

Prevalence of allergic rhinitis and atopic dermatitis among children in four regions of Finland

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The primary aim of the study was to evaluate the prevalences of allergic rhinitis and atopic dermatitis and their regional differences among Finnish children. The secondary objective was to determine whether the responses to the questions used are affected by the pollen season if asked during such a season. In 1994–5, the self-reported prevalence of allergic symptoms in four regions of Finland was studied among 11 607 schoolchildren aged 13–14 years, as part of the International Study of Asthma and Allergies in Childhood (ISAAC). The prevalence of rhinoconjunctivitis during the preceding year was 16% in eastern Finland (Kuopio County, $n=2821$), 23% in southern Finland (Helsinki area, $n=2771$), 15% in southwestern Finland (Turku and Pori County, $n=2983$), and 16% in northern Finland (Lapland, $n=3032$). The respective prevalences of flexural dermatitis were 15%, 19%, 16%, and 18%. The surveys were performed in winter, except in the Helsinki area where the survey was carried out mainly in the spring pollen season. Among the children studied in autumn in Helsinki, the prevalence of rhinoconjunctivitis was 19% and that of flexural dermatitis 17%. In multivariate analysis, flexural dermatitis was slightly more common in Lapland than in all other areas. In contrast, no significant differences were found in rhinoconjunctivitis. The prevalences of both disorders were twice as high in girls as in boys. In conclusion, regional differences in the prevalence of allergic rhinitis and atopic dermatitis were small in our country, and the prevalence figures were rather similar to those reported from other European countries. Almost half of the children had suffered from at least one atopic disorder, and over one-third had had symptoms in the past year. A clear season-of-response effect was observed; the prevalence of rhinoconjunctivitis was 25% when studied during the pollen seasons in the Helsinki area.

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Key words: allergies; children; eczema; hay fever; prevalence; questionnaire; rhinitis; season of response; smoking.

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Atopic diseases have rapidly become a major public health problem in child and adolescent populations in the developed countries (1), such as Finland (2, 3) and Sweden (4). Despite considerable research, the reasons for this trend are not well understood. Changes in environmental exposure in early life may play an important role; the presence of new, unknown adjuvants enhancing sensitization or the absence of factors inducing tolerance have been suggested as possible mechanisms (5).

In Finland, the prevalences of current allergic rhinitis and atopic dermatitis have varied between 6–20% and 4–15% in children (6–8). Unfortunately, the comparison of these figures and com-

parisons between the studies from other countries as well are hampered by the differences in study designs, diagnostic definitions, and study populations. On the other hand, regional comparisons within and between the countries, if possible, would be of great value, as they provide a framework for research on the etiology of atopic diseases (9).

The present study aimed to evaluate the prevalence of allergic diseases, and the regional differences in the prevalences among Finnish children by using the standardized International Study of Asthma and Allergies in Childhood (ISAAC) methodology and a large, representative population sample. In addition, we investigated whether

Table 1. Study populations, response rates, sex, and age^a

	Kuopio	Helsinki	Turku	Lapland
Month of data collection	11/94–1/95	4–12/95 ^b	1–3/95	1–4/95
Schools (n)	17	17	13	20
Responders (n) (%)	2878 (97%)	2855 (95%)	3085 (97%)	3078 (97%)
Exclusions (n) (%)				
Invalid or missing age or sex	57 (2%)	84 (3%)	102 (3%)	46 (2%)
Included in analysis (n)	2821	2771	2983	3032
Sex male (n) (%)	1415 (50%)	1357 (49%)	1479 (50%)	1482 (49%)
Age 13 years (n) (%)	1383 (49%)	1349 (49%)	1503 (50%)	1512 (50%)

^aPublished in Pekkanen et al. (10).^b10% of data were collected in autumn 1995.

responses to the questions on allergic rhinitis and atopic dermatitis are affected by the pollen season if the questionnaires are administered during such a period.

Material and methods

Study design

The study was conducted in four areas of Finland: Helsinki (Helsinki area, southern Finland), Turku (Turku and Pori County, southwestern Finland), Kuopio (Kuopio County, eastern Finland), and Lapland (southern part of Lapland County, northern Finland). In all areas, seventh- and eighth-year pupils aged 13–14 years from randomly selected schools were included in the study. The data were collected during winter, i.e., with snow on the ground, in all centers except Helsinki, where, due to practical problems, the fieldwork was started in early spring, suspended during summer, and completed in autumn. The written and video questionnaires (version AVQ 3.0 of the video questionnaire) of the ISAAC study were used; these questionnaires have been published recently (9). The written questionnaire included questions on rhinitis and dermatitis, as well as questions on wheezing and cough symptoms. The video questionnaire involved the audiovisual presentation of clinical symptoms and signs of asthma, and it included questions on the previous diagnosis of asthma. In addition to these ISAAC questionnaires, children were asked about their smoking habits.

The study design, including data on the coverage of the study and results on asthma and asthma-like symptoms, has been published recently in more detail (10). Response rates were over 95% in all four areas (Table 1). Students who were outside the 13–14-year age range were excluded from the analyses. Approximately 50% of the students were 13 years old, and about 50% were boys in all areas.

Definitions: allergic rhinitis and atopic dermatitis

Rhinitis. Sneezing or runny or blocked nose apart from infections.

Seasonal rhinitis. Rhinitis and symptoms in at least one of the following months: April, May, June, July, or August.

Rhinoconjunctivitis. Rhinitis, as defined above, accompanied by itchy, watery eyes.

Seasonal rhinoconjunctivitis. Rhinoconjunctivitis and symptoms in at least one of the following months: April, May, June, July, or August.

Hay fever. A child answered affirmatively the question: have you ever had hay fever?

Itching dermatitis. Itchy rash coming and going for at least 6 months.

Flexural dermatitis. Itching dermatitis, as defined above, affecting the folds of the elbows or knees, and present in front of the ankles, under the buttocks, or around the neck, ears, or eyes.

Eczema. A child answered affirmatively the question: have you ever had eczema?

The above definitions were applied to the answers in the written questionnaire.

Asthma and asthma-like symptoms

Asthma. A child had ever had doctor-diagnosed asthma.

Wheeze. A child had responded positively to at least one of the three video sequences of wheeze (wheezing while at rest, at night, or during exercise), and wheezing had occurred in the preceding year.

Table 2. Self-reported prevalence of symptoms consistent with allergic rhinitis and atopic dermatitis

	Kuopio n=2821 % n	Helsinki n=2771 % n	Turku n=2983 % n	Lapland n=3032 % n
Rhinitis ever	46 1311	55 1527	44 1300	44 1326
Rhinitis in past year	36 1019	46 1262	33 995	33 1008
Seasonal ^a rhinitis in past year	20 553	33 907	17 497	14 423
Rhinoconjunctivitis in past year	16 452	23 651	15 436	16 477
Seasonal ^a rhinoconjunctivitis in past year	12 329	20 551	10 292	9 258
Hay fever ever	29 820	31 861	27 802	23 704
Itching dermatitis	24 669	28 764	25 760	28 855
Itching dermatitis in past year	17 492	22 612	19 555	21 640
Flexural dermatitis in past year	15 411	19 523	16 477	18 560
Eczema ever	23 645	26 725	24 712	24 731

^aSymptoms in at least one of following months: April, May, June, July, August. For other definitions, see text.

Cough only. A child had neither asthma nor wheeze, but had responded positively in the video sequence of night cough, and cough had occurred in the preceding year.

Healthy. A child did not have any of the above conditions (asthma, wheeze, or cough).

The above definitions were applied to the answers in the video questionnaire.

Smoking

By the answers on smoking in the written questionnaire, smoking was classified into three categories: regular smoking, occasional smoking, and non-smoking. The classification of smoking has been published in more detail elsewhere (10).

Multivariate analyses

Multivariate logistic regression models were used to analyze the independent effects of region, age, sex, and smoking, as well as pollen season in Helsinki, on the prevalence of allergic rhinitis and atopic dermatitis, while adjusting for the other factors. All other analyses are unadjusted.

Results

The estimates of the prevalence of allergic rhinitis depended on the definition used (Table 2). About half of the children, 44–55%, had suffered from rhinitis apart from infections; over 75% of them had been symptomatic in the preceding year. The prevalence of seasonal rhinitis varied from 14% (in Lapland) to 33% (in Helsinki). The prevalence of rhinoconjunctivitis was equally common in Kuopio (16%), Turku (15%), and Lapland (16%), but it

Table 3. Prevalence and co-occurrence of respiratory or dermal symptoms in past year among all children. In calculation of percentages in each cell of table, numbers are compared to total population of 11 607 children

Symptom	n (%)
Wheeze ^a	1305 (11.2)
+Rhinoconjunctivitis ^b	493 (4.2)
+Flexural dermatitis ^b	424 (3.7)
–No second symptom	595 (5.1)
Rhinoconjunctivitis	2016 (17.4)
+Flexural dermatitis ^b	621 (5.4)
–No second symptom	1109 (9.6)
Flexural dermatitis	1971 (17.0)
–No second symptom	1133 (9.8)

^aChildren with diagnosed asthma are included.

^bChildren with all three symptoms (n=207) are included.

was clearly higher (23%) in Helsinki. However, the adjustment of pollen season in multivariate analysis leveled down the high figure in Helsinki (Table 5). In seasonal symptoms (seasonal rhinitis, seasonal rhinoconjunctivitis, and hay fever), there seemed to be a tendency toward lower figures in Lapland and higher figures in Helsinki (Table 2). The prevalence figures of nonseasonal allergic rhinitis (rhinitis, rhinoconjunctivitis) were rather similar in Kuopio, Turku, and Lapland, but, again, higher in Helsinki (Table 2).

Regional differences in atopic dermatitis were small (Table 2). The prevalence of flexural dermatitis in the past year was rather similar in Kuopio (15%) and Turku (16%), and slightly higher in Lapland (18%) and Helsinki (19%). An additional 2–3% of the children in each area reported symptoms of nonflexural itching dermatitis. About 25% of all children reported that they had had eczema at least once. The prevalence figures of eczema (definition based on the previous diagnosis) were rather similar to the lifetime prevalences of itching dermatitis (definition based on symptoms). In Lapland, however, itching dermatitis had a 4% higher prevalence than eczema. The high prevalence of flexural dermatitis in Lapland remained in the multivariate analysis; in contrast, no other significant differences were found between the areas (Table 5).

Among all the 11 607 children, 44% (n=5082) had had at least one atopic disorder (asthma, hay fever, or eczema), and 34% (n=3961) reported having had at least one of the three atopic symptoms (wheeze, rhinoconjunctivitis, or flexural dermatitis) in the past year. The figures were highest in Helsinki (48% for atopic disorders and 40% for atopic symptoms), and they were rather similar in Turku (43% and 33%), Lapland (41% and 34%), and Kuopio (44% and 31%). Among the whole population, 8% (n=917) of the children had suf-

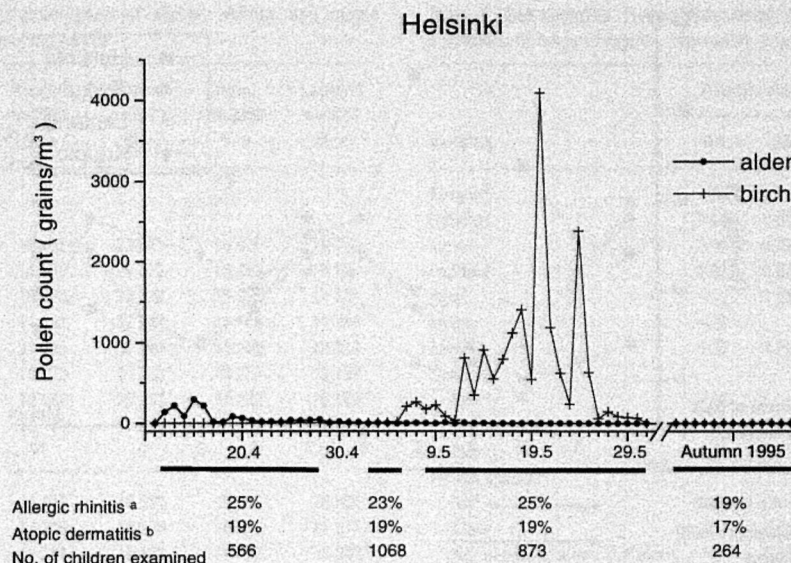


Fig. 1. Pollen counts and prevalence of rhinoconjunctivitis and atopic dermatitis during four time periods of study in Helsinki. x-axis indicates time (date and month); horizontal bars show days when questionnaires were administered. ^aRhinoconjunctivitis in past year. ^bFlexural dermatitis in past year.

ferred from two and 2% ($n=207$) from three atopic symptoms in the past year (Table 3). About one-third of the children with respiratory symptoms (wheeze or rhinoconjunctivitis) also had dermal symptoms, and 43% of the children with dermal symptoms had respiratory symptoms (Table 3).

In Helsinki, most of the data were collected before and during the spring pollen season; some of the data were collected outside the pollen seasons in autumn. In all other areas, the data were collected in winter before any pollen seasons. For examination of the possible effects of pollen exposure on the 1-year prevalence figures of rhinoconjunctivitis and flexural dermatitis, the Helsinki data were divided into four time periods (Fig. 1). The 1-year prevalence of rhinoconjunctivitis in Helsinki fluctuated between 23% and 25% during spring and was 19% in autumn (Fig. 1), which is still higher than the 15–16% prevalence in other areas. In flexural dermatitis, there was less periodic variation; the 1-year prevalence was 19% during spring and 17% in autumn (Fig. 1). The periodic variation found in Helsinki was not due to differences in the age or sex distributions nor to the different prevalence figures of hay fever or eczema in the schools surveyed at different times (data not shown). In Helsinki, the univariate odds ratios for rhinoconjunctivitis and flexural dermatitis were 1.48 (95% CI: 1.36–1.60) and 1.14 (1.05–1.24), respectively. In the multivariate analysis, the odds ratios remained rather similar after adjusting for age, sex, and smoking, being 1.47 (1.36–1.60) and 1.14 (1.04–1.24), respectively. However, the odds ratios decreased to 1.16 (0.91–1.47) and 0.99 (0.77–1.27)

when the adjustment for pollen season was added into the model (Table 5).

There was a distinct seasonal variation in the symptoms of rhinitis (Fig. 2). This seasonal variation was very similar in Turku, Lapland, and Kuopio. In these areas, there was a peak in reported symptoms in midsummer during the main pollen season in Finland. Another peak was seen in winter; this peak seemed to appear just before the collection of the data. The results in Helsinki differed clearly from other results; a high peak was seen in spring months, just before and during the data collection.

Both rhinoconjunctivitis and flexural dermatitis were more common in girls than in boys (Table 4); the sex differences remained also in the multivariate analysis (Table 5). The prevalence of rhinoconjunctivitis seemed to increase with age in all areas except Helsinki. In contrast, age had less effect on the prevalence of flexural dermatitis (Table 4). In the multivariate analysis, the prevalence of rhinoconjunctivitis increased and the prevalence of flexural dermatitis diminished by age when adjusted for other factors (Table 5). Smoking was strongly associated with both rhinoconjunctivitis and flexural dermatitis in all areas (Table 4); this association remained also in the multivariate analysis (Table 5).

There was a significant association of asthma, wheeze, and cough with both allergic rhinitis and atopic dermatitis. As many as 54% of the children with asthma had either rhinoconjunctivitis or flexural dermatitis; 16% had both. The respective figures in the children with wheeze (without asthma), in those with cough only, and in the healthy children were 50% (13% with both disorders), 41%

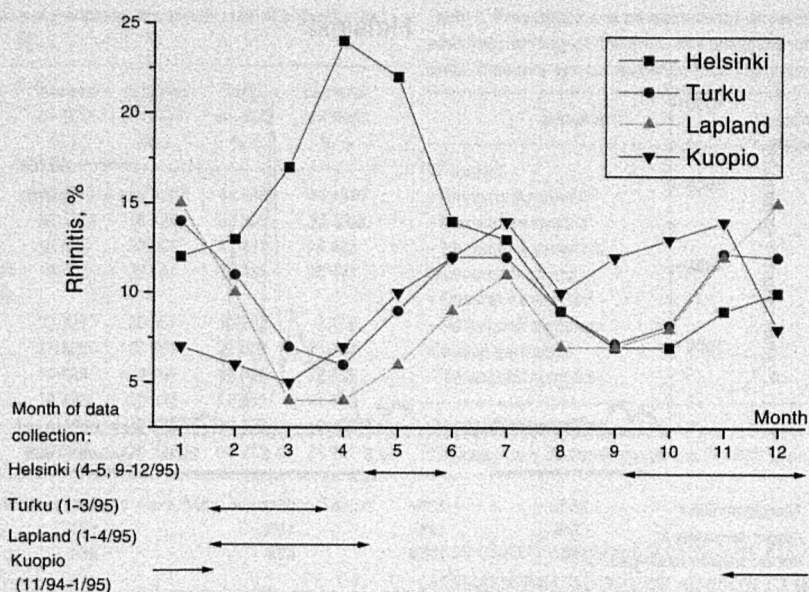


Fig. 2. Occurrence of rhinitis during preceding year in four study areas. Horizontal arrows show period when questionnaires were administered.

(11%), and 23% (3%). In the 316 children with active asthma (asthma diagnosed and wheezing or cough symptoms during the preceding 12 months), the respective figure was as high as 67% (24%) (data not shown).

Discussion

The main result of the present study was that the regional differences in the prevalence of atopy when defined in different ways were small in Finland. However, the prevalence of atopic eczema seemed to be slightly higher in northern Finland than in other parts of the country, a finding which is in accordance with the previous studies (3, 6). The finding that there is a season-of-response effect in the answers concerning seasonal symptoms, studied in the Helsinki area by the effect of the pollen season on rhinoconjunctivitis, supports the results made in other parts of the ISAAC study (11).

Recently, only a few studies have been carried out on the prevalence of allergic diseases in Finnish child and adolescent populations. In the late 1970s, the lifetime prevalence of allergic disorders including asthma was 38% among adolescents in south-eastern Finland (8); the figure was based both on symptoms ascertained by the questionnaire and on the clinical examination. In that study, the lifetime prevalence of allergic rhinoconjunctivitis was 22% and that of current prevalence 20%. In another, more recent study from southwestern Finland, the lifetime prevalence of allergic rhinitis was 15% and that of current prevalence 14% (7). In the present study on 11 607 children, the 1-year prevalence of

allergic rhinoconjunctivitis was 17%, which is close to the above-mentioned figures. In other European countries, very similar figures have been reported: 17–20% in Germany (12), 17% in Sweden (13), and 15% in Turkey (14). A very low prevalence, 2%, was recently reported from China (15). These figures reflect 1-year prevalences and are based on symptom histories of allergic rhinitis and/or rhinoconjunctivitis. In Estonia, a lower prevalence, 7%, was recently reported (16); however, the different formulation of the question used ("allergic reactions in the eye or nose") may partly explain the difference. When the lifetime prevalences of allergic rhinoconjunctivitis or hay fever are considered, more variation is seen. In Finland, the prevalences have varied between 15% and 22% (3, 7, 8), figures which are lower than the figure of 27% in the present study. In other European countries, the reported lifetime prevalences have been 14–21% in Sweden (13, 17), 4–18% in Norway (18–20), 3–9% in Germany (12), 28% in Turkey (14), and 12–16% in the UK (17, 21, 22); a much higher prevalence of 34–43% was reported from Australia (23).

The lifetime prevalence of atopic dermatitis in Finnish children and adolescents aged over 14–19 years varied from 18% to 25%, and that of symptomatic disease from 10% to 15%, both figures being based on symptom histories (7, 8). In both studies, the patients were also examined clinically; skin lesions typical of atopic dermatitis were present in 5–7%. In the present study, the lifetime prevalence of atopic eczema was rather similar, 23–26%, when compared to these previous studies.

Table 4. Self-reported 1-year prevalence of allergic rhinitis and atopic dermatitis by age, sex, and smoking habits

	Kuopio n=2821 % n	Helsinki n=2771 % n	Turku n=2983 % n	Lapland n=3032 % n
Rhinoconjunctivitis in past year				
Total	16 452	23 651	15 436	16 477
Age 13 years	14 189	24 329	13 199	15 220
14 years	18 263	23 322	16 237	17 257
Sex M	11 157	17 227	11 166	11 164
F	21 295	30 424	18 270	20 313
Smoking no	14 223	21 307	13 227	13 199
Occasionally	18 154	25 200	16 122	16 168
Yes	22 73	27 138	18 82	21 100
Flexural dermatitis in past year				
Total	15 411	19 523	16 477	18 560
Age 13 years	14 200	19 260	16 243	21 312
14 years	15 211	18 263	16 234	16 248
Sex M	12 166	13 175	12 174	13 191
F	17 245	25 348	20 303	24 369
Smoking no	13 210	15 213	15 256	16 239
Occasionally	15 127	23 178	17 134	20 204
Yes	21 69	25 129	18 82	23 111

However, the prevalence of symptomatic flexural dermatitis was higher, 15–19%. This finding can be explained by the younger age; the symptoms of atopic dermatitis tend to diminish with age (6). The finding that flexural dermatitis was most common in Lapland could probably be explained by the climatic conditions, i.e., cold winter with low humidity of indoor air. In other European countries, the 1-year symptom prevalence of atopic dermatitis was 18% in Sweden (4) and Germany (12), and lower, 12%, in the UK (24). The lifetime prevalence of atopic eczema has been 22% in Sweden (17), 10–17% in Norway (18–20), 13–14% in Germany (12), 6% in Turkey (14), and 12–16% in the UK (21, 22); it was 24–32% in Australia (23) and 10% in China (15).

In the present study, the crude prevalences of both allergic rhinitis and atopic dermatitis were higher in Helsinki than in other areas, but the differences diminished in the multivariate analysis, mainly due to the adjustment for pollen seasons. The results from the ISAAC study in New Zealand suggested that pollen seasons have no effect on the answers concerning eczema; in contrast, pollen season had a significant effect on rhinoconjunctivitis (11). In addition, a recall bias was found, relating to the recency of symptoms (11). Our results are in accordance with these findings; the high crude prevalences in Helsinki may be biased because of pollen seasons, as a great part of the survey was carried out during the spring pollen seasons. When

Table 5. Self-reported 1-year prevalence of allergic rhinitis and atopic dermatitis: findings of logistic regression analysis

Variable	Allergic rhinitis ^a		Atopic dermatitis ^b	
	OR	95% CI	OR	95% CI
Kuopio ^c	1.00	—	1.00	—
Helsinki	1.16	0.91–1.47	0.99	0.77–1.27
Turku	0.90	0.80–1.01	0.99	0.88–1.11
Lapland	0.95	0.85–1.07	1.15	1.03–1.29
Age ^d	1.12	1.01–1.23	0.85	0.77–0.94
Male	1.00	—	1.00	—
Female	1.97	1.78–2.17	1.91	1.73–2.12
Smoking				
No	1.00	—	1.00	—
Occasionally	1.00	0.93–1.08	1.00	0.93–1.08
Yes	1.20	1.10–1.31	1.26	1.16–1.38
Pollen season				
No ^e	1.00	—	1.00	—
Alder	1.12	0.94–1.33	1.04	0.86–1.26
No, between alder and birch	1.04	0.90–1.21	1.06	0.91–1.24
Birch	1.12	0.96–1.31	1.05	0.89–1.24

OR: odds ratio; 95% CI: 95% confidence interval.

^aRhinoconjunctivitis in past year.

^bFlexural dermatitis in past year.

^cReference category.

^dIncrease in age by 1 year in 13–14 years range.

^eKuopio, Turku, and Lapland areas, and Helsinki in autumn 1995. Others; Helsinki area, see Fig. 1.

studied in autumn, the prevalence of rhinoconjunctivitis was 19%; this figure is still higher than in other areas. Areal differences in rhinoconjunctivitis decreased and were not significant in the multivariate analysis. The survey time had no effect on the prevalence of flexural dermatitis.

Overall, there seems to be a substantial worldwide variation in the prevalence of both allergic rhinitis and atopic dermatitis in children. However, comparisons between the results from different studies are difficult because of differences in the study populations, study methods, and diagnostic definitions used. Despite this, the great variation between the countries seems to be real. The preliminary data of the most recent, worldwide study using standardized methods showed that the prevalence of allergic rhinoconjunctivitis varied from 2% to 30% (25) and that of atopic dermatitis from 1% to 15% (26), with a tendency to higher prevalences in Australia and western Europe and lower prevalences in Asia and eastern Europe (26).

There is much evidence that the prevalence of allergic disorders is increasing in children from Western countries; such an increase is not seen in countries with lower living standards (1, 21–23). The recent studies from Scandinavian countries give similar results. In Finland, the prevalence of doctor-diagnosed asthma increased from 1.0% to 2.8% and that of allergic rhinitis from 5% to 15%

between 1977 and 1991 (3). In Sweden, the prevalence of asthma increased from 2.5% to 5.7%, that of allergic rhinitis from 5.5% to 8.1%, and that of atopic eczema from 7.1% to 18% between 1979 and 1991 (4). These trends may reflect changes in the perception of symptoms, or changes in the diagnostic or treatment practices as well. Alternatively, they may reflect an increased propensity to allergic sensitization in successive generations, leading to an increased occurrence of atopy (9). However, the increase is so constant in many studies that at least part of it has to be real. Reasons for the increase are not known; however, a few possible explanations are under research. Many environmental factors have changed in the last decades (28); in addition, the exposure may take place in early childhood (5) or even during pregnancy (29); i.e., during periods when the human immune system is developing (30). One factor recently changed in Western societies is a reduced exposure to severe or chronic infections, an effect which may direct the development of the human immune system toward a humoral immunity that activates T-helper 2 lymphocyte phenotypes (31). The same factors could also explain the worldwide variation in the prevalence of atopy, due to striking differences in the living environment of developed and developing countries.

In the present study, the standardized ISAAC protocol was used; the prevalence figures are based on the responses by children themselves rather than by their parents, and on the symptoms rather than diagnosed disorders. This approach has many advantages; parents could be unaware of the symptoms of their children, especially during the adolescent years. In the ISAAC questionnaire, questions on symptoms are asked in a form which is easily understood by children. Asking about symptoms rather than diagnosed disorders is also independent of the possible areal differences in diagnostic practices or in the seeking of medical care. Questions concentrating on symptoms alone have their own difficulties. For example, it is probable that the high prevalence of noninfectious rhinitis, up to 50%, reflects nonspecific nasal reactions (32). A previous study with a population sample of 9226 people showed that over 75% of subjects with allergic rhinitis also had conjunctival symptoms (33). There are similar difficulties in defining atopic dermatitis, because itching dermatitis is a nonspecific symptom. Therefore, we used the question on flexural dermatitis, which is the clearest single feature of atopic dermatitis (34).

Smoking had a clear effect on the prevalences of both allergic rhinitis and atopic dermatitis. Almost half of all children reported that they smoked at least occasionally; smoking increased with age, was

more common in girls than in boys, and was least common in Kuopio (10). In the multivariate analysis, regular smokers ran a 1.20-fold risk of rhinoconjunctivitis and a 1.26-fold risk of flexural dermatitis. Of course, nonspecific nasal and eye reactions may be due to tobacco smoke, but this does not explain the increased risk of flexural dermatitis. Smoking, in conjunction with specific allergen exposure, may enhance allergic sensitization and increase skin reactivity (35).

As is well known, asthma was often associated with allergic rhinitis and atopic eczema (36); in many cases, these disorders are only different manifestations of the same IgE-mediated allergy (32). In recent decades, the prevalence of asthma has increased simultaneously with the increase of allergy in general (21). It is probable that the reasons, though thus far unresolved, are the same. For example, smoking had a similar effect on asthma and other allergic diseases in our study (10).

Boys have been reported to have asthma and atopy more often than girls in most epidemiologic surveys (37). In our study, a clear female predominance in the 1-year symptom prevalences of allergic rhinitis and atopic dermatitis, as well as asthmatic symptoms (10), was found. These findings are in accord with other recent ISAAC studies (38) and also with a recent Swedish study (39). Many explanations of the discrepancy between symptoms of asthma and atopy, which are equally common, or more common in girls than boys and a more frequent diagnosis in boys, have been suggested (37). It is possible that girls may have reported mild symptoms more readily than boys (8). On the other hand, the sex difference was similar for both the questions on mild asthmatic symptoms and those on severe ones (10). Thus, the greater occurrence of asthma and other allergic diseases among girls in this age group (13–14 years) seems to be real.

To sum up, 17% of the Finnish schoolchildren had suffered from symptoms suggestive of allergic rhinitis during the preceding year, which is similar to the other recent observations from Finland (7, 8) and other European countries (12–14). Likewise, 17% of the children had suffered from symptoms suggestive of atopic dermatitis during the preceding year. The figure is rather similar to the figures from recent European studies (4, 12, 24), and only slightly higher than the previous figures from Finland (7, 8). Almost half of the schoolchildren had ever had even one atopic disorder, and over one-third reported symptoms in the past year. We conclude that regional differences in the prevalence of both allergic rhinitis and atopic dermatitis are small in Finland, and that the prevalence figures are rather similar to those from other Western

countries. Allergic diseases now pose an important public-health problem in many countries. An important methodologic finding was that there was a season-of-response effect on seasonal symptoms near the pollen season.

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