

# Validation of a rhinitis symptom questionnaire (ISAAC core questions) in a population of Swiss school children visiting the school health services

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The primary aim of the study was to assess the validity of the ISAAC core questions on rhinitis in a population of Swiss school children by comparing them to skin prick test results. Second, the positive predictive value in detecting atopy among children with rhinitis symptoms was determined. Third, agreement between parental reports of hay fever and rhinitis symptoms was evaluated, since earlier Swiss prevalence surveys had exclusively relied on reported hay fever.

**Material and methods:** Two thousand nine hundred and fifty-four (81.2%) parents of 7, 10 and 14-year old children filled in an exhaustive questionnaire which included the ISAAC core questions on rhinitis. Two thousand one hundred and twenty children also underwent skin prick testing against six common aeroallergens (grass mixture, birch, mugwort, D. pteronyssinus, cat and dog dander). The analysis is restricted to children with both questionnaire data and skin prick test results.

**Results:** Sensitization to any allergen was most strongly associated with reported hay fever (OR = 5.7, 95% CI 4.4–7.4), nose problems accompanied by itchy-watery eyes (OR = 4.4, 95% CI: 3.3–5.7), symptoms occurring only during pollen season (March through September) (OR = 4.9, 95% CI: 3.6–6.5) and a combination of these latter two symptoms (OR = 5.8, 95% CI: 4.1–8.1). The association was stronger for a sensitization to outdoor allergens than for indoor allergens. The specificity of the various questions was high, ranging from 77.5% to 97.6%, but the sensitivity was low (2.6% to 42.7%). The positive predictive value for atopy among children with symptoms was 63% for sneezing accompanied by itchy-watery eyes, 67% for symptoms occurring only during the pollen season and 70% for reported hay fever. However, agreement between reported rhinitis symptoms and hay fever was only moderate. About one third of the children with symptoms indicative of seasonal rhinitis did not report the label “hay fever”.

**Conclusions:** We conclude from our analyses that the ISAAC core questions on rhinitis are highly specific and therefore useful in excluding atopy. In addition they have a high positive predictive value in detecting atopy among children with symptoms, but they are not helpful for detecting atopy in a general population of children (low sensitivity). To monitor time trends in the prevalence of allergic rhinitis in Switzerland, questions on rhinitis symptoms as well as on the diagnostic label “hay fever” have to be included in a questionnaire because they contain complementary information since under-diagnosis of allergic rhinitis is common.

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## Introduction

Hay fever is a common disease in most industrialized countries and its frequency seems to be increasing. In Switzerland, several large surveys in the adult population have been conducted since 1920, demonstrating an increase in the prevalence of self-reported hay fever from 0.82% in 1926 (1) to 4.8% in 1958 (2) to 9.6% in 1985 (3) and 13.5% in 1992 (4). A similar increase was observed in adolescents in Geneva and Grabs in two questionnaire surveys, 10 years apart (5,6). This substantial increase in prevalence in Switzerland parallels that described in serial surveys of North American college students (7), Swedish conscripts (8) and British adolescents (9). These trends may reflect changes in the perception and labeling of symptoms, or in presentation for medical diagnosis and treatment. Alternatively, they may reflect an increased propensity to allergic sensitization in successive generations, and thus be of broader relevance. It is, therefore, important to monitor future time trends of hay fever morbidity, and that requires reliable and valid epidemiological data.

Rhinitis is usually considered to be allergic if it involves the clinical manifestation of an immediate hypersensitivity to an identified allergen (10). However, in large community-based studies it will not always be possible to perform skin prick tests or other measures of atopy, such as serum IgE determination. Questionnaires will remain an important tool in assessing the prevalence and time trends of allergic rhinitis in population studies. Recent efforts by the International Study of Asthma and Allergies in Childhood (ISAAC) (11) have been devoted to developing standard questions to distinguish between rhinitic and non-rhinitic individuals in the general population and to predict which individuals are likely to be atopic. These questions have been validated in a British study on adults (12), but so far no validation study with children has been published.

The study presented here is part of a monitoring program of allergies and respiratory symptoms in Swiss school children (SCARPOL, Swiss Study on Childhood Allergy and Respiratory Symptom with respect to Air Pollution and Climate). It incorporated the ISAAC questions on rhinitis symptoms in an exhaustive questionnaire completed by the parents of 7, 10 and 14-year old children. In addition, skin prick tests against six common allergens were performed in a subsample of the children.

The primary objectives of the present analyses were: first, to assess the validity of the ISAAC core questions for rhinitis in our study population by comparing them to an objective measure of atopy and second, to evaluate which symptoms best predict which individuals are atopic. As the earlier Swiss prevalence surveys had exclusively relied

upon self-reported or doctor-diagnosed hay fever, we also examined the agreement between parental reports of hay fever and rhinitis symptoms.

## Methods

### Study organization and participation rate

During the months of November through March of the school year 1992/93, 1st, 4th and 8th-grade children (5–15 years) and their parents living in ten different study communities were invited to participate in the SCARPOL study (13). The study protocol included an exhaustive questionnaire, skin prick testing and environmental monitoring. Since the SCARPOL study design differed in certain respects from the ISAAC study (time of study begin, selection of study areas, number of children per study center), it was not officially integrated in the ISAAC study.

Ten study communities were selected to represent a broad range of urbanization, air pollution and climatic conditions.

The survey was organized by the local School Health Services. All centers were visited by the central study team and received a package of standardized written instructions. Logistic problems in one center resulted in a participation rate below 50%. The survey was repeated in the following year but since no skin prick testing was performed the 1994 data of these two areas are excluded from the present analysis.

In the urban centers (Bern, Biel, Lugano and Zürich) children from a representative sample of schools were invited to participate in the study. In the small communities of Grabs, Langnau, Montana and Payerne all children were invited to participate.

A letter explaining the purpose of the study was distributed in school together with the questionnaire to be completed by the parents. The parents were asked to give written consent for the child's participation in the study.

A total of 2954 (81.2%) parents filled in the questionnaires and allowed their children to participate in the study. The parents' completed questionnaires were returned to the teachers or directly to the school physician when the children routinely visited the School Health Services.

The present analysis is restricted to Swiss nationals in order to avoid problems related to language proficiency and literacy.

### Questionnaire

To facilitate international comparisons of the SCARPOL study results, the core questions on rhinitis of the International Study on Childhood Asthma and Allergy (ISAAC) (11) were incorporated into a

detailed questionnaire. The questions referred to problems with sneezing, or a runny, or blocked nose when the child did not have a cold or the 'flu, "ever" and "in the past twelve months". If a positive response was given to the latter, parents were further asked whether this nose problem had been accompanied by itchy-watery eyes. Parents were then asked to state in which of the past twelve months this nose problem had occurred (several answers were possible). In addition to the questions about rhinitic symptoms, parents were asked whether the child had ever had hay fever.

According to the months given, we divided the symptoms into those occurring only between March through September (main pollen season in Switzerland) (14), those occurring only between October through February, and those occurring during summer and winter months (perennial symptoms). Four point four percent of parents did not indicate the month of symptom occurrence.

Nose problems accompanied by itchy-watery eyes, symptoms occurring only during the pollen season, and the combination of these two symptoms were considered to be indicative of hay fever.

#### Skin prick test

A skin prick test (SPT) against six common allergens was offered to the 2954 participating children, 2120 (71.8%) accepted. Since the prevalence rates of rhinitis symptoms did not differ significantly between those who underwent skin prick testing and those who refused, the present analysis is restricted to the 2120 children with both questionnaire data and SPT results. SPT was performed by five trained fieldworkers according to a standardized protocol during the winter months of November to February 1992/93. Standardized allergen extracts (ALK) of the same batches of outdoor allergens (grass mixture, birch, mugwort), and indoor allergens (*D. pteronyssinus*, cat and dog dander) as well as a negative and positive (histamine) control were used. The largest diameter was added to the diameter at a right angle to it and the sum divided by 2. According to the position paper of the European Academy of Allergology and Immunology (15) the cut-off for a positive reaction was defined as the mean diameter minus the negative control  $\geq 3$  mm.

To adjust for the observed differences in test performance between the fieldworkers we calculated sensitivity and specificity for each allergen and each fieldworker in a subgroup of the study population using the specific IgE measurements in serum samples as "gold standard" (i. e. measured without fieldworker effect) (16). The sum of sensitivity and specificity was then used to determine the cut-off to adjust for the fieldworker effect.

Atopic sensitization was defined as a positive reaction to any of the allergens tested. In addition, positive reactions to any of the outdoor allergens and to any of the indoor allergens were considered in the analyses.

#### Statistical analysis

**Symptom prevalence rates** were analyzed for the total sample and stratified by age-group and gender. Since no significant association between long term exposure to air pollution and rhinitis symptoms had been observed (17), prevalence rates are presented for the total sample. Differences between categorical variables were assessed by the  $\chi^2$ -test.

**Association between rhinitis symptoms and atopic sensitization.** Trouble with sneezing or a runny or blocked nose apart from a cold may include allergic and non-allergic conditions. To validate the allergic form of these symptoms a positive reaction to any of the allergens tested by SPT was considered to be a suitable measure for use as a criterion. The strength of the association between reported symptoms and atopic sensitization was assessed by calculating sensitivity and specificity. Sensitivity was defined as the proportion of children acknowledging a given symptom among all those with a positive SPT. Specificity was defined as the proportion of children without symptoms among those with a negative SPT. In addition, the odds ratio (OR) was calculated as the prevalence of a positive skin prick test in those with a given symptom divided by its prevalence in those without. The 95% confidence intervals (CI) are given for each ratio. The OR provides a unified measure of validity, taking into account the prevalence of atopy in both groups i.e. in children with rhinitis symptoms and in those free of these symptoms (18). It does not assume atopic sensitization to be the "gold standard".

In addition, the positive predictive value in detecting atopy among all children who have a given symptom was calculated as the proportion of atopic children among all those who have the symptom.

**Agreement between reported hay fever and rhinitis symptoms.** In the past, most studies on allergic rhinitis in Switzerland relied upon self-reported "hay fever" which is a diagnostic label. It was therefore important to evaluate whether parental reports of hay fever were in agreement with reported rhinitis symptoms. We calculated the proportion of children with a given symptom who also had hay fever as the number of children with both hay fever and symptoms divided by the total number of children with a given symptom. On the other hand, we determined the proportion of children with hay fever who also

had symptoms as the number of children with both hay fever and symptoms divided by the total number of children with hay fever.

## Results

The study population consisted of three age-groups of schoolchildren: 685 (32.3%) from 1st grade, 750 (35.4%) from 4th grade and 684 (32.3%) from 8th grade. Their respective mean ages were 6.5 years (SD  $\pm 0.5$ ), 10.0 years (SD  $\pm 0.7$ ) and 14.1 years (SD  $\pm 0.7$ ). One thousand and seventy-two (50.6%) were boys and 1047 (49.4%) were girls.

### Prevalence rates

Prevalence rates for each symptom and hay fever for the total sample and stratified by age-group and gender are given in Table 1.

Twenty-nine point one percent (617) of all children had had rhinitis symptoms without a cold at some time in their lives, 23.7% (502) had been symptomatic during the past year. Of these, 55.9% had had symptoms accompanied by itchy-watery eyes, 44% reported symptoms occurring only during the main pollen season (March through September) and 34.7% reported rhinitis symptoms accompanied by itchy-watery eyes and occurring only during the pollen season. Most symptom rates increased significantly with age, an exception being rhinitis symptoms occurring only during winter months and perennial symptoms. Based on reported symptoms no significant gender differences were observed. However, hay fever was significantly more often reported in boys.

### Association between rhinitis symptoms and atopic sensitization

To assess the validity of the questionnaire information, symptom reports were compared to skin prick test results, an objective marker of atopy (Table 2). Sensitization to any allergen was most strongly associated with reported hay fever (OR = 5.7, 95% CI 4.4–7.4), nose problems accompanied by itchy-watery eyes (OR = 4.4, 95% CI: 3.3–5.7), symptoms occurring only during pollen season (OR = 4.9, 95% CI: 3.6–6.5) and a combination of these latter two symptoms (OR = 5.8, 95% CI: 4.1–8.1). The association was stronger for a sensitization to outdoor allergens than for indoor allergens. Nose problems occurring only during winter months were not significantly associated with atopy. Perennial symptoms showed a weak association with atopy, which was, however, statistically significant for a sensitization to indoor allergens. Nose problems accompanied by itchy-watery eyes, seasonal symptoms and a combination of both symptoms showed high specificity (92.8%, 94.9%, and 96.5% respectively), but rather low sensitivity (25.7%, 21.4%, and 17.8%, respectively). Reported hay fever yielded also high specificity (93.8%), but lower sensitivity (28.4%).

In addition, the positive predictive value in detecting atopy among all children who reported a given symptom was calculated. The symptom combination of nose problems accompanied by itchy-watery eyes and occurring only during the pollen season yielded the highest predictive value (71.3%), followed by reported hay fever (70.0%) and seasonal symptoms (67.1%). But only about half of the children acknowledging sneezing at some time in their lives or during the past year were atopic.

Table 1. Prevalence of rhinitis symptoms and hay fever stratified by age-group and gender

Symptoms	Total sample (n=2120)		Age-group (years) <sup>a</sup>			p-value ( $\chi^2$ test)	Gender <sup>b</sup>		p-value ( $\chi^2$ test)
	n	%	5–8	9–12	>13		boys	girls	
			(n=685)	(n=750)	(n=684)	(n=1072)	(n=1047)		
Sneezing, runny, blocked nose without a cold, ever	617	29.1	23.8	31.2	32.2	0.01	30.6	27.5	n.s
Sneezing, runny, blocked nose without a cold, past 12 months	502	23.7	19.0	25.3	26.6	0.002	24.8	22.5	n.s
- accompanied by itchy-watery eyes	281	13.3	10.4	13.1	16.4	0.005	14.0	12.5	n.s
- occurring:									
only March-September	222	10.5	7.6	10.4	13.5	0.002	11.1	9.7	n.s
only October - February	52	2.5	2.9	2.9	1.5	n.s	2.4	2.5	n.s
all year	147	6.9	5.7	7.6	7.5	n.s	7.1	6.8	n.s
no indication of months	81	3.8	2.8	4.4	4.2	n.s	4.1	3.4	n.s
- accompanied by itchy-watery eyes and occurring only March - September	174	8.2	5.7	8.4	10.5	0.005	8.9	7.6	n.s
Hay fever, ever	287	13.5	8.2	13.6	18.7	<0.001	15.1	11.9	0.03

<sup>a</sup> for 1 child no indication of age.

<sup>b</sup> for 1 child gender was not indicated in the questionnaire.

Table 2. Association between atopic sensitization (SPT), and reported rhinitis symptoms and hay fever. Odds ratio, sensitivity, specificity and positive predictive value (Total sample n=2120)

Symptoms	Positive SPT to any allergen n=696 (32.8%)				OR <sup>c</sup> (95% CI)	Positive SPT to any outdoor <sup>a</sup> allergen	Positive SPT to any indoor <sup>b</sup> allergen
	Children with symptoms n (%)	Sensitivity %	Specificity %	Positive predictive value %		n=514 (24.3%) OR <sup>c</sup> (95% CI)	n=434 (20.5%) OR <sup>c</sup> (95% CI)
Sneezing, runny, blocked nose without a cold, ever	617 (29.1)	42.7	77.5	48.1	2.5 (2.1-3.1)	2.6 (2.1-3.1)	1.8 (1.5-2.3)
Sneezing, runny, blocked nose without a cold, past 12 months	502 (23.7)	37.5	83.1	52.0	3.0 (2.4-3.6)	3.0 (2.4-3.7)	2.0 (1.5-2.5)
- accompanied by itchy-watery eyes	281 (13.3)	25.7	92.8	63.7	4.4 (3.3-5.7)	6.3 (4.7-8.4)	2.2 (1.6-2.8)
- occurring only March-September	222 (10.5)	21.4	94.9	67.1	4.9 (3.6-6.5)	6.5 (5.0-8.5)	1.8 (1.3-2.5)
- only October-February	52 (2.5)	2.6	97.6	34.6	1.2 (0.7-2.1)	0.8 (0.40-1.6)	1.2 (0.54-2.3)
- all year	147 (6.9)	8.4	93.8	40.1	1.4 (0.98-1.95)	1.2 (0.8-1.7)	1.5 (1.0-2.2)
- accompanied by itchy-watery eyes and occurring March-September	174 (8.2)	17.8	96.5	71.3	5.8 (4.1-8.1)	7.8 (5.5-10.9)	1.7 (1.2-2.6)
Hay fever, ever	287 (13.5)	28.4	93.8	70.0	5.7 (4.4-7.6)	7.5 (5.7-9.9)	2.1 (1.6-2.8)

<sup>a</sup> outdoor allergens = grass mixture, birch and mugwort pollen.

<sup>b</sup> indoor allergens = house dust mite (*D. pteronyssinus*), cat and dog dander.

<sup>c</sup> OR adjusted for age and gender.

In general, the positive predictive value increased with age. Of those reporting nose problems accompanied by itchy-watery eyes and occurring during the pollen season the positive predictive value increased from 53.8% in the youngest age-group to 81.9% in adolescents. The corresponding figures for hay fever were 55.4% and 78.9%.

Agreement between reported symptoms and hay fever

Table 3 compares reported rhinitis symptoms to reported hay fever. The proportion of symptomatic children reported to have hay fever increased with increasing specificity of the symptoms for the allergic form of rhinitis: only 5.8% of children with nose

Table 3. Agreement between reported rhinitis symptoms and hay fever (questionnaire based information)

Symptoms	Total sample Hay fever (H) vs Symptom (S)				Percentage of symptomatic children reported to have hay fever %	Percentage of children with hay fever reported to have symptoms %
	H+ / S+ n	H+ / S- n	H- / S+ n	H- / S- n		
Sneezing, runny, blocked nose without a cold, ever	227	60	390	1443	36.8	79.1
Sneezing, runny, blocked nose without a cold, past 12 months	202	85	300	1533	40.2	70.4
- accompanied by itchy watery eyes	169	118	112	1721	60.1	58.9
- occurring:						
only March - September	151	136	71	1762	68.0	52.6
only October - February	3	284	49	1784	5.8	1.0
all year	38	249	109	1724	25.9	13.2
- accompanied by itchy-watery eyes and occurring only March - September	132	155	42	1791	75.9	46.0

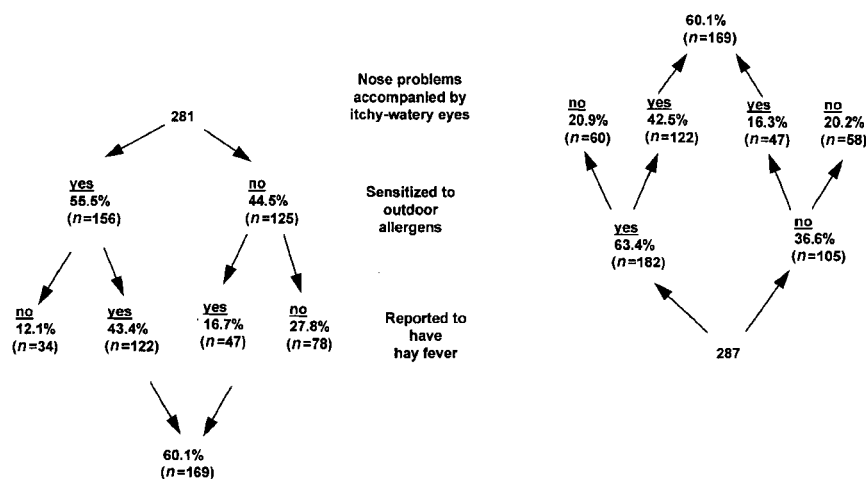


Fig. 1. Relationship between rhinoconjunctivitis symptoms, sensitization to outdoor allergens and reported hay fever.

problems outside the main pollen season were reported to suffer from hay fever, 26% of those with perennial symptoms, and 68% of those with symptoms during the pollen season. However, 39.9% (112) of those with nose problems accompanied by itchy-watery eyes and 24.1% (42) of those with seasonal rhinoconjunctivitis symptoms did not report the label "hay fever". Children with reported hay fever were likely to have suffered from rhinitis symptoms at some time in their lives (79.1%) or during the past year (70.4%). But only 58.9% had symptoms accompanied by itchy-watery eyes and 52.6% symptoms occurring only during the pollen season.

Fig. 1 illustrates the relationship between rhinoconjunctivitis symptom, sensitization to outdoor allergens and reported hay fever in more detail. Of all children with nose problems accompanied by itchy-watery eyes (281) only 55.5% were sensitized to outdoor allergens. Most of these children (122/156) also reported the label "hay fever". Thirty-four children (12.1%) had rhinoconjunctivitis symptoms and were sensitized to outdoor allergens but did not report the label hay fever. However, 47 children (16.7%) with rhinoconjunctivitis symptoms but no sensitization to outdoor allergens were reported to have hay fever.

Of the 287 children reported to have hay fever about two thirds (63.4%) were found to be sensitized to outdoor allergens and 42.5% also reported rhinoconjunctivitis symptoms. However, 20.2% of those with the label "hay fever" were neither sensitized to outdoor allergens nor reported to have had rhinoconjunctivitis symptoms.

In summary, Fig. 1 illustrates that although the prevalence rate of reported rhinoconjunctivitis symptoms (13.3%) and of hay fever (13.5%) was almost the same, the two health outcomes only partially overlapped.

Discussion

The present study is part of a public health program to monitor future time trends in the prevalence of allergic and respiratory diseases in Swiss schoolchildren. The ISAAC core questions for rhinitis have been incorporated into our questionnaire because they represent a widely accepted standardized instrument to assess the prevalence of rhinitis in childhood. The questions have been validated in a community sample of adults (aged 16-65 years) in South West London by comparing them to data obtained by clinical interview and to skin prick test results (12). However, as validity may be different in different age-groups, it was important to assess the validity of the questionnaire in our own study population. Seasonal rhinitis, particularly hay fever, is thought to be caused by type I hypersensitivity to grass or tree pollen or both, whereas perennial rhinitis is thought to be caused by both allergic and non-allergic mechanisms, type I hypersensitivity to house dust mites or animals characterizing the allergic form.

In keeping with this hypothesis, we found that the association between a sensitization to outdoor allergens and both reported hay fever, and symptoms indicative of allergic rhinitis was strongest (Table 2). Perennial symptoms were more closely associated with a sensitization to indoor allergens although the association was rather weak (OR = 1.5). By dividing the months of symptom occurrence into those covering the local pollen season (March through September) and those outside the pollen season (October to February) we defined a symptom category which was more specific for allergic rhinitis than the general question on sneezing during the past year. However, for international comparisons of the prevalence of allergic rhinitis, nose symptoms accompanied by itchy-watery eyes (rhinoconjunctivitis

symptoms) might be a more suitable item as the seasonal pattern of pollen concentrations will not be the same worldwide.

In addition to the odds ratio which provides a single measure of validity and does not require atopic sensitization to be a "gold standard" of allergic rhinitis, we also calculated sensitivity and specificity, the two classical indices of validity which are frequently inversely related.

Nose problems accompanied by itchy-watery eyes, seasonal symptoms and hay fever all showed specificity above 90%. These questions are therefore helpful for identifying those who will have a negative skin test result. In contrast, these questions had low sensitivity, i.e. they are not very helpful for detecting atopy in a general sample of children. Low sensitivity may be expected, since there are clinical manifestations of atopic diseases other than allergic rhinitis and many children with a positive SPT do not experience any clinical symptoms. A recent Canadian study in children comparing standardized questions to skin prick test results (19) found the specificity of the questions to be generally above 80% and sensitivity to range from 11% to 56%, which is in line with our results.

As questionnaires will remain important tools in assessing the prevalence of allergic rhinitis, it might be more relevant to ask which is the probability that a subject will be atopic, given a certain symptom i.e. to explore the predictive value of the various rhinitis symptoms. In our study population, reports of sneezing accompanied by itchy-watery eyes, occurring only during the local pollen season and reported hay fever had the highest predictive values (71.3% and 70.0%, respectively, in the total sample, 81.9% and 78.9%, respectively, in adolescents). This is in close agreement with the prevalence of atopy in Swiss adults reporting hay fever (76.8%) (4) and in British adults (12) reporting seasonal rhinitis symptoms (78%) or hay fever (71%). However, in a French adult population visiting a health center for a check-up (20) the positive predictive value of the question on hay fever was only 41.8%. The lower value found in this latter survey might be due to the overall lower prevalence of hay fever in this population as it has to be kept in mind that the predictive value of a test (or a question) is highly dependent upon the prevalence of the symptom in the target population. This was also seen in our study population where the positive predictive value of the various rhinitis questions increased with age paralleling the increase in prevalence of reported symptoms.

Although the label "hay fever" was strongly associated with atopy in our study population, the observed agreement with reported rhinitis symptoms was only moderate (Fig. 1). This might in part be explained by the fact that the questionnaire asked

for lifetime occurrence of hay fever whereas most symptom questions referred to the past 12 months. It is conceivable that some children had hay fever in the past but did not experience symptoms during the past twelve months. However, about 20% of parents reported their children to have hay fever without the occurrence of rhinoconjunctivitis symptoms and sensitization to the respective seasonal pollen. There exist, on the other hand, a certain number of parents (12.1%) who do not indicate the label "hay fever" although their children suffer from typical symptoms of seasonal rhinitis and are sensitized to outdoor allergens. These parents either do not remember the label "hay fever" or they have never been told that their children are suffering from hay fever. This would indicate a considerable amount of under-diagnosis of this condition, as has been reported by Sibbald & Rink (21). It is evident from our results that the assessment of prevalence rates in epidemiological surveys are not identical with a clinical diagnosis of the disease.

In summary, we conclude that in our study population the ISAAC core questions on rhinitis are highly specific and are therefore useful in excluding atopy. In addition, they have a high positive predictive value in detecting atopy among children with symptoms, but they are not helpful for detecting atopy in a general population of children (low sensitivity). As the validity of a questionnaire might vary between populations our results might not be generalized. In addition, our results are strictly comparable only to the ISAAC results of the youngest age-group (6-7-year old), as the ISAAC study protocol does not include 10-year olds and it requires the adolescents to self-complete the questionnaire.

To monitor time trends in the prevalence of allergic rhinitis in Switzerland, questions on rhinitis symptoms as well as on the diagnostic label hay fever have to be included in a questionnaire because they contain complementary information.

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