Asthma Disparities: A Global View
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SLIDE 1

Tēnā koutou katoa.

Kei te mihi ahau ki ngā tāngata whenua.

SLIDE 2

I am from New Zealand.

In Maori language I have acknowledged the indigenous people of America.

I am enjoying being in ‘Nawlins’ for the first time. I wish to honour the courage of all those affected by Hurricane Katrina.

Thank you for your invitation to speak today.

I will be speaking on behalf of the ISAAC research programme which has provided the first global data on asthma in children.
Disparities are great differences

In this talk I will use ISAAC data to illustrate global disparities in prevalence of asthma symptoms.

And I will examine associations of asthma symptoms with:

- Country income and income inequality;
- Environmental factors;
- Atopy.

ISAAC is a global research programme. It was founded because of increasing concern about asthma and rhinitis and eczema.

Today I will be presenting findings only for asthma.

There has been huge worldwide interest in ISAAC, especially from developing countries where these conditions are becoming significant health issues, even though infectious diseases remain the most important.

The total participation in ISAAC to date – all 3 phases – has involved 423 centres in 105 countries and nearly 2 million children.
SLIDE 5

The ISAAC programme has had three phases so far – Phase One, Phase Two and Phase Three. The dates of data collection are given here.

In this talk I will summarise some key findings from each of these Phases.

I will start with Phase Three.

SLIDE 6

Phase Three, like Phase One, was a multicentre cross-sectional study, selecting children from randomly sampled schools.

Two age groups were studied:

- 13-14 year olds, and 6-7 year olds (optional).
- 3000 per age group per centre.
- Simple standardised, validated written questionnaires, and an optional video questionnaire on asthma symptoms in 13-14 year olds.
SLIDE 7

This shows participation in Phase Three.

There was an amazing number of centres and countries which took part, with a high response rate of the children.

SLIDE 8

Firstly, Disparities in prevalence.

In this talk the asthma symptom I will be talking about is ‘current wheeze’. This is defined as a positive answer to this question:

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

SLIDE 9

Now for some key results.

I will show several maps with this format.

For brevity I will be showing results only for the written questionnaire for 13-14 year olds.
SLIDE 10

Europe is shown in an expanded scale.

Each symbol is a centre.

For most centres there had been no prevalence data before ISAAC began.

The key at bottom left shows the range of prevalence of current wheeze for each centre.

There were striking variations in the prevalence between different geographic areas and populations – 9 fold differences between countries.

SLIDE 11

Centres with the highest prevalence values – the red stars – were found as indicated by the large red circles; mainly in New Zealand and Australia, the UK, parts of Central and South America and in the USA, Seattle, and Chapel Hill.
Centres with the lowest prevalence values – the blue squares – were found as indicated by the large blue circles – in Asia, India, Eastern Mediterranean and Southern Europe.

Other centres were of intermediate prevalence levels.

Similar patterns of prevalence were also found with the video questionnaire in 13-14 year olds, and also with the written questionnaire in 6-7 year olds.

Such large world wide variations in the prevalence of asthma symptoms, many in populations of similar genetic stock, suggest that environmental factors play a key role.

I will now turn to symptoms of severe asthma. These were defined as follows.
The map shows those children with symptoms of severe asthma among current wheezers.

It has a similar format to the previous maps, but the key has a different range.

The red stars are prevalence values > 50% and the blue squares < 30%.

You can see that the centres with the highest proportion of severe wheezers among current wheezers were found mainly in lower and middle income countries – as shown in the large red circles – the Pacific, Asia, India, Africa, eastern Mediterranean, parts of Latin America.

In Phase Three we were able to examine changes in prevalence over time – prevalence in Phase One, then in Phase Three on average 7 years later.

We achieved this comparison in 104 centres in 55 countries.

For most centres it was their first opportunity to obtain time trends information.
The key here is different.

The red triangles indicate an increase in prevalence of at least 1 standard error.

The blue triangles indicate a decrease in prevalence of at least 1 standard error.

And the grey squares indicate no change.

**SLIDE 17**

We had expected prevalence would continue to increase in the high prevalence English language countries, but this was not the case.

They changed little or even decreased.

There were increases in asthma symptom prevalence in locations of high population density such as Africa, Latin America and parts of Asia. This new data indicates the surprising finding that the global burden of asthma is continuing to rise, and at the same time the global disparities are lessening.

**SLIDE 18**

Do country income and inequality influence disparities?
We undertook this ecological analysis with ISAAC Phase Three data. Each dot is a country.

Gross National Income per capita is on the x axis, with high income countries having incomes greater than about 10,000 US dollars.

As GNI increases, so does the prevalence of current wheeze.

You can see that most ISAAC centres were in low and middle income countries.

This shows similar data, but this time the y axis is the proportion of severe wheezers among children with current wheeze.

The trend is reversed.
SLIDE 21

This recent publication written by Richard Wilkinson and Kate Pickett describes the far-reaching effects of income inequality on indicators of societal health and well being.

The measure of income inequality used was the ratio of the income share of the richest 20% of country population to the poorest 20%.

SLIDE 22

And is shown on the X axis here.

The higher number, the more income inequality there is within the country.

SLIDE 23

Which environmental factors may explain disparities in asthma symptoms?
SLIDE 24

Firstly we undertook ecological analyses with Phase One data.

This table summarises our findings.

Four factors showed a positive association with current wheeze.

Five showed a negative association. These are potentially protective factors.

And three showed no association.

SLIDE 25

We explored many of these factors further in ISAAC Phase Three. For the first time we now have individual questionnaire data on environmental exposures.

These data shown here are for 6-7 yr old children.

To date three analyses have been published. We have found a positive association between current wheeze and reported antibiotic use, paracetamol use, truck traffic exposure. These findings all need further investigation.
SLIDE 26

Does atopy influence disparities in asthma symptoms?

Although asthma in children is commonly described as an atopic disease, there is mounting evidence that many children with asthma do not have an atopic constitution.

SLIDE 27

The role of atopic sensitization in determining asthma prevalence in children was explored in ISAAC Phase Two.

ISAAC Phase Two:

- Multicentre cross-sectional study of school children in randomly sampled schools.
- 30 centres in 22 countries. A smaller number of centres took part because of the intensity of the measurements.
- Participants were 9-11 year olds.
- 1000 per age group per centre.
- Simple core written questionnaires.
- Child contact assessments including atopy.

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SLIDE 28

In this analysis the skin prick test reactivity was used as the measure of atopy.

This shows odds ratios for skin prick test reactivity on current wheeze.

The centres in affluent countries are above the line and non-affluent below.

SLIDE 29

The effect size for affluent was...

SLIDE 30

About double that of non-affluent countries, which is where most of the world’s children live.
In a more recent analysis from ISAAC Phase Two, any breastfeeding was associated with less wheeze in countries of all income levels.

This shows Odds ratios and 95% CIs for four categories. The only significant finding was for non-atopic wheeze in low and middle income countries where the effect size was the greatest.

Most research to date on atopy and asthma has been done in high income countries where atopy may be a more important determinant, to the detriment of exploration of the non-atopic mechanisms of asthma. This result illustrates where future research should focus.
SLIDE 33

- There are large global disparities in prevalence of asthma symptoms, and these are lessening.
- There is increasing prevalence in many populous countries – the global burden is increasing.

SLIDE 34

Country Economic Influences:

- Positive associations with GNI and income inequality.
- In less affluent countries, asthma symptoms are more commonly severe.

Environmental Factors

- Several associations – inverse (protective) and positive (risk) – warrant further exploration. Loss of protective factors may be as important as addition of risk factors.

SLIDE 35

Influence of Atopy:

- Less effect in low and middle income countries.
- Protective effect of breastfeeding only for non-atopic wheeze in low and middle income countries.
We need to:

● Understand the influences of income inequality;
● Seek the key environmental factors in low and middle income countries;
● Understand the mechanisms of and influences on non-atopic asthma; and
● Delivering good asthma management to all children with asthma in the world.

I would like to thank the children, parents, school staff, funders, ISAAC staff and collaborators.

This is our website.

Thank you.