Agreement between Responses to a Standardized Asthma Questionnaire and a Questionnaire following a Demonstration of Asthma Symptoms in Adults

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Asthma epidemiology relies heavily on standardized questionnaires, but little is known about the understanding of asthma symptoms among adults in the community. In 2004, the authors assessed the level of agreement between responses to a standardized questionnaire and responses to a questionnaire completed by participants after viewing a demonstration of asthma symptoms. The study involved 601 young adults from Chile. The field-workers were trained to explain and demonstrate the asthma symptoms to the participants. The symptoms were wheeze, waking at night with breathlessness, breathlessness following exercise, and waking with cough. The kappa statistic did not exceed 0.4, and the recorded prevalence of asthma symptoms following the demonstration was 30–60% lower than that for the standardized questionnaire. Using bronchial responsiveness as the proxy gold standard, the positive likelihood ratios for wheeze and waking short of breath were higher following symptom demonstration. The low agreement between the standardized questionnaire and the postdemonstration questionnaire and the likelihood ratios' closeness to 1 for the standardized questionnaire decreases the authors' confidence in the appropriateness of this tool for estimating the prevalence of asthma in the community. For etiologic studies of asthma, it may contribute to the lack of consistency between different studies analyzing the same etiologic exposures.

asthma; data collection; epidemiologic methods; questionnaires; statistics

Abbreviations: ECRHS, European Community Respiratory Health Survey; FEV_1, forced expiratory volume in 1 second; ISAAC, International Study of Asthma and Allergies in Childhood.

Although the identification of asthma by questionnaire remains contentious (1), asthma surveys conducted in the community have relied heavily on responses to standardized questionnaires (1, 2). The understanding of ''wheezing and whistling'' in the community, regardless of cultural background, is essential in the assessment of asthma prevalence and its risk factors. A study of parents who had asthmatic children showed wide variation in the conceptualization of the word ''wheeze'' (3). Parents are said to recognize wheeze from its sound, its cough, the associated difficulty in breathing, and combinations of these characteristics. These differences in the conceptualization of wheeze could explain the fair or low level of agreement between symptoms reported before and after the viewing of a video on asthma symptoms by 13- to 14-year-olds in the International Study of Asthma and Allergies in Childhood (ISAAC) (4). The levels of agreement were related to language and the geographic regions of participating countries. The low level of agreement may also have been related to the lack of experience of adolescents in conceptualizing asthma symptoms as compared with adults. Access to health services in many parts of the world is patchy, and thus subjects have a limited opportunity to modify their perceptions and the meaning of their symptoms. Lack of agreement has also been shown in the understanding of asthma severity between pediatric chest specialists and allergists (5, 6), although one study reported that asthma

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diagnoses based on questionnaire data were in agreement with interviewer-based diagnoses (5).

The value of standardized asthma questionnaires could be supported on the basis of the strong association between asthma symptoms and objective measurements such as lung function, bronchial hyperresponsiveness to challenge, and sensitization to allergens (7–9). There is also evidence that the ISAAC questionnaire and the ISAAC video questionnaire are of similar value for identifying adolescents with bronchial hyperresponsiveness (10). However, in community studies, only a small proportion of persons with asthma symptoms are also sensitized to allergens, are positive for bronchial hyperresponsiveness, or have a low forced expiratory volume in 1 second (FEV_1) (9, 11, 12), and none of these objective measurements are specific to asthma.

Although standardized asthma questionnaires have fulfilled an essential role in epidemiologic studies, it is important to understand their limitations. Peat et al. (13) advised caution in the interpretation of responses to asthma questionnaires. In ISAAC, the agreement between responses to a questionnaire and responses following a video has been reported in several papers (10, 14, 15). Equivalent information is not available for adults, who may differ in their interpretation of symptoms in comparison with adolescents or mothers reporting on behalf of their children. In a semirural area of Chile, we studied the level of agreement between responses to the European Community Respiratory Health Survey (ECRHS) questionnaire and responses to a demonstration of asthma symptoms based on the video developed in ISAAC (4).

MATERIALS AND METHODS

Population and design

The current analysis was based on information obtained on two occasions. On the first occasion, 1,232 subjects randomly selected from persons born at the hospital in Limache, Chile, between 1974 and 1978 were studied at the ages of 22–28 years (9, 16). Of these 1,232 subjects, 601 were revisited in 2004 for assessment of their psychological status. For this study, we oversampled subjects with asthma symptoms ($n = 195$), subjects with both asthma symptoms and bronchial hyperresponsiveness or sensitization to common allergens ($n = 136$), and subjects with bronchial hyperresponsiveness or sensitization but no asthma symptoms ($n = 86$) on the basis of the initial questionnaire; we also included controls (subjects who were asymptomatic, negative for bronchial hyperresponsiveness, and not sensitized) ($n = 184$). The Ethics Committee of the Faculty of Medicine at the University of Chile (Santiago, Chile) and the Research Ethics Committee of St. Thomas' Hospital (London, United Kingdom) approved the study.

Limache is an agricultural town in central Chile with a population of approximately 53,000 Spanish-speaking inhabitants (17). Many of its agricultural products are exported, and its level of poverty broadly corresponds to the median for Chile (18, 19). Most young adults in Limache have received at least 10 years of full-time education.

Data collection

In the first stage of the study, participants completed the Spanish version of the ECRHS questionnaire at home (16, 19). The occurrence of the following asthma symptoms in the previous 12 months was considered for this analysis: wheezing, waking with shortness of breath, breathlessness following exercise, and waking with a cough. We asked about having ever reported asthma, this being related mostly to physician-diagnosed asthma. Skin tests for sensitization to eight common allergens were carried out (16, 19). We assessed bronchial hyperresponsiveness to a methacholine challenge using the tidal breathing method (20). Increasing concentrations of methacholine (0.5, 1, 4, 8, and 16 mg/ml) were used with a Hudson nebulizer (Hudson Inc., Temecula, California). FEV_1 was measured using a Vitalograph 2120 (Vitalograph Ltd., Buckingham, United Kingdom) and Spirotrac IV software (Vitalograph Ltd.) following American Thoracic Society norms (21). A participant with an FEV_1 decrease of 20 percent in comparison with baseline FEV_1 at any concentration up to 16 mg/ml was considered positive for bronchial hyperresponsiveness. These measurements were carried out in a hospital environment. For the purpose of this analysis, we used as a measure of socioeconomic status the presence of material belongings in the household (gas-fueled water-heating devices, personal computers, refrigerators, washing machines, and microwave ovens). Smoking behavior was assessed using the items in the ECRHS questionnaire. In addition, we analyzed the level of agreement in relation to length of full-time education.

Prior to the symptom demonstration, four field-workers, three of whom were university students and the other a psychologist, were given a tutorial about asthma symptoms. They then observed the ISAAC video several times and listened to a recording of the sounds of wheeze and cough. The field-workers had to mimic wheeze and an asthmatic cough separately in front of the rest of the team. The procedure was pilot-tested with several subjects who were not participating in the study in Limache. The field-workers did not commence data collection until they were considered proficient and were confident in the use of procedures. Their supervisor assessed the quality of the entire process at the beginning of the data collection period. To ensure that procedures were carried out as described in the instructions to field-workers, the supervisor visited households unannounced while the field-workers were administering the questionnaire. We did not assess repeatability between observers, since we would have needed another sample and this would have been time-consuming.

At the second study visit, the field-workers administered a list of 50 physical symptoms to assess somatization (22). We excluded from the analysis four respiratory symptoms on the list. Somatization score was calculated as the number of symptoms indicated by the participant (23), grouped as low (0–10), medium (11–20), or high (>20).

During the second visit, the field-workers demonstrated respiratory symptoms as shown in the ISAAC video in relation to wheeze and cough. Following the demonstration, the participants were asked the same questions as those in the ISAAC video questionnaire. The sequence shown was

related to wheezing at rest, exercise-induced wheezing, waking at night with wheeze, and waking at night with cough. The participants were asked whether they had had respiratory symptoms similar to those shown by the field-worker; if yes, whether the symptoms had occurred in the past year; and, if so, whether the symptoms had occurred more than once per month in relation to each item in the sequence. The field-worker demonstrated the symptom until he or she was convinced that the participant indicated an understanding of the characteristics of the symptom shown. We could not use the ISAAC video in our study, because few homes in Limache have video equipment, and in any case it is inappropriate to use a video portraying only adolescents in a study of adults.

Statistical analysis

For each of the four symptoms, the overall proportion of agreement between the questionnaire item and the demonstration by the field-worker was calculated. In addition, the proportions of positive and negative agreement (24) and the chance-corrected kappa statistic (25) were determined. Kappa has the value 0 when agreement is the same as that expected by chance, 1 if agreement is perfect, and –1 for complete disagreement.

For each symptom, we investigated the effect of certain characteristics on the level of agreement by comparing kappa statistics by category. Variables considered were gender (male, female), atopy (yes, no), bronchial hyperresponsiveness (positive, negative), current smoking (yes, no), somatization score (number of symptoms (0–10, 11–20, or >20)), number of material belongings (from the five items specified above (0–1, 2–3, or 4–5)), and length of full-time education (0–10, 11–12, or ≥13 years). The equality of subgroup kappa values was tested using the method of Donner et al. (26). Analyses were performed using Stata, version 8.0 (27). Mean kappa values were compared by category across symptoms using the paired t test (two categories) or repeated-measures analysis of variance (more than two categories).

The validity of the questionnaire and symptom demonstration as screening tools against a proxy gold standard for asthma was investigated for each of the four symptoms in turn. Although bronchial hyperresponsiveness cannot be considered specific to asthma, it is the best proxy measure available for assessing the validity of reported asthma in population studies. Thus, the bronchial hyperresponsiveness result (positive or negative) was taken as the indicator of ''true'' asthma. We describe it as ''relative validity'' to stress the lack of a true gold standard in this analysis. The positive likelihood ratio (sensitivity/(1 – specificity)) and negative likelihood ratio ((1 – sensitivity)/specificity) and their 95 percent confidence intervals (28) were used to compare the relative validity of each symptom in screening for asthma with the questionnaire and symptom demonstration.

RESULTS

The characteristics of the subjects are shown in table 1. Physician-diagnosed asthma was uncommon in this population. Tables 2 and 3 show the prevalences of wheeze in the past 12 months and shortness of breath upon exercising in the past 12 months. The results for awakening short of breath in the past 12 months and being awakened by an attack of coughing in the past 12 months (not shown) displayed a similar pattern. Because of the oversampling of subjects with asthma symptoms from the initial survey, prevalences according to the standardized questionnaire were high. Regardless of the symptom explored, the prevalence values based on the questionnaire were higher than those obtained from symptom demonstration (tables 2 and 3). The proportion of agreement between the questionnaire and the demonstration was typically between 0.6 and 0.8, with positive agreement being considerably smaller than negative agreement. All kappa values were small but positive.

For wheeze in the previous 12 months (table 2), there was an indication of a higher level of agreement for persons with bronchial hyperresponsiveness than for those with a negative response ($p = 0.057$). Agreement was greater for persons with a medium level of somatization ($p = 0.019$), and there was a negative association between agreement and number of possessions ($p = 0.027$). Shortness of breath following exercise showed no agreement between questionnaire and demonstration for subjects with the most possessions, unlike the other possession groups, which had low but positive

TABLE 1. Characteristics of a study sample of young adults ($n = 601$), Limache, Chile, 2004

Characteristic	No. or median	% or IQR*
Female sex	365	60.7
Median age (years)	25	24–26
No. of material possessions†		
0–1	96	16.0
2–3	385	64.2
4–5	119	19.8
Years of full-time education		
0–10	244	40.6
11–12	210	34.9
≥13	147	24.5
Physician-diagnosed asthma	30	5.0
Median body mass index‡	25.1	22.6–28.5
Smoking	351	58.6
Atopy	140	23.3
Bronchial hyperresponsiveness	139	23.1
Somatization§		
Low (0–10)	268	44.6
Medium (11–20)	232	38.6
High (>20)	101	16.8

* IQR, interquartile range.

† Presence of a gas-fueled water-heating device, personal computer, refrigerator, washing machine, or microwave oven in the household.

‡ Weight (kg)/height $(m)^2$.

§ Number of symptoms reported by the participant (23).

TABLE 2. Reported wheeze in the previous 12 months among young adults ($n = 601$), Limache, Chile, 2004

	Prevalence in questionnaire	95% CI*	Prevalence after demonstration	95% CI	Proportion agreement	Positive agreement	Negative agreement	Kappa	*p* value†
Total	0.376	0.337, 0.416	0.168	0.139, 0.200	0.669	0.391	0.773	0.2073	
Gender									
Male	0.360	0.299, 0.425	0.178	0.131, 0.233	0.691	0.425	0.788	0.2454	0.355
Female	0.386	0.336, 0.438	0.162	0.125, 0.203	0.655	0.370	0.762	0.1840	
Atopy									
Yes	0.386	0.305, 0.472	0.250	0.181, 0.330	0.679	0.494	0.764	0.2742	0.186
No	0.373	0.329, 0.419	0.143	0.112, 0.179	0.666	0.353	0.775	0.1841	
Bronchial hyperresponsiveness									
Positive	0.374	0.294, 0.460	0.259	0.188, 0.340	0.698	0.523	0.779	0.3122	0.057
Negative	0.377	0.332, 0.423	0.141	0.110, 0.176	0.660	0.343	0.771	0.1739	
Smoker									
Yes	0.456	0.403, 0.510	0.199	0.159, 0.245	0.613	0.409	0.712	0.1816	0.386
No	0.262	0.208, 0.321	0.125	0.087, 0.173	0.750	0.354	0.845	0.2226	
Somatization‡									
Low (0–10)	0.287	0.234, 0.346	0.067	0.040, 0.104	0.705	0.168	0.821	0.0668	
Medium (11–20)	0.405	0.341, 0.471	0.198	0.149, 0.255	0.681	0.471	0.772	0.2796	0.019
High (>20)	0.545	0.442, 0.644	0.366	0.273, 0.468	0.545	0.500	0.582	0.1103	
No. of material possessions§									
0–1	0.385	0.288, 0.490	0.198	0.124, 0.292	0.708	0.500	0.794	0.3229	
2–3	0.387	0.338, 0.438	0.177	0.140, 0.218	0.670	0.415	0.770	0.2273	0.027
4–5	0.328	0.244, 0.420	0.118	0.066, 0.190	0.639	0.189	0.768	0.0188	

* CI, confidence interval.
† *p* value for difference between category kappa values.
‡ Number of symptoms reported by the participant (23).
§ Presence of a gas-fueled water-heating device, personal computer, refrigerator, washing machine, or microwave oven in the household.

TABLE 3. Reported shortness of breath upon exercise in the previous 12 months among young adults ($n = 601$), Limache, Chile, 2004

	Prevalence in questionnaire	95% CI*	Prevalence after demonstration	95% CI	Proportion agreement	Positive agreement	Negative agreement	Kappa	*p* value†
Total	0.348	0.310, 0.387	0.160	0.131, 0.192	0.692	0.393	0.794	0.2234	
Gender									
Male	0.301	0.243, 0.364	0.153	0.109, 0.205	0.725	0.393	0.822	0.2383	0.610
Female	0.378	0.328, 0.430	0.164	0.128, 0.206	0.671	0.394	0.774	0.2138	
Atopy									
Yes	0.414	0.332, 0.501	0.229	0.162, 0.307	0.671	0.489	0.758	0.2754	0.367
No	0.328	0.285, 0.372	0.139	0.109, 0.174	0.698	0.353	0.803	0.1969	
Bronchial hyperresponsiveness									
Positive	0.482	0.397, 0.568	0.245	0.176, 0.325	0.619	0.475	0.701	0.2231	0.950
Negative	0.307	0.266, 0.352	0.134	0.104, 0.169	0.714	0.353	0.817	0.2043	
Smoker									
Yes	0.387	0.336, 0.441	0.182	0.143, 0.227	0.647	0.380	0.753	0.1756	0.131
No	0.290	0.235, 0.351	0.129	0.090, 0.177	0.758	0.423	0.847	0.2956	
Somatization‡									
Low (0–10)	0.209	0.162, 0.263	0.067	0.040, 0.104	0.761	0.135	0.861	0.0373	
Medium (11–20)	0.388	0.325, 0.454	0.172	0.126, 0.227	0.664	0.400	0.766	0.2118	0.139
High (>20)	0.624	0.522, 0.718	0.376	0.282, 0.478	0.574	0.574	0.574	0.1977	
No. of material possessions§									
0–1	0.344	0.250, 0.448	0.188	0.115, 0.280	0.677	0.392	0.780	0.1974	
2–3	0.374	0.326, 0.424	0.179	0.142, 0.221	0.691	0.441	0.786	0.2626	0.040
4–5	0.269	0.192, 0.358	0.076	0.035, 0.139	0.706	0.146	0.822	0.0321	

* CI, confidence interval.
† *p* value for difference between category kappa values.
‡ Number of symptoms reported by the participant (23).
§ Presence of a gas-fueled water-heating device, personal computer, refrigerator, washing machine, or microwave oven in the household.

TABLE 4. Differences between kappa values averaged over four asthma symptoms (wheezing, awakening short of breath, shortness of breath upon exercise, cough attack) in the previous 12 months among young adults ($n = 601$), Limache, Chile, 2004

Difference	Mean difference in kappa	95% confidence interval	*p* value
Gender (male minus female)	0.048	0.017, 0.078	0.0153*
Atopy (atopic minus not atopic)	0.051	−0.013, 0.115	0.0846*
Bronchial hyperresponsiveness (positive minus negative)	0.090	0.003, 0.177	0.0466*
Smoking (smoker minus nonsmoker)	−0.056	−0.168, 0.055	0.2056*
Somatization (low/medium/high)†			0.1241‡
No. of material possessions (0–1/2–3/4–5)§			0.0882‡

* Paired *t* test.
† Number of symptoms reported by the participant (23): low, 0–10; medium, 11–20; high, >20.
‡ Repeated-measures analysis of variance.
§ Presence of a gas-fueled water-heating device, personal computer, refrigerator, washing machine, or microwave oven in the household.

agreement ($p = 0.040$) (table 3). Kappa values did not show a pattern according to the length of full-time education for any of the symptoms (not shown).

Differences between subgroups were assessed by mean kappa values across the four symptoms (wheeze, awakening short of breath, shortness of breath on exercise, and cough attack) (table 4). Males had consistently higher agreement than did females ($p = 0.0153$), as did persons positive for bronchial hyperresponsiveness as compared with the other participants ($p = 0.0466$). There was a similar trend of higher agreement in subjects with atopy ($p = 0.0846$) and some differences for number of possessions ($p = 0.0882$). For the smoking and somatization groups, there were no consistent trends in level of agreement across the groups.

For wheeze and awakening short of breath, the positive and negative likelihood ratio 95 percent confidence intervals obtained using the standardized questionnaire contained the value 1, indicating no discriminatory value (table 5). In contrast, the positive and negative likelihood ratio 95 percent confidence intervals following symptom demonstration did not include the value 1 for any of the four symptoms, indicating discriminatory value, albeit only of a moderate level. Awakening short of breath had a relatively high positive likelihood ratio (2.62) when symptom demonstration was used. Apart from cough attack, for which the difference was small, positive likelihood ratios were greater for symptom demonstration than for the questionnaire. Negative likelihood ratios were all close to 1 for both the questionnaire and symptom demonstration.

DISCUSSION

In this study, levels of agreement between asthma symptoms reported on a questionnaire and symptoms reported following a demonstration of asthma symptoms were poor, with kappa values always less than 0.4, which is considered the lowest cutoff point for a fair degree of agreement (29). There was some evidence that the level of agreement was slightly higher in males and in persons with bronchial hyperresponsiveness when considering differences in kappa for the four symptoms explored. It is surprising that kappa values for waking with a cough at night were not higher than those for symptoms of wheeze and breathlessness. Persons with bronchial hyperresponsiveness, an intermediate somatization score, and fewer household possessions in the assessment of wheeze had higher kappa values. The prevalence estimates following the demonstration were usually

TABLE 5. Positive and negative likelihood ratios for four asthma symptoms in a comparison of questionnaire responses with responses following symptom demonstration in young adults ($n = 601$), Limache, Chile, 2004*

Symptom	PLR† (questionnaire)	95% CI†	PLR (demonstration)	95% CI	NLR† (questionnaire)	95% CI	NLR (demonstration)	95% CI
Wheezing	0.993	0.778, 1.269	1.841	1.284, 2.639	1.004	0.867, 1.163	0.862	0.776, 0.958
Awakening short of breath	0.739	0.485, 1.126	2.619	1.624, 4.222	1.071	0.983, 1.168	0.875	0.805, 0.952
Shortness of breath upon exercise	1.568	1.258, 1.954	1.823	1.255, 2.646	0.748	0.630, 0.888	0.872	0.789, 0.965
Cough attack	1.586	1.257, 2.002	1.397	1.066, 1.830	0.765	0.651, 0.900	0.862	0.753, 0.988

* Bronchial responsiveness to methacholine (positive or negative) was used as the gold standard for the presence of asthma.
† PLR, positive likelihood ratio; CI, confidence interval; NLR, negative likelihood ratio.

30–60 percent lower than those from the standardized questionnaire. Apart from cough, positive likelihood ratios were higher following the asthma demonstration, indicating that the demonstration increased the relative validity of responses to the questionnaire. However, the negative likelihood ratios were close to 1, indicating that the absence of reported symptoms provides little information regardless of the approach used.

Few studies have assessed level of agreement using two administrations of the same questionnaire. A study conducted in Malaysia showed that most questions from the ISAAC questionnaire and 60 percent of the questions from the American Thoracic Society questionnaire had kappa values greater than 0.4 when the two questionnaires were administered on two occasions 1 month apart (30). However, the time gap in this study was much longer, being approximately 18 months between the completion of the ECRHS questionnaire and the postdemonstration questionnaire. Undeniably, some of the persons with asthma symptoms would have changed their status over this period of time. Estimation of within-person change in status is difficult with the approaches currently available, as investigators from a large follow-up study argued (31). These changes could not be associated with the management of the condition, since appropriate treatment in this population was not available (32). The time gap cannot explain the marked decrease in prevalence after the demonstration of symptoms, since net changes per 10 years of follow-up have been shown to be small (31).

Variations in symptoms due to seasonal effects could have lowered the level of agreement between the two questionnaires, but this lack of consistency would not explain the generally better performance of the questionnaire following a demonstration.

Our study extends to adults the current knowledge regarding the perception of asthma symptoms by adolescents. Crane et al. (4) hypothesized that adults and children may perceive asthma symptoms differently. We are not aware of any comparative studies of asthma symptoms in adolescents and adults. However, the adult participants in our study had the same lack of agreement between responses upon questionnaire assessment and after symptom demonstration as that observed with adolescents. As is well documented, large differences in prevalence between the methods resulted in low kappa values (4, 24); negative agreement tended to be high, but positive agreement was usually low (4). These results extend our knowledge by demonstrating that a higher degree of agreement can be associated with the subject's clinical, social, and gender traits, but these increased agreement levels were still disappointing. In addition, we have shown an increase in relative validity following the demonstration of asthma symptoms compared with the use of a standardized questionnaire alone.

One consideration from this study is whether results from a semirural geographic area in a middle-income country can be extrapolated to developed countries (16, 19). Our sample was based on young adults with a reasonable level of education. The ECRHS questionnaire was administered to the participants, and the participants had ample opportunity for clarifying the questions. In our study, persons with a higher socioeconomic level had a lower degree of agreement than persons from poorer sectors, although there was no association between agreement and length of full-time education. It is not easy to explain why the level of agreement would be slightly higher for persons with fewer possessions with respect to wheeze and shortness of breath following exercise. Respiratory symptoms are more frequent in less-affluent groups, and severe asthma is more common in poor sectors of the community (19). It is possible that persons in lower socioeconomic groups might have more experience with the characteristics of asthma symptoms, enabling them to recognize the symptoms more easily from the demonstration.

We believe that our findings can be extrapolated with caution to older age groups or other ethnic groups, but replication of our findings in other populations would reinforce our beliefs. It is important to conduct further studies, because the exact sound of wheeze is subjective and difficult to replicate.

We expected that persons with atopy would be more consistent in recognizing asthma symptoms than persons without this trait, which is highly associated with asthma. The reason for such a conjecture was that persons with atopy are more likely to have experienced definite asthma symptoms. In our study, there was some evidence for such a trend, but the kappa statistics for differences were inconsistent across the four asthma symptoms explored.

We included somatization in the analysis because we hypothesized that subjects with many physical symptoms indicative of somatization would be more inconsistent in their responses than subjects with fewer physical symptoms. This relation was not seen; persons with an intermediate number of physical symptoms had a higher level of agreement than persons with few symptoms or a high number of symptoms.

The consequences, for community studies, of low agreement between the standardized questionnaire and the postdemonstration questionnaire and the lower relative validity of the standardized questionnaire when it was not preceded by a demonstration are twofold. Firstly, the low agreement provides a degree of uncertainty as to whether estimates of asthma prevalence in the community are appropriate. The two estimates of prevalence in this study were markedly different. If the postdemonstration questionnaire were considered appropriate, it would greatly decrease the prevalence of asthma usually reported in studies using the ISAAC or ECRHS questionnaire.

In terms of etiologic studies of asthma, the low agreement between methods of symptom assessment and the lower relative validity of not using a symptom demonstration provide a possible explanation for the lack of consistency between studies regarding the impact of diet, poverty, and infections on asthma. It is possible that by focusing on obvious symptoms of asthma, the demonstration could have caused participants to overlook minor symptoms that they would have recorded on a questionnaire completed without any prompting. However, the problem may be more related to the chronic nature of asthma symptoms. Proposals for analyzing asthma using a continuous asthma score have started to emerge (33). These new techniques may help to resolve the current unsatisfactory situation.

ACKNOWLEDGMENTS

This study was funded by the Wellcome Trust.

The authors are indebted to Drs. Patricia Bustos and Hugo Amigo for their contribution to the supervision of the fieldwork and to Dr. Javier Mallol for facilitating the use of the video of asthma symptoms.

Conflict of interest: none declared.

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