ISAAC – Global epidemiology of allergic diseases

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on behalf of the ISAAC Study Group
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http://isaac.auckland.ac.nz

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The challenge

A fresh look was needed with a world population view
Rhinoconjunctivitis
Eczema
The ISAAC Programme

- ISAAC Phase One 1991 – 1998
- Phase One Ecological Analyses 1998 – 2002
- ISAAC Phase Two 2000 – 2004
- ISAAC Phase Three 2001 – 2005

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Global variations in asthma prevalence
ISAAC Phase One and Three

Methods

- Multicentre cross-sectional study of school children
- 13-14 year olds and 6-7 year olds
- Schools randomly sampled
- 3000 per age group per centre
- Simple core written questionnaires


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# ISAAC Phase Three (One)

## Global variation - world maps

<table>
<thead>
<tr>
<th></th>
<th>Countries</th>
<th>Centres</th>
<th>Participants</th>
<th>Response Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-14 year</td>
<td>97 (55)</td>
<td>233 (156)</td>
<td>798,685</td>
<td>88</td>
</tr>
<tr>
<td>6-7 year</td>
<td>61 (38)</td>
<td>144 (91)</td>
<td>388,811</td>
<td>85</td>
</tr>
</tbody>
</table>

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Definition of Symptoms of Severe Asthma

Wheezing in the past 12 months and at least one of:

- >4 attacks of wheeze
- >1 night per week sleep disturbance from wheeze
- wheeze affecting speech

ISAAC Phase Three  
*time trends* of asthma prevalence  
*7 year period (average)*

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<tbody>
<tr>
<td>13-14 year</td>
<td>55</td>
<td>104</td>
<td>298,080</td>
</tr>
<tr>
<td>6-7 year</td>
<td>36</td>
<td>64</td>
<td>185,891</td>
</tr>
</tbody>
</table>

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Change in Symptoms of Asthma
13-14 Year Age Group

Δ ≥1 SE Increase
□ No Change
▼ ≥1 SE Decrease


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How have environmental factors been studied in ISAAC?

1. ISAAC Phase One ecological analyses with centre or country data

2. ISAAC Phase Three environmental questionnaires with data reported by individuals
ISAAC Phase One ecological analyses:
What associations were found between symptom prevalence and environmental factors?

- Economic factors – *positive assoc. with GNP*
- Diet – *inverse assoc. with plant food*
- Immunisation – *inverse assoc. with DTP & M*
- Infection – *inverse assoc. with TB*
- Antibiotics – *no assoc.*
- Climate – *little assoc.*
- Indoor environment – *mixed effects of ETS*
- Outdoor allergens – *inverse assoc. with pollens*
- Outdoor air pollution – *little or no assoc.*
- Paracetamol – *positive assoc with sales*
Diet and asthma symptoms

ISAAC Phase One ecological analysis

Calories From Cereals and Rice (% of Total Energy Consumption)

Current Wheeze (%)

New Zealand
Canada
Chile
Mexico
Ethiopia


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<table>
<thead>
<tr>
<th>Factor</th>
<th>Odds Ratio (95%CI)</th>
<th>Multivariate analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibiotic use in the 1st year of life</td>
<td>1.70 (1.60-1.80)</td>
<td></td>
</tr>
<tr>
<td>Paracetamol use in the 1st year of life</td>
<td>1.46 (1.36-1.56)</td>
<td></td>
</tr>
<tr>
<td>Truck traffic in street of residence</td>
<td>1.35 (1.23-1.49)</td>
<td></td>
</tr>
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</table>

Country income and atopy
### Symptoms of Asthma, Lower Income vs. High Income Countries 13-14 yr olds

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Odds Ratio (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheeze in past 12 months</td>
<td>0.55 (0.42-0.72)</td>
</tr>
<tr>
<td>Symptoms of severe wheeze among wheezers in past 12 months</td>
<td>1.46 (1.21-1.75)</td>
</tr>
</tbody>
</table>


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ISAAC Phase Two Association of Wheeze in past 12 months & Skin Prick Test Reactivity

<table>
<thead>
<tr>
<th>Odds Ratio (95%CI)</th>
<th>Non-atopic wheezers in lower income countries</th>
<th>Atopic wheezers in lower income countries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.69 (0.53-0.90)</td>
<td>0.86 (0.55-1.35)</td>
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What's New?
Summary

- Large global variations in asthma prevalence, and environmental factors are important
- Asthma is increasing in prevalence in many populous countries, but is not in some high prevalence countries
- Inverse associations with plant based diet etc
- Positive associations with GNP, paracetamol, antibiotics, truck traffic
- In low and middle income countries the asthma reported is
  - more severe
  - less influenced by allergic sensitisation, and in non-atopic more protected by breastfeeding

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ISAAC has exploded these myths

1. A study of asthma and allergies in more than a few countries is not feasible

2. Asthma is a disease of English-language countries where it continues to increase

3. Asthma is rare in low and middle income countries

4. Asthma is rare in less hygienic environments

5. New genetics will explain asthma

6. Asthma is mainly due to atopy

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Thanks to

- Children
- Parents
- School staff
- Funders
- ISAAC collaborators