The burden of symptoms of asthma, allergic rhinoconjunctivitis and atopic eczema in children and adolescents in six New Zealand centres: ISAAC Phase One

MI Asher, Associate Professor, Division of Paediatrics, University of Auckland; D Barry, Paediatrician, Memorial Hospital, Hastings; T Clayton, Data Manager, Division of Paediatrics, University of Auckland; J Crane, Associate Professor, Department of Medicine, Wellington School of Medicine; W D’Souza, Research Fellow, Department of Medicine, Wellington School of Medicine; P Ellwood, Research Manager, Division of Paediatrics, University of Auckland; RPK Ford, Clinical Associate Professor, Community Paediatrics, Christchurch; R Mackay, Paediatrician, Nelson Hospital, Nelson; EA Mitchell, Associate Professor, Division of Paediatrics, University of Auckland; C Moyes, Paediatrician, Whakatane Hospital, Whakatane; P Pattemore, Senior Lecturer, Department of Paediatrics, Christchurch School of Medicine; N Pearce, Professor, Centre for Public Health Research, Massey University Wellington Campus, Wellington; AW Stewart, Senior Research Fellow, Division of Community Health, University of Auckland.

Abstract

Aim. To describe the burden of symptoms of asthma, allergic rhinoconjunctivitis and atopic eczema in children and adolescents 10%, and atopic eczema 15% and 13% in each age group respectively. More than 40% of participants had symptoms in the last year of at least one condition, most commonly asthma. There were no significant differences among regions, except for six to seven year olds in Nelson who had significantly lower prevalences of some symptoms of asthma and allergic rhinoconjunctivitis.

Methods. ISAAC Phase One was undertaken in six centres in New Zealand. Auckland, Wellington and Christchurch were studied from October 1992 to August 1993, and Hawke’s Bay, Bay of Plenty, and Nelson were studied from May to August 1993. The Auckland centre is the geographical area known as the Auckland District of the Ministry of Education. The Bay of Plenty centre is made up of the Rotorua, Whakatane, Kawerau and Opotiki territorial local authorities. The Hawke’s Bay centre is the geographical area known as the Hastings and Napier territorial local authorities. The Christchurch centre is Christchurch City. The study was approved by the relevant Ethics Committee in each centre.

Sample and Subjects. Within the three large cities, schools with pupils in the relevant age groups were randomly sampled to obtain at least 3000 pupils per age group per centre. In Bay of Plenty, Hawke’s Bay and Nelson, all schools were enrolled. A letter and relevant documentation was sent to the Board of Trustees and school principals requesting permission to conduct the survey. The pupils of the appropriate age group were identified from the school roll and parents sent an information letter about the study. The parents of the adolescents were asked to contact the research team if they did not want their child to participate. If any eligible pupils were absent, the research team returned on another day to include them if possible. For the children, the questionnaire was issued through the class teacher, sent home, and if not returned within one week was sent home again on up to two more attempts.

The International Study of Asthma and Allergies in Childhood (ISAAC) found that the prevalences of symptoms of asthma, allergic rhinoconjunctivitis and atopic eczema in New Zealand and other English-speaking countries are among the highest in the world.1-4 The extent of these diseases and regional variations within New Zealand are examined in this paper.

Many New Zealanders believe there are ‘good’ and ‘bad’ places for asthma, and during the 1980s regional differences in asthma mortality and hospital admissions were studied. The National Asthma Mortality Study 1981-83, which prospectively examined deaths from asthma, identified regional variations between health districts.5 Geographic analysis of hospital admissions for asthma 1982-84 found that Nelson had the lowest hospital admission rate and second lowest asthma mortality rate in New Zealand 1982-84.6 Possible reasons for these variations include asthma prevalence, asthma severity, environmental factors and management practices.

However, the prevalence of asthma symptoms and bronchial hyperresponsiveness in childhood has shown little regional variation in previous studies.7,11 but it has been difficult to be confident of comparisons among these studies because of differences in methodology. A study among adults in four centres, using identical methodology, found only small regional differences, with Wellington and Christchurch reporting slightly more symptoms and asthma treatment than Auckland and Hawke’s Bay.12 More recently, a similar study of adults in all regions of New Zealand found significant urban/rural differences, as well as marked differences between various rural areas.13

ISAAC was developed to measure the prevalence of asthma, allergic rhinoconjunctivitis and atopic eczema symptoms in different populations throughout the world using standardised methodology in two age groups.14 ISAAC Phase One studied over 700,000 children. The younger age group (N = 257,800) was studied in 91 centres from 38 countries and the older age group (N = 463,801) in 155 centres from 56 countries.7 In New Zealand, the ISAAC Phase One study was undertaken in six centres among six to seven year old (‘children’) and thirteen to fourteen year olds (‘adolescents’) and the results are reported in this paper.

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The results from parents of children who returned the questionnaire at the first issue (94.1%) were compared with those who returned the questionnaire after the second or third issue (5.8%). Using six criteria (current wheeze, asthma ever, current nose symptoms, hay fever ever, current itchy skin rash, and eczema ever), there were no differences in prevalence for those responding on early rather than late returns.

The main reason for schools refusing participation was the pressure of curriculum. Among secondary schools in Auckland, two schools which had already seen the video questionnaire were excluded prior to enrolment. Common reasons for pupil non-participation were absence from school during study period (both age groups) and failure to return the questionnaire (children only). Active refusal in both age groups was rare. In the older age group, a minority cited religious reasons for not participating, and in some of these cases the written questionnaire was completed, but not the video. Information on the ethnicity and sex of non-participant children was obtained from school records. A similar proportion of boys and girls were non-participants. The proportion of non-participants was greater among Maori (18.0%, 11.1%) and Pacific Island (19.2%, 6.0%) than European (6.9%, 6.1%), children and adolescents respectively.

Prevalences for symptoms in all centres were similar, except that Nelson children generally had lower prevalences (Table 2A and Table 2B). The relationship between current wheeze and other symptoms is shown in Table 3.

**Asthma symptoms. Children.** The prevalence of ‘wheeze in the last 12 months’ was high, with parents of 24.5% children reporting this symptom (Table 2A). ‘Asthma ever’ was reported by 26.5% of the total sample. However, only 71.8% of those with current wheeze also reported ‘asthma ever’ (Table 3). The only significant regional differences seen for responses to most questions. Nelson had a significantly lower prevalence compared to the other five centres combined, at least 20% below the average for all centres for most variables. Among children with current wheeze, ‘asthma ever’ was reported slightly less often in Nelson than other centres (66 vs. 72.3%). The proportion of children with ‘asthma ever’ who had other symptoms ranged from 71.8 - 89.0% (Table 4).

For severe wheezing 9% of all parents of children reported, in the last twelve months, four or more attacks of wheezing, 3.5% reported sleep disturbance due to wheezing at least one night per week and 5.1% reported wheeze severe enough to limit speech to only one or two words at a time between breaths. Of children with current wheeze, about one third had >4 attacks in the last twelve months, about one in seven had sleep disturbed one or more times a week, and wheeze limited speech in about one in five (Table 3).

**Adolescents.** The prevalence of wheeze in the last twelve months was high (72%), with 26.5% reporting this symptom in three adolescents (30.2%) reporting this symptom (Table 2B). Asthma ever was reported by 24.4% of the total sample. However, only 54.3% of those with current wheeze also reported ‘asthma ever’ (Table 3). The only significant regional differences seen for the written questions were responses to questions about dry cough at night, sleep disturbed by wheezing one or more nights a week, and ‘asthma ever’, with Nelson showing a significantly lower prevalence for ‘asthma ever’. Among adolescents with current wheeze, ‘asthma ever’ was reported slightly less often in Nelson than other centres (46.4 vs. 55.2%). The proportion of adolescents with exercise wheeze who also reported ‘asthma ever’ was only 44.7%, but the proportion with other symptoms and ‘asthma ever’ ranged from 54.3 - 75.0% (Table 4).

Results

The participation rate of schools was high, but varied between centres (children 96-100%, adolescents 73-100%). The sample chosen comprised 40 902 pupils, 20 356 children and 20 546 adolescents. Complete data were available on 18 569 children, a response rate of 91% (49.4% girls) and on 19 023 adolescents (53.3% girls), a response rate of 93%. The participants are described in Table 1.

### Adolescents

Three adolescents self-completed the written questionnaire and the video questionnaire were not the same as the unit of analysis (pupils). Tests of significance and corrections made. A cluster sampling method of analysis was used which completion of the questionnaire were corrected and inconsistencies in the symptom questionnaires, but obvious inaccuracies in date of birth were checked against the questionnaire. Corrections were not made to the responses to which were found to be less than 0.1%. Any inconsistencies were checked.

### Data entry and analysis

Data were entered twice to reduce errors, where no consistent errors were found to be less than 0.1%. Any inconsistencies were checked against the questionnaire. Corrections were not made to the responses to the symptom questionnaires, but obvious inaccuracies in date of collection of the questionnaire were corrected and inconsistencies in dates of birth and age were checked against data from the school and correctly made. A cluster sampling method of analysis was used which randomly sampled schools. The unit of sampling (schools) is therefore not the same as the unit of analysis (pupils). Tests of significance and confidence intervals were calculated with sample sizes appropriately adjusted for cluster sampling, using a correction designed by Rao and Scott prior to analysis. For each question, all respondents were separated into those with a positive response and those with either a negative or missing response. The prevalence of symptoms was compared, adjusted for gender, age and ethnicity using logistic regression. As these analyses showed overall significance, prevalence rates were compared in children because these differences were primarily due to the low prevalences in Nelson, additional analyses were carried out comparing Nelson with the other five centres. Data were analysed using chi squared analysis, to determine whether the variables were present than would be expected by chance and confidence intervals were calculated. Due to the multiple analyses undertaken, a stringent significance level of $p < 0.01$ or less was adopted prior to analysis.

There were seasonal differences in responses to questions on rhinitis symptoms in the previous twelve months, suggesting a recall bias relating to recency of symptoms, but this was not found for asthma or atopic eczema. Since all centres collected data between May and August, but only the three urban centres collected data outside that period, the analysis for the allergic rhinitis questionnaire comparisons were made only for data collected between May and August. This excludes data from about two-thirds of children and adolescents from Auckland, Wellington and Christchurch, with only 3613 included in the analysis of the allergic rhinitis questionnaire.

### Results

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In the last twelve months, 9.9% of all adolescents reported four or more attacks of wheezing, 3.2% reported sleep disturbance due to wheezing at least one night per week and 8% reported wheeze severe enough to limit speech to only one or two words at a time between breaths. Of adolescents with current wheeze, about one third had >4 attacks in the last twelve months, one in ten had their sleep disturbed one or more times a week, and in one in four wheeze-limited speech (Table 3).

For the video questionnaire (Table 2C), there were no regional differences seen except for responses to one scene showing a severe attack of asthma and asking “Has your breathing ever been like this?” If yes; “in the last year?” Hawke’s Bay was lowest and Wellington highest. A small minority of thirteen to fourteen year old children (0.7%, all from Wellington) had seen the video two years before. The proportion of adolescents with ‘exercise wheeze’ or ‘night cough’ who also reported ‘asthma ever’ was 45.5% and 38.3% respectively, but the proportion with other symptoms and ‘asthma ever’ ranged from 60.0 - 65.7% (Table 4). The video questionnaire showed lower prevalences than the written questionnaire for most comparable questions.
Allergic rhinoconjunctivitis. Children. Symptoms of allergic rhinoconjunctivitis in the last twelve months were common with parents of 9.7% of children reporting this symptom. There were significant regional differences seen for ‘allergic rhinoconjunctivitis’ and ‘hay fever ever’, which were lowest in Nelson. Nelson was also lowest for disturbance of activities, but this was not statistically significant. 6% of all children with allergic rhinoconjunctivitis had their activities in the past twelve months disturbed ‘a lot’ by their nasal symptoms.

Table 2B. Prevalence (%) of symptoms reported by adolescents.

|                          | Auckland | Bay of Plenty | Hawke’s Bay | Wellington | Nelson | Christchurch | Total | P values
|--------------------------|----------|---------------|-------------|------------|--------|--------------|-------|-----------
| Asthma                   |          |               |             |            |        |              |       |           
| Asthma symptoms in last 12 months |          |               |             |            |        |              |       |           
| Wheezing                | 26.5     | 29.5          | 32.4        | 31.6       | 30.9   | 29.6         | 30.2  | 0.054     
| Wheezing with exercise  | 36.1     | 39.4          | 42.4        | 41.1       | 43.5   | 40.3         | 40.3  | 0.018     
| Dry cough at night      | 29.7     | 31.3          | 33.2        | 30.3       | 26.3   | 27.4         | 30.0  | 0.003     
| Wheezing severely in last 12 months |          |               |             |            |        |              |       |           
| Four or more attacks of wheeze | 8.0     | 9.0           | 11.0        | 11.1       | 10.2   | 9.7          | 9.9   | 0.023     
| Sleep disturbed by wheeze or more nights per week | 2.7     | 3.3           | 4.6         | 3.0        | 2.6    | 2.9          | 3.2   | <0.001    
| Wheeze limiting speech  | 8.1      | 7.1           | 8.6         | 8.3        | 8.2    | 7.5          | 8.0   | 0.239     
| Asthma ever             | 22.9     | 22.3          | 25.7        | 26.3       | 20.2   | 25.9         | 24.4  | <0.001    
| Allergic rhinitis       |          |               |             |            |        |              |       |           
| Allergic rhinoconjunctivitis | 18.9     | 18.7          | 18.1        | 19.8       | 17.4   | 19.4         | 18.9  | 0.917     
| Activities disturbed a lot by nose symptoms in last twelve months | 1.3     | 1.7           | 1.4         | 1.6        | 0.4    | 1.2          | 1.3   | 0.011     
| Hay fever ever          | 13.7     | 32.6          | 38.2        | 37.3       | 36.1   | 40.4         | 36.6  | <0.001    
| Atopic eczema           |          |               |             |            |        |              |       |           
| Atopic eczema           | 12.4     | 13.8          | 12.1        | 13.2       | 12.8   | 12.3         | 12.7  | 0.355     
| Sleep disturbed by rash one or more nights per week in last twelve months | 2.8     | 3.5           | 3.0         | 2.3        | 2.0    | 2.3          | 2.7   | 0.959     
| Eczema ever             | 23.5     | 25.3          | 26.3        | 27.8       | 26.2   | 24.8         | 25.8  | 0.380     

Table 2C. Prevalence (%) of positive responses to the video by adolescents.

|                          | Auckland | Bay of Plenty | Hawke’s Bay | Wellington | Nelson | Christchurch | Total | P values
|--------------------------|----------|---------------|-------------|------------|--------|--------------|-------|-----------
| Prevalence in last year  |          |               |             |            |        |              |       |           
| Wheeze                   | 16.3     | 18.6          | 19.5        | 19.5       | 19.0   | 17.4         | 18.4  | 0.012     
| Exercise wheeze          | 28.4     | 28.4          | 29.9        | 31.0       | 32.3   | 32.2         | 30.3  | 0.221     
| Night wheeze             | 11.3     | 11.4          | 12.7        | 12.2       | 10.5   | 11.3         | 11.7  | 0.235     
| Night cough              | 20.7     | 25.2          | 22.5        | 23.1       | 23.3   | 22.4         | 22.8  | 0.177     
| Severe wheeze            | 11.4     | 12.8          | 9.8         | 14.9       | 11.7   | 13.2         | 12.4  | <0.001    

| Complications            |          |               |             |            |        |              |       |           
| Severe wheeze            | 11.4     | 12.8          | 9.8         | 14.9       | 11.7   | 13.2         | 12.4  | <0.001    
| Allergic rhinoconjunctivitis |        |               |             |            |        |              |       |           
| Wheeze                   | 26.5     | 29.5          | 32.4        | 31.6       | 30.9   | 29.6         | 30.2  | 0.054     
| Wheezing with exercise   | 36.1     | 39.4          | 42.4        | 41.1       | 43.5   | 40.3         | 40.3  | 0.018     
| Dry cough at night       | 29.7     | 31.3          | 33.2        | 30.3       | 26.3   | 27.4         | 30.0  | 0.003     
| Wheezing severely in last 12 months |          |               |             |            |        |              |       |           
| Four or more attacks of wheeze | 8.0     | 9.0           | 11.0        | 11.1       | 10.2   | 9.7          | 9.9   | 0.023     
| Sleep disturbed by wheeze or more nights per week | 2.7     | 3.3           | 4.6         | 3.0        | 2.6    | 2.9          | 3.2   | <0.001    
| Wheeze limiting speech   | 8.1      | 7.1           | 8.6         | 8.3        | 8.2    | 7.5          | 8.0   | 0.239     
| Asthma ever              | 22.9     | 22.3          | 25.7        | 26.3       | 20.2   | 25.9         | 24.4  | <0.001    

Adolescents. The prevalence of allergic rhinoconjunctivitis in the last twelve months was high, with about one in five adolescents (18.9%) reporting this symptom (Table 2B), double the younger age group. There were no regional differences seen except for ‘hay fever ever’, where Bay of Plenty was lowest and Christchurch the highest. 5% of all adolescents with allergic rhinoconjunctivitis had their activities in the past twelve months disturbed ‘a lot’ by their nasal symptoms.

Atopic eczema. Children. The prevalence of atopic eczema in the last twelve months was high, with parents of about one in seven children (14.7%) reporting this symptom. There were significant regional differences seen for ‘atopic eczema’ and ‘eczema ever’. Nelson was the lowest, 18% and 9% respectively below the average of all centres. Symptoms of eczema which disturbed sleep at least one night a week occurred in 14% of those with atopic eczema.

Adolescents. The prevalence of atopic eczema in the last twelve months was high, with about one in eight (12.7%) adolescents reporting this symptom. There were no significant regional differences seen for any responses. Symptoms of eczema which disturbed sleep at least one night a week averaged 16% of those with atopic eczema.

Table 4. The proportion of pupils with symptoms who reported ‘asthma ever’ (%).

<table>
<thead>
<tr>
<th>Written Questionnaire</th>
<th>Children</th>
<th>Adolescents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current wheeze</td>
<td>71.8</td>
<td>54.3</td>
</tr>
<tr>
<td>Exercise wheeze</td>
<td>80.8</td>
<td>44.7</td>
</tr>
<tr>
<td>Four or more attacks</td>
<td>89.1</td>
<td>72.9</td>
</tr>
<tr>
<td>Sleep disturbed ≥1 night/week</td>
<td>80.4</td>
<td>75.0</td>
</tr>
<tr>
<td>Speech limited by wheeze</td>
<td>84.5</td>
<td>65.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Video Questionnaire</th>
<th>Children</th>
<th>Adolescents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheeze</td>
<td>60.0</td>
<td>62.0</td>
</tr>
<tr>
<td>Exercise wheeze</td>
<td>45.5</td>
<td>45.5</td>
</tr>
<tr>
<td>Night wheeze</td>
<td>65.7</td>
<td>65.7</td>
</tr>
<tr>
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<td>38.3</td>
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</tr>
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<td>Severe wheeze</td>
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All three conditions. The population relationship between symptoms in the last twelve months of asthma, allergic rhinoconjunctivitis and atopic eczema shows that 36.1% of children and 44.1% of adolescents had symptoms of at least one condition, 10.5% of children and 14.7% of adolescents had symptoms of at least two conditions, and only 2.3% of children and 2.9% of adolescents had current symptoms of all three conditions (Figure 1). Of all those with current symptoms, two-thirds had symptoms of only one condition, most commonly asthma. Among children with current wheeze, ‘hayfever ever’ was reported in only 23.3% and ‘eczema ever’ in only 39.5% (Table 3), and for adolescents the rates were 52.7% and 35.7% respectively. Among children with current wheeze, atopic eczema was more common than allergic rhinoconjunctivitis, but among adolescents this relationship was reversed.

Discussion

This study has demonstrated that children and adolescents in New Zealand have a high prevalence of symptoms of asthma, allergic rhinoconjunctivitis and atopic eczema, and that there are a large number who have severe symptoms. Compared with the 55 other countries that undertook ISAAC Phase One, New Zealand ranked among the top twelve for all parameters,1-4 and the prevalence for each ISAAC Phase One, New Zealand ranked among the top 55 other countries that undertook that there are a large number who have severe symptoms. Asthma, allergic rhinoconjunctivitis and atopic eczema, and compared with the 55 other countries that undertook ISAAC Phase Two which is being conducted in over 25 international centres, including Hawkes Bay, New Zealand. This is assessing the relationship between ‘objective’ markers of asthma and allergies (lung function testing, bronchial hyperresponsiveness, skin prick testing), symptom prevalence, and genetic and environmental factors.

The proportion of children who had wheezing in the last twelve months and also had ‘asthma ever’ was 72%, and in adolescents the corresponding proportion was only 54%, and Nelson had slightly lower rates in both age groups. There may be several explanations for this apparent under-diagnosis of asthma. Firstly, there may be genuine under-diagnosis of asthma in both age groups, more marked in adolescents, who may not see a doctor for their symptoms. Secondly, parents, and especially adolescents may have forgotten or even deny a previous label of asthma. Thirdly, wheezing may reflect another diagnosis other than asthma, such as bronchiectasis. Fourthly, in adolescents in particular, normal breathlessness after exercise may be erroneously reported as wheeze, supported by our finding of a particularly low rate of ‘asthma ever’ reported in those with exercise wheeze, on both the written and video questionnaires. These observations warrant further exploration.

Asthma, allergic rhinoconjunctivitis and atopic eczema are generally regarded as atopic diseases with the underlying assumption that the inflammatory response is similar among genetically susceptible individuals. The explanation for the worldwide variations in prevalence, including high rates in New Zealand, have been explored with ecological analyses using the ISAAC Phase One data. These studies have found a weak protective effect from vegetables in the diet,19 immunisations,20 tuberculosis,21 and a positive association with economic development,22 but no association with climate.23 Further in-depth studies are being done in ISAAC Phase Two which is being conducted in over 25 international centres, including Hawkes Bay, New Zealand. This is assessing the relationship between ‘objective’ markers of asthma and allergies (lung function testing, bronchial hyperresponsiveness, skin prick testing), symptom prevalence, and genetic and environmental factors.

Environmental factors are important. The uniformity of the findings in New Zealand children and adolescents also suggests that the high rates in New Zealand could be due to exposure of the whole population to environmental factors which can induce and perpetuate asthma and allergic diseases in genetically susceptible individuals. The assumption that the inflammatory response is similar among genetically susceptible individuals. The uniformity of the findings in New Zealand children and adolescents also suggests that the high rates in New Zealand could be due to exposure of the whole population to environmental factors which can induce and perpetuate asthma and allergic diseases in genetically susceptible individuals. The explanation for the worldwide variations in prevalence, including high rates in New Zealand, have been explored with ecological analyses using the ISAAC Phase One data. These studies have found a weak protective effect from vegetables in the diet,19 immunisations,20 tuberculosis,21 and a positive association with economic development,22 but no association with climate.23 Further in-depth studies are being done in ISAAC Phase Two which is being conducted in over 25 international centres, including Hawkes Bay, New Zealand. This is assessing the relationship between ‘objective’ markers of asthma and allergies (lung function testing, bronchial hyperresponsiveness, skin prick testing), symptom prevalence, and genetic and environmental factors.

The proportion of children who had wheezing in the last twelve months and also had ‘asthma ever’ was 72%, and in adolescents the corresponding proportion was only 54%, and Nelson had slightly lower rates in both age groups. There may be several explanations for this apparent under-diagnosis of asthma. Firstly, there may be genuine under-diagnosis of asthma in both age groups, more marked in adolescents, who may not see a doctor for their symptoms. Secondly, parents, and especially adolescents may have forgotten or even deny a previous label of asthma. Thirdly, wheezing may reflect another diagnosis other than asthma, such as bronchiectasis. Fourthly, in adolescents in particular, normal breathlessness after exercise may be erroneously reported as wheeze, supported by our finding of a particularly low rate of ‘asthma ever’ reported in those with exercise wheeze, on both the written and video questionnaires. These observations warrant further exploration.

Asthma, allergic rhinoconjunctivitis and atopic eczema are generally regarded as atopic diseases with the underlying assumption that the inflammatory response is similar among the three conditions. However, this study demonstrated that most children and adolescents with asthma do not have symptoms or past history of allergic rhinoconjunctivitis or atopic eczema, although there is some interrelationship
between these conditions. The separateness of asthma and eczema in New Zealand children has been previously noted in Christchurch. The three conditions behave differently, with the prevalence of asthma and allergic rhinoconjunctivitis increasing with age, while the prevalence of atopic eczema shows a small decline. These observations suggest that the factors inducing and perpetuating the inflammatory responses of asthma, allergic rhinoconjunctivitis and atopic eczema, and even the nature of the inflammatory response may be different between the three conditions. There is evidence that asthma is increasing in New Zealand, but we do not know if it is atopic or non-atopic disease which is increasing, or both.

![Venn diagrams of prevalence (% of study population) of current symptoms of asthma, allergic rhinoconjunctivitis and atopic eczema in 6-7 year olds (A), and 13-14 year olds (B).](image)

Our study has estimated that 25-30% of New Zealand children and adolescents have symptoms of asthma, of whom 10-14% had ‘severe’ symptoms defined as sleep disturbed due to wheezing one or more times a week. Other ‘severe’ symptoms were more common; 10-19% of children and adolescents had allergic rhinoconjunctivitis of whom 5-6% had severe symptoms; and 13-15% of children and adolescents had eczema of whom 14-16% had severe eczema. We did not collect data on the cost of treatments for participants in this study. However, the total cost (direct and indirect) of these conditions is high. The Asthma & Respiratory Foundation of New Zealand in 1998 conservatively estimated that the direct and indirect costs of asthma for the whole New Zealand population is $376 million or $835 per person with asthma. For allergic rhinitis, the costs in New Zealand are not known, although costs have been estimated in adults in the USA. The costs of atopic eczema have recently been estimated in Australia, from AS$1142 per child with mild eczema to AS$6099 per child for a child with severe atopic eczema.

In conclusion, ISAAC Phase One has demonstrated that New Zealand children and adolescents have prevalences of symptoms of asthma, allergic rhinoconjunctivitis and atopic eczema among the highest in the world. However, in the six centres studied within New Zealand, there were no regional differences, except for lower rates in the younger age group of Nelson children (but not adolescents). There were large numbers of children and adolescents affected by each of the three conditions. Symptoms of asthma were twice as common as symptoms of allergic rhinoconjunctivitis and eczema, and symptoms of asthma occurred most commonly without reported symptoms of either of the other two conditions. Further research is needed to explain the high rates of these three conditions in New Zealand and other English-speaking countries. Any strategies to reduce the prevalence or severity of these conditions will have a large economic benefit to the sufferers, their families and New Zealand.

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Correspondence. Associate Professor MI Asher, Division of Paediatrics, Faculty of Medical and Health Sciences, University of Auckland, Private Bag 92019, Auckland 1001. Fax: (09) 373 7602.
In 1996, based on the perceived success of the Decade of the Brain in terms of fostering interest and promoting research, Swedish orthopaedists conceived the idea of a decade devoted to musculoskeletal disease. After favourable preliminary soundings, the International Steering Committee for the Decade of Bone and Joint 2000–2010 was established and the Decade officially launched in Geneva on 13 January 2000. Over the past 20 years and more, a major focus of public attention has been on the so-called killer diseases, heart disease and cancer. There has been good reason for that insofar as preventative measures can be taken to reduce their incidence. But the downside has been the overshadowing of other areas of health which account for no less a burden of morbidity and misery in the community. The prime one of these is musculoskeletal disease and the Decade of Bone and Joint is intended to raise general awareness of this burden, to empower patients to take greater responsibility for their health and its management by educating the public, to focus more effectively the resources that are available towards musculoskeletal disease, and to encourage and coordinate the activities of other groups that, through the International Steering Committee, have also endorsed the Decade. The Decade is intended to include all musculoskeletal disease and to embrace all those groups (lay, professional, industrial and governmental) which have an interest in this burden of disease and its relief. A Consensus Meeting in 1998 began the global initiative by focusing on the four specific areas – arthritis, spinal disorders/back pain, cancer and major trauma. The overall aim is to raise awareness of the growing burden of musculoskeletal disease and to introduce cost-effective and more effective therapy for musculoskeletal disease. The Decade will also seek to improve diagnosis and treatment of musculoskeletal disorders and to coordinate the activities of other groups that have also endorsed the Decade.

The goals of the Decade are:

- to raise awareness of the growing burden of musculoskeletal disorders on society, especially in ageing populations such as New Zealand’s
- to promote prevention of musculoskeletal disorders and empower patients through education campaigns
- to advance research in prevention, diagnosis, and treatment of musculoskeletal disorders
- to improve diagnosis and treatment of musculoskeletal disorders

Some practical goals for the Decade are:

- a 25% reduction in the expected increase in osteoporotic fractures
- a 25% reduction in the expected increase in joint destruction from joint diseases
- a 25% reduction in the expected increase of severely injured people
- a 25% reduction in the expected increase in the indirect health costs of spinal disorders.

To date, 25 countries including the United Kingdom, USA and Australia, together with the World Bank, the World Health Organisation, and the secretary-general of the UN have officially endorsed the Decade of Bone and Joint 2000-2010. Each country organises, at the local level, a National Action Network which has responsibility for coordinating its activities. Such a Network has been formed in New Zealand at a meeting in February 2000 with the active support of professional organisations (orthopaedic surgeons, physiotherapists, rheumatologists, etc.).