Trends in the prevalence of respiratory symptoms and treatment in Dutch children over a 12 year period: results of the fourth consecutive survey

M Mommer, C Gielkens-Sijsterrmans, G M H Swaen, C P van Schaayck

Background: Although there is considerable evidence that the prevalence of childhood asthma has increased over the last decades, it is not clear if this trend is still ongoing. A study was undertaken to investigate whether previously observed trends in the prevalence of respiratory symptoms, physician visits, medication use, and absence from school in Dutch children aged 8–9 years persisted in 2001.

Methods: Parents of 1154 children aged 8–9 years eligible for a routine physical examination in 2001 were asked to complete a questionnaire on the respiratory health of their child.

Results: In 2001, 1102 children (95.5%) participated in the survey. Similarly high response rates were obtained in the surveys of 1989, 1993 and 1997, with 1794, 1526 and 1670 children aged 8–9 years participating in the respective surveys. The decreasing trend previously observed for recent wheeze between 1989 and 1997 persisted into 2001, particularly in boys. After increasing between 1989 and 1997, the prevalence of shortness of breath with wheeze decreased between 1997 and 2001. The proportion of wheezy children using medication increased between 1989 and 2001 in boys (42.9% v 64.8%; p = 0.003), but the increase was not statistically significant in girls (34.0% v 45.7%; p=0.096).

Conclusion: The prevalence of recent wheeze in Dutch school children has declined steadily since 1989. The rising prevalence of medication use in symptomatic children over time may reflect better asthma control and may partly explain the concurrently decreasing trend in the prevalence of asthma symptoms in our study population.
The results from the 2001 survey showed a continued decrease in recent wheeze in 8–9 year old Dutch children from 13.4% in 1989 to 9.1% in 2001 (p = 0.001). This decrease was seen in both boys and girls, but only reached statistical significance in boys (table 1). The effect of study year on the prevalence of wheeze did not differ significantly by sex ($p_{sex}$study year = 0.270). The increase in prevalence of recent shortness of breath and recent shortness of breath with wheeze between 1989 and 1997 was not continued in 2001; for shortness of breath the increase levelled off (8.3% in 1997, 7.9% in 2001; $p = 0.708$), while shortness of breath with wheeze decreased from 7.9% in 1997 to 5.5% in 2001 ($p = 0.014$). Table 1 shows that the prevalence of any one or more respiratory symptoms also decreased between 1989 and 2001, which was statistically significant for boys.

For children with recent wheeze the prevalence of physician visits did not show a significant trend between 1989 and 2001 (table 1). School absence in boys was higher in 1997 than in 2001 (23.1% vs 3.7%; $p = 0.002$). The prevalence of school absence in girls remained stable during the study period, with the exception of a high prevalence of school absence in 1993. The proportion of wheezy children using medication steadily increased between 1989 and 2001, especially for boys (table 1). The effect of study year on medication use did not differ significantly by sex ($p_{sex}$study year = 0.445). The overall prevalence of medication use for respiratory symptoms remained unchanged between 1989 (9.4%) and 2001 (9.2%).

### DISCUSSION

Our findings suggest that the decrease in recent wheeze previously reported for school children living in the southeast of the Netherlands persisted in 2001. Others observed an increasing prevalence of wheeze in preschool children until the late 1990s, but very recently the first signs indicating that the rising trend in asthma prevalence might have come to an end have been observed, at least for Australian and Swiss children. In the present study the declining prevalence of recent wheeze was paralleled by increased medication use in wheezy boys, while the prevalence of physician visits remained relatively stable over this study period. There was also little change in the overall prevalence of medication use for respiratory symptoms (9.4% in 1989 and 9.2% in 2001). However, it is likely that medication use in wheezy children has increased proportionally, but the number of wheezy children needing medication has remained unchanged or has decreased.

Possible explanations for the decreasing prevalence of asthma symptoms include a true decrease in prevalence, influence of improved identification and treatment, and changes in environmental influences such as indoor environmental factors, outdoor air pollution, infectious burden in early childhood, and lifestyle changes such as shorter duration of breastfeeding. We have previously found that changed exposure to cigarette smoke or pets did not explain our results. Likewise, the Swiss study found that none of a series of known risk factors had a significant influence on the observed time trends.

Our results are more in line with the second view—namely, that the decreasing prevalence of asthma symptoms might reflect improved diagnostics followed by appropriate treatment. Moreover, the significant decrease in the prevalence of wheeze and shortness of breath with wheeze seen between 1997 and 2001 coincided with the introduction of the revised guidelines in 1998 in which the importance of corticosteroids

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### Table 1

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<tbody>
<tr>
<td><strong>Boys</strong></td>
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<tr>
<td><strong>All children</strong></td>
<td>N = 2560</td>
<td>N = 2158</td>
<td>N = 2340</td>
<td>N = 1500</td>
<td></td>
<td>N = 240</td>
<td>N = 203</td>
<td>N = 198</td>
<td>N = 100</td>
<td></td>
<td>N = 100</td>
</tr>
<tr>
<td>Percentage of children with recent wheeze</td>
<td>13.4% (240)</td>
<td>13.3% (203)</td>
<td>11.9% (198)</td>
<td>9.1% (100)</td>
<td>0.001</td>
<td>15.6% (140)</td>
<td>14.7% (114)</td>
<td>13.1% (111)</td>
<td>9.6% (54)</td>
<td>0.001</td>
<td>11.1% (100)</td>
</tr>
<tr>
<td>Percentage of children with recent shortness of breath</td>
<td>6.5% (116)</td>
<td>7.9% (121)</td>
<td>8.3% (138)</td>
<td>7.9% (87)</td>
<td>0.077</td>
<td>8.2% (73)</td>
<td>8.1% (63)</td>
<td>9.1% (77)</td>
<td>9.4% (53)</td>
<td>0.304</td>
<td>4.8% (43)</td>
</tr>
<tr>
<td>Percentage of children with recent shortness of breath with wheeze</td>
<td>2.8% (5)</td>
<td>4.5% (9)</td>
<td>3.6% (6)</td>
<td>2.6% (3)</td>
<td>0.145</td>
<td>1.8% (2)</td>
<td>2.1% (1)</td>
<td>1.3% (1)</td>
<td>0.85</td>
<td>0.15</td>
<td>1.1% (1)</td>
</tr>
<tr>
<td>Percentage of children with recent coughing with phlegm</td>
<td>3.9% (70)</td>
<td>4.4% (67)</td>
<td>3.8% (62)</td>
<td>3.0% (33)</td>
<td>0.210</td>
<td>5.0% (45)</td>
<td>4.3% (33)</td>
<td>3.9% (33)</td>
<td>3.4% (19)</td>
<td>0.117</td>
<td>2.8% (25)</td>
</tr>
<tr>
<td>Percentage of children with any respiratory symptom</td>
<td>17.4% (313)</td>
<td>17.1% (260)</td>
<td>16.1% (259)</td>
<td>13.5% (146)</td>
<td>0.007</td>
<td>19.8% (177)</td>
<td>18.0% (139)</td>
<td>17.3% (141)</td>
<td>15.0% (83)</td>
<td>0.022</td>
<td>15.1% (136)</td>
</tr>
<tr>
<td><strong>Girls</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Percentage of children with recent wheeze</td>
<td>15.6% (140)</td>
<td>14.7% (114)</td>
<td>13.1% (111)</td>
<td>9.6% (54)</td>
<td>0.001</td>
<td>12.4% (17)</td>
<td>11.0% (14)</td>
<td>9.9% (11)</td>
<td>5.6% (3)</td>
<td>0.043</td>
<td>12.1% (17)</td>
</tr>
<tr>
<td>Percentage of children with recent shortness of breath</td>
<td>8.2% (73)</td>
<td>8.1% (63)</td>
<td>9.1% (77)</td>
<td>9.4% (53)</td>
<td>0.304</td>
<td>5.0% (6)</td>
<td>5.9% (8)</td>
<td>5.5% (7)</td>
<td>3.7% (2)</td>
<td>0.008</td>
<td>3.5% (4)</td>
</tr>
<tr>
<td>Percentage of children with any respiratory symptom</td>
<td>23.8% (57)</td>
<td>37.3% (75)</td>
<td>21.6% (42)</td>
<td>11.1% (11)</td>
<td>0.011</td>
<td>25.0% (35)</td>
<td>31.9% (36)</td>
<td>23.1% (25)</td>
<td>3.7% (2)</td>
<td>0.008</td>
<td>22.0% (22)</td>
</tr>
</tbody>
</table>

Data are presented as percentages with number of positive responses in parentheses. In the study year 1997 information on sex was not available for one child. Due to missing observations, numbers do not always add up to total.

*Test for trend.

$X^2_{Mantel-Haenszel}$ for trend.
in asthma management was stressed, and might be viewed as an indication in favour of improved treatment.

Our data are consistent with recent reports from the UK and the US indicating no further increase in asthma visits since the early 1990s, and probably reflect improved asthma control. Diagnostic changes as well as changes in underlying prevalence have been thought to play a part in the increasing prevalence in asthma symptoms seen over the last decades. The decreasing prevalence found in the present study may likewise be the result of a number of opposing forces which cannot be disentangled here. Although improved identification and treatment of asthmatic children is a likely explanation for our results, the finding that the prevalence of wheezy children not using medication also declined may suggest that improved treatment alone does not explain the whole decrease. Also, among children not reporting wheeze in the past year, the prevalence of medication use remained fairly constant (4.8% in 1989 and 4.3% in 2001, p = 0.545).

The 2001 survey was conducted in the same standardised way as the three previous surveys, using the same study design and questionnaire. The study population consisted of all 8–9 year old children living in the study area, excluding age as a confounder. Selection bias is unlikely to explain our results, given the high response rates of more than 95% achieved in all surveys. However, questionnaire surveys may be subject to information bias.

In conclusion, the prevalence of recent wheeze has declined steadily since 1989 in school children living in the south-east of the Netherlands, with the decline being especially prominent in boys. The rising prevalence of medication use in symptomatic children over time may reflect better asthma control and may partly explain the concurrently decreasing trend in the prevalence of asthma symptoms in our study population.

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