

THE HUNTER-ILLAWARRA STUDY OF AIRWAYS AND AIR POLLUTION: REFINING THE PROCESS

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This article describes pilot studies and reports initial results from the Hunter-Illawarra Study of Airways and Air Pollution (HISAAP). HISAAP aims to examine the relationship between the occurrence of cough, wheeze and colds in children, and indicators of exposure to indoor and outdoor air pollution and aeroallergens.

HISAAP arose from longstanding community concerns about the health effects of air pollution in the Hunter and Illawarra areas. These areas have similar types of heavy industry and share relatively high levels of particulate and sulphur dioxide air pollution in residential areas in close proximity to industrial sites. HISAAP is part of the NSW Health Department's Health and Air Research Program (HARP), which was initiated as a consequence of the NSW Air Quality Summits.

The objectives of HISAAP were to determine whether children:

- living in areas with high levels of air pollution have more lung problems (cough, wheeze, colds) than children living in areas with low levels of air pollution;
- have episodes of lung problems more often on days when air pollution levels are high than on days when levels are low; and
- have lung problems more often in response to air pollutants or aeroallergens in outdoor air than in indoor air.

METHODS

HISAAP comprises three phases which correspond to its three objectives.

- Phase I was a cross-sectional survey of respiratory and atopic symptoms in primary school children, other family members' symptoms, and the children's home environments.
- Phase II follows a cohort of children who reported frequent and recent lung symptoms. These children will keep a diary over a seven-month period, noting symptoms, peak flow measurements, treatment, time off school and visits to the doctor or hospital. These daily records will be compared with daily measurements of air pollution and pollens in each of the study areas.
- Phase III involves a clinical assessment of a smaller group of children from Phase II and detailed indoor air quality measurements.

This article focuses on a pilot study of Phases I and II, and presents some of the findings from Phase I.

The study was conducted in:

- three localities near heavy industry in the Hunter (Mayfield, Stockton and North Lake Macquarie);
- one locality near heavy industry in the Illawarra (Port Kembla);
- two localities further from heavy industry in the Hunter (Wallsend and Beresfield); and
- three localities progressively further from heavy industry in the Illawarra (Wollongong, Kembla Grange and Albion Park).

These localities were chosen because they were the sites of existing air quality monitoring stations, operated either by industry or the Environment Protection Authority.

All primary schools within a radius of about 3km of these monitoring sites were approached to be involved in the study. Children who were attending these schools in years 3, 4 and (from small schools) year 5 were given a questionnaire to take home for their parents to complete.

An important feature of HISAAP is its use of multiple study localities in the two areas, with several high-exposure localities and localities which provide a gradient of exposure intensity. This increases the statistical power to detect a relationship and promotes the general application of the results.

PILOT STUDIES

Pilot studies of Phase I and Phase II were carried out in both areas. This provided an opportunity for testing the questionnaire that was developed for the study, and enabled team members to gain experience in managing a cohort of children who were keeping symptom diaries over two months.

The diversity of cultural backgrounds found in the Illawarra was specifically addressed in the pilot program. In some schools in the Illawarra, more than half of the children's parents speak a language other than English as their first language. The pilot helped to solve problems in the translation of questionnaires and the use of interpreters to assist in their completion.

In the pilot study of Phase I response rates differed between the Illawarra (82 per cent) and the Hunter (74 per cent). An investigation of this difference revealed the Illawarra team had spent much more time establishing rapport with the teachers at the pilot school while the Hunter team had communicated mainly with the school principal.

The pilots emphasised the need for detailed written protocols to ensure consistent procedures across both areas. These included uniform procedures for the diary-keeping component of Phase II and clear criteria for intervention if a child was found to be (or became) unwell during the study.

Outcomes of the pilots

As a result of the pilots, the approach to each school was modified. Initially, the study team met the school principal to explain the study and gain consent for the school to be involved. At this meeting appointments were made to meet

teachers at the school (often at a staff meeting) and also the school council or parents and friends groups. Ideally, these meetings occurred before the questionnaire was sent home with the children.

Only minor changes to the questionnaire were required; and while only a few changes were made to the diary as a result of the pilot, the demands on researchers' time for enrolling children in the study and following them up fortnightly provided essential insights for the effective planning of Phase II.

The investigators made contact with the mass media (print, radio and television) before the study began. The investigators explained the aim of the study, indicated how long it would take to complete and discussed the obligations of the study team to participating families and schools. These included a recognition that it was important for participants to receive results from the study team, rather than through the media (a responsibility acknowledged and respected by the media). Regular contact was maintained and media releases were made after the results were presented to the schools. Where possible, the timing and content of the releases was coordinated between the Illawarra and the Hunter.

In summary, the pilot studies showed the importance of communicating with teachers and parents before the survey began. This improved the profile of the study and contributed to the high response rate. Regular feedback of results was provided to the participating families and schools, parent and community groups, other interested groups (EPA, industry) and the media. The communication effort was demanding but the response was rewarding.

PHASE I RESULTS

Eighteen schools in the Hunter and 17 schools in the Illawarra participated in the study. About 1,500 primary school children in each region were given questionnaires in the fourth term of 1993. In the Hunter 1,284 questionnaires were returned (82 per cent) and in the Illawarra 1,056 questionnaires were returned (72 per cent). No attempt was made to take account of migration effects which might have occurred as a result of people developing symptoms and moving out of one area and into another.

Asthma diagnosis

The proportions of primary school children ever diagnosed with asthma by a doctor or at a hospital were generally higher in the Hunter study localities than those in the Illawarra (Figure 2). Factors to be considered in this comparison include the community's use of doctors or hospitals (for the diagnosis to be made) and the variability between doctors in their readiness to make a diagnosis of asthma.

Four or more episodes of wheeze in the previous 12 months

The question about episodes of wheeze in the previous 12 months was asked before the asthma questions and no distinction was sought on the basis of the presence or absence of a diagnosis of asthma. In the Hunter, the proportion of children who reported four or more episodes of wheeze was higher in the localities closer to heavy industry (Figure 3). This observation may be confounded by the use of medication and other environmental factors and may also be subject to recall bias. The overall proportion of children

FIGURE 2

PERCENTAGE OF CHILDREN EVER DIAGNOSED WITH ASTHMA BY AREA
HISAAP 1993

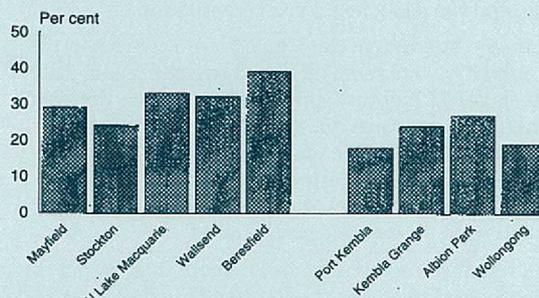
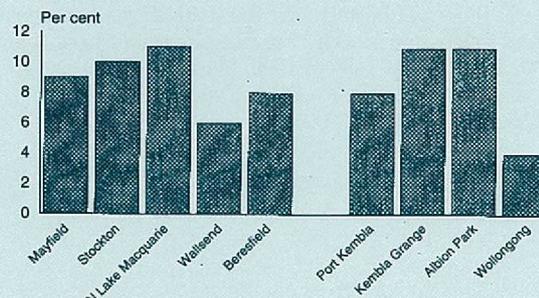


FIGURE 3

PERCENTAGE OF CHILDREN WITH 4 OR MORE EPISODES OF WHEEZE IN THE LAST 12 MONTHS, BY AREA
HISAAP 1993



reporting four or more episodes of wheeze was similar to that found in a Melbourne study (about 9 per cent of children).

Adult(s) smoking cigarettes inside the home

Relatively high proportions of children lived in households where one or more adults smoked cigarettes inside the home (Figure 4). This is an important factor when trying to interpret any of the findings of this study relating to children's symptoms^{1,2}.

Domestic gas appliances

The proportions of children who lived in a home where gas was available for cooking varied greatly, especially between Mayfield and Beresfield (Figure 5). Domestic gas appliances, gas stoves and heating appliances can contribute nitrogen oxides to the indoor environment which have the potential to affect airways^{3,4}. The survey did not explore the use of gas appliances or the conditions under

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which they were used, e.g. whether they were flued to the outside, and the adequacy of cross-ventilation.

In summary, children in the Hunter localities closest to heavy industry were more likely to have had frequent wheeze in the 12 months before the survey, but were not more likely to have been diagnosed with asthma. Other factors that may influence lung symptoms in children (e.g. gas appliances, cigarette smoking inside the home, pets, and house dust mite) could vary between the study areas and need to be considered.

Of children diagnosed with asthma, more than 30 per cent had a written plan of what to do when they had an episode of asthma. This represented a big improvement from the 1990 National Asthma Campaign survey, which reported that only 20 per cent had a plan⁵.

NEXT STEPS

A more detailed analysis of Phase I data is being done to take these other causative factors, including air pollution measures, into account.

Children taking part in Phase II were split into two groups. Those in Phase IIa kept diaries from February to October 1994, and those in Phase IIb started their diaries in August 1994 and finished in March 1995. Results from Phase II are likely to be available early in 1996. Planning of Phase III, which examines indoor air pollution and specific clinical variables, is in progress.

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FIGURE 4

PERCENTAGE OF CHILDREN IN A HOUSEHOLD WHERE ONE OR MORE ADULTS SMOKE CIGARETTES INSIDE THE HOUSE, BY AREA HISAAP 1993

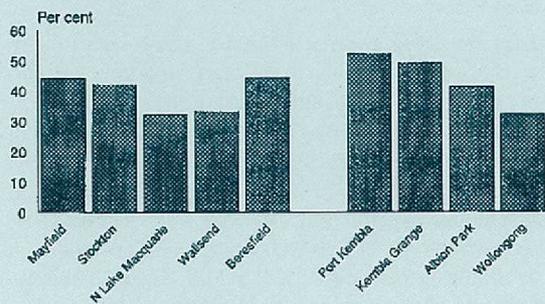


FIGURE 5

PERCENTAGE OF CHILDREN IN A HOUSEHOLD WITH GAS COOKING, BY AREA HISAAP 1993

