

# Limited Agreement Between Written and Video Asthma Symptom Questionnaires

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**Summary.** The prevalence of asthma remains difficult to determine with precision with no absolute or “gold” standard for diagnosis. A recently developed video questionnaire for epidemiological studies with less reliance on understanding written questions provides another tool for determining prevalence and severity of asthma. This report from the International Study of Asthma and Allergies in Childhood (ISAAC) examines the agreement between the ISAAC video questionnaires on respiratory symptoms and reported asthma. Between December 1993 and April 1995, 4952 children aged 13–14 years in two Canadian communities completed sequentially the ISAAC written and video questionnaires at school. The agreement between responses to the two questionnaires for reported *wheeze ever*, *current wheeze*, *wheeze on exercise*, and *nocturnal wheeze* (the latter three questions relating to symptoms in the last 12 months), and to any combination of the latter three questions was examined in the full sample and in those reporting diagnosed asthma, using concordance and kappa coefficients as measures of agreement.

The prevalences of *wheeze ever*, *current wheeze*, *wheeze on exercise*, and *nocturnal wheeze* were significantly lower based on responses to the video questionnaire compared with the written questionnaire in both regions in the full sample and in those labeled as having asthma. Although concordance between video and written questionnaires always exceeded 60% and often exceeded 70% for related questions, agreement measured by the kappa statistic for each question was only fair to moderate ( $\kappa = 0.22$ – $0.51$ ).

We conclude that the video questionnaire yields lower reported prevalence rates for asthma symptoms, and that there is limited agreement between responses to the two questionnaires that is not explained by issues of language, culture, or literacy. **Pediatr Pulmonol.** 2000; **30:307–312.** © 2000 Wiley-Liss, Inc.

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## INTRODUCTION

Comparing the prevalence of asthma in different populations has been difficult because of the lack of a precise definition, differences in diagnostic habits, and dissimilarities in survey methods. Epidemiological studies rely largely on reported symptoms (such as dyspnea, wheezing, chest tightness, and cough), sometimes accompanied by one or more physiological measurements. Although symptoms are sensitive for the presence of asthma, they are relatively nonspecific. Furthermore, they may be influenced by perception, recollection, culture, and the interviewer. On the other hand, physiological measurements do not fully match with symptoms, particularly when these components of asthma are surveyed at different points in time, e.g., wheeze in the past year vs airway hyperresponsiveness today.<sup>1</sup>

Written questionnaires are the most frequently used instruments to document asthma and respiratory symptoms within populations, but may be subject to bias because of language, culture, literacy, perception of dis-

ease, or interviewer technique.<sup>2,3</sup> Video questionnaires have been developed to facilitate more reliable comparisons between populations. Showing, rather than describing, symptoms and signs of asthma may provide more accurate recognition of asthma without the potential biases of written questionnaires.<sup>3</sup>

The International Study of Asthma and Allergies in Childhood (ISAAC) used both written and video questionnaires to determine the prevalence and severity of

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asthma symptoms in 13- to 14-year-old children.<sup>4,5</sup> The written questionnaire sought information on the presence, frequency, and severity of *wheeze*, *wheeze on exercise*, and *nocturnal wheeze*. The ISAAC video questionnaire involved audiovisual presentations of sequences of young people displaying these features of asthma, followed by questions on screen asking the viewer whether they had similar episodes. If the video scenes corresponded well to the questions presented in the written questionnaire, good agreement between these questionnaires would be expected in populations with the same language and literacy backgrounds.

Relatively high levels of concordance have been reported between these questionnaires by other investigators.<sup>6-9</sup> However, reporting only concordance introduces two weaknesses, namely, a strong dependence on the distribution of positive and negative responses, and failure to account for agreement occurring by chance. We have examined the agreement between the ISAAC written and video questionnaires within two populations of 13- to 14-year-old Canadian children for whom English is the first language to determine the reproducibility of responses to two different methods of assessing prevalence, using the kappa coefficient as a more appropriate measure of agreement than concordance alone.

## METHODS

### Study Areas and Populations

This survey was conducted in two English-speaking Canadian communities, one within an industrial and densely populated region (Hamilton and adjacent cities within 30 km, total population 450,000) and the other within a less populated prairie city (Saskatoon, population 200,000). Full details of the study in Canada have been published.<sup>10</sup> In the Hamilton region, 4529 children were randomly selected by schools from 22,864 children in Grade 8 (mainly 13–14-year-olds) from seven regional Boards of Education. In Saskatoon, all children in Grade 8 of this age were recruited, because the total population of these children was only 2692. In Hamilton, 75% of the children were surveyed in May, June, and September 1994 and the remainder in March and April 1995. The Saskatoon survey was completed between December 1993 and March 1994. The study was approved by the Ethics Research Committees in each center. A parent of each participant gave written informed consent.

### Questionnaires

The standardized ISAAC written questionnaire<sup>5</sup> and the ISAAC video questionnaire (European version)<sup>7</sup>

were sequentially completed in one session by the children at school. Responses to four questions from the written questionnaire were used for comparison with responses to the corresponding video questionnaire, namely, 1) "Have you ever had wheezing or whistling in your chest at any time in the past?"; 2) "Have you had wheezing or whistling in your chest at any time in the last 12 months?"; 3) "In the last 12 months has your chest sounded wheezy during or after exercise?"; and 4) "In the last 12 months have you been awoken by wheezing or whistling in the chest?". Three sequences of the video questionnaire showing young people with overt signs of asthma were used: 1) moderate wheezing at rest; 2) wheeze and shortness of breath after exercising; and 3) nocturnal wheeze. The first scene was accompanied by the following questions: 1) "Has your breathing ever been like this, at any time of your life?"; "if *YES*, in the last year?". The second scene was followed by the question: "Has your breathing been like the girl in the video following exercise, at any time in your life?"; "if *YES*, in the last year?". The third scene was followed by the question "Have you been awoken like this at night, at any time of your life?", "if *YES*, in the last year?". The written questionnaire included the question "Have you ever had asthma?" and was used to classify subjects with and without a diagnostic label of asthma.

### Statistical Methods

The agreement between video and written questionnaire was examined in each region both in the full sample and in those labeled as having asthma. The kappa ( $\kappa$ ) coefficient was used to measure the agreement between questions.<sup>11-13</sup> The responses considered were *YES* and *NO*: any other response was collapsed with *NO*. The strength of agreement by kappa coefficient was appraised as recommended by Altman<sup>11</sup>  $<0.20$  = poor,  $0.21-0.40$  = fair,  $0.41-0.60$  = moderate,  $0.61-0.80$  = good, and  $0.81-1.0$  = very good. To enable comparison with reports from ISAAC studies in other regions, concordance was also calculated by dividing the sum of the frequencies in the agreement cells in  $2 \times 2$  tables (*YES* + *YES* and *NO* + *NO*) by the total number of observations and expressed as a percentage. We calculated kappa coefficients from the published data in previously reported ISAAC studies, which have provided only concordance results.

## RESULTS

In Hamilton, 3051 children (67.4% response rate) completed the written and video questionnaires, whereas in Saskatoon, 1901 children completed both questionnaires (70.6% response rate) with 49% males in each area.

#### Abbreviations

ISAAC	International Study of Asthma and Allergies in Childhood
$\kappa$	Kappa coefficient

**TABLE 1—Reported Prevalences of Asthma Symptoms in the ISAAC Written and Video Questionnaires in Two Canadian Communities**

	Ever wheeze (%)		Current wheeze (%)		Wheeze on exercise (%)		Nocturnal wheeze (%)	
	Hamilton	Saskatoon	Hamilton	Saskatoon	Hamilton	Saskatoon	Hamilton	Saskatoon
All children (Hamilton n = 3051, Saskatoon n = 1901)								
Written	44.4*,**	36.4**	30.6*,**	24.0**	36.5*,**	30.8**	11.4**	7.6
Video	21.6*	16.9	13.3*	9.9	30.8*	23.5	7.2	5.4
Children labeled as having asthma (Hamilton n = 587, Saskatoon n = 232)								
Written	83.8**	84.5**	67.1**	67.2**	72.4**	69.4**	32.0**	28.0**
Video	53.3	56.9	36.6	36.6	57.2	53.4	20.1	24.1

\* $P < 0.001$  between center.\*\* $P < 0.001$  within center between written and video questionnaires.**TABLE 2—Responses of the Whole Sample to Written and Video Questionnaires for *Wheeze Ever*, *Current Wheeze*, *Wheeze on Exercise*, and *Nocturnal Wheeze*, and a Positive Response to Any of the Three Video Sequences of Wheezing**

Question	Questionnaire answer				Measurement	
	Written yes Video yes n (%)	Written yes Video no n (%)	Written no Video yes n (%)	Written no Video no n (%)	Concordance	Kappa
Ever wheeze						
Hamilton	567 (18.6%)	789 (25.9%)	93 (3.0%)	1602 (50.5%)	71%	0.38
Saskatoon	260 (13.7%)	432 (22.7%)	62 (3.3%)	1147 (60.3%)	74%	0.37
Current wheeze						
Hamilton	320 (10.5%)	614 (20.1%)	87 (2.9%)	2030 (66.5%)	77%	0.36
Saskatoon	151 (7.9%)	306 (16.1%)	37 (1.9%)	1407 (74.0%)	82%	0.38
Wheeze on exercise						
Hamilton	688 (21.9%)	447 (14.7%)	276 (9.0%)	1660 (54.4%)	76%	0.47
Saskatoon	309 (16.3%)	276 (14.5%)	138 (7.3%)	1178 (62.0%)	78%	0.45
Nocturnal wheeze						
Hamilton	129 (4.2%)	219 (7.2%)	91 (3.0%)	2612 (85.6%)	90%	0.40
Saskatoon	59 (3.1%)	85 (4.5%)	43 (2.3%)	1714 (90.2%)	93%	0.44
A positive response to any of 3 wheezing sequences <sup>1</sup>						
Hamilton	655 (21.5%)	279 (9.1%)	450 (14.7%)	1667 (54.6%)	76%	0.46
Saskatoon	303 (15.9%)	154 (8.1%)	221 (11.6%)	1223 (64.3%)	80%	0.49

<sup>1</sup>Comparison of response to written questionnaire for current wheeze and response to video questionnaire for a positive response to any of the three wheezing sequences.

As previously reported, the prevalence of *asthma ever* was higher in the Hamilton region than in Saskatoon (19.2% vs 12.2%)<sup>10</sup> The prevalences of *wheeze ever*, *wheeze in the last 12 months* (current wheeze), *wheeze on exercise in the last 12 months*, and *nocturnal wheeze in the last 12 months*, in both written and video questionnaires (Table 1) were also higher in the Hamilton region, and were significantly higher (in both study populations) with the written questionnaire than the video questionnaire. In both study populations, concordance between video and written questionnaires was >60%, whereas agreement as measured by the kappa coefficient for each question analyzed was only fair to moderate (Table 2). Some 50% or more of the participants who answered positively to each of the written questions regarding *wheeze ever*, *current wheeze*, *wheeze on exercise*, and *nocturnal wheeze* responded negatively to the corresponding scene in the video questionnaire, whereas only

approximately 5% of the children who answered negatively to the written questionnaire responded positively to the comparable scene in the video questionnaire.

### Children Labeled as Having Asthma

The prevalences of *wheeze ever*, *current wheeze*, *wheeze on exercise*, and *nocturnal wheeze*, among children labeled as having asthma were similar in the Hamilton region and Saskatoon. The prevalences of these symptoms reported by each population remained higher in the written than in the video questionnaire (Table 1). Although concordance between video and written questionnaire was good, agreement between video and written questionnaire as measured by the kappa coefficient was only fair to moderate (Table 2). As in the full sample, between one third and one half of the participants with diagnosed asthma who answered positively to

**TABLE 3—Concordance Versus Agreement Between the ISAAC Video and Written Questionnaires for Current Wheeze in Different Studies**

Current wheeze study	Ref.	Country	Center	Language	N	Concordance %	Agreement kappa <sup>1</sup>
Pearce et al. <sup>2</sup>	6	Germany	Bochum	English	1928	76	0.35
		England	West Sussex	English	2097	78	0.46
		New Zealand	Wellington	English	1863	79	0.52
		Adelaide	English	1428	85	0.68	
		Sydney	English	1519	74	0.44	
Pekkanen et al. <sup>2</sup>	8	Finland	Kuopio	Finnish	2821	88	0.41
		Helsinki	Finnish	2771	84	0.40	
		Turku	Finnish	2983	87	0.45	
		Lapland	Finnish	3032	86	0.41	
Leung et al. <sup>2</sup>	9	China	Hong Kong	Chinese	4665	80	0.30
Lai et al. <sup>3</sup>	14	China	Hong Kong	Chinese	189	—	0.44
Pizzichini et al. <sup>2</sup>		Canada	Hamilton	English	3051	76	0.47
		Saskatoon	English	1901	80	0.49	

<sup>1</sup>Kappa was calculated by the authors from data published.

<sup>2</sup>For the video questionnaire, wheezing was defined as a positive response to any of the following three video sequences: wheeze at rest, wheeze after exercising, or night waking with wheeze.

<sup>3</sup>For the video questionnaire, wheezing was defined as a positive response to any of the following two video sequences: wheeze at rest and wheeze after exercising.

written questions regarding *wheeze ever*, *current wheeze*, *wheeze on exercise*, and *nocturnal wheeze* responded negatively to the corresponding scene in the video questionnaire. In contrast, only 5% to 10% of these children who responded negatively to the written questionnaire responded positively to the comparable scene in the video questionnaire.

To enable comparison with reports from ISAAC studies in other regions, we determined concordance and kappa coefficient for agreement between written and video questionnaires using responses to any one or more of three video scenes of asthma to define the presence of wheezing. Our results for concordance in the Hamilton region (76%) and in Saskatoon (80%) are within the range reported from other studies (74% to 88%), and agreements expressed as kappa statistic (0.47 and 0.49, respectively) were likewise within the range of values we calculated from data provided in other studies (0.30 to 0.68, median 0.44) (Table 3).

## DISCUSSION

The ISAAC video questionnaire is a validated instrument<sup>7</sup> recently developed for use in international epidemiological studies to facilitate comparisons between countries involving different languages and cultural groups, aiming to elicit responses regarding wheezing and asthma without using language-dependent instruments.<sup>3–5</sup> The two questionnaires have a reasonable and comparable sensitivity and specificity for airway hyper-responsiveness to methacholine in English-speaking<sup>3</sup> and Chinese-speaking children.<sup>14</sup> There are several reported comparisons of these questionnaires applied to children with different languages or cultural groups.<sup>6–9,14–20</sup> In-

consistencies between the written and video questionnaires have been assumed to be due to the video questionnaire being less influenced by cultural differences than the written questionnaire.<sup>7</sup> However, in the present study the significant disagreements between the responses given to these questionnaires cannot be ascribed to differences in language, culture, or literacy. Because there is no “gold standard” for a certain diagnosis of asthma, we are unable to determine which questionnaire gave greater accuracy in diagnosis.

In this study, the agreement between the ISAAC written and video questionnaires applied to two populations of Canadian children, as measured by the kappa coefficient, varied between fair and moderate depending on the question analyzed. In addition, whether or not children were already labeled as having asthma, many more children changed answers from a previous *YES* in the written questionnaire to *NO*, than changed a previous *NO* to a *YES* response after watching the corresponding scene in the video questionnaire. Hence, children with the same language and similar literacy responded differently to the questionnaires. The results derived from the ISAAC written and video questionnaires are not interchangeable. The relatively low response rate of 68.6% achieved in the Canadian part of the ISAAC study (related to issues of confidentiality at schools) should not bias these results because this study examines within-subject agreement of those completing both questionnaires. Similarly, the between-region differences in the Canadian study,<sup>10</sup> whereas interesting and requiring further investigation, should not bias these analyses.

Our conclusions regarding the strength of the agreement between the ISAAC video and written questionnaires differ from those reported by others.<sup>3,6–9</sup> Most of



the previous authors reported concordance as the measure of agreement, and did not calculate kappa ( $\kappa$ ). The degree of concordance between written and video questionnaire in our study was as high as the concordances previously reported.<sup>3,6-9</sup> Although straightforward, the simple calculation of concordances has two weaknesses.<sup>12,13</sup> First, concordance does not take into account that this measure is strongly dependent on the distribution of positive and negative responses. A striking example of this is seen in Table 2. Concordances for nocturnal wheeze in all children were 90% to 93% (heavily influenced by the fact that 4326 of 4952 responses [87.4%] were negative), yet only 38% of those responding *YES* to the written questionnaire also responded *YES* to the video questionnaire (188 of 492). Second, concordance does not consider that some of the agreements occur just by chance. In contrast, the kappa coefficient examines the proportion of responses that would be expected by chance given the marginal distributions.<sup>12</sup> Although the kappa coefficient is generally used to examine interobserver agreement, it does not need to be restricted to such purposes.<sup>13</sup> Our results confirm and extend the observations of Lai et al.<sup>14</sup> in 189 Chinese children in whom the agreement between written and video questionnaire, as measured by the kappa coefficient, was low for *wheeze ever*, *wheeze on exercise*, and *nocturnal wheeze*. Similarly, we calculated low kappa values for agreement from published studies in France (all kappa < 0.35),<sup>21</sup> Australia (all < 0.6),<sup>22</sup> with a broader range in Italy (0.37–0.77).<sup>15</sup> These findings suggest that the discrepancies between video and written questionnaire cannot be simply attributed to difficulties in translation of the questionnaires.

Previous studies have reported that the proportion of positive answers to the written questionnaire, either in children of the same language<sup>7-9,14-16,18</sup> or in children of different countries,<sup>6,17,19</sup> was higher than obtained with the video questionnaire. Whether these children changed their *YES* responses to *NO* after watching the video questionnaire is unknown, because in some studies the sequence of completion of the questionnaires differed in about half of the children. Two early pilot studies suggested that the order of administration of video and written questionnaires did not influence responses.<sup>3,6</sup> If it is true that the ISAAC video questionnaire, by showing rather than describing symptoms and signs of asthma, provides a more accurate recognition of asthma, then the significant decrease in the prevalence of each grade of asthma illustrated by the video questionnaire suggests that the written questionnaire overestimates the prevalence of asthma in these children. However, the video questionnaire, which first shows a scene and then asks the question (for example, wheeze at rest followed by the question "Has your breath ever been like this, at any time of your life?") very precisely defines the type and sever-

ity of wheeze under study, and therefore restricts the answer *YES* to children who have experienced wheeze "like" that displayed by the video. Hence, the ISAAC video questionnaire may introduce yet another type of bias. Furthermore, the scenes displayed on the video reflect more severe wheeze, and hence the video questionnaire probably underestimates the prevalence of milder asthma. This possibility is supported by studies showing that the ISAAC video questionnaire is more reliable than the ISAAC written questionnaire in identifying children with airway hyperresponsiveness,<sup>3,14,23</sup> suggesting that it detects children with more severe asthma. However the written questionnaire provided greater repeatability on retest.<sup>24</sup>

Some previous reports have used a positive response to any of the three video scenes of wheezing to code a positive answer to wheeze, and have determined higher prevalences of wheezing so defined than by the written questionnaire.<sup>9,20</sup> This was also seen in our study in the whole sample of children, whereas among those with the label of asthma, overall prevalence rates for wheeze were very similar, although there remained substantial individual variations in responses. The combination of the three video scenes provides a broader visual presentation of wheezing, and gives closer agreement to responses from a single written question.

In conclusion, we have shown that the agreement between the ISAAC written and video questionnaire in children with the same language and good literacy is only fair to moderate. The limited agreement between the two instruments is not simply related to cultural, language, literacy, or interviewer bias associated with written questionnaires. Further studies are required to determine the measurement properties of the ISAAC video questionnaire.

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