

# The relationship between *asthma* and *outdoor air pollution* among primary school learners in Durban, South Africa

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## **Collaborators**

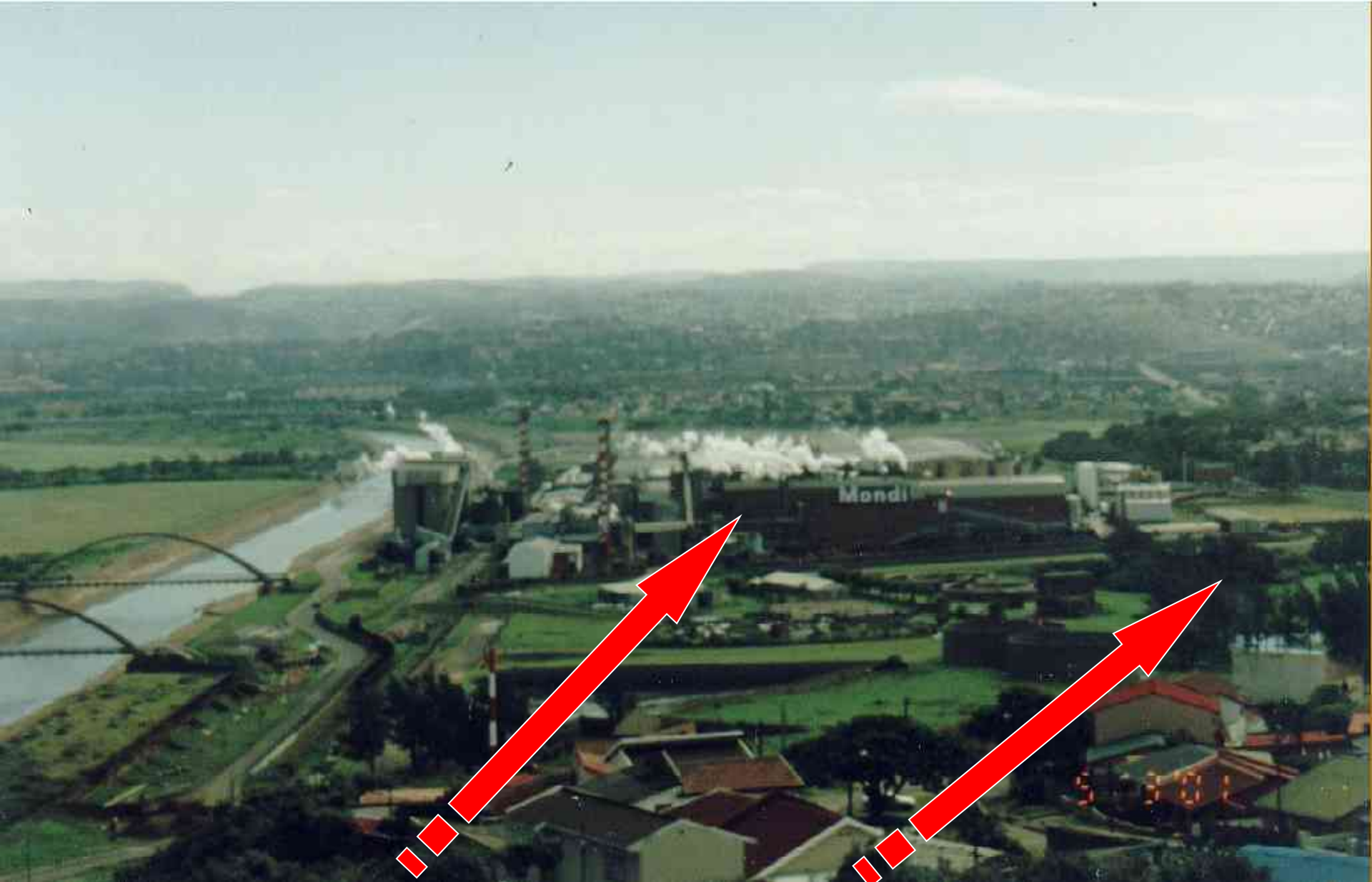
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**Refinery**  
**with community residences (back and front)**



**Paper Mill and Sewage Works with  
community residences (back and front)**

# Aims

- To determine the **prevalence of asthma** among learners from Grades 3 and 6 at Settlers Primary School, South Durban
- To investigate whether **outdoor air pollutant concentrations** of  $\text{SO}_2$ ,  $\text{NO}_x$ ,  $\text{O}_3$ , TRS, CO and  $\text{PM}_{10}$  are associated with **increased symptoms of asthma** in the study population.



**Settlers Primary School**



# Study Design

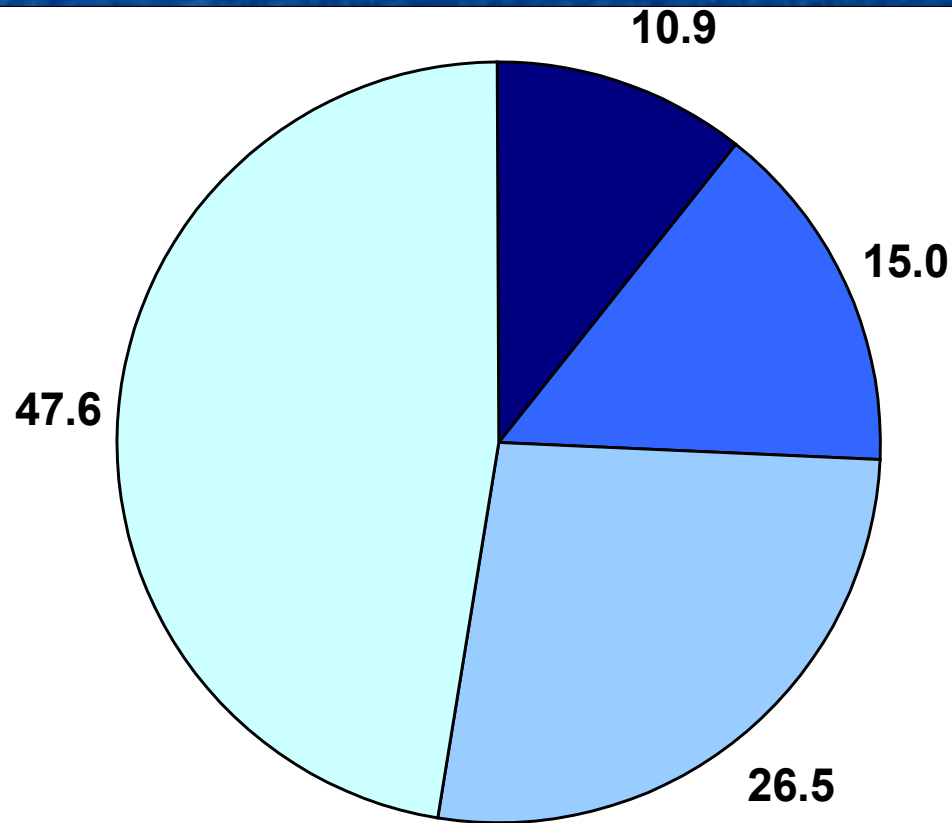
- **Interview of child and caregiver**
- **Lung function testing:** including methacholine challenge and exhaled nitric oxide tests
- **Three week intensive data collection:**
  - Exposure monitoring
  - Bihourly peak flow recordings
  - Bihourly symptoms and activity checklist
  - Daily diaries

# Statistical Analysis

- **Descriptive statistics**
  - Asthma severity
  - Symptoms from diaries and bihourly logs
- **Linear and logistic regression models looking at relationship of exposures to health status**
  - lag effects (prior day or prior 48 hours)
  - asthma status as an effect modifier

# Results

Percentage of asthma severity from parent baseline interview among students in grades 3 and 6, Settlers School, South Durban



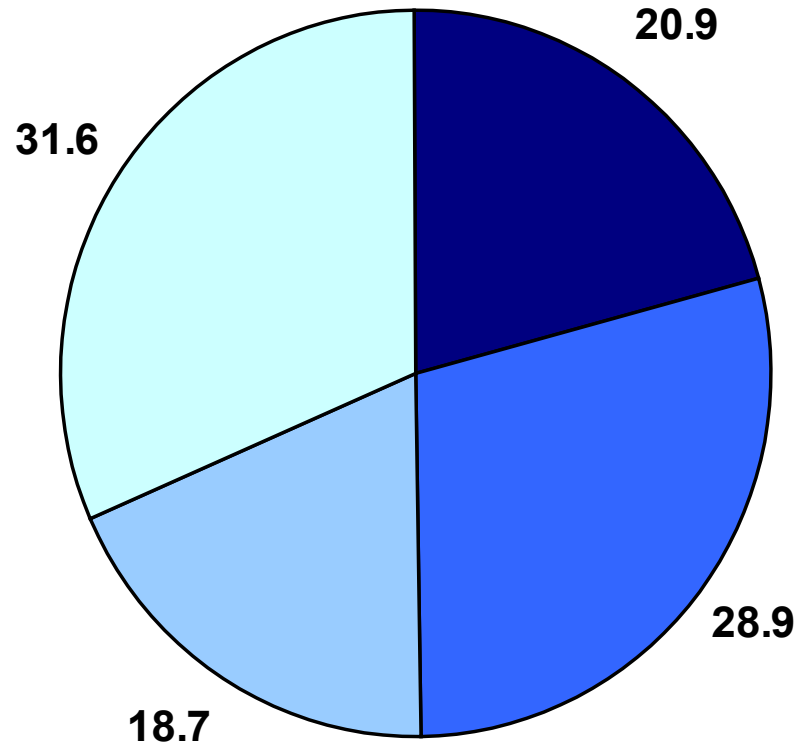
■ Moderate to severe asthma

■ mild persistent

■ mild intermittent

■ none

# Percentage of methacholine challenge test results among students in grades 3 and 6, Settlers School, South Durban



Degree of Airway Hyperreactivity

■ marked

■ probable

■ possible

■ none

# Summary of Air Pollutant Levels at Settlers School

Measure	SO <sub>2</sub> (ppb)	TRS (ppb)	CO (ppm)	NO <sub>x</sub> (ppb)	PM <sub>10</sub> + (µg/m <sup>3</sup> )	PM <sub>10</sub> * (µg/m <sup>3</sup> )
<b>24-hr average</b>						
Average	8.2	9.0	0.9	26.5	28.8	35.9
Median	7.3	8.3	0.9	26.6	26.5	36.0
Maximum	19.7	13.7	1.4	49.7	55.2	68.0
<b>15-min peak</b>						
Average	51.9	36.8	2.6	118.0	85.6	-
Median	53.5	20.8	2.5	118.6	76.1	-
Maximum	93.5	131.7	4.7	226.4	193.2	-

+ from TEOM

\*from gravimetric filter (Partisol)

# **PM<sub>10</sub> and SO<sub>2</sub>**

**showed more consistent and  
stronger associations  
with health effects  
than any of the  
other pollutants**

- **Asthma signs and symptoms take approx 24 – 48 hours to fully develop after exposure**
- **Prior day  $SO_2$  – strong influence on wheeze**
- **Prior day  $PM_{10}$  – chest tightness and shortness of breath**

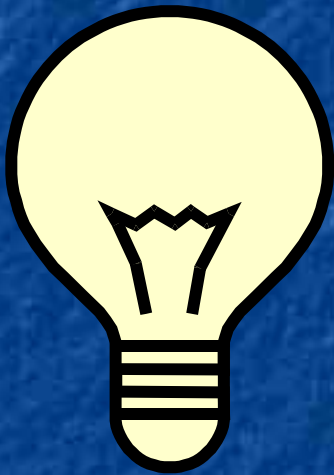
# Conclusion

- 52% learners (129 / 248) with known or probable asthmatics (Parent Q)
- 69% learners (171 / 248) have airway hyperreactivity
- Participants socio-economic background
- Proximity of polluting industries

ISAAC:  
Global and regional comparisons of asthma prevalence in adolescents aged 13-14 years  
  
(Ehrlich, 2002)

Region	Asthma Prevalence (%)
<b>Settlers Primary</b>	<b>52.4</b>
<b>Australia</b>	<b>28.2</b>
<b>UK</b>	<b>20.7</b>
<b>North America</b>	<b>16.5</b>
<b>Latin America</b>	<b>13.4</b>
<b>Cape Town</b>	<b>13.3</b>
<b>Western Europe</b>	<b>10.3</b>
<b>India</b>	<b>4.5</b>
<b>Northern &amp; Eastern Europe</b>	<b>4.4</b>
<b>Global average</b>	<b>11.3</b>
<b>Africa (excl SA)</b>	<b>9.1</b>

# Recommendations



- Improving quality of life for the asthmatic
- Improving the treatment of asthma
- Improving air quality

# Acknowledgements

- **Settlers School community**
- **All collaborators**
- **Funders**

***Thank you***