of Community Health and Epidemiology, Health Sciences Building, University of Saskatchewan, 107 Wiggins Rd., Saskatoon SK S7N 5E5; sentil@sask.usask.ca



# Prescribed READING

- Drugs of Choice
- The Cochrane Library
- Physicians' Legal Manual
- Best Evidence
- Canadian Immunization Guide



For information call the CMA Member Service Centre  
888 855-2555 (toll free)  
cmamsc@cma.ca