Asthma and allergies: Where in the world are we now?

Innes Asher
Department of Paediatrics: Child and Youth Health
The University of Auckland
Chair of the International Study of Asthma and Allergies in Childhood (ISAAC)

http://isaac.auckland.ac.nz
Ehara tāku toa i te toa takitahi ēngari he toa takimano e

*My strength is not mine alone, but that of many*
In This Lecture

1. ISAAC: The International Study of Asthma and Allergies in Childhood

2. Some commonly held beliefs – have they been changed by ISAAC?

3. What is happening in New Zealand?
International Study of Asthma and Allergies in Childhood
ISAAC studies three conditions

Asthma

Rhinitis

Eczema

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ISAAC – how did it start?
ISAAC Formed in 1991 From Two Initiatives

1. Does New Zealand have more severe asthma than other English speaking countries? (NZ asthma deaths and admissions were high)

2. Monitoring trends and underlying causes of asthma and allergies in childhood – following the fall of the Berlin wall. (genetically similar populations, different environments)

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Rationale of ISAAC

- Increasing concern about asthma and allergies.
- A fresh look was needed with a world population view – between populations rather than within populations.
- Most of world not yet studied – may add something.
- A standardised and coordinated approach was needed to obtain comparable worldwide data.
Few Centres With Information on Prevalence* of Asthma Symptoms in Children up to 1991

* Prevalence = how common it is
ISAAC: 306 research centres in 105 countries
Local collaborating centres

National coordinators

Regional coordinators

Steering Committee (IA Chair)

International Data Centre (Auckland)
Funders of The ISAAC Programme in New Zealand

- The Auckland Medical Research Foundation
- The Health Research Council of NZ
- The Asthma and Respiratory Foundation of NZ
- The National Child Health Research Foundation
- The Hawke's Bay Medical Research Foundation
- The Waikato Medical Research Foundation
- Glaxo Wellcome NZ, and International Medical Affairs
- Astra NZ
- Maurice & Phyllis Paykel Trust
- BUPA Foundation
- NZ Lotteries Commission
- The University of Auckland
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Asthma, rhinitis and eczema
Commonly held beliefs in 1991

- Diseases of only affluent western countries
- More severe in affluent than non-affluent countries
- On the increase in western countries
- Strongly associated with allergy
Asthma, rhinitis and eczema
Commonly held beliefs in 1991

- More allergen exposure is causing the high rates of asthma and rhinitis
- Air pollution is a key reason for high rates of asthma
- Genetics will explain differences in asthma rates
ISAAC – what did we do?
The ISAAC Programme

ISAAC Phase One 1991 – 1998
- Worldwide prevalence (questionnaires)
- ISAAC Phase One ecological analyses

ISAAC Phase Two 2000 – 2004
- Questionnaires & additional markers

ISAAC Phase Three 2001 – 2005
- Repetition of Phase One
- Addition of more centres
- Environmental questionnaire

© ISAAC 2011
ISAAC Methods: Phases One & Three

- Multicentre cross-sectional studies of children in randomly sampled schools.
- 13-14 year olds and optional 6-7 year olds.
- 3000 per age group per centre.
- Standardised validated simple written questionnaires (optional video asthma questionnaire in 13-14 year olds).


© ISAAC 2011
Similar, but these differences:

- Smaller number of children, centres and countries.
- 9-11 year old children.
- Addition of child contact modules including allergy skin prick tests and IgE.

ISAAC Methods: Phase Two

### How many took part?
**ISAAC Phase Three**

<table>
<thead>
<tr>
<th>Age Group</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</td>
<td>233</td>
<td>798,685</td>
<td>88</td>
</tr>
<tr>
<td>6-7 year</td>
<td>61</td>
<td>144</td>
<td>388,811</td>
<td>85</td>
</tr>
</tbody>
</table>

© ISAAC 2011
The Prevalence of Asthma Symptoms Between Populations

Current wheeze definition

Yes to:

“Have you (Has your child) had wheezing or whistling in the chest in the past 12 months?”
Definition of Symptoms of Severe Asthma

Current wheeze and at least one of:

- ≥4 attacks of wheeze
- ≥1 night per week sleep disturbance from wheeze
- wheeze limiting speech

ISAAC – what did we find?
Asthma, rhinitis and eczema: diseases of ONLY affluent western countries?
ISACC Phase Three

Wheeze in the Past 12 Months
13-14 Year Age Group

- ≥20%
- 10 to <20%
- 5 to <10%
- <5%

© ISAAC 2011
Asthma, rhinitis and eczema: diseases of ONLY affluent western countries?

NOT TRUE

© ISAAC 2011
Asthma, rhinitis and eczema: more severe in affluent than non-affluent countries?
Symptoms of Severe Asthma Among Current Wheezers 13-14 Year Age Group


© ISAAC 2011
Asthma, rhinitis and eczema: more severe in affluent than non-affluent countries? NOT TRUE
Asthma, rhinitis and eczema: on the increase in western countries?
Increase in Current Wheeze in School Children, 1973 - 1995

Change in Prevalence of Current Symptoms of Rhinocconjunctivitis, 13-14 Year Age Group

- ≥1 SE Increase
- Little Change
- ≥1 SE Decrease

Asthma, rhinitis and eczema:
on the increase in western countries?
PARTLY TRUE
Is air pollution a key reason for high rates of asthma?
<table>
<thead>
<tr>
<th>Exposure</th>
<th>Direction of Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air pollution</td>
<td>-</td>
</tr>
</tbody>
</table>

No relationship between air pollution and symptoms of asthma

What about trucks?
Current wheeze & truck traffic in street of residence “almost the whole day” vs “never” (13-14 yr olds)

Odds Ratio
1.35 (1.22-1.48)
Current wheeze & truck traffic in street of residence “almost the whole day” vs “never” (13-14 yr olds)

Odds Ratio
1.35 (1.22-1.48)
Is air pollution a key reason for high rates of asthma?

NOT TRUE

but truck traffic causes more asthma symptoms in some children

More study needed!
Which other environmental factors may influence how common asthma, rhinitis and eczema symptoms are in populations?
Current Wheeze and Gross National Income (GNI), 13-14 Year Age Group

## Current wheeze and tobacco consumption

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Direction of Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco (females)</td>
<td>↑</td>
</tr>
</tbody>
</table>

Smoking in pregnancy increases the risk of asthma in the child.
### Exposures in the child first year of life and symptoms (individual questionnaires)

<table>
<thead>
<tr>
<th>Exposures</th>
<th>Fully adjusted Odds Ratio (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibiotic use in the 1(^{st}) year of life</td>
<td>1.70 (1.60-1.80)</td>
</tr>
<tr>
<td>Paracetamol use in the 1(^{st}) year of life</td>
<td>1.46 (1.36-1.56)</td>
</tr>
</tbody>
</table>

Which dietary factors are important?
## Current Wheeze and Diet

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Direction of Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burger consumption</td>
<td>↑</td>
</tr>
<tr>
<td><em>Trans</em> fatty acids</td>
<td></td>
</tr>
<tr>
<td>Plant based foods</td>
<td>↓</td>
</tr>
<tr>
<td>Fresh fruit</td>
<td></td>
</tr>
<tr>
<td>Fresh vegetables</td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td></td>
</tr>
<tr>
<td>Mediterranean diet</td>
<td></td>
</tr>
</tbody>
</table>
## Protective Effect of Breastfeeding

<table>
<thead>
<tr>
<th>Countries</th>
<th>Current wheezers</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-allergic</td>
<td>Allergic</td>
<td></td>
</tr>
<tr>
<td>Low and middle income countries</td>
<td>protective</td>
<td>no effect</td>
<td></td>
</tr>
<tr>
<td>High income countries</td>
<td>no effect</td>
<td>no effect</td>
<td></td>
</tr>
</tbody>
</table>

Is more allergen exposure causing the high rates of asthma and rhinitis?
Lower rates of rhinitis with high pollen in centres

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Direction of Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollens</td>
<td>↓</td>
</tr>
</tbody>
</table>

Is more allergen exposure causing the high rates of asthma and rhinitis?

NOT TRUE
Asthma, rhinitis and eczema: strongly associated with allergy?
Association of Current Wheeze & Skin Prick Test Reactivity

Association of Current Wheeze & Skin Prick Test Reactivity
Association of Current Wheeze & Skin Prick Test Reactivity

Models of asthma causation (Neil Pearce)

Allergen exposure → Allergic tendency → Asthma, Rhinitis, Eczema

Source: N Pearce 2011
Models of asthma causation (Neil Pearce)

Allergen exposure

- Allergic tendency
- Asthma
- Rhinitis
- Eczema

Source: N Pearce 2011
Models of asthma causation (Neil Pearce)

Allergen exposure

Other exposures

Allergic tendency

Asthma

Rhinitis

Eczema

Source: N Pearce 2011
Asthma, rhinitis and eczema: strongly associated with allergy?

NOT STRONGLY
Is genetics explaining differences in asthma rates?
**Asthma and eczema genetics**

- Massive developments in genetics over 20 years
- Have completed genome-wide association and interactions studies (GWAS & GWIS)
- In largest study ever - 15 billion genotypes - very few associations found, none new
- None useful predictors of disease in individual people
- Findings explain only a fraction of the familial aggregation

- EXCEPTION is the fillaggrin gene mutations & eczema
Loci associated with IgE were not associated with asthma

Is genetics explaining differences in asthma rates?

NOT YET
Asthma, rhinitis and eczema
Commonly held beliefs in 1991

- Diseases of only affluent western countries – NOT TRUE
- More severe in affluent than non-affluent countries – NOT TRUE
- On the increase in western countries – PARTLY TRUE
- Strongly associated with allergy – NOT STRONGLY
Asthma, rhinitis and eczema
Commonly held beliefs in 1991

- More allergen exposure is causing the high rates of asthma and rhinitis – NOT TRUE
- Air pollution is a key reason for high rates of asthma – NOT TRUE but watch out for trucks......
- Genetics will explain differences in asthma rates – NOT YET
Further directions

- Asthma rhinitis and eczema symptoms are a big global problem, and the global burden is increasing – more research needed.

- Environmental factors are key, and we need to find out which matter most, especially in low and middle income countries.

- Understand the mechanisms of and influences on non-allergic asthma.

- Deliver good asthma, rhinitis and eczema management to all children with asthma in the world.

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ISAAC New Zealand Centres
All similar rates
Asthma symptoms in NZ among the highest in the world 13-14 Year Age Group

<table>
<thead>
<tr>
<th>Country</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand</td>
<td>26.3</td>
</tr>
<tr>
<td>Channel Islands</td>
<td>26.5</td>
</tr>
<tr>
<td>Republic of Ireland</td>
<td>26.7</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>27.3</td>
</tr>
<tr>
<td>Vietnam</td>
<td>29.5</td>
</tr>
<tr>
<td>Australia</td>
<td>30.6</td>
</tr>
<tr>
<td>El Salvador</td>
<td>30.8</td>
</tr>
<tr>
<td>Isle of Man</td>
<td>31.2</td>
</tr>
<tr>
<td>Liechtenstein</td>
<td>31.7</td>
</tr>
<tr>
<td>Marshall Islands</td>
<td>31.8</td>
</tr>
<tr>
<td>Macedonia</td>
<td>31.8</td>
</tr>
<tr>
<td>Morocco</td>
<td>32.1</td>
</tr>
<tr>
<td>Croatia</td>
<td>32.2</td>
</tr>
<tr>
<td>Cameroon</td>
<td>32.5</td>
</tr>
<tr>
<td>Pakistan</td>
<td>32.9</td>
</tr>
<tr>
<td>Russia</td>
<td>33.3</td>
</tr>
<tr>
<td>Mauritius</td>
<td>33.7</td>
</tr>
<tr>
<td>Chile</td>
<td>34.2</td>
</tr>
<tr>
<td>Namibia</td>
<td>34.5</td>
</tr>
<tr>
<td>Tonga</td>
<td>35.0</td>
</tr>
<tr>
<td>New Caledonia</td>
<td>35.0</td>
</tr>
<tr>
<td>Laos</td>
<td>35.3</td>
</tr>
<tr>
<td>Nepal</td>
<td>35.5</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>35.9</td>
</tr>
<tr>
<td>New Zealand</td>
<td>36.0</td>
</tr>
<tr>
<td>Singapore</td>
<td>36.3</td>
</tr>
<tr>
<td>Portugal</td>
<td>36.4</td>
</tr>
<tr>
<td>Colombia</td>
<td>36.6</td>
</tr>
<tr>
<td>Peru</td>
<td>36.8</td>
</tr>
<tr>
<td>Venezuela</td>
<td>37.1</td>
</tr>
<tr>
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<td>Colombia</td>
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</tr>
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</tr>
<tr>
<td>Bolivia</td>
<td>37.7</td>
</tr>
<tr>
<td>Tunisia</td>
<td>37.8</td>
</tr>
<tr>
<td>Canada</td>
<td>37.9</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>38.0</td>
</tr>
<tr>
<td>Barbados</td>
<td>38.1</td>
</tr>
<tr>
<td>Trinidad</td>
<td>38.2</td>
</tr>
<tr>
<td>Suriname</td>
<td>38.3</td>
</tr>
<tr>
<td>Ecuador</td>
<td>38.4</td>
</tr>
<tr>
<td>Perú</td>
<td>38.5</td>
</tr>
<tr>
<td>Panama</td>
<td>38.6</td>
</tr>
<tr>
<td>Santo Domingo</td>
<td>38.7</td>
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<tr>
<td>Tunisia</td>
<td>40.5</td>
</tr>
</tbody>
</table>
How common are symptoms of asthma in New Zealand?

<table>
<thead>
<tr>
<th></th>
<th>6-7 Yrs</th>
<th>13-14 Yrs</th>
<th>20–44 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheeze in the past year</td>
<td>22.2%</td>
<td>26.7%</td>
<td>25.9%</td>
</tr>
</tbody>
</table>

ECRHS. Eur Respir J 1996; 9, 687-95.
## Symptoms of asthma are reducing

<table>
<thead>
<tr>
<th></th>
<th>6-7 Yrs</th>
<th>13-14 Yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wheeze in the</strong></td>
<td>22.2%</td>
<td>26.7%</td>
</tr>
<tr>
<td><strong>past year</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ECRHS. Eur Respir J 1996; 9, 687-95.
Symptoms are higher and going up in Māori children and lower and going down in European.

- the gap is widening

<table>
<thead>
<tr>
<th></th>
<th>Maori</th>
<th>Pacific</th>
<th>European</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheeze in the past year</td>
<td>28.5%</td>
<td>25.2%</td>
<td>20.7%</td>
</tr>
</tbody>
</table>
# More severe asthma symptoms are more common Māori children

<table>
<thead>
<tr>
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<th>Maori</th>
<th>Pacific</th>
<th>European</th>
</tr>
</thead>
<tbody>
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<td>28.5%</td>
<td>25.2%</td>
<td>20.7%</td>
</tr>
<tr>
<td>≥4 wheezing attacks in the past year</td>
<td>9.3%</td>
<td>7.1%</td>
<td>6.8%</td>
</tr>
<tr>
<td>≥1 night waking from wheeze in the past year</td>
<td>17.1%</td>
<td>16.4%</td>
<td>12.1%</td>
</tr>
<tr>
<td>≥ 1 wheeze affecting speech in the past year</td>
<td>6.2%</td>
<td>5.1%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Asthma ever</td>
<td>38.8%</td>
<td>26.4%</td>
<td>29.0%</td>
</tr>
</tbody>
</table>

He Mate Huango: an update on Maori asthma

LIS ELISON-LOSCHMANN
NEIL PEARCE

Abstract

In 1990, a Ministerial Review to consider asthma among Maori people was undertaken following concern about disproportionate mortality and morbidity rates from asthma in Maori compared with non-Maori. Findings from the Maori Asthma Review included: an increase in cost of health care, increased hospitalisation costs, increased patient education, use of asthma management plans, and greater Maori participation in the planning and delivery of asthma services and asthma education. Alongside this, a significant and complex issue was highlighted regarding Maori not accessing asthma services and asthma resources, the result of which was reflected in worse severity asthma and higher hospital admission rates and death rates. The Review made a number of recommendations focused on a need for substantial improvements in asthma management and asthma education, with the significant involvement of Maori people.

This paper reviews the work and conclusions of the Maori Asthma Review and considers what developments have been made in research and policy since then.

A literature review was undertaken examining asthma prevalence studies and asthma mortality and morbidity data among Maori since the Maori Asthma Review was completed. Health policies and relevant government health initiatives were examined to assess the policy outcomes resulting from the findings and recommendations of the Review.

The findings indicate that asthma prevalence remains similar between Maori and non-Maori children but asthma severity is greater in Maori children. Both prevalence and severity of asthma are greater in Maori than in non-Maori adults. Funding of health services in New Zealand have undergone dramatic changes since the introduction of the health reforms in 1990. These changes have affected the development and implementation of asthma services to Maori at both local and national levels. The planning and development of asthma services will continue to be hindered by lack of dedicated and ongoing funding, which is necessary, to ensure long-term planning and implementation of asthma services to Maori can take place.

Introduction

The purpose of this paper is to review the work and conclusions of the He Mate Huango: Maori Asthma Review and to consider what developments have been made in research and policy on asthma in Maori since that time. Recent data regarding asthma prevalence and asthma morbidity among Maori is presented along with discussion on one of the critical areas raised by the Review, that of access to asthma services and education resources. While asthma remains a major cause of both acute and long-term morbidity in Maori people, issues concerning access to services must be addressed if improvements in this critical area of Maori health is to be made.

The Maori Asthma Review was undertaken in 1990 because of concerns brought to the attention of the then Minister of Maori Affairs, Hone Kora Whnero, over a range of asthma health issues. It was noted that there was an excessive number of deaths from asthma among Maori people and that many required hospital treatment, even though current evidence at the time, suggested asthma was no more common in Maori than Pakeha. There were problems in the management of asthma in Maori, major difficulties in getting expert help when it was required, and a serious lack of readily available, clear information about asthma.
Addressing the Inequalities in NZ

What have we done to try to make some improvements?

- Paediatric asthma guideline discussed some issues.
- More Maori and Pacific health providers.
- Pharmac/BPAC working to lower reliever:preventer prescriptions in Maori and Pacific (‘Space to breathe’).
What needs to be done?

● Address the root disparities in the underlying influences on health through government policy. – see www.cpag.org.nz

● Address all the recommendations of He Mate Huangō 1991 including
  • Reduce cost of doctors visits and prescriptions
  • Improve housing
ISACC, The International Study of Asthma and Allergies in Childhood, is a unique worldwide epidemiological research programme established in 1991 to investigate asthma, rhinitis and eczema in children due to considerable concern that these conditions were increasing in western and developing countries.

ISACC has become the largest worldwide collaborative research project ever undertaken, involving more than 100 countries and nearly 2 million children and its aim is to develop environmental measures and disease monitoring in order to form the basis for future interventions to reduce the burden of allergic and non-allergic diseases, especially in children in developing countries.

The ISACC findings to date have shown that these diseases are increasing in developing countries and that they have little to do with allergy, especially in the developing world. Further population studies are urgently needed to discover more about the underlying mechanisms of non-allergic causes of asthma, rhinoconjunctivitis and eczema and the burden of these conditions.

**ISACC 20 Year Anniversary Symposium**

The International Study of Asthma and Allergies in Childhood (ISACC) celebrated its 20 year anniversary with a one day international symposium on asthma, eczema, rhinitis and the environment on 27 Jan 2011, in Auckland, New Zealand. Speakers notes are now available on the website.

[Download slides]

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**Phase Three Data**

The ISACC Phase Three summary data is now available on the ISACC website

[View]

**ISACC Tools**

ISACC questionnaires and tools have now been collated on one page for ease of use

[View]

**ISACC Publications**

Our user friendly publications page is regularly updated with the latest ISACC publications.

[View]
ISAAC 20 year Anniversary Symposium
Asthma, eczema, rhinitis and the environment
Auckland, New Zealand
Thursday 27 January 2011

The International Study of Asthma and Allergies in Childhood (ISAAC) Steering Committee with The University of Auckland and Massey University hosted this international symposium on asthma, eczema, rhinitis and the environment 20 to celebrate the 20th anniversary of the ISAAC study. Members of the ISAAC Steering Committee gave illuminating talks on recent research and findings in these fields. The symposium was opened by Hon. Tariana Turia, Associate Minister of Health. View Speech

Selected speakers presentations are available to download below.

For more details on topics and speakers, download the programme.

Guest Speakers

Professor Innes Asher  
- New Zealand

Professor Hywel Williams  
- United Kingdom

Professor Nadia Ait-Khaled  
- Africa

Topic: ISAAC
The International Study of Asthma and Allergies in Childhood - what have we learned?
Download notes
Notes + Audio (wmv file)
Audio only .mp3 | .ogg

Topic: What is new for children with eczema?
Download notes
Notes + Audio (wmv file)
Audio only .mp3 | .ogg

Topic: Access to asthma drugs in resource poor countries
Download notes
Notes + Audio (wmv file)
Audio only .mp3 | .ogg

Professor Neil Pearce  
- New Zealand

Professor Nadia Ait-Khaled  
- Africa

Dr Sunia Foliaki  
- Tonga

Dr Lisa Ellison-Loschmann  
- New Zealand
Thanks to children, parents, school staff, ISAAC staff and collaborators, funders

http://isaac.auckland.ac.nz