COMMISSION OF THE EUROPEAN COMMUNITIES
Directorate-General for Science, Research and Development
Directorate-General for Employment, Social affairs and Education

ENVIRONMENTAL RESEARCH PROGRAMME

REPORT
on the
EC EPIDEMIOLOGICAL SURVEY ON THE RELATIONSHIP BETWEEN AIR POLLUTION AND RESPIRATORY HEALTH IN PRIMARY SCHOOL CHILDREN

BRUSSELS, DECEMBER 1983

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REPORT ON THE EC EPIDEMIOLOGICAL SURVEY ON THE RELATIONSHIP BETWEEN AIR POLLUTION AND RESPIRATORY HEALTH IN PRIMARY SCHOOL CHILDREN

Edited by

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PREFACE

This report summarizes the results of a pioneering collaborative venture between Member States of the European Community in the field of epidemiology, which has been conducted within the framework of the Environmental Research Programme.

Every effort has been made to ensure maximum trans-frontier collaboration on the "Epidemiological Survey on the Relationship between Air Pollution and Respiratory Health in Primary School Children". The twenty-six participating institutes and the very many scientists from the various countries who have collaborated on the project are to be thanked for their willing cooperation and invaluable assistance.

Apart from its positive aspects, this report highlights the numerous practical problems to be faced when undertaking epidemiological studies across national boundaries and cultures. In fact, the complexity of this international survey and the consequent necessity to ensure data comparability have resulted in some unavoidable delay in publication.

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SUMMARY

This epidemiological survey undertaken within the framework of the European Community Environmental Research Programme was carried out in 1975. It was the direct consequence of the call for a scientific evaluation of the health effects of pollutants and the establishment of dose-response relationships laid down in the Environmental Action Programme of the Community. A Directive setting limits and guide values for atmospheric particulates and sulphur dioxide (SO_2) was recently adopted by the Council of Ministers (OJ L 229, 30.08.80) following a proposal made by the Commission in 1976 (OJ C 63, 19.03.76).

The aim of the study, carried out in 19 geographical areas of the European Community (in Belgium, France, FRG, Ireland, Italy and the United Kingdom) was to determine the effects of atmospheric particulates and SO_2 on the health of primary school children.

A number of primary schools were chosen in each of the 19 areas and all children aged 6-11 years in the selected schools were considered eligible for the study. Data was obtained on 22,337 children.

The health status of the children was assessed from answers to an interviewer administered questionnaire on respiratory symptoms and illness. Other questions sought information on demographic variables, on the home circumstances and the occupational and educational background of the childrens' parents or guardians. Height, weight and peak expiratory flow rate (PEFR) (as measured with Wright peak flow meters) were also determined.

Air pollution data were collected from monitoring stations where these were sited according to criteria laid down in the protocol; in a few instances additional monitoring stations had to be installed. As it became clear that the monitoring stations were unlikely to produce comparable results because of the use of several different measuring methods and the lack of an overall standardizing system, a set of 20 identical monitoring stations was placed beside existing monitors. The data from these stations were used to calculate conversion factors for the readings from the local monitors to take into account the differences in technique.

Local fieldworkers were recruited in each area. One from each area was trained centrally in the use of the questionnaire and the physical measurements. These fieldworkers returned to their own areas and trained the remaining fieldworkers. A team of six check measurement fieldworkers were also trained centrally and then tested for comparability. Their job was to obtain check measurements during the fieldwork to determine how comparable the measurements were from one team of local fieldworkers to another.

The results are presented in three parts. The first gives a descriptive analysis of the epidemiological data. The symptoms were analysed individually and as a composite variable called chronic non-specific lung disease (CNSLD) which included any positive answer to the presence of cough, unusual breathlessness, or wheeze. Prevalence rates are given according to several factors associated with respiratory illness which include age, sex and cigarette smoking in the home. Other descriptive analyses are included for socio-economic and demographic characteristics and for height, weight and peak expiratory flow rate (PEFR). In general all measured variables showed considerable variation between areas. Children with symptoms in all areas tended to have lower PEFRS than those without symptons. This relation was most consistently found for CNSLD.

The second part addresses the air pollution variables and discusses the details of the corrections used in the attempt to normalise the measurements obtained from the local measuring stations. Included there is some discussion of the considerable difficulties which were encountered in this exercise. The range for adjusted annual median black smoke values was 5-57$\mu g/m^3$ and for annual median SO_2 levels was 19-326$\mu g/m^3$.

The third part describes regression analyses of the relation between the prevalence of symptoms and the air pollutants, age, sex, smoking in the home, crowding in the bedroom and father's (guardian's) employment status and occupation. The possibility of systematic differences between countries (Member States) was also taken into account. These analyses confirmed that the grouping of symptoms under CNSLD provided a satisfactory measure of outcome. Positive associations between the prevalence of CNSLD and smoking in the home were found for both sexes; significant in the girls. Non-significant but positive associations between the prevalence of CNSLD and crowding in bedrooms and unemployment were found. When country distinctions were ignored and the differences between them allowed to appear as the effects of other factors there were no significant associations between the prevalence of CNSLD or other individual symptoms with either smoke or SO_2 levels. However the model used for these analyses did not fit the data at all well and allowance had to be made for systematic differences in prevalence between countries. When this was done it emerged that within some countries there were highly significant associations with smoke and SO_2, but they differed greatly from one country to another. In three countries CNSLD was highly significantly and positively associated with smoke, but the magnitudes of these effects differed by a factor of about seven. The range of annual median smoke values was the same in all three countries (about 15-40$\mu g/m^3$. In four countries there were significant associations with SO_2 but two of these associations were negative; the range of annual median SO_2 values in the countries with negative associations was 60-160$\mu g/m^3$ and in the countries with positive associations 20-120$\mu g/m^3$. As these results are inconsistent it seemed more likely that they have occurred as a result of chance geographical variations coinciding with differences in pollution levels than as a result of genuine pollution effects.

Results of other similar studies on children are discussed. The data from these suggest that consistent positive associations are only likely to be found with this type of study if the annual average levels of black smoke are greater than 140 $\mu g/m^3$ in the presence of SO_2 at a level of 180 $\mu g/m^3$ or more. None of the areas in this study was found to have pollution above these levels. The analysis identified no association between respiratory illness and pollution over all countries and inconsistent associations within countries. Consequently we concluded that with the approach we used no specific effect of outdoor pollution on the children's respiratory health could be identified at the levels of black smoke and SO_2 found in the study, but that there was some evidence for an increase in respiratory symptoms resulting from tobacco smoking in the home.

INTRODUCTION

The First Environmental Action Programme (Official Journal of the EC. C112 of 20.12.73) of the European Communities called for the scientific evaluation of the health effects of pollutants and the establishment of dose-response relationships. Air pollutants required priority consideration.

The need for data concerning the effects of air pollutants on specific sensitive groups, such as children, was the basis for the decision to include among the four topics of the First Environmental Research Programme (Official Journal of the EC. L189 of 11.07.73) an epidemiological survey on the relationship between air pollution and respiratory illnesses.

Performance of a survey at Community Level had the following three advantages:

- the possibility of drawing on the expertise of all Member States;
- the establishment of co-operation between institutes in a joint long term effort;
- the availability of study areas with a great diversity of socio-economic,geographic and climatic conditions as well as a wide range of pollution levels.

However, there were three major problems to be overcome, namely:

- differences in language and culture in relation to the subjective appreciation of the respiratory illnesses;
- inter-observer variations in the epidemiological study;
- differences in air pollution measuring techniques.

This survey on health effects of air pollution is the first example of a co-ordinated research project sponsored by the European Commission and carried out jointly in six Member States (Figure 1). The institutions which participated in the survey performed the investigation under contract with the Commission of the European Communities on the basis of a common protocol, previously prepared by a group of experts, which covered both epidemiological and air pollution measurements.

As a result of agreement that air pollution was one of the major problems of environmental health, the Commission of European Communities called together a group of experts in epidemiology and respiratory illness in early 1973 to design a study to assess the health effects of ambient air pollutants in children in the European Community (page 12).

Despite recognition of the effects of air pollution on health in industrial countries where coal has been widely used for many centuries, the use of coal for basic industrial purposes continues and is likely to increase in the Community. To this has been added the problems created by use of oil as an industrial, domestic and vehicular fuel. Industry has begun to use coal more efficiently and since the early 1920s in many places there has been a gradual decline in smoke concentrations. However at the beginning of the 1970s there were still areas within the Community with substantial but declining air pollution. A number of reviews have discussed the problem of air pollution and its relationships with disease, particularly of the respiratory system (e.g. Ferris, 1978; Holland et al, 1979; Rall, 1974; US Dept of HEW, 1970).

Both now and in the past ambient air pollution in industrialised countries has been measured mostly as sulphur compounds (usually measured as sulphur dioxide (SO_2) and suspended particulate matter or black smoke. In addition to these, other pollutants have assumed increasing importance such as heavy metals, nitrogen oxides, photochemical oxidants and ozone. The levels of various pollutants vary greatly from place to place and substantial differences are found between Member States.

Attention was focussed on SO_2 and smoke(suspended particulates) as these had been singled out for priority action by the Environmental Action Programme and because data on these pollutants were being accumulated at Community level following the Council decision on the exchange of information between air pollution networks (O.J.L210 19.07.82). Consequently it was decided that the question of their effects on respiratory health should be investigated.

Within the Community, studies on chronic bronchitis and other respiratory symptoms had already been undertaken on a number of occupational groups such as post office and telephone workers in urban and rural areas (Holland et al, 1965) and general populations (Kourilsky et al, 1966; Minette, 1976; Reichel and Ulmer, 1978; Ulmer et al, 1970; Van der Lende, 1969) However, there are problems associated with the study of adult groups because of interference from such habits as smoking and the tendency of individuals to alter their exposure to pollutants by moving from one place of residence or work to another and possible occupational exposure. The decision about which group to choose for the present study had to take these elements into account.

A number of investigators (Douglas and Waller, 1966; Holland et al, 1969; Colley and Reid, 1970) have shown how primary school children are particularly suitable for the demonstration of health effects of environmental factors. There are three major advantages of using this group rather than adults: children are unlikely to have moved to any extent from place to place, so in general their exposure to atmospheric pollution may be estimated from what is known of pollutant levels in their current area of residence; secondly, although some children do take up tobacco smoking early in life it is likely that only a small proportion will be exposed to the hazards of smoking before they are ten years old; thirdly primary school children have the advantage that they are not usually exposed to any recognised occupational pollutants. For these reasons it was decided that the subjects for study should be primary school children. For the study to be effective it was necessary not only to have children exposed to both high and low levels of pollution, but also to have data on the pollution levels readily available and local experts able to organise the collection of the epidemiological data. This eventually led to the selection of 19 different areas in six Member States (Figure 1). The areas and the criteria for their selection are discussed in more detail in the Materials and Methods section.

The aim of the survey described in this report was to assess the separate effects of black smoke and SO_2 on respiratory health. This was one of the rare occasions when researchers in different countries were constrained to follow the same protocol. Considerable effort was also made to ensure the compatibility of the measurements obtained from all the areas; it must however be recognised that this was not fully achieved.

A list of publications on the study is given in Appendix I.

MATERIALS AND METHODS

General Considerations

The hypothesis to be tested was that both atmospheric smoke and sulphur dioxide contribute to the frequency of respiratory conditions and to altered lung function. The design chosen was a cross-sectional study which, if it had seemed appropriate at a later stage, could have been converted to a cohort (longitudinal) or a mixed longitudinal design.

The hypothesis was to be tested by considering the frequency of respiratory conditions and a measure of lung function (dependent variables) as functions of the air pollutants and certain interfering variables (independent variables). Data suitable for testing the hypothesis had to be collected from a defined population available in all Member States, and to consist of information on lung function, respiratory symptoms and illness and their associated factors, and on the levels of ambient air pollution experienced by the defined population.

Choice of Population

For the reasons given in the Introduction, children were defined as the population to be surveyed. The choice of which type of child to sample was determined by practical considerations.

Sampling frames for children under primary school age are not often available, but a fairly broad cross-section of children can be defined from the class lists of primary schools for an age range in which there is likely to be only limited experience of cigarette smoking. The parents could be contacted through the school for permission for their children to take part and they could complete questionnaires on their children's health. Physical measurements could be made on the children when they were already gathered together at school.

The school entry and leaving ages differ slightly between Member States. In order that the same age range was covered in every Member State involved in the study, children aged 6 to 10 years were selected.

Choice of Study Areas

To ensure the generality of the study results it was determined that the areas should:

- involve as many Member States as possible;
- span the range of climates in the community;
- have interested groups of medical and air pollution experts;
- have sufficient children in the age range 6-10 years;
- have air pollution data already available;
- have, at least in part predominantly SO_2 and smoke pollution;
- have minimal air pollution gradients so that each area could be considered homogeneous;
- have as compatible as possible air pollution measuring teachniques;
- cover a sufficient range of pollution levels

For both pollutants, high levels were arbitrarily defined as annual mean values greater than 100 $\mu g/m^3$ (microgrammes per cubic metre of air) and low levels as annual mean values less than 50 $\mu g/m^3$. It was intended that data would be collected from areas with all four combinations of high and low levels of the two pollutants in each Member State.

Assessment of Respiratory Symptoms and Illnesses and of Lung Function

In epidemiological studies levels of respiratory illness may be assessed in a variety of ways. These include routinely collected data on school absences, data from doctors records or answers to questions on illness given by a parent or guardian. Because of the uncontrolled and unstandardized information on reasons for absence (truancy may masquerade as a variety of illnesses) and the difficulty of obtaining confidential information held by doctors, the questionnaire was the preferred method for this study, with personal interviews by trained observers.

Several methods have been used to measure lung function in epidemiological surveys. The two most common have been spirometry and the measurement of peak respiratory flow rate (PEFR). In the former, forced expiratory volume at one second (or 3/4 second for children of primary school age) and forced vital capacity (FEV_1 and FVC respectively) are commonly used measures although now, with computerised spirometers, all the characteristics of the flow-volume curve can be obtained with relative ease. At the time this study was set up such devices were not available, so the PEFR was chosen because of the simplicity of its measurement both mechanically and as a manoeuvre.

As PEFR is correlated with body size, both height and weight were also measured so that their effects could be taken into account when comparing the PEFR values between different groups.

All these measurements had to be taken in a standard way so that observer bias would be reduced to a minimum. This would involve the central training of field workers and the use of a team of check measurement fieldworkers. In addition, the problem of comparability of instruments had to be considered.

Assessment of Air Pollution Levels

It was recognised at a very early stage in the planning of the project, that if relationships between smoke and SO_2 levels and the health of schoolchildren were to be investigated then either the smoke and SO_2 levels would have to be measured in a uniform manner throughout the 19 study areas, or the levels obtained locally from a variety of different methods would require standardization. In most study areas there already existed much historical data on levels of air pollution, together with considerable local knowledge not only of the pollution levels but of the accuracy of the local measurement techniques. It was decided to use local station data rather than establish a completely new network of monitoring stations. This left, however, the problem of comparability which arose from differences in the number and disposition of the measuring sites within each study area and differences in the methods and sampling techniques adopted for determining pollutant concentrations. How these problems were dealt with is discussed below in the section on measurement.

Epidemiological Methods

Number of Children Required

The sample size estimation was based on the assumption that the prevalence of children with respiratory conditions in one area would be compared with the prevalence of children with respiratory conditions in another area. The expected prevalences of respiratory conditions varied from 2% to about 30% according to symptom or illness. A biologically important difference between two prevalences at the upper end of the range would have been between 5 and 10 percentage points. In order to detect a significant difference between say 30 and 37% at the 5% level (x) with a 10% chance of failing to show a difference when one truly existed (b), each group of children would require a sample size of approximately 1000. At the same levels of x and b this sample size would detect a true difference between prevalences of 2% and 4.5%. This sample size was probably an overestimate, as the projected analysis involved regression methods taking all the survey areas into account simultaneously rather than the pairwise comparisons which formed the basis of the sample size calculation.

In many of the areas all the available schools were included in the sample in order to obtain a sample size of about 1000.

The Questionnaire

The questionnaire was designed for use by interviewers. The collection of information by structured interview was preferred to self completion of the questionnaire as, before the study started, it was not certain whether an adequate response would be obtained in all the selected samples by the latter method. Poor response might arise from semi-literacy or the respondent being unfamiliar with the language of the country of residence.

The first draft of the questionnaire was drawn up in English by the panel which prepared the protocol (see page 12). It was based partly on the standard MRC questionnaire on respiratory symptoms for adults (MRC, 1966; ECCS, 1967) partly on the WHO questionnaire on respiratory symptoms for children (WHO, 1973) and partly on the field experience of the panel. This draft was later modified according to suggestions from intending collaborators and others to take into account the differing circumstances in the six Member States involved.

An instruction manual about the questionnaire was prepared for use by the fieldworkers. The questionnaire and instruction manual were tested in each country, after translation, to determine what difficulties both fieldworkers and respondents would encounter. The two documents were revised in the light of the experience and translated into Dutch, French German and Italian.The questionnaires were translated back into English by people other than those who made the original translations to see whether the meaning of the questions had been retained in each language. Some minor adjustments to the translations were made.

The final questionnaire is given in Appendix II and the instruction manual in Appendix III. The questionnaire includes the child's name, the interview date and the fieldworker's code. The 33 questions are divided between those on respiratory symptoms and illnesses and those on the social environment. Factors which it was thought might influence the relations between the frequency of respiratory symptoms and illness and levels of air pollution were included, such as tobacco smoking in the home, socio-economic status and degree of crowding in the home. The manual gives detailed instructions on how to interview and how to cope with ill-defined answers to each question.

Physical Measurements

Three physical measurements were made on each child: height, weight and peak expiratory flow rate (PEFR). In order that measurements made by the different teams would be comparable, detailed instructions were prepared (Appendix III).

Briefly, height was measured on a portable stadiometer with special attention being paid to the placing of the child's feet and the angle at which the head was held. The measurement was read to the nearest 0.5cm mark below the cursor. Weight was measured on a level balance to the nearest 100gm mark below the cursor. The child was without shoes or socks and wore only underpants. The manufacturers of these instruments differed from one country to another.

PEFR was measured with a Wright Peak Flow Meter. All the meters were obtained at the same time after calibration at the factory. Calibration during fieldwork was impractical. Five recordings were made after the child had been shown how to blow into the machine. The way the dial was read is described in detail in Appendix III.

The data were written on a measurement form (Appendix IV) by the fieldworker who had made the measurement. This form also requested information on the sex, birthdate and the fieldworkers estimate of the child's ethnic origin. These data were later combined with those on the questionnaire after they had been entered into a computer.

Fieldworkers and their training

i) Recruitment

Two categories of fieldworkers were used in the study. The check measurement fieldworkers were used to check the technique of physical measure of the local fieldworkers. These six field-workers each came from a different country and checked the measurements of local fieldworkers in a country not their own. They all worked in epidemiological research units and had had previous experience of such surveys.

The local fieldworkers were recruited in their own study areas and carried out the study in that area. Some belonged to existing teams and were accustomed to carrying out field studies (nurses and social workers) and some were recruited specifically for the study (medical doctors, students, social workers, psychologists, sociologists, teachers, laboratory assistants, secretaries, a commercial traveller and housewives).

Table 1 shows the number and usual occupations of the interviewers by country and study area. The numbers of measurement fieldworkers and peak flow meters are also given.

ii) Training

The check measurement fieldworkers and one of the local fieldworkers from each area were trained during a two day programme held in London in March 1975. The aim of the programme were first to teach the local fieldworkers the precise methods of measurement so that they could help to train their companion fieldworkers who could not come to London. Secondly, the programme was to retrain the check measurement fieldworkers and test whether they measured height, weight and PEFR in a repeatable way among themselves.

iii) Fieldwork

The fieldworkers carried out two main functions; measurement of the children and interviewing the children's mothers of guardians. Physical measurements were made in the schools. Children temporarily absent were noted and if possible examined as soon as they returned to school, before the end of the school year. The questionnaire was completed during an interview with the child's mother or, in her absence, the female guardian, the father or another member of the family. The interview took place either at school and in the home or only in the home according to survey area (Table 1). When no response was obtained, the fieldworkers made three attempts to interview at home.

In all countries pilot studies were carried out between January and March, 1975, to find where there were difficulties with the protocol. The fieldwork has carried out between April and July, 1975 except for 55 interviews which were not completed until October 1975.

Air Pollution Measurement

Consideration had to be given both to the measurement methods used in the different study areas and their comparability and to the suitability of the location of the monitoring stations with respect to the population studied.

Measurement of Sulphur Dioxide and Black Smoke

There were a number of problems to be considered in setting up the network of monitoring sites which require some discussion here. To start with the units in which pollution was measured varied to some extent. The agreed standard units were 24 hour mean concentrations in microgrammes per cubic metre of air ($\mu g/m^3$). Most stations were operating in these units or could convert to them, but some special attention was required in the calculation of the 24 hour means where random, short duration sampling methods were used.

Of somewhat more importance were the differences in analytical techniques used to measure these pollutants. Throughout the study areas there were six different analytical procedures for sulphur dioxide, and two different techniques for the measurement of suspended particulate matter (Table 3). In order to simplify matters we refer generally in this report to "sulphur dioxide" and "suspended particulate matter" or "smoke", although what was being measured in some instances can more accurately be described as "high acidity" or "black smoke".

Because of the wide variation in the techniques, standardised "comparison stations" were installed. Twenty identical measurement stations were each placed beside a "local station" and standardized by a member of the Commission staff to ensure complete uniformity of equipment and sampling train. The sites where these stations were set up are given in the last column Table 3. All equipment was supplied by the Institut d'Hygiène et d'Epidémiologie, Brussels (IHE) and carefully checked by the Institute's staff before delivery.

The comparison stations used a high acidity technique for SO_2 and a reflectometry method for black smoke.

Supplies of hydrogen peroxide loaded dreschel bottles prepared by the IHE Laboratories in Brussels and the filter papers for smoke stains were d spatched to the participants either by road, rail or air. Exposed samples were all sent back to Brussels for standard determination within the same laboratory, the participants merely being responsible for servicing the instrument in a manner very carefully laid down in a standard set of instructions.

Careful design of the packing cases was necessary to reduce loss or degradation of hydrogen peroxide and breakage of the bottles during transit, above all where air transport was used.

On completion of the comparison station programme, the IHE carried out a detailed day by day analysis of the data, to determine the degree of correlation between the values obtained from the comparison and local stations.

Choice of Air Pollution Monitoring Sites

Since the section of the population to be investigated was schoolchildren, each monitoring network for SO_2 and smoke was centred around the children's schools. None of the air pollution measuring systems could reflect the air quality much further than within a 2 kilometre radius of the measurement site, and even that was dependent on pollution concentration.

The criteria for the siting of measurement stations based geographically on the schools were, therefore, set as follows (see Figure 2):-

(a) For most schools; that is, where the pupils lived within a 2 kilometre radius from the school and annual mean pollutant levels were in excess of 50µg/m^3 of smoke, and 100µg/m^3 of SO_2 the minimum measurement station requirement was:-

(i) A primary station within 1 kilometre of the school.
(ii) One or more secondary stations within a 2 kilometre radius of the school.
(iii) A second secondary station when the annual means of the primary station and the first secondary station differed by more than 30%. This station had to be sited so that the school lay within a triangle formed by the three stations.
(iv) If the angle formed by the primary station, the school and each of the secondary stations was less than 90°,the

(b) For schools in very densely populated areas:-
(i) The primary station had to be located within 0.5 kilometre of the school.
(ii) One secondary station could suffice within 3 kilometres of the school provided its annual means did not differ by more than 30% from the annual means of the primary station.

(c) For schools in low pollution areas:-
Areas with an annual mean SO_2 of less than 50µg/m^3, and smoke of less than 30µg/m^3, had only to be served by a single primary station located within 1.

There was of course no restriction on the use of more stations than the criteria minima, provided they gave satisfactory results. In some areas extra stations were installed to resolve problems where there appeared to be a marked air pollution gradient across the area. Following detailed consideration of all of this information, and discussions with the local air pollution experts, adjustments were made where necessary to the monitoring stations, and the total network finalised.

Further details about the areas and sites supplied by those responsible for the local air pollution measurements are given in (Appendix V).

Data Processing

Air Pollution Data

In the final network there were about 500 stations, each measuring SO_2 and either suspended particulates or black smoke. File headings were set up on the Commission's computer coding each monitoring station against the school (or schools) on which it was centred and adding information on analytical techniques. Daily data for all sites were recorded on computer files, covering up to five years for each site. Data were submitted either on a standard form or in a standard format on magnetic tape copied from the participant's own computer files.

Epidemiological Data

The epidemiological data were converted to computer readable form at each participating institute. Most of the questionnaire was self coding, but recourse to the International Standard Classification of Occupations (ILO, 1969) was made for coding the job descriptions given in questions 24 and 28. This code uses nine major categories of occupations and these were used in the analysis (Table 2). When the data had been cleaned, magnetic tapes or punched cards were sent to the Centre de Gestion (computer centre) in Luxembourg for further verifying and analysis. Complete data tapes were then sent to London, Paris and Padua for detailed analysis.

Statistical Analysis

The analysis is in three parts. The first covers a quantitative description of how the children in various categories differed with respect to the outcome variables: the prevalence of the various symptoms and conditions plus a combined symptom outcome measure and the mean levels of PEFR. The second part describes the pollution levels observed in the study areas and the levels obtained after adjustment for differences in methods of measurements.

Thirdly, the relationship between these outcome measures and pollution is investigated making maximum use of all the data using linear regression models. These allow the use of classical regression techniques such as multilinear regression, analysis of covariance and the analysis of variance to be used for counts and proportions (Nelder and Wedderburn, 1972). In these analyses it is possible to assess the effects on outcome of all the factors, including pollution, separately and together. This makes it possible to investigate whether particular combinations of factors have more effect on outcome than might be expected from their separate effects. Once it is deemed safe to assume that such interactions may be ignored, the models are used to estimate the effects while ensuring that the effects of one set of factors do not distort or appear as the effects of another. From a model considered to fit the data sufficiently well (this is tested using a likelihood ratio chi-squared test), estimates can be obtained of the likely effect on the risk of symptoms or level of lung function of altering the level of particular factors.

DESCRIPTION OF AREAS

The 19 study areas (figure 1) fell into four broad categories of pollution as follows:

5 low pollution areas
- Galway, Cork, Ardennes, Ferrara and Rheydt;

5 moderate urban pollution levels
- Bordeaux, Dublin, Düsseldorf, Lyon-Duchère and Hartlepool;

4 large urban centres with significant pollution
- Paris, Milan, Lyon-Guillotière and Gent

5 special situations with either mixed industrial/domestic or single sources of pollution
- Middlesborough, Stockton, Venice/Marghera, Duisburg and Lacq.

Brief descriptions of each area are given below:

Düsseldorf

The schools and residences of the children investigated were covering an area of about 10 km^2 in a densely populated urban area with only small industrial activities. Domestic heating and intense automobile traffic were the main contributors to air pollution (Map).

Duisburg

The study covered a densely populated urban area with important industrial activities (power plants, steel and iron industries, etc...). Domestic heating and intense automobile traffic contributed to air pollution (Map).

Rheydt

The study area covered a low density residential semi-urban community, with domestic heating, small secondary industries, and some automobile traffic being the main contributors to air pollution (Map).

Bordeaux

The study area Bordeaux-Cauderan, was located north east of the city centre of Bordeaux with westerly prevailing winds. The seven schools included in the survey drew children from an area of about $4km^2$. The The area was a very homogeneous residential urban zone, composed essentially of individual houses with gardens; most of the automobile traffic was local (Map).

The pollution levels were low and due mainly to domestic heating and some automobile traffic.

Lyon-Duchère

The study area Lyon-Duchère, was located west of the city centre of Lyon. The five schools included in the survey were drawing children from an area of about $2km^2$; the main air pollution sampling station was located in the middle of the area (Map).

The area is a homogenous residential suburban zone composed of 15-20 storey high apartment buildings and green spaces. There is only local automobile traffic. The main source of air pollution is the urban heating plant located a few hundred meters north of the area.

Lyon-Guillotière

The study area Lyon-Guillotière was located east of the city centre of Lyon. The six schools included in the survey drew children from an area of about $3km^2$ with very homogeneous pollution levels. The main air pollution sampling station was located in the middle of the area (map).

The area is a very densely populated residential urban zone with commercial activities. There are no important single pollution sources in the vicinity of the area. The main air pollution sources were individual domestic heating and automobile traffic.

Paris

The study area in which six schools were selected was located within the city limits of Paris. Four of the schools were close to the city centre, while the other two are located in the southern part of the city (map). Since all children lived within 1km of the school they attended the area covered by the six schools was quite small, representing less than 5% of the total size of the city. The area was a very densely populated urban residential area, with apartment buildings, (25,000 inhabitants/km^2) and commercial activities.

Since 1964, Paris has been a zone protected from air pollution by specific legislation. The main sources of pollution were automobile traffic and domestic heating. The whole area was considered to have homogeneous air pollution. For several of the schools point sources of sulphur dioxide were located within 2km but they did not seem to influence the pollution level significantly.

Lacq

The study area of the Lacq region covers several localities situated within a radius of about 15km of a major single source of sulphur dioxide emissions. The prevailing winds were westerly. A total of 18 schools in 13 localities were included in the survey (four maps). The study area included urban residential zones (6 schools), suburban residential zones (3 schools) and industrial zones (9 schools).

Due to the importance of the single SO_2 source, all the areas were occasionally affected by the sources. In the residential urban areas there were additional small contributions to the pollution levels from domestic heating and automobile traffic. The schools located in the industrial area near the single SO_2 source were exposed to additional pollutants from the secondary industrial activities in the area.

Milan

The study area in Milan was located near the city centre. All the children were located within an area of about $2km_2$ and attended two schools (map).

Overall the study area was a very densely populated zone (25,000 - 31,000 inhabitants/km_2) with intense local automobile traffic but no nearby sources of industrial air pollution. There were also local individual and centralized heating installations using low sulphur fuel.

Due to the importance of industrial installations in the Milan area and to the generally prevailing atmospheric conditions, the study area was often subjected to the general air pollution prevailing in Milan.

Venice

The study area of about $10km^2$ was located in Mestre at the limit between a densely populated urban area and a very large complex industrial zone. The children involved in the study attended two schools located near the industrial zone. In addition to the air pollution emissions predominantly from the petrochemical industry, there was also a contribution from automobile traffic. (Map.)

Probably in this area the levels of smoke and SO_2 are not good indicators of the overall pollution level.

Ferrara

The study area of about $3km^2$ covers a moderately populated urban zone under the influence of emissions from an important idustrial zone located a few km away. Domestic heating and automobile traffic contributed significantly to the air pollution level.

Gent

The study area in Gent was located east of the city centre in a densely populated area.

The 13 schools and the catchment area of the children covered about $5km^2$ (map). In addition to domestic heating and moderate automobile traffic, several important single industrial sources of air pollution were affecting the area, namely, a power plant, textile works and steel mills.

Ardennes

The schools and residences of the children under investigation covered four small rural and semi-urban communities (about $200km^2$). Domestic heating was the main but minor source of air pollution.

Stockton-on-Tees

The administrative area of this town covers the northern bank of the mouth of the River Tees on the north-east coast of England. The lower reaches of the River Tees are subject to intense industrial activity. Oil is imported both by ship and by pipeline from the Ekofisk field in the Norwegian sector of the North Sea, and processed in stabilisation plants and refineries. There is a heavy concentration of petrochemical works in the area, and of other chemical works producing, for instance, chemical fertilizers. The area chosen for the study was the most polluted housing area in the town, consisting of the commercial and administrative centre, with nearby areas of high density housing. At the outset of this study a programme to convert household coal fires to other fuels had not reached this area.

There has been a history of ground level concentrations of pollution being affected by industry relatively distant from the area owing to a known meteorological phenomenon, but there were also local sources from such processes as iron smelting furnaces. Owing to the complexity of the industry, pollutants other than smoke and SO_2 may well have been present, e.g. ammonia, oxides of nitrogen, hydrocarbons. All children in the study lived within 2km of the schools as shown on the map.

Hartlepool

This is a town situated to the north of the River Tees and having its own sea port. It is a town with a long history of heavy industry, much in decline. Its southern portion may be affected by the petrochemical developments within the Stockton-on-Tees administrative area. At the start of the study there were two large steel making plants in the town, the older of which undoubtedly had an effect on the air quality in the study area. Since this works included coke making processes, sulphur compounds in the form of merceptans will have had an effect on the expressed levels of sulphur dioxide, as these are assessed by the high acidity method. The study area consisted of medium density housing, mostly owned and maintained by the local council. The prohibition of the use of coal on household fires was quite extensive and this coupled with the progressive decline in steel making, ultimately to the closure of both of the works, has resulted in the steady reduction in pollution levels which must be compared with the historic exposure levels. All children in the study lived within 2km of the school, as shown on the map.

Middlesbrough

This town is sited on the southern bank of the River Tees geographically at the centre of the conurbation and of all the industry. It is now, however, largely a dormitory, shopping and administrative centre for the region. The study area chosen consisted of low to medium density housing in a dormitory suburb. All houses in the area were subject to UK law prohibiting the use of coal in household fires, and in converting their fireplaces the majority of householders had chosen natural gas as a fuel, resulting in a further drop in levels of sulphur dioxide. All children in the study lived with 2km of their school (Map).

Dublin

The study area was located in a densely populated urban zone. The main contributions to air pollution are from domestic heating, automobile traffic and power plants (Map).

Cork

The schools and residences of the children investigated were in an area of about 5km^2 in a moderately populated urban area. Domestic heating and automobile traffic were the main contributors to air pollution although some may emanate from heavy industry in the docks area (Map).

Galway

The study area of about 5km^2 was located in a low density residential area of a small urban centre. Domestic heating and some automobile traffic were the main contributors to air pollution, the level of which is usually low due to favourable meteorological conditions.

RESULTS

The first part of the analysis consists of a description of the comparability of the check measurement fieldworkers and of the data collected during the measurement of the children and the interviews with their parents; the second describes the characteristics of the air pollution in the 19 study areas and the third gives the analysis of the relationship between pollution and respiratory symptoms and illness and PEFR. Unless otherwise stated two-tailed tests with a 5% level of significance have been used.

PART I

Check Measurement Fieldworker Trial

Six check measurement fieldworkers took part in a balanced incomplete block experiment. In this, 30 children had their height, weight and PEFR measured twice such that each fieldworker measured two of the children that one of the other fieldworkers had measured. The data were analysed by analysis of variance.

Because of the way height was measured (see above), the minimum recordable non-zero difference in height measurements was 0.5cm. This difference was exceeded in one pair of readings out of the 30. Similarly, the minimum recordable non-zero difference in weight measurement was 100gm. This was also exceeded in only one pair of readings. No significant differences in height and weight measurements were found between the fieldworkers.

The minimum recordable non-zero difference in PEFR was 5l/min. Tables 4 and 5 show the differences observed for all the pairs of readings for the two blows recorded for each child by each fieldworker. Although there were some large differences, they were not statistically significant. As only one meter was used, no between meter error could be estimated in the analysis.

Check Measurements in the Field

The six check measurement fieldworkers made 666 paired measurements with local fieldworkers on height, weight and two observations of PEFR. The measurements were made by the check measurement fieldworker alternately before and after the local fieldworker. For PEFR, the check measurement fieldworker either measured before the five blows obtained by the local fieldworker or after the five blows. The order alternated from one child to the next. Table 6 shows the mean differences between the two fieldworkers' readings (the local fieldworker value minus the check measurement fieldworker value, regardless of order) for these variables by country. If the mean value is positive, the local fieldworkers read on average higher than the check measurement fieldworker.

Differences between fieldworkers will increase the variability of the measurements and systematic differences may introduce bias. An analysis of variance to estimate the variation from this source showed it to be less than 1% of the biological variation to be expected in all three variables, height, weight and PEFR. There was, however, evidence of some small biases.

In three countries the local fieldworkers read height significantly higher (2 countries) or lower (1 country) than the check measurement fieldworker. The largest mean difference was however so small (<.2cm) that the consequent bias in the final results could be ignored. No significant differences were found for weight. The PEFR reading was read significantly lower by the local fieldworkers in two countries and the overall difference of -3.99l/min was significantly non-zero. These differences did not alter significantly between countries so it is fair to assume that the tendency to read low applied equally to all the local fieldworkers. Consequently the bias should not distort the results of any comparative analysis.

Preliminary Analyses

Table 7 shows the total number of children who had any data on either the measurement or questionnaire forms or both. In all, 22 337 children had some data and of these (97.5%) had information on both forms. In some areas it was possible to obtain lists of the children in each class so that the total sample could be enumerated and a response rate calculated. Elsewhere headteachers felt unable or unwilling for reasons of confidentiality to give the names and addresses of children not allowed to take part. For these areas response rates are missing.

Table 8a shows the numbers of boys and girls grouped by age at last birthday. Tables 8b and 8c give the numbers of children by age and sex according to whether or not there was at least one smoker in the home. The total of these two latter tables is 22 less than in Table 8a because of missing data on smoking. These numbers form the denominators on which the prevalence rates in many of the following tables were calculated.

Tables 9-26 give results for questions 1-14 in the order they were asked in the questionnaire. Table 9 shows the percentage of children with morning cough. The highest rates, quite distinct from the others, were found in Dublin and the lowest in the Ardennes and Galway. Cough in the day or at night (Table 10) was highest in Duisburg, Rheydt, Hartlepool, Stockton and Dublin: the levels were low in Venice, the Ardennes and Galway.

Table 11 shows the proportion of children answering yes to either question 1 or 2 who were also said to have cough for three months consecutively each year. The lowest rates were found in Ferrara and Dublin, and the highest rate in Middlesbrough. This suggests that the high rates for the first two questions in Dublin may have been due to the respondents' readiness to admit to their children's cough even if they were relatively trivial.

Parents believed their children to be breathless while playing most frequently in Duisburg, Lyon Guillotière and Paris (Table 12). Low rates were found in Venice, the Ardennes and Galway. Only about half of those children thought to be breathless were considered to be more so than children of their own age (Table 13). The lowest rates were found in Ferrara and Venice.

Very high rates of wheeze or whistling in the chest (Table 14) were found in all UK areas and in Dublin whereas low levels were seen in the Ardennes and Venice. The rates were calculated separately for children living in homes where there were no smokers and in homes where there was at least one smoker (Tables 15 and 16). Although the values in the UK and Dublin for children in homes without smokers were still high relative to the other areas, they were very much lower than the values for the children from smokers' homes (4-8 percentage points). The effect was most marked in Hartlepool where it occurred at all ages in both sexes except ten year old boys. A similar pattern was found in Stockton, but in both Middlesbrough and Dublin the differences varied somewhat in size and direction in an unpredictable way. In Hartlepool and Stockton it is possible that the effect of a smoker in the home was obscured in the older boys because they themselves were beginning to take up smoking regardless of the situation at home.

Table 17 gives the results for children who were said to have a wheezy or whistling chest on most days or nights. Although the German children were said to have no more than a moderate prevalence of wheezy or whistling chest (Table 14), a strikingly high proportion had it most days or nights compared with all other areas.

The prevalence rates for asthma varied from 0.8% in the Ardennes to 4.3% in Bordeaux, where the prevalence was much higher in boys than girls (Table 18). Eczema was notably common in Ferrara (Table 19). The overall prevalence of hayfever varied from 2.0% in Dublin to 9.6% in Bordeaux. (Table 20).

Table 21 gives the proportion of children with a cold in the last 12 months. One might have expected close to 100% of children to have had a cold in this time, particularly in the younger ones. That some rather low percentages were recorded suggests poor recall on the part of the parent. However the intention of this question was to lead into the next, asking whether the reported colds usually went to the chest. On average among children who had had colds, they went to the chest in 30.7% of cases (Table 22). Ardennes and Galway had rates for this condition which were unusually low. The data for this question were divided according to the presence or absence of a smoker at home (Tables 23-24). A substantial effect of smoking was found in Gent, Ardennes, the UK and Galway.

The rates for phlegm for three weeks in the last year (Table 25) were above average in the FRG, Italy and France (except Bordeaux) and below average in Belgium and Ireland. Chest illness which confined children to bed for one week or more was infrequent in Ireland and exceptionally frequent in the FRG (Table 26). Such severe illness was generally less frequent in older than younger children, although a declining trend with age was not found in all areas.

Table 27 gives the prevalence rates (as percentages) of at least one positive response to the questions on cough, breathlessness, wheeze and asthma (questions 1-3 and 5-8, Appendix II). For lack of a better term this will be referred to as chronic non-specific lung disease (CNSLD). This grouping of questions drew together the responses to all the questions on respiratory symptoms. As it was not possible to estimate how much each quetion contributed to the severity of CNSLD, no scoring system was used to weight the contribution of each symptom. Low rates were found in Venice, the Ardennes and Galway. The highest rates by a substantial margin were found in the UK areas and Dublin.

In some countries (The FRG, Belgium, UK and Ireland) the presence of a smoker in the home of the child was associated with increased prevalence rates of CNSLD. We therefore examined this in greater detail as shown in

Tables 28 and 29.

Table 28 gives prevalence rates for the 8292 children in homes where no-one was reported to smoke regularly and Table 29 gives the rates for the 13789 children in homes with smokers. There appeared to be little effect of smoking in the FRG. In the two Belgian areas there was a relationship, more clearly seen in both sexes at each age in Ardennes. However the most clear cut effect was in the UK and Dublin, with differences between the overall prevalence rates of 4 to 12 percentage points.

The apparent effect of smoking in the home on CNSLD prevalence in the UK and Dublin might have been due to correlated effects of social class. The measure of social class used in this study was father's occupation from which three groups were formed. Professional occupations comprised those in ISCO major groups coded 0 and 1, manual occupations were those in groups 7 to 9 and groups 2-6 formed an intermediate group. There was some overlap of manual jobs into the intermediate group since the ISCO codes are not defined precisely along the lines of our classification, but there was no overlap between the professional and the intermediate or manual groups. Table 30 shows the distribution of the children according to the three occupation categories and Tables 31-34 show the prevalence of CNSLD in each area by the fathers' occupations and by presence or absence of a smoker in the home. The general impression is that, in the UK areas and Dublin, CNSLD was more common in children from homes with at least one smoker and where the father's occupation was manual. This relation is explored further in Part III of the results section.

Tables 35-38 give the mean, standard deviation and number of children according to age, sex and area for height, weight and two selected values of PEFR. Table 39 gives the mean ages in each group for those children with either a height or weight measurement. The average height of German children was about 2-4cm greater than that of children in all other countries (Table 35): there was no other difference between areas of this magnitude and it could not be accounted for by the local fieldworker bias shown in Table 6. The greater height of the German children was associated with greater weight (Table 36).

PEFR is presented as the mean of the highest of each child's five measurements (Table 37) and the average of the last three measurements (Table 38). Although the average of the last three measurements was always lower than the best of the five measurements, the pattern of the distribution of the mean values was the same in both tables. Despite their greater height, the German children had unexceptional PEFRs. The highest values were found in the three Italian areas and in Gent and the lowest values were seen in the UK and Ireland. The values in the tables have not been corrected for differences in the functioning of the peak flow meters.

Table 40 shows the mean of the best of the five PEFRs according to area and sex, after adjustment by analysis of covariance for differences between the groups in age, height and weight. The adjustment was made, by analysis of covariance, to the overall mean values of age, height and weight of each sex separately.

This means that the values are comparable between areas within sex but not between the sexes. There was some heterogeneity in regression slopes between the area groups so caution is required in interpretation of the results. The tests of heterogeneity of adjusted means were very highly significant for both sexes (p<.0005).

The highest values for both sexes tended to be in Italy and France and the lowest values in the FRG and the UK. The values for Dublin, an area of high morbidity according to the results of the questionnaire, were about average. These findings must however be considered with care, as over 80 peak flow meters were used (Table 1) and there was probably sufficient variation between the meters to account for some of the variability in the adjusted means.

It was not possible to estimate the variation between meters over the whole sample. However, because relatively few meters were used in each area, it was possible to compare the peak flow rates of children with and without symptoms within an area, making adjustments for the differences in performance of the meters. In this way we could determine whether the lung function tended to be lower in the children with symptoms, as would be expected if answers to the questions did indeed depend on the condition of the respiratory system.

For each area the children were divided into two groups according to whether the answer was yes or no to the questions on CNSLD, morning cough and asthma and into three groups according to whether the answers were no/no, yes/no or yes/yes for the pairs of questions on day and night cough, breathlessness at play and wheeze. The mean values for peak flow rate were calculated for each group and adjusted for differences in age, height, weight and meter. The adjusted values were compared between the groups defined by the presence or absence of a given symptom. The differences between the adjusted means are given for CNSLD, morning cough and asthma in Tables 41-43. For the other three symptoms, differences were calculated between those without any positive response ("normal") and each of the other two groups composed of those with one and those with both answers positive (Tables 44-46). Those differences with a negative sign attached were in the unexpected direction, that is, the children with symptoms had a higher peak flow rate than those without symptoms. The column marked "p reg" gives the probability that the relationship between the peak flow rate and the adjusting variables (covariates) were the same in the compared groups. When this is significant the result must be interpreted with caution. The column marked "p diff" gives the probability that the observed differences occurred by chance if the true population difference were zero.

It can be seen that in all the tables the differences were in the expected direction more frequently than not. The results for CNSLD were the most consistently positive and significant. Wheeze showed nearly the same consistency but in some areas there was only one child with a yes/yes answer and the analysis could not be completed. Children who were said to have asthma also tended to have significantly lower peak flow rates.

These results show that the presence of CNSLD is associated more consistently than any single symptom with reduced lung function and suggest that this composite variable may be the best of the indicators we studied for relating respiratory illness to the harmful effects of air pollution.

Table 47 shows the distributions of some of the social characteristics of the areas which are related to the frequency of respiratory symptoms and illness. The percentages refer to data for those children for whom the relevant questions were completed.

PART II

Air Pollution Data

Preliminary Analysis

Initially the study areas were classified in four broad categories as shown in the DESCRIPTION OF AREAS section. This proved helpful for a number of interim analyses before the data set was complete, but it became clear that the measurements themselves, normalised using data from the comparison stations, were the most precise measures of the children's exposure available.

Normalisation using Comparison Station Data

Black smoke and SO_2 levels were obtained from local and from standardized comparison stations. The correlations between the 24 hour mean values obtained by the two stations was rather low, particularly for SO_2. This poor comparability may have been due to the evaporation of exposed hydrogen peroxide during transport to the laboratory where the comparison stations samples were analysed.

The correlations between the annual or winter median values obtained by the two types of station was rather stronger (Table 48). Nonetheless the data were clearly not sufficient to obtain generally applicable conversion factors. However for the purposes of the analysis of the epidemiological data it was possible to calculate conversion factors (Table 49) to obtain reasonably well corrected annual and winter medians of standard black smoke.

The conversion factors for SO_2 median values obtained in the same manner are likely to be much less reliable and their use in the analysis must be seen in this light. Problems arose from differences in sampling methods (static or mobile), the effects of mist or fog on some of the methods, changes in the relation between levels measured in the summer and winter by comparison and local stations and so on. The conversion factors for SO_2 (Table 49) are the result of a considerable compromise in assessing the comparison data at our disposal. The adjusted values for "black smoke" and SO_2 are given in Table 50 for the 55 distinguishable pollution areas.

Sometimes there appears the seemingly illogical situation of a corrected winter median being less than the corrected annual median. The variation between the values is however, insignificant in air pollution terms, and less than the limits of accuracy of most of the measurement methods. In general, we would not consider a variation in levels of less than $10 \mu g/m^3$ of any significance.

The range of smoke and SO_2 levels in the 55 distinguishable pollution areas and the relationship between them is shown in Figure 3.

PART III

The Inter-relationship of Respiratory Symptoms, Illnesses and PEFR with Measures of Pollution and Other Potentially Related Variables

These analyses consider in turn a number of outcome variables:

The prevalence of cough (morning and/or day or night) (Q1+2)
The prevalence of breathlessness (Q4+5)
The prevalence of wheezing (Q6+7)
The prevalence of asthma (Q8)
The prevalence of CNSLD (Q1-3,5-8)
Peak expiratory flow rate

and use regression techniques to investigate how the variation in levels of these variables was related to SO_2 and smoke levels in the areas. At the same time, the analysis included a number of other variables to ensure that their effects did not distort or obscure any effect that SO_2 and smoke might have had.

The variables included with smoke and SO_2 were age, sex, smoking in the home, crowding in the bedroom, country, father's employment status and occupation category and the child's length of residence in the area. How the 55 distinguishable pollution areas varied with respect to country, proportion of girls in the survey, crowding in the bedroom, smoking in the home, father's occupation category and employment status, is shown in Figures 3-9.

There were a number of other variables which contributed nothing to explaining variation in the prevalence of CNSLD once allowance had been made for the variables listed in the previous paragraph. These were excluded from the detailed analyses: the child's racial origin, crowding in the household, type of domestic heating used, number of children in the household aged less than 15 years, the parent's educational attainment, and whether or not the children were born in the area.

In addition, there was a possibility that the effects of pollution might include some sort of interaction (synergism or antagonism). To investigate this, a product term SO_2xSmoke was included in the model. However the effect of this term could only be estimated when there were more than three areas with identifiably different pollution levels in the country concerned. This only occurred in three countries; Belgium, France and Ireland.

The 1974 annual median figures for smoke and SO_2 were used because they were very highly correlated with the winter medians, and the 1973 and 1975 figures, and were also the most recent values before the children were observed.

Because the whole data set was too large for the computer resources available it was necessary to analyse the data for the boys and girls separately. Since the sexes were analysed separately, there was no direct test of sex differences. The findings are reported for each outcome variable in turn. Where associations are complex, they have been presented as tables of regression coefficients. If the outcome was a prevalence, these coefficients represent changes in the prevalences (p) on the logistic or log-odds scale log(p/(1-p)) per unit increase of the independent variable. Details of the analyses are given in Appendix VII.

Cough in the Morning and/or during the day or night.

Cough was related to smoking in the home in both sexes (although not quite significant), to crowding in the bedrooms (significantly for boys) and to having an unemployed father (significant for boys and girls). The decline in the prevalence of cough with age was clearly and significantly demonstrated in both sexes. The product pollution term was not significant for either sex although the apparent effects of the pollutants differed markedly from country to country. These effects are summarised as regression coefficients in Table 51.

Breathlessness (Q4)

The product pollution terms were significantly non-zero ($p<.01$) for the boys. This represents a curvilinear relationship between prevalence and pollution which is sometimes impossible to interpret biologically. For instance in the French data increasing pollution levels appeared to be associated with an initial decrease in prevalence followed by an increase. To pursue the analysis it is necessary to treat this as a chance finding and concentrate on the model where pollutant effects are represented by simple linear trends. From the simplified model crowded bedrooms appeared to be negatively associated with breathlessness amongst the boys ($p<.01$) There was some evidence of an occupation effect - girls with fathers in jobs coded as manual were significantly more often breathless than other children. The age trend just reached significance in the boys. The effects of the pollutants estimated from the simple linear trend model are summarised in Table 52.

Greater than average breathlessness (Q5)

It is possible that positive answers to this question are more representative of respiratory disease than a simple report of breathlessness. For that reason the analysis was repeated using this prevalence as the dependent variable.

There was some evidence from the girls that the association with pollution was a complex one - the product term reaching significance ($p<.05$) in one country. However, ignoring this and allowing only simple linear associations it appeared that only one of the factors, age, was consistently associated with the prevalence of this symptom. The association with age was consistently positive and reached significance in the boys ($p<.05$). The effects of the pollution variables, which differed markedly from country to country are summarised in Table 53.

Wheezing (Q6)

The pollution product term was significant for the girls in two of the countries (France and Ireland). This appeared to indicate that for low pollution levels the prevalence of wheezing increased with pollution whereas above levels of $50 \mu g/m^3$ of both SO_2 and smoke the effect was reversed.

If this is treated as a chance finding, then the pollution effects can be represented in the analyses as simple linear trends. These analyses indicated that the presence of a smoker in the home was associated with a higher prevalence of wheeze. The pattern was the same in both sexes, but only reached significance in the girls. There was no association apparent between the prevalence of wheeze and father's employment status, social class or the factor representing 'crowding in the bedroom'. The usual pattern of prevalence decreasing with age was seen clearly and significantly in both sexes. The effects of pollution are summarised in Table 54.

Frequent wheezing (Q7)

Age showed a consistent negative association with the prevalence of frequent wheezing although only significantly among the boys. There was a range of associations with the pollution variables among the various countries, but only two reached significance in the girls and none did so in the boys. These are shown in Table 55.

Asthma (Q8)

The prevalence of asthma was analysed in the same way. There was a significant association with father's occupation in the boys and almost in the girls - children with professional fathers having the highest prevalence. Only two of the pollution coefficients reached signficance, among boys in Eire there was a significant positive association with SO_2 while boys in France showed a significant negative association.

CNSLD (Q1-3, 5-8)

Because length of residence would be expected to be intimately involved with any dose-response relation that existed between respiratory symptoms and pollution, it requires a particular analytical approach. Assuming that those children resident in the area less than three years had a different exposure to those resident longer (untestable, but reasonable) they should show a different relation between prevalence and pollution level. In fact the prevalences and the pattern of their relation with pollution was almost identical in the two groups for both sexes. Practically exactly the same results were obtained when the cut off point was taken at two years. It appears that length of residence does not affect the prevalence of CNSLD or modify the effect of pollution. In consequence this variable was omitted from subsequent regression analyses (Appendix VII).

The way in which the overall prevalences vary over the range of pollution exposures is shown in Figure 9. The regression analysis is designed to detect any systematic pattern in this picture after determining the effects of and allowing for the confounding variables.

Although not tested statistically, it was reasonably clear that girls had a lower prevalence than boys - all else equal. Smoking in the home increased the prevalence, but only significantly in the girls. This effect was highly significant in the UK and Ireland when their data was analysed separately, but not in the other four member states. Children whose fathers were unemployed also appeared to have higher prevalences, although again this only reached significance in the girls. The decrease in prevalence with age was very clear and significant in both sexes.

The analyses showed that there was some effect of the pollution product term in the girls which differed significantly among the three countries with sufficient pollution data for it to be estimated; the product effects were trivial in the boys.

Although the product terms seemed to indicate curvilinear prevalence-pollution relationships for girls to pursue the analysis further it was necessary to summarise the apparent effects of the pollutants as simple linear trends. This revealed marked differences between countries, illustrated by the regression coefficients in Table 56. Notice that only two areas in the FRG had both smoke and SO_2 levels. This meant their effects could only be estimated one at a time assuming the other zero.

The discrepancies between countries was tested by fitting models where the apparent pollution effects were forced to be the same in all countries. This model fitted significantly worse and was clearly not consistent with the patterns in the data.

CNSLD - Areas Grouped by Type of Pollution

It is arguable that the large and highly significant differences in the prevalences from country to country are themselves manifestations of pollution effects, since the pollution levels are generally different. Of course, a genuine biological effect should also appear as an association among the areas with differing pollution levels within each country and consistently from country to country. This is obviously not the case in our data. Nonetheless it is possible that differences in the type of pollution from country to country might result in a genuine effect producing the apparently inconsistent results so far obtained.

One possibility is that industrial and domestic pollution have different effects. To investigate this, the pollution areas were grouped according to type of pollution ignoring country and hence assuming all country differences previously unaccounted for were due to differences in pollution levels. Omitting areas where the type of pollution was not obviously industrial or domestic left 33 of the 55 pollution areas suitable for analysis. This model fitted the data very badly. However, for completeness the fitted parameters are described below.

The analysis showed a positive association with smoking in the home, significant in the girls, and a positive association with crowding, significant in the boys. In girls there were also positive associations with unemployed fathers, with father's occupation - girls with fathers in the middle and manual occupational groups having the lowest prevalence. There was a significant decrease in prevalence with increasing age in both sexes.

The associations with pollution variables were quite complex - the SO_2xSmoke product term coefficients reaching significance in boys and girls for the domestic pollution group of areas and almost reaching significance among boys in the industrial pollution areas (Table 57). These coefficients imply that the associations between prevalence and one pollution variable change according to the level of the other. For both sexes and both types of air pollution, when SO_2 levels were below 90-100$\mu g/m^3$ increasing smoke was associated with decreasing prevalence. On the other hand, for smoke levels above about 20-40$\mu mg/m^3$ increasing SO_2 was associated with increasing prevalence.

PEFR

There were two reasons for including a lung function measurement in the study despite the difficulty of standardizing meters to avoid bias. The first was that despite the possible bias lung function is an outcome variable of some interest. The second was to use the observed association between lung function measures and the presence of symptoms to assess the validity of the questionnaire. The relationship between PEFR and symptoms was examined for each area in part I of the results section and summarised in tables 41-46. However it was necessary to reassess this relationship allowing for possible pollution effects. The appropriate analyses were performed by using PEFR as the dependent variable in a standard multilinear regression analysis. The association between PEFR and symptoms was assessed from the regression by including an independent variable with values 1 and 0 representing the presence or absence of any symptoms (CNSLD). Five PEFR readings were taken. The analyses were performed using the highest of the five readings as the dependent variable (Table 37). The pattern of associations with the pollution variables was significantly different from country to country so the interpretation below is of separate analyses for each country.

In an analysis omitting CNSLD, the effects of sex, age, height and weight were all highly significant throughout ($p<.001$). Of the other factors, the presence of a smoker in the home and having an unemployed father were consistently associated with a reduction in PEFR although only significantly in the UK in both cases. Father's occupation was significantly associated with PEFR in the UK and France, children with fathers with middle or manual occupations having the lowest PEFR. The pattern of associations of PEFR and the pollution variables is given in Table 58 (NB boys and girls were analysed together so the associations are averaged over the two sexes).

The analysis was then repeated including CNSLD as an independent variable. This showed that after allowing for age, sex, social class, father's employment, crowding in the bedroom, smoking in the home, height and weight, those with symptoms had lower PEFR readings in all countries. The differences ranged from 5.3 to 10.7 litres per minute. In all cases differences were highly significant ($p<.01$).

DISCUSSION

Because of the large number of symptoms and the consequent multiplicity of relations examined between each symptom and environmental, demographic and socioeconomic variables, there is no simple way of describing our findings. There was a need for one measure of respiratory health to reduce this complexity and the composite outcome variable CNSLD was proposed. The analyses have shown that this was related to the factors age, sex, smoking in the home, crowding in the bedroom, employment status and occupation of the father and country in much the same way as its constituent symptoms of cough, breathlessness and wheeze. There were only two notable exceptions to this. One was that breathlessness appeared to increase with age whereas the other symptoms decreased. The other was that, in boys, the significant associations for cough and breathlessness with crowding did not reach the 5% level of significance when these symptoms were combined as CNSLD. With these exceptions in mind, we have chosen to discuss the results of the study in terms of CNSLD which by and large reflects the findings for individual symptoms.

The relationship between CNSLD and the non-pollution factors showed some signs of changing from country to country. The effect of smoking in the home was clearly associated with increased symptoms in the UK and Ireland, but not in the other four countries. A significant decrease in CNSLD prevalence with increasing age was only seen clearly in the UK, Ireland and France. Nonetheless the differences between countries with respect to associations with the non-pollution factors were nowhere near significant. A model assuming these associations to be the same in all six countries proved to fit the data more than adequately. The apparent effects of pollution were not so tractable. They clearly differed from country to country and the differences were highly significant ($p<.01$). A model ignoring this proved to be quite inappropriate for the data. The analyses allowing for length of residence clearly showed that the associations were independent of how long the children had been exposed to the levels of a particular area. It seemed possible that differences between countries might have been due to each country having a different mix of industrial and domestic heating pollution. The model to test this was a bad fit to the data and implied a very odd set of associations between CNSLD and pollution where at low to moderate levels increasing pollution appeared to be associated with decreasing prevalences. With the apparent pollution effects necessarily differing from country to country, the associations were so inconsistent as to be contradictory (Table 56). Strong associations are seen in Italy and Ireland but their magnitudes were dramatically different and in Italy the association with SO_2 is actually negative. There are effectively only three distinguishable pollution areas in each of these two countries. In Ireland where the area with the highest prevalence also had the highest pollution (Dublin) there was a significant positive association. In Italy where the area with the highest prevalence had a lower pollution level than the area with the lowest prevalence, a significant negative association was obtained. In Belgium there appeared to be a positive association between CNSLD prevalence and smoke levels, but a negative association with SO_2. In France there were significant associations with SO_2, but not smoke. In neither the FRG nor the UK did any associations reach statistical significance. Furthermore, although there was the expected relationship between PEFR and the presence of symptoms, the relationships between PEFR and pollution varied equally erratically from country to country. The likely explanation of these inconsistent results is that different prevalence rates may be reported from different areas for a variety of reasons which are not necessarily quantifiable. When the areas also have different pollution levels then the geographical differences appear as the effect of pollution in the analysis. It is therefore quite possible that all the differences observed in this study are due simply to geographical variation quite unrelated to pollution.

Cultural and linguistic as well as geographic differences may also have had an important effect on the results. In Ireland, for example, parents seemed to respond positively to questions on the more trivial aspects of cough, whereas elsewhere a higher positive response was found to the question on cough three months of the year. Furthermore the highest prevalence rates for cough and wheezing were found in Ireland and the UK whereas breathlessness was most prevalent in the FRG (Duisburg) and France (Lyon-G and Paris). Another example comes from the observation that the parents of the German children recalled in almost all cases that the children had had a cold in the last twelve months (as would be expected in this age range) whereas in all other countries the prevalence rates were much lower. German parents also seemed more concerned about chest illnesses which confined their children to bed for a week or more. These examples and other anomalies in the data suggest that the understanding of the questions differed between countries and even between areas and that there were differences in appreciation of the severity of illness which were culturally determined.

Other evidence of life style differences comes from the analysis of cigarette smoking. Smoking in the home is quite clearly associated with an increase in the prevalence of respiratory symptoms and illness in Dublin and the UK but the relation was weak or non-existent elsewhere. The exposure of children to tobacco smoke will depend on the type of tobacco burned, the size and ventilation of the child's home, the time spent in the house and the climate, which affects the design of houses.

Over and above these cultural, linguistic and geographical differences is the possibility of bias introduced by having so many fieldworkers and, in those analyses using lung function measurements, a large number of PEFR meters. Although efforts were made to standardize the procedures and to train the fieldworkers, and checks were made on actual performance during the fieldwork, there were still peculiar discrepancies in the results. For example, although the German children were on average 2-4 cm taller than other children, their uncorrected PEFRs were slightly below the age-sex specific mean values for the entire sample. In fact PEFR was used only for confirmatory analyses since there is some doubt as to the usefulness of the PEFR for the detection of small effects on the airways due to pollution. It may be that more sensitive tests are required such as the combination of vital capacity and forced expiratory volume in a given time. Results from studies in Holland for example show that it is possible to detect a decline in the values of these measures in a cohort followed for a number of years (Van der Lende et al, 1981).

The present study has produced contradictory evidence on associations between the outdoor pollution levels to which the children were exposed and both their respiratory illness and peak flow rates. Given the limitations of the methodology and the quality of the data just described, is this a reasonable result in the light of other studies done on children or does it run counter to current assessments?

As the literature of the health effects of air pollution has been reviewed frequently and extensively, we will consider here only the findings of studies on children which used a similar methodology and estimated exposure in concentrations of black smoke and sulphur dioxide.

Several studies have been done in populations exposed to what would nowadays be considered as very high levels. The studies in Sheffield U.K. by Lunn and co-workers (1967; 1970) were carried out in primary school children during the 1960s. A group of five year olds was studied living in four different areas exposed to annual mean levels of smoke ranging from 97 to 301µg/m^3 and of SO_2 ranging from 123 to 275µg/m^3. Eight hundred and nineteen children were examined between 1963-1965. The children in the three more polluted areas had significantly higher prevalence rates than children in the 'clean' area for three or more colds per year, persistent or frequent coughs, and colds going to the chest. The lung function measured as $FEV_{0.75}$ and FVC and expressed as a percentage of the expected value for children of that height was significantly lower in children living in the most polluted of the four areas.

When the children reached the age of nine years they were seen again. Of the 819 children seen originally, 558 (68%) were seen in 1967-69. No significant differences in either respiratory symptoms or lung function were found between children in the 'clean' area and those in the three dirty areas combined. By 1968, because of the effects of implementation of the Clean Air Act of 1956, the pollution levels were much lower. In the clean area the smoke and SO_2 mean annual levels were 48 and 94µg/m^3, respectively and the mean annual levels for the three dirty areas were 140 and 180µg/m^3.

The results have been fairly criticised because of loss to follow-up of 32% of the children and because the number of children was too small for the detection of important differences. The authors state that there was no evidence that those examined in 1967-9 were a biased sample of the original cohort, although they showed no analysis to support this. On the other hand the numbers were indeed small, to the extent that true differences of 10 percentage points would have been detected at the five per cent level of statistical significance in only 80 per cent of such studies and true differences of 5 percentage points would have had only a 30 per cent chance of detection.

However, there was supporting evidence for the conclusion that there was no longer an effect of pollution in 1967-9. A sample of 1049 10-11 year olds was investigated in the first part of the study, in 1963-5. The frequency of symptoms in the children from the dirty areas was higher for three or more colds per year and persistent or frequent cough than in the nine year olds in the same areas seen four years later. If the pollution levels in the dirty areas had remained constant, the nine year olds in 1967-9 would have been expected to have had the same frequency of symtoms as the 11 year olds in 1963-5 (or slightly higher, since they were younger). Yet they were considerably lower, implying that the diminution of the pollution levels was accompanied by a rapid decline in symptomatology towards that expected in an unpolluted area.

Although this study in no way provides incontrovertible evidence for a safe level of smoke and SO_2, its results might be used to set a benchmark by which to judge the results of other studies. The Sheffield study indicates that average annual mean levels of smoke in excess of 200μg/m^3 in association with annual mean levels of SO_2 above 180μg/m^3 are associated with increased frequency in symptoms and decreased lung function in five year olds. No significant associations were found in nine year olds with annual mean levels of 140 and 180μg/m^3 of smoke and SO_2 respectively.

A set of studies very similar to the EC study was sponsored by the World Health Organization (1980). The populations sampled were primary school children in areas selected for high or low levels of pollution. Eight countries took part, with some adjustments to the protocol to allow for the different situations in each country. It was not possible to conduct quality control checks on the fieldwork or on air pollution measurements in the way described for the EC study. The same questionnaire was used in all countries; sometimes it was given by interview, sometimes by self-administration. Lung function was measured as PEFR using the Wright peak flow meter although in some countries spirometry was used. The national studies were carried out between 1973 and 1975 and their data were then pooled for an overall analysis.

The data from the different countries appeared to be variably incomplete, which makes comparison with the present study difficult. The areas in which the studies were carried out were defined according to the protocol as having high levels of pollution if the annual median levels of smoke were >50μg/m^3 and of SO_2 >100μg/m^3 and as having low levels of pollution if the annual medians of these pollutants were <30 and <50μg/m^3 respectively. However, data for smoke levels were available for only 11 of the 20 areas in the study. Table 59 summarises the results by country for those 11 areas. The only significant findings were obtained in Poland and Romania where the median values of smoke given for the polluted areas implied annual mean values of over 200μg/m^3. The unusual findings in Yugoslavia, where the children in the rural areas had more symptoms than the city children, may indicate that at the levels of pollution experienced the null hypothesis was correct and the observed differences (in the "wrong" direction) occurred by chance. Alternatively there may have been environmental factors peculiar to those rural areas which were far more powerful at provoking symptoms than the pollutants in the city.

The results in the table are consistent with the conclusions drawn from the Sheffield study. Those were that in epidemiological studies differences in symptomatology and lung function are only likely to be consistently detected when annual mean levels of smoke are above some level between 140 and 200μg/m^3 in the presence of 180μg/m^3 or more of SO_2.

In the published regression analyses where all the areas with data were used together, it was suggested that a straight line relation existed between pollution levels and frequency of symptoms. We are somewhat hesitant in accepting these analyses as indicating an effect of pollution over the whole range because missing data on smoke levels excluded almost half the areas from those analyses which involved smoke values. Moreover, there were potential biases due to the exclusion of the rural areas of Yugoslavia from all analyses for lack of appropriate pollution data and because other factors which might have influenced the relation were not taken into account. Among these were age, sex and country. The results of the analyses, had country been considered, would have shown that the frequency of symptoms in Poland, Yugoslavia and Romania tended to be much higher than in Denmark or the Netherlands, regardless of pollution level. Certainly our own results would suggest the need to have a country variable in the statistical model to take into account differences in language, appreciation of the meaning of the questions, cultural factors related to illness or even genuine differences in illness level distinct from the effects of pollution.

There are a number of other studies which bear similarities to the present one and their findings are relevant. Paccagnella and co-workers (1968) observed the changes in acute respiratory disorders in children aged 7-12 years living in one clean and two polluted areas. The highest yearly average smoke level was 45μg/m^3 in association with 115μg/m^3 of SO_2. No relation was found between variation in pollution levels and frequency of acute disorders in the two polluted areas, though one was found in the clean area. This finding was not related to higher peak levels in the clean area and may have been due to other factors than air pollution.

Holland and co-workers (1969c) studied the families of children born between July 1963 and June 1965 to families living in a suburb of northwest London. They lived in two areas with high levels of SO_2 (mean winter levels > 200μg/m^3) of which one had also had, just prior to the study, high levels of smoke (>200μg/m^3). After controlling for differences in social class, no differences in symptom frequency was found between fathers in the two areas, but mothers and the siblings of the index children in the formerly more polluted area reported more symptoms than the same groups in the other area. If these differences in symptom frequency were causally related to the earlier difference in pollution levels, then they would probably have been associated with annual mean levels in excess of 150μg/m^3 for both smoke and SO_2 (only the winter mean levels at the time of the study were given in the publication).

In another study, Holland and co-workers 1969a; 1969b; Bennett et al, 1971) investigated over 10 000 children aged 5, 11 and 14 years in four areas of Kent, U.K. The mean winter smoke levels in the two polluted areas were 69 and 50μg/m^3, and 34μg/m^3 in the one rural area where it was measured. After adjustment of mean PEFR for age, height, weight, history of bronchitis or pneumonia, social class and number of siblings, the ranking of lung function values was not related to the ranking of air pollution levels. If we are correct that effects on health in such studies are unlikely to be found consistently at levels of smoke and SO_2 below 140μg/m^3, then this result would be expected.

Biersteker and Van Leeuwen (1970) studied 935 primary schoolchildren in Rotterdam, Holland. The children went to schools in two areas. The cleaner area had a winter mean smoke level of 40μg/m^3 and SO_2 level of 120μg/m^3. The more polluted areas had "approximately 50 per cent higher" levels. There were no differences in height adjusted PEFRs between boys or girls from the two areas, but a history of bronchitis was more common in the more polluted, poor downtown district. The authors were inclined to attribute this difference to the poor living conditions in general rather than to the higher levels of pollution. They also noted that although the levels of SO_2 in the clean area were quite high, there was a prevalence of only 1 per cent of bronchitis, suggesting that such levels might exist without apparent damage to the health of the schoolchildren.

Three cross-sectional studies in which data were collected similar to those in the EC study drew positive conclusions for effects of pollution on children's health at low ambient levels. Tessier and co-workers (1976) published a preliminary report of a three year study of over 1000 children aged 6-11 living in Bordeaux, France. Annual mean levels of smoke varied from 50-90$\mu g/m^3$ and SO_2 varied from 40-74$\mu g/m^3$ in different parts of the city. Associated with short term elevations in pollution was an increase in absenteeism from respiratory disease in the following week. The effects of meteorological changes taking place at the same time as the pollution changes were not taken into account in this preliminary report.

The second study was also carried out in France (PAARC, 1982a; 1982b). The sample consisted of 19191 people, including 2527 children aged 6-10 years, living in 28 areas in 7 cities. No relation was found between particulate levels and respiratory symptoms, illnesses or lung function for men, women or children. However, there were significant ($p<.05$) associations in all three groups between SO_2 and symptoms and lung function. SO_2 level over the range of three year averages of 20-85$\mu g/m^3$ was positively related to the prevalence of chronic cough and phlegm production in adults. In children, there was a significant association between SO_2 level and upper respiratory tract infections (nose usually blocked or runny, usually sleeps with mouth open, tonsillitis, rhinopharyngitis, otitis or sinusitis during the past year), but not lower respiratory tract symptoms (similar though not identical to those sought in the EEC study). In all groups FEV_1, or $FEV_{0.75}$ were negatively correlated with SO_2 levels. This study suggests that there may be effects on health of low levels of SO_2, but the only part of the results that may be reasonably compared with the EEC study results - the relation with lower respiratory symptoms and illnesses in children - shows incompatibility between the studies. No relation was found in the PAARC study, yet in the French data for the EEC study there was a significant positive relation between SO_2 level and symptoms (CNSLD). In as far as PEFR and $FEV_{0.75}$ may be correlated in children, the EEC results for the former in French children show no relation with SO_2 levels and a highly significant negative relation with smoke, the reverse of the PAARC findings for $FEV_{0.75}$. We do not believe that these differences in results are due to real differences, but rather demonstrate the unreliability of results from studies of this design at low levels of ambient air pollution.

The third study was analysed both cross-sectionally and longitudinally. Melia and co-workers (1981a; 1981b) investigated over 4000 primary schoolchildren living in 19 areas in the U.K. The frequency of respiratory illness, defined by answers to a questionnaire, was found in cross-sectional analysis to be positively associated with levels of smoke over the range of annual mean value of 8 to 51$\mu g/m^3$, though not with SO_2 annual levels of 12 to 114 $\mu g/m^3$.

Allowance was made for many interfering factors including age, social class and cigarette smoking in the home. However, when changes in the number of respiratory conditions from one annual examination to another were analysed in relation to changes in pollution levels, no association was found between improvement in health and decreasing levels of pollution. Putting the results of these two analyses together, the authors suggested that the cross-sectional findings might have been due to previous higher levels of pollution experienced in the more polluted areas. As no improvement in health could be found associated with a decline in pollution over the period of the study, it was felt that the measured levels were not detectably harmful to health.

There are many other studies of children but we have omitted them in this review because different methods of measuring pollution were used or the biological measurements were different. Those studies in which smoke has been measured (usually by the British Standard or OECD method, but sometimes reported after using a conversion factor on results from other methods) suggest in general that smoke levels need to be higher than are usually found in Western Europe in order to have sufficient effect on the health of young children to be detectable by current epidemiological methods.

CONCLUSION AND RECOMMENDATIONS

The overall interpretation we have put on this study is that the findings are contradictory. Whether or not there is a harmful effect of smoke and SO_2 in the ranges found in this study (5-60 and 20-160 $\mu g/m^3$ respectively) our data do not provide evidence for it in the form of a threshold effect or an underlying dose response curve. We believe the different results according to country are reflections of regional or geographic influences which may be due to cultural, linguistic and climatic differences and possibly to differences in welfare policies.

In contrast, certain other relations were found that would have been expected based on the results of other studies. These include the greater susceptibility to CNSLD in boys compared with girls, the general decline in the prevalence of symptoms with age, and the association of smoking in the home and of manual occupation or unemployment of the father with respiratory symptoms and illnesses in the children.

The data contain many interesting contrasts between areas, such as the greater height of German children or the very high prevalence of asthma in Bordeaux. These we have not had the space here to pursue but hope that they may provoke new hypotheses for study about environmental influences on health.

Experience in this study would lead us to make the following recommendations. Large scale international studies which cross cultural and linguistic boundaries need to be designed so that these differences may be adequately taken into account. This may mean that each cultural/linguistic unit should be surveyed in such a way that reliable conclusions might be drawn solely from the data of that unit. The similarities or differences between units may then be used to assess the consistency or otherwise of an environmental effect on health or to raise new hypotheses. However, this approach should not open the way to methodological anarchy. A single detailed protocol would still be required and a high degree of coordination in training and timetabling would be necessary. We believe, despite the hard work of the check measurement fieldworkers and the rapidity with which they had to move from one area to another, that greater attention and resources needed to be given to quality control than we managed to achieve. This may take a noticeable proportion of the total budget and be extremely demanding on the specialist fieldworkers.

Finally, we would recommend that the now traditional epidemiological method for estimating the effects of air pollution on health - comparing cross-sectional observations of populations experiencing different levels of air pollution - be abandoned. It is a methodology which at current ambient smoke and SO_2 levels as have been achieved in many areas of the European Community by appropriate air pollution control measures leads for the most part to confusing and arguable results even when all precautions are taken. Methods should be developed to estimate individual exposure to pollution so that cohorts of homogeneous populations living in the same climatic conditions but experiencing different individual exposure can be investigated over a period of time. This approach is well known in, for example, cardiovascular epidemiology. It would allow not only the impact of the outdoor pollution to be assessed, but would account for indoor exposure as well. Many epidemiologists are already turning to the study of the indoor environment (WHO, 1979), but their investigations are limited by the lack of appropriate passive personal samplers. We feel that cooperation between epidemiologist and environmental chemist is essential to realise the full benefit of both disciplines in the study of the environment and human health.

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Table 1

Characteristics of the fieldworkers and their interviews and number of measurement fieldworkers and PEFR used.

AREAS	No. & sex of interviewers M	F	Usual occupation	Place of interview	% of interviews with the mother as a proportion of all interviews	Number of: Measurement Fieldworkers	PEFR meters
Duisburg		39	S	Home	90.6	8	6
Düsseldorf		36	Para	Home	93.0	6	5
Reydt		38		Home	90.6	7	5
Bordeaux		8	S + SW	Home	86.1	2	2
Lyons D		10	S, SN	School and	87.8	8	2
Lyons G		10	CT, H/W	Home	84.9	5	2
Paris		5	SW, N, MD	Home	85.5	5	6
Lacq		4	SW, ST		91.3	4	2
Milan	1	3	SMD	School	85.3	3	2
Venice		2	N	and	88.6	4	3
Ferrara		6		Home	83.3	6	3
Gent	5	5	SW,MD,P,Sec	Home	75.0	3	3
Ardennes	4	11	N,SW	Home	89.9	2	3
Hartlepool		2		School	96.8	2	2
Middlesbrough		2	N	and	90.6	2	4
Stockton		2		Home	77.4	2	2
Dublin		5	N	Home	89.9	4	13
Cork		5	MD		95.2	4	7
Galway		5			93.4	4	10

See next page for key

5)

Abbreviations used in Table 1

CT	=	Commercial traveller
H/W	=	Housewife
MD	=	Doctor
N	=	Nurse
P	=	Psychologist
Para	=	Paramedical staff
S	=	Student
Sec	=	Secretary
SMD	=	School doctor
SN	=	Student nurse
Soc	=	Sociologist
SW	=	Social worker

Table 2

Major job categories of the International Standard Classification of Occupations (ISO, 1969)

Major Group Code	Description
0/1	Professional, technical and related workers
2	Administrative and managerial workers
3	Clerical and related workers
4	Sales workers
5	Service workers
6	Agricultural, animal husbandry and forestry workers, fishermen and hunters
7/8/9	Production and related workers, transport equipment operators and labourers

Table 3

Methods Of Air Pollution Measurement By Site

SITE		S.P.M.	SO_2	No. of Comparison stations
Duisburg	Germany	Bat tape	Wosthoff (Conduct)	2
Düsseldorf	Germany	Bat tape	Wosthoff (Conduct)	1
Rheydt	Germany	Lib filtre	Silica gel.	1
Bordeaux	France	Reflectometry Gravimetry	Zinc acetate H_2O_2	1
Lyon D	France	Reflectometry	H_2O_2	1
Lyon G	France	Reflectometry	H_2O_2	1
Paris	France	Reflectometry	H_2O_2	1
Lacq	France	Reflectometry Millipor	Zinc acetate	1
Venezia	Italy	Gravimetry	Coulometry	1
Milano	Italy	Gravimetry	Coulemetry	1
Ferrara	Italy	Reflectometry	West-Gaeke	1
Gent	Belgium	Reflectometry	H_2O_2	1
Ardennes	Belgium	Reflectometry	'Acid titration'	-
Hartlepool	U.K.	Reflectometry	H_2O_2 (B.S.)	-
Middlesbro	U.K.	Reflectometry	H_2O_2	1
Stockton	U.K.	Reflectometry	H_2O_2	2
Dublin	Ireland	Reflectometry	H_2O_2	2
Galway	Ireland	Reflectometry	H_2O_2	1
Cork	Ireland	Reflectometry	H_2O_2	1

N.B. Slight variations occur in the reflectometer curves in use, and in the high acidity methods.

Table 4

Check measurement fieldworker trial

Difference between peak flow readings of pairs of fieldworkers
PEFR(1)

Lower numbered fieldworker pairing		Higher numbered fieldworker				
		2	3	4	5	6
1	1st	-10	15	15	-20	-25
	2nd	5	5	-5	15	25
2	1st		10	-15	65	-15
	2nd		-10	-5	5	-25
3	1st			15	80	-5
	2nd			10	15	15
4	1st				-15	-45
	2nd				20	20
5	1st					0
	2nd					60

Example:
Fieldworkers 1 and 2 were paired for child number 1 and 16.
The difference between the readings for child 1 was 190-200 = -10 l/min
The difference between the readings for child 16 was 170-165 = 5 l/min

Table 5

Check measurement fieldworker trial

Difference between peak flow readings of pairs of fieldworkers
PEFR(2)

Lower numbered fieldworker pairing		Higher numbered fieldworker				
		2	3	4	5	6
1	1st	-20	-20	10	10	-10
	2nd	15	55	-5	10	-45
2	1st		0	0	25	0
	2nd		-10	15	-45	-20
3	1st			-15	20	-45
	2nd			-15	-10	-5
4	1st				-5	-25
	2nd				-30	0
5	1st					-20
	2nd					5

Example:
Fieldworkers 1 and 2 were paired for child number 1 and 16.
The difference between the readings for child 1 was 170-160 = -20 l/min
The difference between the readings for child 16 was 190-175 = 15 l/min

Table 6

Mean differences in physical measurements between pairs of observations made on each child by a local fieldworker and a check measurement fieldworker by country

	Number	Mean (Standard Error) of differences in measurements of:		
		Height (cms)	Weight (Kg)	PEFR (l/min)
FRG	94	.162 (.057)**	.095 (.095)	-7.81 (3.17)**
France	144	-.083 (.041)*	-.038 (.059)	-2.88 (2.00)
Italy	61	-.008 (.032)	.005 (.012)	-0.61 (1.99)
Belgium	69	.087 (.043)*	-.041 (.095)	-4.28 (4.23)
U.K.	68	.059 (.055)	.127 (.087)	-10.52 (4.23)***
Ireland	228	-.013 (.024)	-.012 (.008)	-1.95 (1.14)
Totals	666	.003 (.017)	.012 (.023)	-3.99 (0.98)***

NOTE
Probability: * $p<.05$ ** $p<.01$ *** $p<.001$

Table 7

Sample sizes, number of children seen and response rates by country

Area	Sample size	Total seen	Response Rate (%)
Duisburg	2014	1305	64.80
Düsseldorf	1680	1277	76.01
Rheydt	1735	1069	61.61
Bordeaux	1943	1429	73.55
Lyon D	2025	1442	71.21
Lyon G	1377	958	69.57
Paris	*	1012	*
Lacq	1968	1723	88.97
Milan	917	890	97.06
Venice	999	973	97.34
Ferrara	870	859	98.73
Gent		1273	
Ardennes	1130	1124	99.47
Hartlepool	1113	931	83.65
Middlesborough	1064	1055	99.25
Stockton	732	716	97.81
Dublin		1471	
Cork		1468	
Galway		1362	
Total		22337	

* Sample size not known

Table 8A

Number Of Children With Questionnaire Data By Area, Sex and Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	19	151	174	156	146	31	164	182	147	111	1281
Düsseldorf	21	151	160	174	148	40	163	156	136	128	1277
Rheydt	29	129	164	135	91	25	134	135	126	101	1069
Bordeaux	110	115	131	158	199	87	128	151	162	188	1429
Lyon D	113	141	155	172	149	89	162	160	165	136	1442
Lyon G	74	101	129	109	107	64	79	96	92	107	958
Paris	92	132	109	104	99	82	85	91	111	107	1012
Lacq	118	178	164	194	200	122	186	177	194	190	1723
Milan	50	89	101	100	82	46	91	123	131	77	890
Venice	53	114	106	101	125	48	94	108	116	108	973
Ferrara	47	87	90	109	120	49	88	77	90	102	859
Gent	20	76	156	156	148	34	98	147	168	166	1169
Ardennes	66	101	126	118	136	77	130	111	137	122	1124
Hartlepool	26	112	117	103	123	24	99	101	120	103	928
Middlesbrough	92	107	113	109	95	102	107	106	100	87	1018
Stockton	49	80	62	71	99	41	59	63	59	67	650
Dublin	137	172	148	138	136	133	154	141	155	157	1471
Cork	117	171	145	163	137	91	176	141	167	160	1468
Galway	116	124	132	149	148	121	128	144	170	130	1362
Totals	1349	2331	2482	2519	2488	1306	2325	2410	2546	2347	22103

Table 8b

Total Number Of Children With Questionnaire Data By Area, Sex And Age

No Smoker In The Home

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	11	63	61	68	65	16	68	69	51	42	514
Düsseldorf	13	53	70	89	73	17	61	66	66	75	583
Rheydt	13	62	78	77	43	12	54	76	62	53	530
Bordeaux	46	45	68	67	98	35	50	70	73	91	643
Lyon D	53	61	63	73	61	38	70	64	69	65	617
Lyon G	31	47	58	45	46	27	40	45	39	55	433
Paris	40	56	38	45	39	27	36	40	43	46	410
Lacq	65	90	81	99	90	56	99	78	116	91	865
Milan	15	36	25	44	29	15	31	31	49	26	301
Venice	17	35	36	45	45	19	36	30	35	30	328
Ferrara	16	33	35	37	37	18	27	27	35	40	305
Gent	3	20	30	38	35	10	23	46	54	42	301
Ardennes	18	31	42	31	48	27	49	32	47	42	367
Hartlepool	4	20	27	23	25	5	21	24	22	23	194
Middlesbrough	41	47	51	51	43	45	51	50	52	39	470
Stockton	7	28	19	9	27	13	19	16	16	16	170
Dublin	16	30	20	19	17	19	23	19	26	25	214
Cork	43	70	51	54	51	41	55	49	63	53	530
Galway	38	49	45	63	65	50	48	52	62	45	517
Totals	490	876	898	977	937	490	861	884	980	899	8292

Table 8c

Total Number Of Children With Data By Area, Sex And Age

At Least One Smoker In The Home

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	8	88	113	88	81	15	96	113	96	69	767
Düsseldorf	8	98	90	85	75	23	102	90	70	53	694
Rheydt	16	66	85	57	48	13	80	59	64	48	536
Bordeaux	64	70	63	91	101	52	78	81	89	97	786
Lyon D	60	80	92	99	88	51	90	96	96	71	823
Lyon G	43	54	71	64	61	37	39	51	53	52	525
Paris	52	76	71	59	59	55	49	51	68	61	601
Lacq	53	88	83	95	110	66	87	99	78	99	858
Milan	35	53	76	56	53	31	60	91	81	49	585
Venice	36	79	69	56	80	29	57	78	79	78	641
Ferrara	31	53	55	72	83	31	61	47	55	62	550
Gent	17	56	125	118	113	24	75	101	114	124	867
Ardennes	48	70	84	87	88	50	81	79	90	80	757
Hartlepool	22	92	90	80	98	19	78	77	98	80	734
Middlesbrough	49	59	62	58	52	57	56	56	48	48	545
Stockton	42	52	43	62	72	28	40	47	43	51	480
Dublin	121	142	128	119	119	114	131	122	129	132	1257
Cork	74	101	94	109	86	50	121	92	104	107	938
Galway	78	75	87	86	83	71	80	92	108	85	845
Totals	857	1452	1581	1541	1550	816	1461	1522	1563	1446	13789

Table 9

Percent of Children with Morning Cough By Area, Sex and Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	10.5	9.9	8.0	9.0	11.6	16.1	10.4	6.0	10.2	9.0	9.4
Düsseldorf	14.3	7.9	10.0	6.3	3.4	5.0	2.5	7.7	2.9	4.7	5.9
Rheydt	3.4	10.9	6.7	6.7	7.7	12.0	9.0	6.7	7.1	5.0	7.5
Bordeaux	5.5	9.6	3.1	.6	3.0	5.7	3.1	3.3	3.1	2.1	3.6
Lyon D	5.3	6.4	1.9	4.1	4.7	4.5	4.9	3.8	4.2	5.9	4.5
Lyon G	5.4	6.9	5.4	4.6	5.6	1.6	6.3	3.1	4.3	.9	4.5
Paris	12.0	10.6	4.6	6.7	5.1	8.5	11.8	4.4	5.4	.9	6.9
Lacq	6.8	3.4	3.0	7.2	3.0	13.1	6.5	1.1	3.1	4.7	4.9
Milan	14.0	5.6	12.9	6.0	11.0	10.9	7.7	5.7	6.1	6.5	8.1
Venice	7.5	2.6	4.7	2.0	1.6	14.6	7.4	3.7	2.6	2.8	4.1
Ferrara	6.4	4.6	5.6	3.7	3.3	10.2	2.3	3.9	4.4	2.9	4.3
Gent	0.0	10.5	6.4	7.1	5.4	8.8	6.1	5.4	6.0	5.4	6.2
Ardennes	3.0	4.0	0.0	2.5	1.5	5.2	4.6	.9	2.9	1.6	2.5
Hartlepool	7.7	14.3	9.4	7.8	4.9	4.2	12.1	11.9	4.2	6.8	8.6
Middlesbrough	12.0	10.3	3.5	2.8	1.1	12.7	4.7	4.7	7.0	5.7	6.4
Stockton	8.2	10.0	16.1	8.5	5.1	14.6	10.2	7.9	3.4	10.4	9.1
Dublin	15.3	11.0	17.6	12.3	16.9	21.1	14.3	19.9	14.8	12.1	15.4
Cork	5.1	3.5	5.5	7.4	8.8	7.7	4.0	5.0	6.0	3.8	5.5
Galway	2.6	2.4	3.0	4.0	.7	2.5	1.6	4.2	2.9	1.5	2.6
Totals	7.7	7.5	6.5	5.8	5.3	9.6	6.6	5.7	5.4	4.8	6.3

Total Number Of Observations In Table = 22103.

Table 10

Percent Of Children With Cough Day Or Night By Area, Sex And Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	10.5	14.6	11.5	12.2	8.2	16.1	13.4	8.2	8.8	10.8	11.1
Düsseldorf	9.5	6.0	11.3	8.0	6.1	5.0	6.7	9.0	5.1	4.7	7.2
Rheydt	10.3	14.0	12.8	9.6	6.6	12.0	9.0	11.9	7.9	5.9	10.1
Bordeaux	5.5	7.0	3.1	1.9	4.5	5.7	5.5	6.6	3.7	2.1	4.3
Lyon D	5.3	6.4	1.3	2.9	3.4	3.4	8.0	3.8	4.8	5.1	4.4
Lyon G	12.2	5.9	8.5	1.8	2.8	9.4	2.5	2.1	3.3	3.7	5.0
Paris	12.0	5.3	6.4	14.4	4.0	11.0	11.8	8.8	7.2	.9	7.9
Lacq	6.8	4.5	6.1	8.8	5.0	9.8	4.8	5.6	2.6	4.2	5.6
Milan	10.0	10.1	10.9	8.0	8.5	13.0	4.4	4.1	9.2	6.5	8.1
Venice	5.7	1.8	6.6	3.0	2.4	12.5	6.4	3.7	.9	1.9	3.8
Ferrara	6.4	5.7	3.3	3.7	5.0	8.2	2.3	2.6	2.2	3.9	4.1
Gent	0.0	10.5	6.4	5.8	3.4	8.8	8.2	4.8	4.8	4.2	5.6
Ardennes	1.5	2.0	2.4	1.7	2.9	5.2	6.9	.9	2.9	3.3	3.0
Hartlepool	11.5	22.3	15.4	15.5	15.4	4.2	21.2	21.8	5.0	12.6	15.5
Middlesbrough	13.0	15.9	7.1	11.9	3.2	14.7	7.5	9.4	7.0	9.2	9.9
Stockton	18.4	18.8	17.7	15.5	7.1	26.8	20.3	23.8	13.6	11.9	16.5
Dublin	17.5	11.6	9.5	10.1	9.6	11.3	11.7	13.5	8.4	8.9	11.1
Cork	6.8	5.3	4.8	3.7	6.6	9.9	6.3	7.8	5.4	4.4	5.9
Galway	4.3	.8	3.0	4.7	2.0	3.3	3.1	5.6	4.1	.8	3.2
Totals	8.9	8.6	7.6	7.2	5.5	9.4	8.1	7.7	5.4	5.2	7.2

Total Number Of Observations In Table = 22101.

Table 11

Percent Of Children With Cough Three Months A Year By Area, Sex And Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	10.5	8.6	7.5	7.1	4.8	12.9	7.3	5.5	6.1	3.6	6.6
Düsseldorf	14.3	3.3	5.0	2.3	2.7	5.0	2.5	7.1	1.5	1.6	3.5
Rheydt	3.4	7.8	4.9	7.4	5.5	12.0	6.0	5.9	3.2	1.0	5.4
Bordeaux	6.4	1.7	0.0	0.0	1.0	4.6	1.6	1.3	.6	1.1	1.5
Lyon D	2.7	4.3	1.3	2.3	.7	1.1	6.8	3.1	1.8	2.2	2.7
Lyon G	2.7	3.0	1.6	.9	2.8	1.6	1.3	2.1	2.2	.9	1.9
Paris	5.4	5.3	3.7	6.7	2.0	7.3	9.4	5.5	1.8	.9	4.6
Lacq	2.5	2.2	1.2	3.6	2.5	5.7	1.6	1.1	.5	1.1	2.1
Milan	6.0	4.5	6.9	2.0	2.4	4.3	1.1	2.4	3.1	1.3	3.3
Venice	5.7	1.8	2.8	1.0	2.4	4.2	3.2	3.7	.9	0.0	2.3
Ferrara	0.0	4.6	1.1	.9	0.0	0.0	1.1	0.0	0.0	1.0	.9
Gent	0.0	6.6	3.2	3.8	2.0	2.9	5.1	4.8	3.0	3.6	3.7
Ardennes	0.0	1.0	.8	0.0	1.5	3.9	3.1	0.0	3.6	0.0	1.4
Hartlepool	7.7	11.6	6.0	4.9	5.7	0.0	6.1	5.9	0.0	5.8	5.6
Middlesbrough	12.0	9.3	4.4	3.7	2.1	12.7	5.6	6.6	7.0	8.0	7.1
Stockton	12.2	8.8	8.1	5.6	2.0	9.8	6.8	7.9	5.1	9.0	7.1
Dublin	5.1	2.3	2.7	2.2	5.1	4.5	.6	2.8	2.6	3.8	3.1
Cork	.9	3.5	3.4	5.5	3.6	4.4	2.8	2.8	3.0	2.5	3.3
Galway	.9	.8	.8	2.0	.7	.8	1.6	2.8	1.8	0.0	1.2
Totals	4.4	4.6	3.3	3.3	2.5	4.9	3.7	3.7	2.4	2.3	3.4

Total Number of Observations In Table = 22101

Table 12

Percent Of Children With Breathlessness When Playing By Area, Sex And Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	10.5	11.9	13.2	15.4	14.4	19.4	9.1	18.7	12.9	12.6	13.7
Düsseldorf	4.8	8.6	6.3	9.8	10.1	5.0	7.4	7.7	3.7	7.8	7.6
Rheydt	10.3	4.7	9.1	7.4	9.9	0.0	6.0	11.1	11.9	5.9	8.1
Bordeaux	7.3	3.5	6.1	6.3	7.5	4.6	4.7	4.6	8.6	5.9	6.1
Lyon D	7.1	6.4	9.7	8.7	14.1	7.9	7.4	10.0	8.5	8.1	8.9
Lyon G	16.2	11.9	17.1	15.6	12.1	9.4	12.7	10.4	8.7	11.2	12.7
Paris	9.8	15.9	11.9	17.3	16.2	14.6	9.4	13.2	9.0	11.2	12.9
Lacq	6.8	6.7	7.9	6.7	8.5	9.0	6.5	5.1	9.3	8.4	7.5
Milan	4.0	4.5	9.9	12.0	11.0	4.4	11.0	9.8	10.7	13.0	9.6
Venice	1.9	5.3	2.8	4.0	4.0	2.1	1.1	3.7	2.6	5.6	3.5
Ferrara	4.3	3.4	5.6	2.8	5.8	2.0	8.0	2.6	2.2	2.9	4.1
Gent	5.0	10.5	3.2	7.7	7.4	5.9	7.1	4.8	4.8	7.2	6.2
Ardennes	3.0	4.0	4.0	5.1	5.1	2.6	3.1	0.0	2.9	.8	3.1
Hartlepool	3.8	8.9	9.4	7.8	13.0	4.2	5.1	7.9	5.0	7.8	8.0
Middlesbrough	1.1	5.6	4.4	9.2	8.4	3.9	2.8	.9	3.0	5.7	4.5
Stockton	2.0	11.3	4.8	4.2	8.1	2.4	10.2	1.6	6.8	11.9	6.8
Dublin	13.1	8.1	10.1	3.6	5.1	9.8	8.4	11.3	5.8	7.0	8.2
Cork	5.1	2.9	6.2	6.1	6.6	5.5	4.0	4.3	2.4	2.5	4.4
Galway	4.3	2.4	2.3	8.7	5.4	4.1	2.3	4.2	1.8	1.5	3.7
Totals	6.7	7.2	7.8	8.3	8.9	6.5	6.4	7.4	6.4	6.9	7.3

Total Number Of Observations In Table = 22099.

Table 13

Percent Of Children Short Of Breath When Playing With Children

Of The Same Age, By Area, Sex and Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	5.3	6.0	6.3	5.8	9.6	6.5	4.9	7.1	6.1	3.6	6.2
Düsseldorf	4.8	6.0	4.4	6.9	7.4	0.0	4.3	5.8	.7	3.1	4.8
Rheydt	3.4	3.1	6.1	3.7	7.7	0.0	3.7	5.9	9.5	1.0	5.0
Bordeaux	5.5	0.0	2.3	3.8	6.0	1.1	3.1	2.6	4.3	3.2	3.4
Lyon D	3.5	4.3	4.5	2.9	7.4	2.2	3.1	3.8	4.8	5.1	4.2
Lyon G	5.4	5.0	5.4	3.7	5.6	1.6	2.5	6.3	3.3	4.7	4.5
Paris	7.6	6.8	4.6	8.7	9.1	8.5	2.4	3.3	6.3	4.7	6.2
Lacq	4.2	2.8	5.5	2.6	6.0	4.9	3.2	4.0	5.7	5.3	4.4
Milan	2.0	3.4	2.0	4.0	4.9	4.4	2.2	3.3	1.5	7.8	3.4
Venice	0.0	.9	1.9	2.0	1.6	0.0	1.1	2.8	.9	1.9	1.4
Ferrara	4.3	1.1	3.4	.9	2.5	0.0	4.5	1.3	0.0	0.0	1.8
Gent	5.0	6.6	2.6	4.5	4.7	5.9	5.1	2.0	1.8	4.2	3.8
Ardennes	1.5	3.0	1.6	3.4	5.1	1.3	1.5	0.0	2.9	0.0	2.1
Hartlepool	3.8	6.3	4.3	1.9	6.5	4.2	3.0	5.9	3.3	4.9	4.5
Middlesbrough	1.1	5.6	4.4	7.3	5.3	3.9	1.9	.9	3.0	3.4	3.7
Stockton	0.0	7.5	4.8	2.8	5.1	0.0	6.8	0.0	1.7	7.5	4.0
Dublin	6.6	3.5	5.4	2.2	2.9	3.8	3.9	5.7	2.6	1.9	3.8
Cork	5.1	1.8	4.8	5.5	6.6	3.3	2.3	2.8	1.2	1.3	3.3
Galway	3.4	2.4	2.3	6.7	2.0	2.5	1.6	2.1	1.2	.8	2.5
Totals	4.1	3.9	4.2	4.2	5.6	3.1	3.2	3.7	3.3	3.2	3.9

Total Number Of Observations In Table = 22099.

Table 14

Percent Of Children With A Wheezy Or Whistling Chest By Area, Sex And Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	5.3	13.2	12.6	10.9	8.9	12.9	7.9	7.7	7.5	7.2	9.6
Düsseldorf	9.5	11.3	15.0	19.0	13.5	15.0	9.2	9.6	11.0	9.4	12.5
Rheydt	10.3	10.9	11.6	5.9	4.4	8.0	6.7	9.6	8.7	5.9	8.3
Bordeaux	15.5	14.8	13.7	12.0	10.1	6.9	7.8	9.9	9.9	5.9	10.4
Lyon D	10.6	13.5	9.0	9.9	8.1	15.7	8.0	8.1	7.3	6.6	9.4
Lyon G	12.2	11.9	6.2	6.4	3.7	12.5	5.1	9.4	3.3	4.7	7.2
Paris	20.7	14.4	10.1	8.7	11.1	20.7	20.0	14.3	5.4	7.5	12.8
Lacq	10.2	5.1	9.8	9.3	8.0	11.5	5.9	5.1	9.3	5.8	7.8
Milan	12.0	10.1	8.9	11.0	8.5	4.3	12.1	5.7	7.6	6.5	8.7
Venice	3.8	3.6	2.8	2.0	2.4	2.1	3.2	0.0	2.6	1.9	2.4
Ferrara	10.6	10.3	16.7	11.1	10.0	14.3	8.0	3.9	4.4	9.8	9.8
Gent	10.0	17.1	10.3	5.8	10.1	11.8	7.1	10.2	6.0	5.4	8.6
Ardennes	3.0	5.9	3.2	7.6	4.4	10.4	4.6	8.1	4.4	4.1	5.4
Hartlepool	15.4	25.0	19.7	12.6	19.5	20.8	23.2	19.8	12.5	9.7	17.8
Middlesbrough	29.3	33.6	19.5	22.0	17.9	24.5	18.7	19.8	17.0	16.1	21.9
Stockton	16.3	15.0	25.8	18.3	17.2	19.5	20.3	12.7	11.9	14.9	17.1
Dublin	30.7	24.4	18.9	21.7	15.4	27.8	24.0	22.0	23.9	19.7	22.8
Cork	12.0	11.1	9.0	12.3	14.6	22.0	10.8	10.6	7.2	7.5	11.2
Galway	11.2	12.9	8.3	13.4	10.1	9.1	6.3	7.6	5.9	6.9	9.1
Totals	14.8	13.8	11.8	11.6	10.3	15.2	10.5	10.0	8.8	8.0	11.1

Total Number Of Observations In Table = 22100.

Table 15

Percent Of Children With A Wheezy Or Whistling Chest By Area, Sex And Age

No Smoker In The Home.

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	0.0	9.5	13.1	10.3	13.8	6.3	5.9	7.2	3.9	9.5	8.9
Düsseldorf	7.7	5.7	12.9	19.1	12.3	5.9	8.2	6.1	13.6	12.0	11.5
Rheydt	0.0	6.5	12.8	5.2	2.3	0.0	7.4	9.2	9.7	5.7	7.4
Bordeaux	17.4	17.8	16.2	13.4	8.2	2.9	8.0	8.6	11.0	7.7	10.9
Lyon D	18.9	9.8	6.3	6.8	6.6	13.2	8.6	7.8	4.3	9.2	8.8
Lyon G	9.7	8.5	6.9	4.4	2.2	7.4	5.0	4.4	2.6	7.3	5.8
Paris	22.5	17.9	7.9	11.1	5.1	29.6	19.4	12.5	4.7	6.5	13.2
Lacq	9.2	3.3	7.4	11.1	8.9	14.3	7.1	6.4	8.6	7.7	8.2
Milan	20.0	8.3	8.0	11.4	17.2	0.0	9.7	9.7	4.1	3.8	9.0
Venice	5.9	5.7	2.8	4.4	4.4	0.0	2.8	0.0	2.9	0.0	3.0
Ferrara	12.5	6.1	11.4	13.5	10.8	11.1	3.7	0.0	5.7	10.0	8.5
Gent	0.0	15.0	13.3	7.9	2.9	0.0	13.0	8.7	7.4	2.4	7.6
Ardennes	0.0	6.5	0.0	6.5	2.1	11.1	2.0	6.3	6.4	4.8	4.4
Hartlepool	0.0	15.0	14.8	4.3	28.0	20.0	19.0	8.3	4.5	8.7	12.9
Middlesbrough	19.5	38.3	13.7	21.6	16.3	20.0	17.6	22.0	17.3	0.0	18.9
Stockton	0.0	10.7	26.3	33.3	22.2	7.7	10.5	6.3	6.3	12.5	14.1
Dublin	37.5	13.3	5.0	10.5	11.8	21.1	8.7	26.3	11.5	20.0	15.9
Cork	11.6	8.6	5.9	9.3	21.6	22.0	9.1	8.2	1.6	3.8	9.6
Galway	13.2	12.2	4.4	9.5	9.2	2.0	6.3	1.9	4.8	4.4	6.8
Totals	13.7	11.0	9.8	10.7	10.0	11.4	8.5	8.1	7.2	7.1	9.5

Total Number Of Observations In Table = 8292.

Table 16

Percent Of Children With A Wheezy Or Whistling Chest By Area, Sex And Age

At Least One Smoker In The Home.

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	12.5	15.9	12.4	11.4	4.9	20.0	9.4	8.0	9.4	5.8	10.0
Düsseldorf	12.5	14.3	16.7	18.8	14.7	21.7	9.8	12.2	8.6	5.7	13.3
Rheydt	18.8	15.2	10.6	7.0	6.3	15.4	6.3	10.2	7.8	6.3	9.3
Bordeaux	14.1	12.9	11.1	11.0	11.9	9.6	7.7	11.1	9.0	4.1	10.1
Lyon D	3.3	16.3	10.9	12.1	9.1	17.6	7.8	8.3	9.4	4.2	9.8
Lyon G	14.0	14.8	5.6	7.8	4.9	16.2	5.1	13.7	3.8	1.9	8.4
Paris	19.2	11.8	11.3	6.8	15.3	16.4	20.4	15.7	5.9	8.2	12.6
Lacq	11.3	6.8	12.0	7.4	7.3	9.1	4.6	4.0	10.3	4.0	7.3
Milan	8.6	11.3	9.2	10.7	3.8	6.5	13.3	4.4	9.9	8.2	8.5
Venice	2.8	2.6	1.4	0.0	1.3	3.4	3.5	0.0	2.5	2.6	1.9
Ferrara	9.7	11.3	20.0	9.9	9.6	16.1	9.8	6.4	3.6	9.7	10.4
Gent	11.8	17.9	9.6	5.1	12.4	16.7	5.3	10.9	5.3	6.5	8.9
Ardennes	4.2	5.7	4.8	8.0	5.7	10.0	6.2	8.9	3.3	3.8	5.9
Hartlepool	18.2	27.2	21.1	15.0	17.3	21.1	24.4	23.4	14.3	10.0	19.1
Middlesbrough	34.7	30.5	24.2	22.4	19.2	28.1	19.6	17.9	16.7	29.2	24.2
Stockton	19.0	17.3	25.6	16.1	15.3	25.0	25.0	14.9	14.0	15.7	18.1
Dublin	29.8	26.8	21.1	23.5	16.0	28.9	26.7	21.3	26.4	19.7	24.0
Cork	12.2	12.9	10.6	13.8	10.5	22.0	11.6	12.0	10.6	9.3	12.0
Galway	10.3	13.3	10.3	16.3	10.8	14.1	6.3	10.9	6.5	8.2	10.5
Totals	15.3	15.4	12.8	12.1	10.5	17.5	11.8	11.1	9.7	8.5	12.1

Total Number Of Observations In Table = 13786.

Table 17

Percent Of Children With A Wheezy Chest At Most Times By Area, Sex and Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	5.3	9.9	8.0	6.4	4.1	6.5	4.3	4.9	2.0	6.3	5.8
Düsseldorf	9.5	4.6	6.9	5.7	6.1	2.5	3.7	4.5	4.4	3.1	4.9
Rheydt	3.4	3.9	8.5	5.2	4.4	8.0	3.7	4.4	6.3	3.0	5.1
Bordeaux	1.8	0.0	0.0	.6	0.0	0.0	0.0	.7	0.0	0.0	.3
Lyon D	1.8	1.4	0.0	1.7	.7	0.0	0.0	.6	0.0	0.0	.6
Lyon G	0.0	1.0	0.0	.9	.9	0.0	1.3	0.0	0.0	0.0	.4
Paris	0.0	1.5	0.0	1.0	0.0	1.2	1.2	0.0	0.0	.9	.6
Lacq	.8	0.0	.6	1.5	0.0	1.6	.5	.6	.5	.5	.6
Milan	2.0	1.1	0.0	1.0	0.0	2.2	2.2	0.0	0.0	0.0	.7
Venice	0.0	.9	1.9	0.0	.8	0.0	1.1	0.0	.9	.9	.7
Ferrara	2.1	1.1	0.0	1.8	.8	0.0	1.1	1.3	2.2	2.0	1.3
Gent	5.0	2.6	1.3	.6	2.0	0.0	1.0	1.4	0.0	0.0	1.0
Ardennes	0.0	1.0	0.0	0.0	0.0	0.0	.8	0.0	0.0	0.0	.2
Hartlepool	3.8	10.7	3.4	1.9	4.9	8.3	7.1	4.0	.8	3.9	4.6
Middlesbrough	4.3	4.7	1.8	1.8	1.1	2.0	0.0	0.0	2.0	3.4	2.1
Stockton	2.0	6.3	3.2	1.4	3.0	2.4	5.1	1.6	1.7	1.5	2.9
Dublin	8.0	4.7	4.1	1.4	3.7	5.3	3.9	6.4	3.9	3.8	4.5
Cork	1.7	2.3	1.4	.6	4.4	1.1	1.7	.7	.6	0.0	1.4
Galway	2.6	1.6	2.3	4.7	2.0	3.3	.8	1.4	2.4	3.8	2.5
Totals	2.5	3.2	2.5	2.2	2.0	2.0	2.0	1.9	1.4	1.6	2.1

Total Number Of Observations In Table = 22101.

Table 18

Percent Of Children With Asthma In Last 12 Months By Area, Sex And Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	0.0	.7	3.4	1.3	2.1	0.0	1.2	0.0	.7	0.0	1.2
Düsseldorf	4.8	.7	1.3	2.3	2.7	2.5	.6	.6	0.0	1.6	1.3
Rheydt	0.0	0.0	1.2	.7	3.3	0.0	0.0	1.5	2.4	1.0	1.1
Bordeaux	4.5	8.7	6.1	4.4	5.0	3.4	3.9	1.3	3.7	2.7	4.3
Lyon D	4.4	5.7	2.6	2.9	3.4	2.2	.6	3.8	1.2	2.2	2.8
Lyon G	4.1	2.0	1.6	2.8	.9	3.1	1.3	5.2	1.1	.9	2.2
Paris	6.5	3.0	.9	2.9	4.0	3.7	1.2	1.1	.9	0.0	2.4
Lacq	0.0	2.8	4.3	4.6	4.0	3.3	2.2	2.8	4.6	2.1	3.2
Milan	0.0	3.4	5.0	5.0	1.2	0.0	2.2	0.0	3.8	2.6	2.6
Venice	3.8	4.4	3.8	3.0	3.2	4.2	2.1	2.8	0.0	0.0	2.6
Ferrara	4.3	2.3	3.3	2.8	3.3	0.0	2.3	1.3	1.1	2.0	2.3
Gent	0.0	0.0	3.2	1.3	1.4	0.0	0.0	.7	0.0	.6	.9
Ardennes	0.0	2.0	0.0	1.7	1.5	2.6	.8	0.0	0.0	0.0	.8
Hartlepool	3.8	3.6	6.0	1.9	3.3	4.2	1.0	2.0	.8	1.9	2.7
Middlesbrough	0.0	1.9	1.8	3.7	2.1	1.0	.9	0.0	2.0	1.1	1.5
Stockton	2.0	5.0	3.3	2.8	3.1	2.4	3.4	1.6	1.7	6.0	3.2
Dublin	2.2	1.2	3.4	0.0	5.1	.8	3.2	.7	1.9	1.9	2.0
Cork	5.1	2.3	1.4	2.5	8.0	4.4	2.3	2.1	1.2	1.9	2.9
Galway	.9	1.6	1.5	2.7	2.0	2.5	0.0	1.4	.6	2.3	1.5
Totals	2.7	2.6	2.8	2.6	3.3	2.3	1.5	1.5	1.5	1.6	2.2

Total Number Of Observations In Table = 22095.

Table 19

Percent Of Children With Eczema By Area, Sex And Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	10.5	6.0	10.9	9.6	8.2	16.1	10.4	8.2	8.2	8.1	9.0
Düsseldorf	9.5	13.2	11.3	8.6	11.5	5.0	8.6	10.3	8.8	14.1	10.5
Rheydt	6.9	9.4	8.5	11.9	9.9	8.0	10.4	9.6	9.5	15.8	10.3
Bordeaux	4.5	7.8	7.6	9.5	6.5	8.0	6.3	7.3	6.8	8.0	7.3
Lyon D	10.6	11.3	8.4	8.7	10.7	9.0	5.6	5.6	9.1	8.1	8.6
Lyon G	8.1	8.9	8.5	8.3	9.3	4.7	5.1	4.2	10.9	9.3	7.9
Paris	13.0	7.6	11.0	5.8	9.1	7.3	10.6	5.5	6.3	6.5	8.2
Lacq	5.1	9.0	6.7	6.7	4.5	4.1	5.4	6.8	9.8	5.8	6.5
Milan	12.0	16.9	10.9	15.0	14.6	8.7	9.9	10.6	11.5	7.8	11.9
Venice	3.8	5.3	6.6	3.0	1.6	2.1	3.2	5.6	7.8	4.6	4.5
Ferrara	19.1	20.7	17.8	22.0	14.2	12.2	14.8	16.9	16.7	20.6	17.7
Gent	25.0	15.8	10.9	9.6	12.2	8.8	10.2	15.6	10.7	10.2	11.8
Ardennes	1.5	8.9	6.3	.9	2.2	6.7	5.4	4.5	12.1	6.6	5.7
Hartlepool	15.4	11.6	7.7	6.8	6.5	8.3	7.1	7.9	5.8	1.9	7.2
Middlesbrough	18.5	10.3	11.5	7.3	15.8	15.7	15.0	12.3	16.0	8.0	13.1
Stockton	2.0	11.3	12.9	9.9	9.1	4.9	10.2	6.3	10.2	4.5	8.5
Dublin	2.9	3.5	3.4	3.6	2.2	3.8	3.9	3.5	3.2	3.8	3.4
Cork	12.0	12.3	6.9	9.2	8.8	7.7	5.7	5.0	7.8	11.3	8.7
Galway	4.3	3.2	4.5	4.0	4.1	4.1	3.1	4.2	2.4	1.5	3.5
Totals	8.5	9.7	8.8	8.3	8.0	7.2	7.6	7.8	8.7	8.2	8.3

Total Number Of Observations In Table = 22088.

Table 20

Percent Of Children With Hayfever By Area, Sex And Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	5.3	2.0	3.4	5.1	4.1	0.0	.6	2.7	5.4	4.5	3.4
Düsseldorf	9.5	6.0	6.3	5.7	2.7	0.0	.6	5.1	1.5	.8	3.7
Rheydt	0.0	4.7	4.3	3.0	9.9	4.0	1.5	2.2	.8	3.0	3.4
Bordeaux	10.0	11.3	13.7	10.8	10.6	8.0	7.0	4.6	9.3	10.1	9.6
Lyon D	5.3	8.5	9.7	6.4	12.8	3.4	8.0	5.6	7.3	3.7	7.3
Lyon G	8.1	7.9	7.0	5.5	10.3	9.4	10.1	10.4	12.0	4.7	8.4
Paris	2.2	4.5	5.5	10.6	5.1	4.9	2.4	11.0	6.3	4.7	5.7
Lacq	8.5	5.6	6.7	6.7	5.5	5.7	4.3	6.2	6.2	6.8	6.2
Milan	2.0	7.9	8.9	9.0	7.3	0.0	4.4	3.3	5.4	3.9	5.6
Venice	5.7	6.1	5.7	2.0	5.6	0.0	2.1	1.9	1.7	1.9	3.4
Ferrara	4.3	2.3	3.3	4.6	10.8	6.3	2.3	3.9	6.7	7.8	5.5
Gent	0.0	1.3	3.2	4.5	4.7	0.0	3.1	2.7	2.4	6.6	3.6
Ardennes	1.5	4.0	8.7	3.4	5.1	6.5	3.1	2.7	2.9	5.7	4.4
Hartlepool	0.0	1.8	4.3	2.9	5.7	4.2	2.0	1.0	.8	0.0	2.4
Middlesbrough	2.2	3.7	13.3	7.3	19.1	1.0	3.7	4.7	11.0	9.2	7.5
Stockton	2.0	0.0	9.7	2.8	7.1	2.4	0.0	3.2	0.0	3.0	3.2
Dublin	1.5	.6	2.0	3.6	2.2	2.3	1.3	2.8	1.9	2.5	2.0
Cork	5.1	4.7	5.5	10.4	11.7	1.1	1.7	3.5	6.0	4.4	5.5
Galway	5.2	4.0	4.5	2.7	4.7	2.5	0.0	2.8	1.2	5.4	3.2
Totals	4.6	4.6	6.4	5.8	7.4	3.5	3.0	4.2	4.6	4.9	5.0

Total Number Of Observations In Table = 22094.

Table 21

Percent of Children With Any Cold In The Last Twelve Months

By Area, Sex and Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	100.0	94.7	92.5	92.9	93.2	96.8	94.5	92.3	93.2	90.1	93.2
Düsseldorf	81.0	92.7	93.7	92.5	95.9	95.0	90.8	96.2	91.9	95.3	93.4
Rheydt	96.6	96.1	90.2	91.1	90.1	96.0	97.8	95.6	94.4	95.0	93.9
Bordeaux	75.5	81.7	66.4	70.9	68.8	75.9	74.2	77.5	78.4	76.6	74.3
Lyon D	67.3	70.9	65.2	65.7	65.8	75.3	76.5	74.4	73.9	67.6	70.2
Lyon G	81.1	75.2	74.4	75.2	68.2	64.1	79.7	74.0	75.0	68.2	73.5
Paris	81.5	79.5	78.9	77.9	72.7	78.0	83.5	72.5	72.1	81.3	77.8
Lacq	78.8	69.7	69.5	67.0	60.5	69.7	71.0	70.1	69.1	67.4	68.8
Milan	78.0	88.8	84.2	84.0	86.6	93.3	81.3	84.6	80.8	89.6	84.7
Venice	77.4	68.8	64.8	65.0	63.3	87.2	67.7	68.9	76.5	71.0	69.7
Ferrara	78.3	67.8	73.3	79.2	82.2	79.6	78.4	69.7	77.3	80.4	76.8
Gent	55.0	86.8	83.3	77.6	69.6	61.8	75.5	79.6	77.4	80.7	77.6
Ardennes	84.8	74.3	74.6	64.4	69.1	80.5	80.8	76.6	75.9	75.4	75.0
Hartlepool	80.8	86.6	79.5	81.4	80.5	91.7	87.9	79.2	85.0	83.5	83.1
Middlesbrough	88.0	90.7	77.0	77.1	83.2	82.4	80.4	75.5	73.0	81.6	80.7
Stockton	81.6	78.8	82.3	77.5	79.8	80.5	84.7	84.1	89.8	80.3	81.7
Dublin	87.6	83.7	85.1	81.2	76.5	90.2	87.7	83.0	84.5	80.3	84.0
Cork	77.8	79.5	69.7	68.7	67.2	79.1	73.9	75.2	78.4	73.8	74.2
Galway	84.5	82.3	83.3	83.9	81.1	86.8	85.9	91.7	83.5	90.8	85.3
Totals	80.5	81.6	78.8	77.5	75.6	81.0	81.8	80.8	80.3	79.6	79.6

Total Number Of Observations In Table = 22073.

Table 22

Percent Of Children With Colds Usually Going To The Chest

By Area, Sex and Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	47.4	37.8	34.2	37.9	37.5	45.2	40.6	28.0	34.3	27.0	35.3
Düsseldorf	64.7	37.1	36.2	42.9	34.5	52.6	35.1	33.3	39.2	32.0	37.3
Rheydt	32.1	53.7	49.0	39.8	28.9	29.2	35.9	45.0	35.3	34.0	40.6
Bordeaux	22.9	25.5	16.1	26.8	19.7	27.3	18.9	25.6	23.6	25.7	23.3
Lyon D	39.5	30.0	27.7	31.9	19.4	25.4	35.5	26.1	28.7	21.7	28.7
Lyon G	21.7	30.3	27.1	20.7	16.4	31.7	27.0	26.8	21.7	21.9	24.3
Paris	33.3	29.5	31.4	34.6	30.6	43.8	35.2	28.8	25.0	19.5	30.7
Lacq	19.4	21.0	26.3	29.2	23.1	31.8	31.8	28.2	26.9	25.8	26.4
Milan	35.9	41.8	48.2	31.0	36.6	74.4	31.1	32.7	40.6	40.6	39.8
Venice	39.0	43.0	39.1	43.1	28.2	38.1	29.7	40.5	27.0	36.8	36.0
Ferrara	24.3	27.1	37.9	23.0	29.3	51.3	31.9	27.8	25.7	28.0	29.8
Gent	36.4	53.0	38.5	43.0	44.7	33.3	37.8	41.0	28.5	32.6	38.7
Ardennes	23.2	20.0	16.0	18.4	16.0	17.7	15.2	18.8	8.7	7.6	15.5
Hartlepool	23.8	44.3	35.5	27.7	33.3	36.4	35.6	32.5	16.7	36.0	32.5
Middlesbrough	39.5	46.4	27.6	36.9	21.5	35.7	34.9	20.0	28.8	23.9	32.0
Stockton	42.5	39.7	38.0	32.7	38.8	42.4	36.0	35.8	24.5	24.5	35.3
Dublin	42.5	30.6	26.2	30.4	31.7	42.5	30.4	35.0	34.4	36.5	33.9
Cork	34.1	39.7	38.6	30.4	33.7	36.1	30.8	24.5	19.8	17.8	30.1
Galway	16.3	20.6	20.9	20.8	13.3	21.0	16.4	15.2	12.7	9.3	16.4
Totals	31.5	35.3	32.5	32.2	28.2	36.0	31.2	29.8	26.7	26.3	30.7

Total Number Of Observations In Table = 17595.

Table 23

Percent Of Children With Colds Usually Going To The Chest By Area, Sex And Age

No Smoker In The Home

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	54.5	44.1	36.8	41.3	33.3	50.0	47.7	34.4	28.3	29.7	38.5
Düsseldorf	45.5	39.6	35.4	45.0	40.0	50.0	38.2	41.3	44.8	41.4	41.2
Rheydt	41.7	54.1	50.0	40.0	28.2	18.2	40.4	52.1	39.0	32.0	42.6
Bordeaux	24.3	34.2	18.4	38.6	13.0	25.0	25.8	25.0	27.3	30.9	25.7
Lyon D	41.5	28.9	26.8	31.9	23.7	26.7	35.4	21.7	24.1	26.8	28.8
Lyon G	16.7	39.3	34.1	20.6	9.1	26.3	33.3	21.2	18.5	23.5	24.5
Paris	31.4	31.0	38.7	30.6	37.9	54.5	43.3	20.7	25.0	22.2	32.7
Lacq	19.6	20.6	20.6	31.9	23.1	34.2	30.9	25.0	27.2	25.0	25.8
Milan	16.7	40.0	54.5	25.7	36.0	53.8	33.3	18.5	36.6	50.0	35.7
Venice	46.7	39.3	30.8	25.0	33.3	37.5	23.8	54.2	25.9	50.0	35.8
Ferrara	28.6	29.2	32.1	20.0	24.1	60.0	42.1	36.8	25.9	26.7	30.6
Gent	0.0	37.5	29.2	30.3	33.3	33.3	35.3	27.8	20.5	29.0	28.9
Ardennes	26.7	16.7	13.8	10.5	18.2	11.1	7.5	12.0	7.7	3.2	11.7
Hartlepool	0.0	29.4	26.1	5.6	36.8	40.0	50.0	20.0	15.8	50.0	28.8
Middlesbrough	20.0	44.2	23.8	41.0	20.5	35.1	26.8	14.6	27.5	10.7	27.0
Stockton	50.0	31.8	28.6	25.0	38.1	25.0	31.3	28.6	23.1	23.1	30.1
Dublin	38.5	43.5	0.0	33.3	23.1	47.1	15.0	37.5	22.7	47.6	31.1
Cork	30.0	37.5	30.3	31.6	41.7	35.5	19.0	22.5	21.3	21.4	28.9
Galway	15.6	12.5	13.5	11.8	12.5	15.6	11.9	8.5	7.8	7.3	11.5
Totals	28.4	35.1	29.9	31.4	26.6	33.9	31.3	28.5	25.8	28.1	29.7

Total Number Of Observations In Table = 6529.

Table 24

Percent Of Children With Colds Usually Going To The Chest By Area, Sex And Age

At Least One Smoker In The Home

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	37.5	33.3	32.7	35.4	40.8	40.0	35.6	24.3	37.4	25.4	33.2
Düsseldorf	100.0	35.9	36.9	40.7	29.2	54.5	33.3	27.6	34.3	19.2	34.1
Rheydt	25.0	53.2	48.1	38.5	29.5	38.5	32.9	36.2	31.7	36.2	38.4
Bordeaux	21.7	19.6	13.2	19.1	26.5	28.6	15.6	26.2	20.8	21.1	21.3
Lyon D	37.1	30.9	28.3	31.8	16.7	24.3	35.1	28.8	32.4	17.6	28.5
Lyon G	25.0	25.0	21.2	20.8	22.5	36.4	21.2	31.6	23.8	20.5	24.1
Paris	35.0	28.6	27.3	37.8	25.6	38.1	29.3	35.1	25.0	17.6	29.4
Lacq	19.0	21.3	33.3	26.2	23.2	29.8	32.8	30.9	26.4	26.5	27.1
Milan	44.4	42.9	46.0	34.7	37.0	83.3	30.0	36.8	42.2	38.3	41.7
Venice	34.6	45.1	44.2	56.8	26.3	38.5	33.3	34.0	28.3	32.1	36.4
Ferrara	21.7	23.5	42.1	24.6	31.4	45.8	28.0	25.0	25.6	28.8	29.3
Gent	36.4	58.0	41.0	47.7	47.1	33.3	38.6	46.9	32.6	33.7	41.9
Ardennes	22.0	21.6	16.9	21.1	14.8	20.5	20.0	21.7	9.2	9.8	17.4
Hartlepool	27.8	47.5	38.6	33.8	32.5	35.3	32.4	35.4	16.9	32.4	33.4
Middlesbrough	52.3	49.1	31.1	33.3	22.5	36.2	42.2	25.6	30.3	32.6	36.2
Stockton	41.7	43.9	41.7	34.0	39.0	48.0	38.2	38.5	25.0	25.0	37.0
Dublin	43.0	28.1	30.3	29.8	33.0	41.7	33.0	34.7	36.7	34.3	34.4
Cork	36.1	41.3	42.6	29.7	28.6	36.6	36.4	25.8	19.0	15.8	30.8
Galway	16.7	25.8	24.7	27.0	14.1	25.0	19.1	18.8	15.4	10.4	19.4
Totals	33.1	35.4	34.1	32.6	29.2	37.2	31.2	30.6	27.2	25.3	31.2

Total Number Of Observations In Table = 11048.

Table 25

Percent Of Children With Cough And Phlegm For 3 Weeks In Last Year

By Area, Sex and Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	10.5	6.6	6.9	8.3	6.2	12.9	8.5	7.7	7.5	7.2	7.6
Düsseldorf	14.3	8.6	8.8	8.0	5.4	17.5	6.7	8.3	8.1	7.0	8.1
Rheydt	6.9	11.7	6.7	7.4	8.8	4.0	10.4	5.2	7.1	5.9	7.8
Bordeaux	7.3	3.5	4.6	3.2	3.5	2.3	7.8	6.0	5.6	5.3	4.9
Lyon D	10.6	9.2	10.3	8.7	8.1	15.7	13.6	10.0	7.3	7.4	9.8
Lyon G	10.8	15.8	12.4	10.1	12.1	12.5	17.7	10.4	13.0	6.5	12.0
Paris	14.1	12.1	4.6	20.2	3.0	13.4	12.9	9.9	10.8	4.7	10.5
Lacq	5.9	9.6	7.9	8.2	7.0	12.3	7.5	5.1	7.2	6.8	7.7
Milan	12.0	7.9	8.9	7.0	12.2	30.4	13.2	6.5	12.2	10.4	10.9
Venice	22.6	14.9	10.4	6.9	6.4	22.9	8.5	8.3	7.8	12.0	10.8
Ferrara	12.8	9.2	8.9	11.9	7.6	18.4	5.7	7.8	6.7	6.9	9.0
Gent	5.0	9.2	5.1	7.1	5.4	0.0	6.1	5.4	3.6	4.8	5.4
Ardennes	4.5	5.0	6.3	.8	2.9	10.4	6.9	7.2	3.6	1.6	4.7
Hartlepool	19.2	14.4	8.6	12.6	13.8	20.8	17.2	11.9	8.3	16.5	13.2
Middlesbrough	9.8	7.5	1.8	4.6	5.3	10.8	4.7	3.8	4.0	8.0	5.9
Stockton	6.1	6.3	14.5	5.6	5.1	12.2	15.3	7.9	8.5	4.5	8.2
Dublin	8.0	5.2	4.1	4.3	4.4	7.5	4.5	4.3	7.1	3.2	5.2
Cork	4.3	4.1	2.8	3.7	2.2	9.9	5.7	5.7	3.0	1.9	4.1
Galway	3.4	4.8	2.3	3.4	1.4	6.6	5.5	2.8	2.9	2.3	3.5
Totals	8.9	8.5	6.9	7.3	6.1	11.6	8.8	6.8	6.8	6.1	7.5

Total Number Of Observations In Table = 22099.

Table 26

Percent Of Children With At Least One Week In Bed For Chest Illness

By Area, Sex and Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	15.8	20.5	17.8	21.8	13.0	29.0	18.3	18.7	15.6	12.6	17.8
Düsseldorf	23.8	19.9	14.4	20.1	19.6	27.5	14.7	16.7	20.6	14.1	17.9
Rheydt	20.7	25.8	22.6	16.3	17.6	4.0	16.4	18.5	25.4	13.9	19.5
Bordeaux	10.9	7.8	6.1	7.6	7.5	9.2	6.3	8.6	5.6	8.5	7.7
Lyon D	10.6	14.2	9.7	9.3	6.7	11.2	16.0	12.5	7.9	5.9	10.4
Lyon G	0.0	9.9	7.8	9.2	4.7	10.9	10.1	6.3	5.4	2.8	6.7
Paris	13.0	12.1	11.0	8.7	6.1	15.9	10.6	9.9	10.8	2.8	10.0
Lacq	13.6	9.0	13.4	9.3	7.0	15.6	12.9	8.5	14.4	6.3	10.7
Milan	8.0	14.6	8.9	12.0	13.4	17.4	12.1	10.6	9.2	14.3	11.7
Venice	13.2	17.5	8.5	4.0	6.4	12.5	16.0	6.5	6.9	9.3	9.7
Ferrara	14.9	4.6	5.6	13.8	6.7	18.8	8.0	9.1	7.8	8.8	9.1
Gent	5.0	18.4	8.3	10.3	14.2	11.8	12.2	15.0	8.3	9.6	11.4
Ardennes	12.1	13.9	9.5	12.7	6.6	14.3	10.0	9.9	5.8	4.1	9.4
Hartlepool	11.5	8.9	7.7	6.8	7.3	8.3	8.1	7.9	4.2	5.9	7.2
Middlesbrough	14.1	18.7	10.6	8.3	4.2	11.8	11.2	7.5	8.0	9.2	10.4
Stockton	12.2	12.5	9.7	4.2	5.1	19.5	11.9	6.3	8.5	11.9	9.5
Dublin	3.6	5.2	3.4	2.9	4.4	8.3	2.6	1.4	5.8	1.9	3.9
Cork	4.3	7.0	6.2	7.4	4.4	7.7	5.1	7.1	2.4	2.5	5.3
Galway	3.4	4.8	2.3	4.7	2.0	4.1	5.5	.7	2.4	.8	3.0
Totals	9.6	12.7	10.1	10.3	8.2	12.3	11.0	10.0	9.2	7.2	10.0

Total Number Of Observations In Table = 22100.

Table 27

Percent Of Children With Any Positive Reply To Questions 1-3,5-8 (CNSLD)

By Area, Sex and Age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	10.5	29.1	24.1	26.3	22.6	29.0	22.0	17.0	19.0	19.8	22.5
Düsseldorf	19.0	23.8	24.4	28.2	21.6	17.5	16.6	19.2	15.4	16.4	20.8
Rheydt	13.8	24.0	23.2	16.3	18.7	20.0	18.7	23.0	19.0	13.9	19.7
Bordeaux	22.7	21.7	17.6	13.9	16.6	12.6	14.1	15.9	16.0	11.2	16.0
Lyon D	15.0	19.9	14.8	15.7	17.4	21.3	17.3	15.6	14.5	15.4	16.5
Lyon G	28.4	22.8	20.9	15.6	14.0	18.8	13.9	15.6	13.0	11.2	17.2
Paris	32.6	26.5	20.2	28.8	20.2	30.5	30.6	20.9	18.0	13.1	23.8
Lacq	21.2	14.6	15.9	19.6	15.0	22.1	15.1	12.4	19.1	14.7	16.7
Milan	26.0	24.7	22.8	29.0	26.8	23.9	17.6	16.3	22.9	23.4	22.9
Venice	15.1	9.6	11.3	6.9	8.0	18.8	9.6	9.3	5.2	5.6	9.0
Ferrara	14.9	12.6	21.1	18.3	16.7	20.4	15.9	10.4	8.9	13.7	15.3
Gent	10.0	25.0	17.9	17.3	14.2	20.6	17.3	15.6	11.9	13.9	16.0
Ardennes	6.1	8.9	4.8	10.2	12.5	15.6	10.0	9.0	10.2	7.4	9.4
Hartlepool	30.8	34.8	30.8	24.3	29.3	20.8	34.3	34.7	18.3	22.3	28.3
Middlesbrough	38.0	37.4	23.9	28.4	21.1	40.2	25.2	28.3	22.0	25.3	29.0
Stockton	28.6	27.5	33.9	28.2	23.2	36.6	33.9	34.9	23.7	23.9	28.8
Dublin	40.1	32.6	31.1	31.9	27.9	37.6	35.7	36.2	35.5	29.9	33.8
Cork	18.8	14.0	14.5	20.2	17.5	30.8	15.3	17.0	13.8	15.0	17.0
Galway	14.7	12.9	11.4	17.4	12.8	~~13.2~~	10.2	13.2	7.6	7.7	12.0
Totals	23.2	22.2	19.9	20.6	18.3	24.4	19.1	18.6	16.5	15.6	19.4

Total Number Of Observations In Table = 22103.

Table 28

Percent Of Children With Any Positive Reply To Questions 1-3,5-8 (CNSLD)

No Smoker In The Home

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	9.1	33.3	19.7	30.9	24.6	37.5	19.1	15.9	7.8	23.8	22.4
Düsseldorf	23.1	17.0	20.0	27.0	19.2	11.8	16.4	12.1	18.2	18.7	18.9
Rheydt	0.0	19.4	20.5	14.3	14.0	0.0	22.2	26.3	22.6	13.2	18.5
Bordeaux	26.1	24.4	20.6	16.4	15.3	8.6	10.0	18.6	16.4	16.5	17.3
Lyon D	28.3	14.8	14.3	9.6	21.3	18.4	17.1	17.2	7.2	10.8	15.4
Lyon G	22.6	17.0	22.4	8.9	17.4	18.5	10.0	8.9	17.9	14.5	15.7
Paris	35.0	28.6	23.7	26.7	15.4	44.4	27.8	17.5	14.0	8.7	23.4
Lacq	23.1	11.1	12.3	24.2	15.6	30.4	13.1	14.1	17.2	18.7	17.5
Milan	33.3	25.0	16.0	29.5	34.5	13.3	16.1	29.0	22.4	23.1	24.6
Venice	17.6	8.6	11.1	8.9	8.9	21.1	5.6	10.0	5.7	3.3	9.1
Ferrara	18.8	6.1	17.1	18.9	13.5	22.2	14.8	7.4	11.4	15.0	14.1
Gent	0.0	20.0	16.7	21.1	8.6	0.0	13.0	10.9	14.8	14.3	14.0
Ardennes	0.0	6.5	2.4	6.5	8.3	14.8	8.2	6.3	10.6	4.8	7.1
Hartlepool	0.0	20.0	22.2	17.4	32.0	20.0	23.8	12.5	13.6	21.7	20.1
Middlesbrough	31.7	40.4	17.6	27.5	18.6	33.3	23.5	28.0	19.2	10.3	25.1
Stockton	28.6	14.3	31.6	44.4	29.6	30.8	26.3	31.3	18.8	18.8	25.9
Dublin	37.5	20.0	15.0	21.1	23.5	31.6	21.7	36.8	19.2	20.0	23.8
Cork	20.9	10.0	7.8	18.5	25.5	31.7	18.2	16.3	7.9	11.3	16.0
Galway	18.4	12.2	6.7	11.1	12.3	6.0	10.4	5.8	6.5	4.4	9.3
Totals	23.5	18.5	16.5	19.5	17.8	22.0	16.1	16.5	14.3	14.2	17.4

Total Number Of Observations In Table = 8292.

Table 29

Percent Of Children With Any Positive Reply to Questions 1-3,5-8 (CNSLD)

At Least One Smoker In The Home

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Total
Duisburg	12.5	26.1	26.5	22.7	21.0	20.0	24.0	17.7	25.0	17.4	22.6
Düsseldorf	12.5	27.6	27.8	29.4	24.0	21.7	16.7	24.4	12.9	13.2	22.5
Rheydt	25.0	28.8	25.9	17.5	22.9	38.5	16.3	18.6	15.6	14.6	20.9
Bordeaux	20.3	20.0	14.3	12.1	17.8	15.4	16.7	13.6	15.7	6.2	14.9
Lyon D	3.3	23.8	15.2	20.2	14.8	23.5	17.8	14.6	19.8	19.7	17.4
Lyon G	32.6	27.8	19.7	20.3	11.5	18.9	17.9	21.6	9.4	7.7	18.5
Paris	30.8	25.0	18.3	30.5	23.7	23.6	32.7	23.5	20.6	16.4	24.1
Lacq	18.9	18.2	19.3	14.7	14.5	15.2	17.2	11.1	21.8	11.1	15.9
Milan	22.9	24.5	25.0	28.6	22.6	29.0	18.3	12.1	22.2	24.5	22.1
Venice	13.9	10.1	10.1	5.4	7.5	17.2	12.3	9.0	5.1	6.4	8.9
Ferrara	12.9	15.1	23.6	18.1	18.1	19.4	16.4	12.8	7.3	12.9	15.8
Gent	11.8	26.8	18.4	16.1	15.9	29.2	18.7	17.8	10.5	13.7	16.7
Ardennes	8.3	10.0	6.0	11.5	14.8	16.0	11.1	10.1	10.0	8.8	10.6
Hartlepool	36.4	38.0	33.3	26.3	28.6	21.1	37.2	41.6	19.4	22.5	30.5
Middlesbrough	40.8	35.6	29.0	29.3	23.1	45.6	26.8	28.6	25.0	37.5	32.1
Stockton	28.6	34.6	34.9	25.8	20.8	39.3	37.5	36.2	25.6	25.5	29.8
Dublin	40.5	35.2	33.6	33.6	28.6	38.6	38.2	36.1	38.8	31.8	35.5
Cork	17.6	16.8	18.1	21.1	12.8	30.0	14.0	17.4	17.3	16.8	17.6
Galway	12.8	13.3	13.8	22.1	13.3	18.3	10.0	17.4	8.3	9.4	13.7
Totals	22.9	24.4	21.8	21.3	18.6	25.9	20.9	19.9	17.8	16.4	20.6

Total Number Of Observations In Table = 13789.

Table 30

Number of Children According to Father's Occupation and Area of Residence

	NUMBERS				PERCENTAGE			
	PROF*	MID	MAN	TOT	PROF	MID	MAN	TOT
Duisburg	206	325	610	1141	18.05	28.48	53.46	100.00
Düsseldorf	175	459	508	1142	15.32	40.19	44.48	100.00
Rheydt	181	410	405	996	18.17	41.16	40.66	100.00
Bordeaux	361	527	388	1276	28.29	41.30	30.41	100.00
Lyon D	144	455	664	1263	11.40	36.03	52.57	100.00
Lyon G	138	290	400	828	16.67	35.02	48.31	100.00
Paris	289	344	259	892	32.40	38.57	29.04	100.00
Lacq	332	301	1002	1635	20.31	18.41	61.28	100.00
Milan	164	445	238	847	19.36	52.54	28.10	100.00
Venice	115	328	491	934	12.31	35.12	52.57	100.00
Ferrara	283	375	165	823	34.39	45.57	20.05	100.00
Gent	143	316	556	1015	14.09	31.13	54.78	100.00
Ardennes	160	411	487	1058	15.12	38.85	46.03	100.00
Hartlepool	60	81	623	764	7.85	10.60	81.54	100.00
Middlesbrough	218	250	452	920	23.70	27.17	49.13	100.00
Stockton	47	117	373	537	8.75	21.79	69.46	100.00
Dublin	29	301	1051	1381	2.10	21.80	76.10	100.00
Cork	196	617	609	1422	13.78	43.39	42.83	100.00
Galway	256	535	520	1311	19.53	40.81	39.66	100.00
Totals	3497	6887	9801	20185	17.32	34.12	48.56	100.00

* PROF = ISCO Numbers 0-1
MID = ISCO Numbers 2-6
MAN = ISCO Numbers 7-9

See Table 2

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Table 31

Total number of children with data for CNSLD according to father's major group occupational code

Area	Boys							Girls							
	0–1	2	3	4	5	6	7–9	0–1	2	3	4	5	6	7–9	Totals
Duisburg	105	3	65	62	30	1	313	101	5	65	70	22	2	297	1141
Düsseldorf	92	2	104	101	21	3	263	83	7	89	94	34	4	245	1142
Rheydt	99	6	95	98	18	3	192	82	5	82	78	22	3	213	996
Bordeaux	176	51	102	80	34	5	193	185	32	86	110	26	1	195	1276
Lyon D	74	9	104	48	78	0	325	70	9	82	47	77	1	339	1263
Lyon G	81	16	34	60	41	1	221	57	15	33	50	40	0	179	828
Paris	155	41	41	75	40	1	130	134	27	40	56	23	0	129	892
Lacq	163	2	45	29	42	42	484	169	3	46	22	39	31	518	1635
Milan	78	32	74	64	35	2	112	86	30	103	64	40	1	126	847
Venice	65	4	83	27	48	5	242	50	3	82	34	41	1	249	934
Ferrara	146	24	58	58	49	10	81	137	24	56	45	41	10	84	823
Gent	72	8	74	34	39	1	255	71	8	73	32	46	1	301	1015
Ardennes	71	8	72	51	26	38	252	89	6	98	39	27	46	235	1058
Hartlepool	31	7	13	13	10	2	327	29	10	6	9	10	1	296	764
Middlesbrough	114	32	28	30	33	2	231	104	26	32	36	31	0	221	920
Stockton	29	11	18	22	10	1	204	18	13	11	16	15	0	169	537
Dublin	15	3	51	24	56	7	528	14	2	59	34	57	9	522	1381
Cork	116	70	96	116	45	5	261	80	46	88	97	51	3	348	1422
Galway	142	56	57	85	57	12	236	114	55	60	98	43	12	284	1311
Totals	1824	385	1214	1077	712	141	4850	1673	326	1191	1031	685	126	4950	20185

Table 32

Percent of children with CNSLD according to
father's major group occupational code and area, sex and age

Area	Boys							Girls							
	0-1	2	3	4	5	6	7-9	0-1	2	3	4	5	6	7-9	Totals
Duisburg	21.0	33.3	27.7	22.6	33.3	100.0	24.3	15.8	0.0	21.5	24.3	4.5	0.0	20.9	22.1
Düsseldorf	21.7	0.0	27.9	25.7	28.6	33.3	23.2	14.5	57.1	16.9	11.7	8.8	0.0	19.6	20.7
Rheydt	23.2	0.0	16.8	19.4	11.1	0.0	21.9	14.6	20.0	19.5	12.8	4.5	0.0	24.4	19.5
Bordeaux	17.6	15.7	17.6	16.3	17.6	20.0	21.2	13.5	12.5	14.0	11.8	3.8	0.0	16.4	16.1
Lyon D	18.9	33.3	14.4	14.6	16.7	0.0	16.6	14.3	11.1	13.4	14.9	19.5	0.0	17.7	16.6
Lyon G	14.8	18.8	20.6	20.0	22.0	0.0	18.6	15.8	13.3	15.2	8.0	10.0	0.0	14.5	16.2
Paris	21.3	26.8	22.0	28.0	27.5	0.0	27.7	24.6	18.5	20.0	12.5	21.7	0.0	21.7	23.2
Lacq	18.4	0.0	20.0	10.3	14.3	19.0	15.7	16.6	33.3	15.2	4.5	20.5	16.1	17.2	16.6
Milan	26.9	34.4	14.9	32.8	20.0	0.0	31.3	17.4	23.3	12.6	17.2	22.5	0.0	27.8	23.1
Venice	9.2	0.0	8.4	11.1	6.3	0.0	11.2	4.0	0.0	11.0	5.9	4.9	0.0	9.6	9.1
Ferrara	19.9	12.5	10.3	10.3	24.5	20.0	19.8	15.3	8.3	10.7	13.3	7.3	20.0	15.5	15.4
Gent	13.9	0.0	12.2	17.6	20.5	0.0	19.2	7.0	12.5	6.8	28.1	15.2	0.0	16.6	15.7
Ardennes	7.0	12.5	8.3	11.8	15.4	7.9	8.3	6.7	0.0	10.2	10.3	7.4	2.2	13.2	9.5
Hartlepool	32.3	28.6	23.1	23.1	60.0	0.0	29.4	27.6	50.0	33.3	11.1	0.0	0.0	26.7	28.1
Middlesbrough	29.8	25.0	25.0	33.3	18.2	50.0	30.3	25.0	23.1	56.3	25.0	38.7	0.0	24.9	28.5
Stockton	27.6	45.5	16.7	31.8	50.0	100.0	22.1	38.9	38.5	18.2	25.0	26.7	0.0	31.4	27.7
Dublin	26.7	33.3	29.4	33.3	26.8	28.6	33.0	21.4	0.0	18.6	26.5	38.6	33.3	37.2	33.4
Cork	25.9	14.3	14.6	12.9	8.9	0.0	18.8	17.5	4.3	11.4	17.5	23.5	100.0	18.1	17.1
Galway	10.6	14.3	14.0	18.8	12.3	8.3	14.0	6.1	18.2	5.0	10.2	4.7	16.7	11.6	11.8
Totals	19.6	19.5	17.3	20.1	19.7	14.9	21.5	15.5	17.2	14.9	14.7	16.5	12.7	20.7	19.1

Table 33

Percent of children with CNSLD according to
father's major group occupational code and area, sex and age

No Smoker In The Home.

Area	Boys							Girls							
	0-1	2	3	4	5	6	7-9	0-1	2	3	4	5	6	7-9	Totals
Duisburg	19.0	50.0	25.0	32.0	30.8	0.0	27.4	12.5	0.0	13.6	18.5	11.1	0.0	22.1	21.9
Düsseldorf	13.5	0.0	27.8	30.2	14.3	50.0	15.9	19.6	100.0	13.6	8.3	7.1	0.0	17.0	17.8
Rheydt	16.7	0.0	19.1	17.0	12.5	0.0	16.9	15.2	33.3	22.2	8.9	0.0	0.0	28.9	18.4
Bordeaux	19.5	25.0	17.2	20.0	17.6	0.0	22.5	15.5	23.1	16.7	12.8	0.0	0.0	14.8	17.3
Lyon D	13.9	50.0	16.3	16.7	15.6	0.0	16.5	23.1	20.0	12.1	16.0	12.5	0.0	11.9	15.3
Lyon G	18.5	0.0	7.1	13.3	20.0	0.0	18.9	11.5	12.5	12.5	4.0	11.1	0.0	16.0	14.6
Paris	22.4	28.6	16.7	32.4	27.8	0.0	28.6	26.5	0.0	14.3	14.3	0.0	0.0	22.0	23.1
Lacq	13.7	0.0	18.2	9.1	4.8	22.2	17.7	19.0	0.0	11.1	10.0	25.0	27.8	18.0	17.4
Milan	27.8	40.0	13.8	47.6	14.3	0.0	28.6	10.7	16.7	21.1	14.3	36.4	0.0	26.1	24.5
Venice	12.5	0.0	10.0	10.0	11.8	0.0	11.1	4.0	0.0	12.0	7.7	0.0	0.0	9.2	9.5
Ferrara	19.4	0.0	6.7	11.8	11.8	33.3	20.0	9.8	8.3	6.3	20.0	15.8	25.0	18.2	14.4
Gent	15.0	0.0	23.5	22.2	0.0	0.0	14.6	10.7	14.3	0.0	10.0	0.0	0.0	15.9	13.3
Ardennes	3.3	0.0	3.8	10.0	10.0	8.3	4.5	4.5	0.0	8.6	0.0	25.0	0.0	13.4	7.1
Hartlepool	14.3	50.0	0.0	50.0	100.0	0.0	19.1	30.8	50.0	50.0	20.0	0.0	0.0	16.3	21.3
Middlesbrough	28.1	21.1	28.6	50.0	7.1	100.0	27.8	21.2	13.3	52.0	16.7	38.5	0.0	16.5	25.1
Stockton	26.7	40.0	12.5	37.5	0.0	0.0	22.5	33.3	20.0	50.0	14.3	40.0	0.0	23.7	25.3
Dublin	0.0	0.0	0.0	33.3	12.5	50.0	20.0	0.0	0.0	22.2	25.0	9.1	33.3	26.7	21.0
Cork	25.0	14.3	14.6	13.2	6.7	0.0	16.3	23.3	0.0	5.6	10.3	25.0	100.0	16.4	15.9
Galway	8.8	13.6	8.7	15.4	14.3	20.0	12.7	4.0	14.3	10.5	0.0	5.9	40.0	6.9	9.5
Totals	17.9	19.6	16.9	22.4	14.9	19.6	18.6	15.5	13.1	15.7	10.5	15.0	19.2	17.5	17.1

Table 34

Percent of children with CNSLD according to father's major group occupational code

At Least One Smoker In The Home.

Area	Boys							Girls							
	0-1	2	3	4	5	6	7-9	0-1	2	3	4	5	6	7-9	Totals
Duisburg	23.4	0.0	31.0	16.2	35.3	100.0	22.7	18.9	0.0	25.6	27.9	0.0	0.0	20.2	22.2
Düsseldorf	32.5	0.0	28.0	22.4	35.7	0.0	28.2	8.1	40.0	20.0	15.2	10.0	0.0	21.2	23.1
Rheydt	33.3	0.0	14.9	22.2	10.0	0.0	25.2	13.9	0.0	16.2	18.2	7.7	0.0	21.1	20.6
Bordeaux	16.0	11.4	18.2	14.0	17.6	50.0	20.4	11.9	5.3	11.4	11.1	6.7	0.0	17.8	15.0
Lyon D	23.7	0.0	13.1	12.5	17.4	0.0	16.7	9.1	0.0	14.3	13.6	24.4	0.0	21.6	17.6
Lyon G	13.0	37.5	30.0	26.7	23.8	0.0	18.3	19.4	14.3	17.6	12.0	9.1	0.0	13.3	17.4
Paris	20.8	25.9	26.1	24.4	27.3	0.0	27.2	23.5	29.4	23.1	11.4	29.4	0.0	21.4	23.3
Lacq	22.2	0.0	21.7	11.1	23.8	16.7	13.6	14.1	33.3	17.9	0.0	15.8	0.0	16.3	15.8
Milan	26.2	31.8	15.6	25.6	21.4	0.0	32.5	19.6	25.0	7.7	18.4	17.2	0.0	29.1	22.5
Venice	6.1	0.0	7.5	11.8	3.2	0.0	10.7	4.0	0.0	10.5	5.0	6.9	0.0	9.9	8.8
Ferrara	19.3	16.7	11.6	9.8	31.3	14.3	19.7	18.6	8.3	12.8	11.4	0.0	16.7	14.3	15.9
Gent	13.5	0.0	8.8	16.0	23.5	0.0	20.3	4.7	0.0	9.6	36.4	16.7	0.0	16.8	16.4
Ardennes	9.8	16.7	10.9	12.2	18.8	7.7	9.7	8.9	0.0	11.1	13.8	0.0	3.2	13.1	10.6
Hartlepool	37.5	20.0	27.3	18.2	50.0	0.0	32.0	25.0	50.0	25.0	0.0	0.0	0.0	28.5	29.8
Middlesbrough	32.0	30.8	14.3	27.3	27.8	0.0	31.9	28.8	36.4	71.4	29.2	38.9	0.0	31.5	31.6
Stockton	28.6	50.0	20.0	28.6	71.4	100.0	22.0	50.0	50.0	0.0	33.3	20.0	0.0	33.6	28.7
Dublin	33.3	33.3	33.3	33.3	29.2	20.0	34.9	33.3	0.0	18.0	26.7	45.7	33.3	38.9	35.5
Cork	26.7	14.3	14.5	12.8	10.0	0.0	19.9	10.8	7.1	15.4	20.6	22.6	100.0	18.9	17.8
Galway	12.2	14.7	17.6	20.3	10.3	0.0	14.6	7.8	22.2	2.4	16.7	3.8	0.0	13.7	13.2
Totals	21.0	19.4	17.6	18.7	22.5	12.2	22.8	15.4	20.4	14.3	17.5	17.3	8.1	22.4	20.3

TABLE 35

Mean, standard deviation and number of observations for height in centimetres by area, sex and age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Totals
Duisburg	123.2	127.4	132.9	139.3	143.2	125.3	127.0	131.9	137.0	141.8	134.2
	6.0	5.5	5.9	6.7	6.0	5.0	5.6	5.8	5.9	6.7	8.4
	17	150	169	154	144	30	160	178	139	111	1252
Dusseldorf	123.9	127.6	133.7	139.5	142.9	124.0	127.9	133.0	138.5	142.3	135.0
	3.9	5.4	5.4	6.0	6.7	4.6	6.2	6.0	6.2	6.5	8.5
	20	136	152	162	137	39	150	143	133	120	1192
Rheydt	125.4	128.2	133.8	138.4	142.8	126.0	127.3	133.4	137.5	141.6	134.4
	4.7	5.5	5.4	5.0	5.5	4.1	5.0	6.3	6.6	5.8	7.8
	27	124	152	126	86	25	125	129	124	97	1015
Bordeaux	119.0	124.4	129.6	134.2	141.7	118.2	123.4	128.5	133.8	140.7	131.2
	5.7	5.1	5.8	6.5	6.7	5.6	5.5	5.7	6.1	7.0	9.9
	108	113	131	158	199	87	127	150	161	188	1422
Lyon D	117.8	122.1	128.0	133.1	136.7	116.7	121.6	127.2	132.1	137.6	128.0
	5.5	5.4	5.6	6.1	6.0	5.5	5.8	6.4	5.7	6.0	8.9
	113	141	155	172	149	89	162	160	165	136	1442
Lyon G	117.7	122.7	128.3	134.3	138.7	116.8	121.9	127.1	133.0	137.9	128.8
	4.8	5.5	5.2	6.3	5.9	5.5	5.3	6.5	5.8	6.9	9.3
	74	101	129	109	107	64	79	96	92	107	958
Paris	118.1	123.3	128.6	134.1	138.8	118.3	123.2	128.5	133.8	138.0	128.8
	5.5	6.8	5.5	6.5	5.4	5.2	5.6	5.3	5.7	7.1	9.3
	89	128	108	99	99	78	83	88	107	106	985
Lacq	117.5	122.5	127.5	132.5	137.6	116.5	121.5	125.9	131.9	137.9	128.0
	5.7	6.1	5.7	6.0	6.6	4.8	5.6	5.4	6.3	6.4	9.3
	117	178	164	191	196	122	184	177	189	188	1706
Milan	118.3	123.4	129.7	134.4	138.5	117.8	123.0	128.9	134.1	138.9	129.8
	5.4	6.2	5.5	6.2	6.7	5.8	5.6	5.4	5.8	7.3	8.9
	50	89	101	100	81	46	91	123	131	77	889
Venice	116.9	121.8	127.5	133.2	139.9	116.7	121.5	126.6	133.0	138.5	129.1
	5.7	6.5	5.0	6.7	6.1	5.3	5.5	5.6	6.7	6.8	9.7
	53	114	106	101	125	48	94	108	116	108	973
Ferrara	118.9	124.8	130.3	136.1	141.6	117.9	123.8	128.6	135.4	140.9	131.7
	5.1	5.7	5.3	5.8	7.0	4.4	6.2	6.0	6.5	6.2	9.8
	47	87	90	109	120	49	88	77	90	102	859
Gent	120.4	126.2	130.6	136.0	140.6	120.0	125.1	129.1	135.0	139.7	133.0
	7.6	5.5	4.9	6.2	6.6	4.7	5.5	5.6	6.2	6.8	8.4
	22	87	168	167	158	38	107	163	181	182	1273
Ardennes	120.9	125.4	129.9	135.0	139.7	118.9	123.3	128.7	134.2	140.0	130.7
	5.4	6.3	5.4	6.2	6.5	5.2	5.1	6.3	6.3	5.4	9.0
	66	101	126	118	136	77	130	111	137	122	1124
Hartlepool	116.6	122.1	126.9	132.6	137.7	118.0	120.8	127.2	131.4	138.0	129.0
	4.2	5.9	6.3	6.8	6.9	5.1	5.0	6.3	5.9	7.5	9.0
	26	111	117	102	121	25	97	98	120	101	918
Middlesbrough	118.3	124.7	130.2	136.5	140.8	118.8	123.7	129.3	135.2	140.6	129.8
	5.6	5.6	5.6	5.7	5.8	5.1	5.4	5.7	5.2	7.6	9.6
	89	115	112	109	98	102	108	106	105	91	1035
Stockton	117.4	123.4	129.9	133.1	138.7	117.4	123.4	125.9	133.1	139.3	129.3
	4.7	5.4	5.1	6.4	6.1	5.0	4.2	5.5	6.0	6.5	9.3
	47	82	64	74	101	44	56	70	57	67	662
Dublin	117.7	122.3	127.4	131.7	136.0	116.1	122.4	126.6	131.0	137.4	126.9
	5.0	5.3	5.7	6.5	6.1	6.6	7.2	5.8	6.6	6.5	9.2
	137	172	148	138	136	133	154	141	155	157	1471
Cork	118.8	123.8	129.5	133.6	139.0	117.5	121.3	127.8	133.0	137.8	128.7
	4.8	5.5	5.6	5.7	5.4	4.6	5.0	5.6	5.2	6.5	8.9
	117	171	145	163	137	91	176	141	167	160	1468
Galway	117.2	124.0	128.4	133.7	138.1	117.6	121.7	127.3	132.4	137.7	128.3
	4.8	4.8	5.9	5.9	6.3	4.9	4.7	5.5	6.0	6.5	9.1
	116	124	132	149	148	121	128	144	170	130	1362
Totals	118.4	124.2	129.7	134.9	139.6	118.1	123.4	128.6	133.9	139.2	130.2
	5.5	6.0	5.9	6.6	6.6	5.6	6.0	6.2	6.4	6.8	9.4
	1335	2324	2469	2501	2478	1308	2299	2403	2539	2350	22006

TABLE 36

Mean, standard deviation and number of observations for weight in kilogrammes by area, sex and age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Totals
Duisburg	23.4	25.7	28.4	32.3	35.1	24.5	25.1	28.2	31.0	34.7	29.6
	3.2	5.0	4.9	5.8	6.0	3.7	4.6	5.4	5.6	6.8	6.5
	17	150	169	154	144	30	160	178	139	111	1252
Düsseldorf	24.0	25.1	28.6	32.6	34.6	23.2	26.0	28.8	32.1	34.4	29.9
	2.4	3.3	4.4	5.6	6.2	2.2	4.9	5.2	5.7	6.5	6.3
	20	136	152	162	137	39	150	143	133	120	1192
Rheydt	24.4	25.6	28.7	31.7	34.5	25.3	25.6	29.0	30.5	33.7	29.3
	2.7	4.0	4.5	5.3	6.3	4.8	3.4	5.4	5.6	6.4	5.9
	27	124	152	126	86	25	125	129	124	97	1015
Bordeaux	22.7	24.7	27.0	29.7	34.3	21.6	24.3	26.5	29.5	34.0	28.4
	3.2	3.5	3.3	4.3	6.0	2.7	3.4	3.9	4.5	5.9	6.1
	108	113	131	158	199	87	127	150	161	188	1422
Lyon D	21.5	23.2	26.0	28.6	30.8	21.1	23.1	25.8	28.1	31.4	26.3
	2.7	3.1	3.3	4.2	4.8	3.3	3.5	4.2	4.3	5.7	5.3
	113	141	155	172	149	89	162	160	165	136	1442
Lyon G	21.3	23.9	26.9	30.5	32.5	21.2	23.5	26.0	29.5	32.9	27.4
	2.4	3.4	4.4	5.5	5.5	3.5	3.6	4.4	4.9	6.3	6.1
	74	101	129	109	107	64	79	96	92	107	958
Paris	21.7	24.3	27.4	30.1	33.1	22.1	24.1	27.4	29.6	32.9	27.5
	2.7	3.9	4.2	5.3	5.6	3.0	3.9	3.9	4.4	6.1	5.9
	89	128	108	99	99	78	83	88	107	106	985
Lacq	21.8	23.8	26.2	28.8	31.5	21.2	23.3	25.5	28.6	31.9	26.7
	3.0	3.4	3.7	4.0	4.9	3.0	3.6	3.5	4.9	5.5	5.4
	117	178	164	191	196	122	184	177	189	188	1706
Milan	23.0	24.6	27.9	30.5	34.1	22.0	24.4	27.5	30.9	33.8	28.4
	3.9	4.1	4.8	4.7	6.3	3.2	4.0	4.3	5.8	7.6	6.3
	50	89	101	100	82	46	91	123	131	77	890
Venice	22.4	24.2	26.6	29.8	33.3	21.8	23.8	26.8	29.5	33.3	27.9
	2.9	3.9	3.6	5.4	5.0	3.9	3.5	4.9	5.4	7.0	6.2
	53	114	106	101	125	48	94	108	116	108	973
Ferrara	22.5	26.3	28.2	31.4	35.9	21.6	25.0	27.6	31.7	34.1	29.5
	3.3	4.9	4.2	5.9	7.3	2.7	4.2	5.1	6.0	6.4	7.0
	47	87	90	109	120	49	88	77	90	102	859
Gent	23.0	25.1	27.1	30.5	32.9	22.2	25.1	26.8	30.3	32.4	28.9
	4.1	3.6	3.6	5.8	5.6	2.8	4.8	4.5	6.4	5.9	6.0
	22	87	168	167	158	38	107	163	181	181	1272
Ardennes	22.4	24.6	27.3	30.0	32.5	21.7	23.3	26.5	28.9	32.5	27.5
	3.2	4.1	3.9	5.4	5.4	2.8	3.8	4.5	4.5	4.7	5.7
	66	101	126	118	136	77	130	111	137	122	1124
Hartlepool	21.0	23.5	25.6	28.7	32.0	22.4	23.6	26.7	28.8	32.4	27.4
	2.3	3.7	3.7	4.8	5.6	3.1	3.5	4.8	4.3	6.4	5.7
	26	111	117	102	121	25	97	98	120	101	918
Middlesbrough	21.3	23.9	26.3	29.9	32.4	21.2	23.4	25.8	29.1	32.9	26.6
	3.0	3.9	3.5	5.3	5.6	3.4	3.5	4.3	4.2	6.7	5.9
	89	115	112	109	98	102	108	106	105	91	1035
Stockton	21.1	24.3	26.1	28.6	31.9	21.2	24.3	24.7	28.9	33.7	27.1
	2.9	4.4	3.4	4.4	5.1	3.3	4.0	3.8	5.4	6.2	6.0
	47	82	64	74	101	44	56	70	57	67	662
Dublin	21.4	23.1	25.3	27.4	29.9	20.5	23.3	24.6	26.8	31.2	25.4
	2.3	3.3	3.5	4.4	4.6	2.5	4.6	3.4	4.3	6.5	5.3
	137	172	148	138	136	133	154	141	155	157	1471
Cork	22.0	23.7	26.5	28.3	31.2	21.1	22.5	25.5	27.9	30.5	26.1
	2.5	2.7	3.8	3.8	4.1	2.4	2.9	4.4	3.9	4.9	4.9
	117	171	145	163	137	91	176	141	167	160	1468
Galway	21.5	24.3	26.5	29.0	31.0	21.4	22.9	25.7	28.3	30.9	26.4
	2.6	2.9	3.2	3.6	4.1	2.4	2.9	4.1	4.2	4.9	4.9
	116	124	132	149	148	121	128	144	170	130	1362
Totals	21.9	24.3	27.0	29.9	32.8	21.6	24.0	26.6	29.4	32.7	27.6
	2.9	3.8	4.0	5.1	5.7	3.1	4.0	4.6	5.1	6.2	6.0
	1335	2324	2469	2501	2479	1308	2299	2403	2539	2349	22006

TABLE 37

Mean, standard deviation and number of observations for best of 5 PEFRS in l/min by area, sex and age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Totals
Duisburg	204.4	221.7	249.2	277.3	295.5	209.8	216.8	236.7	265.7	289.2	252.6
	56.9	37.5	42.6	42.8	48.5	39.4	37.0	41.4	40.5	44.5	50.7
	17	150	169	154	144	30	160	178	139	111	1252
Düsseldorf	215.3	227.3	256.0	275.1	294.2	210.3	217.8	245.1	267.7	282.1	255.3
	33.2	42.5	40.5	46.0	47.4	35.5	39.7	40.0	46.8	48.9	50.7
	20	136	152	162	137	39	150	142	133	120	1191
Rheydt	221.5	230.4	252.5	279.8	301.0	204.2	221.1	247.6	265.3	291.3	256.1
	44.1	34.9	41.5	41.7	46.7	33.9	39.1	45.6	42.1	41.2	49.1
	27	124	152	126	86	25	125	129	124	97	1015
Bordeaux	214.4	230.8	256.5	281.5	309.2	203.4	223.4	248.2	278.2	311.2	264.0
	35.3	34.1	38.9	43.4	45.2	33.9	33.4	37.5	46.4	43.4	54.2
	108	113	131	158	199	87	127	150	161	188	1422
Lyon D	211.1	221.6	255.9	280.8	295.1	192.2	214.9	242.3	270.4	290.2	250.9
	37.3	40.4	42.6	38.4	48.5	39.0	44.9	42.6	40.9	51.7	54.0
	113	141	155	172	149	89	162	160	165	136	1442
Lyon G	190.9	219.4	248.3	267.1	291.1	182.5	199.1	233.0	250.8	275.7	241.0
	48.7	52.2	48.2	44.5	58.1	45.2	39.7	47.4	51.9	55.3	59.9
	74	101	129	109	107	64	79	96	92	107	958
Paris	209.7	234.3	258.5	290.6	315.8	208.3	220.7	250.1	278.6	310.2	259.8
	43.9	41.5	43.7	48.7	42.5	44.3	35.0	44.4	42.7	48.1	57.2
	89	128	108	99	99	78	83	88	107	106	985
Lacq	207.9	229.5	261.2	274.1	307.1	198.7	222.2	243.0	267.4	296.9	255.0
	46.2	39.7	47.0	46.3	50.7	38.5	46.5	42.6	42.8	48.6	56.4
	117	178	164	191	196	122	184	177	189	188	1706
Milan	223.2	239.2	267.3	295.1	315.3	204.0	220.6	242.8	275.5	304.2	262.5
	34.8	43.8	40.2	43.0	45.6	33.8	37.5	42.0	43.1	43.0	53.0
	50	89	101	100	82	46	91	123	131	77	890
Venice	214.3	240.6	264.1	293.4	313.2	205.4	238.8	253.9	274.4	295.5	266.2
	39.4	39.9	46.4	41.7	47.2	37.7	35.8	39.2	45.7	46.5	52.6
	53	114	106	101	125	48	94	108	116	108	973
Ferrara	226.6	240.3	261.7	286.8	313.4	200.0	227.8	239.5	280.7	305.4	266.2
	33.3	41.2	41.4	43.1	49.7	34.6	46.4	36.6	44.8	44.2	54.9
	47	87	90	109	120	49	88	77	90	102	859
Gent	216.1	246.6	257.0	282.1	308.6	208.9	229.3	244.8	277.9	293.4	268.1
	32.5	41.3	42.6	46.3	45.3	28.6	40.4	42.0	44.8	48.8	51.4
	22	87	168	167	158	38	107	163	181	182	1273
Ardennes	210.3	234.9	251.5	273.7	307.6	188.2	216.4	251.0	264.3	296.8	254.7
	36.0	38.6	48.0	43.1	40.9	37.6	37.0	45.2	42.8	46.1	54.5
	66	101	126	118	136	77	130	111	137	122	1124
Hartlepool	179.6	205.6	233.6	256.4	287.1	176.6	189.8	226.2	249.7	272.4	237.7
	32.8	44.6	38.0	47.2	45.6	38.9	43.3	43.3	42.3	50.9	54.9
	26	111	117	102	121	25	97	98	120	101	918
Middlesbrough	195.0	220.4	256.9	288.6	302.4	184.0	213.9	240.6	273.6	286.6	246.1
	38.2	38.3	37.9	42.2	42.0	36.2	43.8	41.9	37.7	44.5	55.9
	89	115	112	109	98	102	108	106	105	91	1035
Stockton	179.7	210.4	237.1	253.0	280.7	179.7	202.6	219.2	249.1	284.2	235.3
	39.8	39.3	43.6	46.8	50.0	40.1	36.9	45.0	45.7	46.0	56.1
	47	82	64	74	101	44	56	70	57	67	662
Dublin	203.7	230.8	240.3	259.9	284.1	196.1	220.0	239.2	256.4	283.4	241.7
	35.4	37.0	40.2	44.2	44.2	33.0	44.2	40.7	45.0	55.4	50.9
	137	172	148	138	136	133	154	141	155	157	1471
Cork	210.8	231.0	253.8	276.5	297.2	200.7	216.7	238.0	252.2	287.7	248.5
	31.1	35.0	42.0	42.6	51.2	37.5	38.4	45.3	50.0	48.3	52.3
	117	171	145	163	137	91	176	141	167	160	1468
Galway	193.9	219.9	240.5	261.7	284.1	181.7	198.2	234.5	253.7	270.7	236.4
	32.0	34.6	42.5	43.8	44.7	39.9	43.9	39.7	39.0	45.9	52.1
	116	124	132	149	148	121	128	144	170	130	1362
Totals	206.1	227.9	252.8	276.5	300.2	195.3	216.9	241.4	266.2	291.4	252.6
	39.6	40.6	43.3	45.1	48.3	38.6	41.8	42.7	44.9	49.0	54.5
	1335	2324	2469	2501	2479	1308	2299	2402	2539	2350	22006

TABLE 38

Mean, standard deviation and number of observations for average of last 3 PEFRS by area, sex and age

Area	Boys					Girls					
	6	7	8	9	10	6	7	8	9	10	Totals
Duisburg	192.5	210.4	237.9	265.1	284.1	199.1	205.9	226.1	253.2	274.9	241.0
	57.5	36.8	42.0	43.9	49.7	40.3	37.0	41.3	41.6	44.3	50.6
	17	149	169	154	144	30	160	177	139	111	1250
Düsseldorf	201.8	216.3	244.3	263.3	283.3	197.2	207.5	232.4	256.1	270.5	243.8
	35.2	41.3	41.3	46.7	47.0	35.6	39.1	40.8	48.3	48.9	50.9
	20	136	152	162	137	39	150	142	133	120	1191
Rheydt	212.8	219.6	241.2	269.6	291.0	196.3	209.6	236.6	253.2	281.2	245.3
	43.8	33.9	42.5	40.8	45.9	33.0	38.7	43.8	41.8	42.1	48.9
	27	124	152	126	86	25	125	129	124	97	1015
Bordeaux	203.5	219.4	245.6	270.5	298.5	195.0	211.9	236.7	267.9	299.0	253.0
	35.2	33.9	36.9	43.6	45.2	33.9	33.2	36.7	45.1	44.3	53.8
	108	113	131	158	199	87	127	150	161	188	1422
Lyon D	201.2	211.7	246.6	270.6	285.9	182.2	205.3	232.6	260.9	279.8	241.2
	36.8	40.3	43.7	40.0	49.3	37.7	45.0	43.6	41.9	52.3	54.4
	113	141	155	172	149	89	162	160	165	136	1442
Lyon G	181.4	207.0	236.0	256.2	281.2	173.7	189.1	222.0	240.6	265.6	230.4
	49.1	52.4	49.1	47.9	57.9	45.4	40.9	46.9	53.6	56.6	60.5
	74	101	129	109	107	64	79	96	92	107	958
Paris	198.4	221.8	246.8	280.0	304.9	195.9	208.9	238.7	266.6	300.5	248.3
	39.6	40.4	43.2	48.0	42.9	42.9	35.5	44.4	44.5	48.1	57.2
	89	128	108	99	99	78	83	88	107	106	985
Lacq	198.5	219.4	251.6	264.0	296.9	190.4	213.2	232.3	257.4	287.6	245.3
	45.0	40.3	46.4	47.0	50.7	38.4	45.9	43.2	43.2	50.2	56.4
	117	178	164	191	196	122	184	177	189	188	1706
Milan	215.8	230.0	256.9	285.4	306.0	194.9	211.5	232.4	264.9	294.4	252.8
	34.0	43.2	39.8	44.4	47.0	34.1	38.1	41.6	44.0	44.4	53.2
	50	89	101	100	82	46	91	123	131	77	890
Venice	206.4	229.9	251.8	282.6	299.9	196.8	227.7	243.4	263.7	283.6	255.1
	38.4	38.7	44.7	40.8	47.4	35.5	36.3	38.4	46.4	48.2	51.8
	53	114	106	101	125	48	94	108	116	108	973
Ferrara	216.6	229.3	251.0	275.5	303.1	190.6	216.0	226.7	269.7	294.4	255.2
	33.4	43.2	41.6	44.7	51.7	35.0	45.8	39.4	44.3	43.5	55.6
	47	87	90	109	120	49	88	77	90	102	859
Gent	206.7	237.1	245.4	272.4	299.5	200.6	218.6	234.2	268.7	282.7	258.0
	30.8	39.6	43.2	45.1	45.7	30.5	41.0	40.9	44.8	49.4	51.4
	22	87	168	167	158	38	107	163	181	182	1273
Ardennes	200.5	225.1	242.4	263.4	297.8	180.7	207.4	241.1	253.5	286.5	245.0
	36.5	38.4	47.4	43.0	40.5	36.8	37.1	45.6	44.0	45.1	54.1
	66	101	126	118	136	77	130	111	137	122	1124
Hartlepool	168.3	196.1	223.8	246.6	277.5	163.9	180.7	216.2	239.2	263.9	227.9
	30.3	44.5	36.2	46.6	45.1	39.5	43.6	43.7	42.0	50.6	54.7
	26	111	117	101	121	25	97	98	120	101	917
Middlesbrough	184.9	210.9	248.5	279.8	293.0	175.6	205.8	232.1	265.5	278.7	237.4
	36.9	38.7	37.9	41.6	41.6	35.3	42.4	41.3	38.2	44.3	55.7
	89	115	112	109	98	102	108	106	105	91	1035
Stockton	164.8	196.3	222.8	239.6	267.0	168.1	192.3	207.1	234.6	272.3	222.2
	37.6	40.2	43.4	47.7	51.6	40.4	34.9	46.0	45.9	46.6	56.3
	47	82	64	74	101	44	56	70	57	67	662
Dublin	195.6	221.3	229.1	248.4	272.9	187.8	209.3	227.4	244.6	271.3	231.1
	34.4	36.8	39.6	43.6	42.5	32.8	43.7	40.7	44.2	54.5	49.7
	137	172	148	138	136	133	154	141	155	157	1471
Cork	201.0	221.9	243.7	265.4	287.1	191.9	207.1	227.9	240.6	277.7	238.5
	29.5	34.7	41.8	42.6	50.8	36.5	38.6	45.6	49.9	48.5	51.9
	117	171	145	163	137	91	176	141	167	160	1468
Galway	185.7	211.6	231.3	251.4	275.9	173.3	189.0	227.0	244.8	261.8	227.7
	31.4	35.4	41.9	44.1	45.0	40.2	44.4	39.9	39.7	46.1	52.2
	116	124	132	149	148	121	128	144	170	130	1362
Totals	196.4	217.6	242.1	265.8	289.8	186.1	206.8	230.8	255.5	280.8	242.2
	38.8	40.4	43.1	45.5	48.4	38.2	41.6	42.7	45.4	49.3	54.4
	1335	2323	2469	2500	2479	1308	2299	2401	2539	2350	22003

TABLE 39

Mean, standard deviation and number of observations for age in years by area, sex and age

Area	Boys 6	Boys 7	Boys 8	Boys 9	Boys 10	Girls 6	Girls 7	Girls 8	Girls 9	Girls 10	Totals
Duisburg	6.9	7.5	8.5	9.5	10.5	6.8	7.5	8.5	9.5	10.4	8.8
	.1	.3	.3	.3	.3	.1	.3	.3	.3	.3	1.2
	17	150	169	154	144	30	160	178	139	111	1252
Düsseldorf	6.9	7.5	8.5	9.5	10.4	6.8	7.5	8.5	9.5	10.4	8.8
	.1	.3	.3	.3	.3	.1	.3	.3	.3	.2	1.2
	20	136	152	162	137	39	150	143	133	120	1192
Rheydt	6.9	7.5	8.5	9.5	10.4	6.9	7.5	8.5	9.4	10.4	8.7
	.1	.3	.3	.3	.3	.1	.3	.3	.3	.3	1.1
	27	124	152	126	86	25	125	129	124	97	1015
Bordeaux	6.7	7.5	8.6	9.5	10.5	6.6	7.5	8.5	9.5	10.5	8.9
	.2	.3	.3	.3	.2	.2	.3	.3	.3	.2	1.4
	108	113	131	158	199	87	127	150	161	188	1422
Lyon D	6.6	7.6	8.5	9.5	10.5	6.7	7.5	8.5	9.5	10.4	8.7
	.2	.3	.3	.3	.3	.2	.3	.3	.3	.3	1.3
	113	141	155	172	149	89	162	160	165	136	1442
Lyon G	6.7	7.5	8.5	9.5	10.4	6.7	7.5	8.5	9.5	10.5	8.7
	.2	.3	.3	.3	.3	.2	.3	.3	.3	.3	1.3
	74	101	129	109	107	64	79	96	92	107	958
Paris	6.7	7.5	8.5	9.4	10.5	6.7	7.5	8.5	9.5	10.4	8.6
	.2	.3	.3	.3	.3	.2	.3	.3	.3	.3	1.4
	89	128	108	99	99	78	83	88	107	106	985
Lacq	6.6	7.5	8.5	9.5	10.5	6.7	7.5	8.5	9.5	10.5	8.7
	.2	.3	.3	.3	.3	.2	.3	.3	.3	.3	1.4
	117	178	164	191	196	122	184	177	189	188	1706
Milan	6.7	7.5	8.5	9.5	10.5	6.7	7.5	8.5	9.5	10.4	8.7
	.2	.3	.3	.3	.3	.2	.3	.3	.3	.3	1.2
	50	89	101	100	82	46	91	123	131	77	890
Venice	6.7	7.5	8.5	9.5	10.5	6.7	7.5	8.5	9.5	10.5	8.8
	.2	.3	.3	.3	.3	.2	.3	.3	.3	.3	1.3
	53	114	106	101	125	48	94	108	116	108	973
Ferrara	6.7	7.5	8.5	9.5	10.5	6.7	7.4	8.5	9.5	10.5	8.8
	.2	.3	.3	.3	.3	.2	.3	.3	.3	.3	1.3
	47	87	90	109	120	49	88	77	90	102	859
Gent	6.7	7.6	8.5	9.5	10.5	6.7	7.6	8.5	9.5	10.5	9.1
	.2	.3	.3	.3	.3	.2	.3	.3	.3	.3	1.2
	22	87	168	167	158	38	107	163	181	182	1273
Ardennes	6.7	7.5	8.5	9.5	10.6	6.7	7.5	8.5	9.5	10.5	8.8
	.2	.3	.3	.3	.3	.2	.3	.3	.3	.3	1.3
	66	101	126	118	136	77	130	111	137	122	1124
Hartlepool	6.9	7.5	8.5	9.5	10.5	6.9	7.5	8.5	9.5	10.5	8.9
	.1	.3	.3	.3	.3	.1	.3	.3	.3	.3	1.2
	26	111	117	102	121	25	97	98	120	101	918
Middlesbrough	6.5	7.5	8.5	9.5	10.5	6.5	7.5	8.5	9.5	10.5	8.5
	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3	1.4
	89	115	112	109	98	102	108	106	105	91	1035
Stockton	6.6	7.5	8.5	9.4	10.5	6.6	7.5	8.5	9.5	10.5	8.7
	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3	1.4
	47	82	64	74	101	44	56	70	57	67	662
Dublin	6.6	7.5	8.5	9.5	10.5	6.6	7.5	8.5	9.5	10.5	8.5
	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3	1.4
	137	172	148	138	136	133	154	141	155	157	1471
Cork	6.6	7.5	8.5	9.5	10.5	6.6	7.5	8.5	9.5	10.5	8.6
	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3	1.4
	117	171	145	163	137	91	176	141	167	160	1468
Galway	6.5	7.5	8.5	9.5	10.5	6.6	7.5	8.5	9.5	10.5	8.6
	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3	1.4
	116	124	132	149	148	121	128	144	170	130	1362
Totals	6.6	7.5	8.5	9.5	10.5	6.7	7.5	8.5	9.5	10.5	8.7
	.3	.3	.3	.3	.3	.2	.3	.3	.3	.3	1.3
	1335	2324	2469	2501	2479	1308	2299	2403	2539	2350	22007

Table 40

Mean Best Peak Expiratory Flow Rates (l/min) according to area and sex, after adjustment for differences in age, height and weight.

AREA	BOYS	GIRLS
Duisburg	243.6	235.5
Düsseldorf	245.4	234.4
Rheydt	248.6	238.1
Bordeaux	262.1	257.4
Lyon D	264.0	252.4
Lyon G	251.8	236.9
Paris	268.7	259.6
Lacq	266.8	256.4
Milan	273.4	253.0
Venice	274.1	261.7
Ferrara	265.2	253.2
Gent	262.6	251.7
Ardennes	259.1	248.2
Hartlepool	245.4	233.0
Middlesbrough	257.0	243.0
Stockton	240.8	234.6
Dublin	257.2	250.4
Cork	261.2	247.8
Galway	248.7	237.5

Table 41

Difference in Adjusted Peak Expiratory Flow Rates (l/min) between those with and without "CNSLD"

	BOYS			GIRLS		
AREA	Differences without - with	P reg	P diff	Differences without - with	P reg	P diff
Duisburg	5.5	*	NS	9.0	NS	**
Düsseldorf	0.6	NS	NS	11.1	NS	***
Rheydt	4.0	*	NS	5.5	NS	NS
Bordeaux	13.5	NS	***	11.8	NS	***
Lyon D	13.8	NS	***	12.3	*	***
Lyon G	4.9	NS	NS	6.7	*	NS
Paris	6.8	NS	NS	16.6	NS	***
Lacq	10.5	*	*	19.0	NS	***
Milan	2.4	*	NS	- 0.3	NS	NS
Venice	22.9	NS	***	6.6	NS	NS
Ferrara	9.2	NS	(*)	7.7	NS	NS
Gent	15.0	NS	***	5.9	NS	NS
Ardennes	6.9	NS	NS	5.5	NS	NS
Hartlepool	12.2	NS	***	- 1.7	*	NS
Middlesbrough	7.5	NS	*	8.5	NS	*
Stockton	10.7	NS	*	3.9	*	NS
Dublin	12.5	*	***	9.0	NS	***
Cork	6.5	**	NS	11.4	NS	***
Galway	15.9	NS	***	10.1	NS	*

NOTES
Probability: * $p<.05$ ** $p<.01$ *** $p<.001$ NS= Not Significant
Peak Expiratory Flow rates were adjusted for differences in age, height, weight and peak flow meters.
P_{reg} - Degree to which the four regression coefficients differed between the two groups.
P_{diff} - Probability that the difference between groups arose by chance despite a true value of zero.

Table 42

Difference in Adjusted Peak Expiratory Flow Rates (l/min) between those with and without Morning Cough (Question 1)

	BOYS			GIRLS		
AREA	Differences without - with	P reg	P diff	Differences without - with	P reg	P diff
Duisburg	0.0	NS	NS	6.6	NS	NS
Düsseldorf	- 4.3	NS	NS	5.2	NS	NS
Rheydt	9.4	*	NS	5.5	NS	NS
Bordeaux	11.9	NS	NS	9.9	NS	NS
Lyon D	14.4	NS	*	11.4	NS	NS
Lyon G	- 6.1	NS	NS	- 0.6	NS	NS
Paris	12.1	NS	*	9.7	NS	NS
Lacq	19.5	*	*	18.5	NS	**
Milan	5.3	NS	NS	- 7.1	NS	NS
Venice	23.0	NS	*	8.1	*	NS
Ferrara	8.1	NS	NS	8.8	NS	NS
Gent	18.0	NS	*	3.0	NS	NS
Ardennes	7.3	NS	NS	1.0	NS	NS
Hartlepool	9.9	NS	NS	5.1	NS	NS
Middlesbrough	10.7	*	NS	16.1	NS	**
Stockton	21.1	NS	**	6.5	NS	NS
Dublin	13.0	*	***	6.9	NS	NS
Cork	12.2	***	*	16.0	NS	*(*)
Galway	20.8	NS	*	- 0.8	NS	NS

See Notes for Table 41

Table 43

Difference in Adjusted Peak Expiratory Flow Rates (l/min) between those with and without Asthma (Question 8)

	BOYS			GIRLS		
AREA	Differences without - with	P reg	P diff	Differences without - with	P reg	P diff
Duisburg	- 2.2	NS	NS	11.6	NS	NS
Düsseldorf	38.7	NS	***	19.0	NS	NS
Rheydt	15.8	*	NS	32.3	NS	*
Bordeaux	13.7	NS	*	19.9	*	*(*)
Lyon D	26.0	NS	***	41.4	**	***
Lyon G	4.3	NS	NS	20.9	NS	NS
Paris	0.2	NS	NS	- 5.9	NS	NS
Lacq	33.1	***	***	22.3	(*)	*(*)
Milan	2.6	NS	NS	6.2	NS	NS
Venice	15.7	NS	NS	3.9	NS	NS
Ferrara	10.2	NS	NS	5.1	NS	NS
Gent	45.0	NS	***	53.8	NS	(*)
Ardennes	9.7	NS	NS	-2.30	NS	NS
Hartlepool	2.3	NS	NS	8.0	NS	NS
Middlesbrough	-13.0	*	NS	44.7	NS	**
Stockton	9.1	***	NS	- 0.8	NS	NS
Dublin	45.0	NS	***	54.1	***	***
Cork	22.3	***	***	21.3	NS	*
Galway	20.7	NS	*	9.6	NS	NS

See notes for table 41

Note - Much asthma, but little wheeze in Bordeaux

Table 44

Difference in Adjusted Peak Expiratory Flow Rates (l/min) between those without cough day and night (--) and
(a) those who cough day and night for as much as three months in a row each year (++) and
(b) those who cough like this less than three months each year (+-)

	BOYS				GIRLS			
AREA	++/--	+-/--	P reg	P diff	++/--	+-/--	P reg	P diff
Duisburg	13.6	- 8.3	NS	(*)	4.8	10.0	NS	NS
Düsseldorf	1.8	- 1.7	NS	NS	15.4	- 5.8	NS	NS
Rheydt	4.4	9.1	NS	NS	- 4.7	8.0	NS	NS
Bordeaux	18.0	20.7	NS	*	21.7	7.1	NS	NS
Lyon D	2.5	15.9	NS	NS	10.5	10.7	NS	NS
Lyon G	- 5.3	1.6	NS	NS	0.5	-14.5	NS	NS
Paris	15.5	9.3	NS	NS	14.2	5.6	*	NS
Lacq	14.1	24.1	**	*	10.5	19.6	NS	*
Milan	- 2.2	7.2	NS	NS	- 4.2	4.4	NS	NS
Venice	22.6	38.0	NS	**	-16.0	31.8	NS	**
Ferrara	3.7	23.0	NS	NS	- 5.6	4.4	NS	NS
Gent	35.8	10.4	NS	**(*)	13.6	- 4.2	NS	NS
Ardennes	14.1	20.9	NS	NS	- 4.7	7.0	NS	NS
Hartlepool	1.6	16.5	NS	*	8.6	- 1.3	NS	NS
Middlesbrough	12.1	4.0	NS	NS	16.0	6.8	NS	NS
Stockton	2.8	11.0	NS	NS	-22.7	2.9	*	*
Dublin	31.4	12.9	NS	***	12.4	3.8	NS	NS
Cork	12.4	7.7	***	NS	23.4	11.3	NS	*
Galway	46.4	- 0.6	NS	***	29.1	- 5.1	NS	NS

See Notes for Table 41

++/-- = Difference in adjusted PEFR between those answering YES to both questions 2 and 3 and those answering NO

+-/-- = Difference in adjusted PEFR between those answering YES only to question 2 and those answering NO

Table 45

Difference in Adjusted Peak Expiratory Flow Rates (l/min) between those without breathlessness when playing with other children (--) and (a) those who are more breathless than other children of the same age (++) and (b) those who are breathless but not more than other children (+-) Questions 4 and 5

	BOYS				GIRLS			
AREA	Differences ++/--	Differences +-/--	P reg	P diff	Differences ++/--	Differences +-/--	P reg	P diff
Duisburg	24.4	2.2	NS	***	11.7	7.0	NS	NS
Düsseldorf	10.7	11.5	NS	NS	29.0	8.7	NS	**
Rheydt	27.9	- 6.3	NS	NS	27.9	- 6.3	NS	**
Bordeaux	22.4	21.3	NS	***	28.5	3.2	**	***
Lyon D	8.8	- 5.6	NS	NS	13.5	21.7	NS	**
Lyon G	8.1	12.3	*	NS	18.7	8.7	NS	NS
Paris	0.8	- 1.3	NS	NS	16.7	15.5	NS	*
Lacq	- 0.4	15.1	NS	NS	20.4	5.3	NS	*(*)
Milan	-10.9	- 0.1	NS	NS	- 6.4	6.4	NS	NS
Venice	50.1	-17.5	NS	**(*)	- 6.5	- 0.9	NS	NS
Ferrara	4.8	13.8	NS	NS	- 3.1	-11.9	NS	NS
Gent	26.6	- 8.9	NS	**	5.2	12.7	NS	NS
Ardennes	11.1	-12.2	NS	NS	15.8	6.7	*	NS
Hartlepool	15.4	4.1	NS	NS	7.9	- 8.3	NS	NS
Middlesbrough	12.0	- 6.3	NS	NS	19.2	4.1	NS	NS
Stockton	10.0	3.9	NS	NS	7.1	-11.7	NS	NS
Dublin	30.6	- 6.2	**(*)	***	11.9	6.2	NS	NS
Cork	21.0	-11.6	***	***	19.0	13.2	NS	NS
Galway	15.6	- 2.8	NS	NS	20.1	- 4.2	NS	NS

See Notes for Tables 41 and 44

Table 46

Difference in Adjusted Peak Expiratory Flow Rates (l/min) between those without a Wheezy or Whistling Chest (--) and
(a) those who have this most days or nights (++) and
(b) those who have ever had it (+-)
Questions 6 and 7

	BOYS				GIRLS			
AREA	Differences ++/--	Differences +-/--	P reg	P diff	Differences ++/--	Differences +-/--	P reg	P diff
Duisburg	11.1	9.2	NS	NS	15.0	12.8	NS	*
Düsseldorf	0.1	1.1	NS	NS	17.5	15.3	NS	**
Rheydt	5.6	18.7	NS	NS	6.5	3.8	NS	NS
Bordeaux	19.4	14.4	NS	**	Insufficient ++ observations			
Lyon D	- 7.4	18.0	NS	***	"			
Lyon G	-23.1	3.7	NS	NS	"			
Paris	30.2	10.1	NS	NS	25.9	15.0	NS	*
Lacq	-18.2	11.3	**	NS	15.9	18.3	NS	*(*)
Milan	- 6.4	13.1	*	NS	-22.8	5.2	NS	NS
Venice	47.4	23.0	*	*(*)	- 2.7	-11.0	NS	NS
Ferrara	-20.2	- 9.5	NS	NS	26.4	10.5	NS	NS
Gent	43.8	1.6	NS	**	41.9	13.9	NS	*
Ardennes	Insufficient ++ observations				Insufficient ++ observations			
Hartlepool	17.8	14.4	NS	***	12.2	- 4.6	NS	NS
Middlesbrough	14.4	6.3	NS	NS	29.6	4.5	NS	NS
Stockton	29.1	6.2	NS	*	4.0	13.0	NS	NS
Dublin	24.4	5.6	NS	***	31.4	7.9	NS	***
Cork	34.3	6.0	NS	***	27.0	12.1	NS	**
Galway	23.5	16.4	NS	***	5.1	20.4	NS	**

See Notes for Tables 41 and 44

Table 47

Social Characteristics of the Areas
(% based on all those questionnaires with data)

AREA	Caucasian %	Unemployed %	Fathers in non-manual jobs %	Children living >2 years at address %	Living with father %
Duisburg	99.9	3.2	41.7	77.0	89.1
Düsseldorf	100.0	3.1	50.1	88.9	87.4
Rheydt	99.5	3.6	54.7	88.9	92.1
Bordeaux	98.9	1.6	64.4	80.1	92.7
Lyon D	91.3	4.0	35.1	80.3	99.6
Lyon G	99.3	3.0	41.8	74.6	89.5
Paris	95.5	4.0	63.8	86.1	88.4
Lacq	99.1	2.4	29.3	91.5	95.3
Milan	99.9	1.2	62.3	94.7	95.3
Venice	99.7	2.4	37.3	84.9	95.6
Ferrara	99.8	1.7	66.6	85.1	95.4
Gent	97.8	5.6	36.7	83.7	85.3
Ardennes	100.0	5.0	41.0	94.0	94.9
Hartlepool	98.5	11.7	15.4	84.4	88.8
Middlesbrough	97.4	0.5	43.7	77.7	96.9
Stockton	82.8	5.2	25.7	64.7	86.3
Dublin	99.7	24.6	14.6	92.2	94.1
Cork	100.0	4.7	49.9	92.9	97.3
Galway	99.9	6.7	50.9	82.2	96.5

ISCO major groups 0-4
Detailed breakdown in Table 2

Table 48

Correlation coefficients for annual and winter median levels of the pollutants measured by comparison and local stations.

Method	Year	No of Obs	Annual Median	No of Obs	Winter Median
SO_2	75/76		0.67		0.94
H_2O_2	76/77		0.34		0.86
SO_2 Conductimetric	76/77		0.59		0.99
Smoke Reflectometry	75/76		0.40		0.37
	76/77		0.52		0.49
SDM Bat Tape	76/77		0.91		0.99

Table 49

Conversion factors for adjusting median values of suspended particulate matter and sulphur dioxide measured by local stations to take into account the results from comparison stations

AREA		Conversion factors for	
		Suspended particulate matter	Sulphur dioxide
Duisburg		0.43	1.6
Düsseldorf		0.43	1.64
Rheydt		0.43	-
Bordeaux	- winter	0.62	0.79
	annual	0.88	1.05
Lyon		1.11	1.1
Paris	- winter	1.08	0.89
	annual	1.08	1.1
Lacq	- winter	0.99	2.3
	annual	0.68	2.3
Milan		0.25	0.47
Venice		0.33	1.17
Ferrara		0.83	3.85
Gent		1.97	1.42
Ardennes		1.97	1.42
Hartlepool		1.03	0.89
Middlesbrough		1.03	0.89
Stockton		1.03	0.89
Dublin	- winter	1.25	0.69
	- annual	1.25	0.78
Cork		1.25	1.1
Galway		1.25	1.82

Table 50

Median levels of "black smoke" and sulphur dioxide in $\mu g/m^3$ in 1974/75 after adjustment using the conversion factors obtained from comparison station data

Area	School No	Black Smoke Annual	Black Smoke Winter	SO_2 Annual	SO_2 Winter
Duisburg	All	23	-	326	Limited data
Düsseldorf	All	11	-	100	
Rheydt	All	33	-	Not available	
Bordeaux	All	38	29	25	27
Lyon	1-5	46	60	61	82
	6-11	57	72	85	128
Paris	1	48	54	92	100
	2	40	43	115	116
	3	48	55	90	103
	4	39	46	108	107
	5	41	50	117	129
	6	43	31	114	107
Lacq	1	5	11	55	51
	2,19	7	10	64	58
	3	7	14	94	71
	4	5	10	78	61
	5	7	15	88	67
	6,7	8	11	31	23
	8	5	9	65	51
	9	6	12	59	45
	10	8	17	98	69
	11-15	5	10	39	36
	16	9	13	39	39
	17,18	20	29	79	66
Milan	Both	30	48	98	183
Venice	1	34	34	122	184
Ferrara	All	18	26	65	90

Table 50 (contd)

Area	School No	Black Smoke Annual	Black Smoke Winter	SO_2 Annual	SO_2 Winter
Gent	1,4	24	31	156	173
	2	25	30	144	153
	3	27	33	156	168
	5	29	37	147	151
	6	31	38	156	163
	7	26	32	150	163
	8	27	35	150	160
	9	26	32	147	157
	10	25	32	129	142
	11,12	27	35	135	145
Ardennes	All	15	14	57	43
Hartlepool	All	16	17	25	31
Middlesbrough	All	12	18	32	38
Stockton	All	22	28	42	48
Dublin	1	37	54	58	59
	2	36	50	64	62
	3	35	42	54	51
	4	37	46	55	53
	5	38	49	58	57
	6,7	33	49	54	55
	8	36	46	57	56
	9	27	37	60	61
	10	25	33	50	48
	11	28	36	59	59
	12	32	44	54	56
Cork	1-3	14	16	57	57
	4-6	14	18	63	70
Galway	All	17	24	19	27

Table 51

Regression coefficients representing the rate of change in the prevalence of cough on the logistic scale per unit increase in pollutant.

		FRG	FRANCE	ITALY	BELGIUM	UK	IRELAND
Boys	SO2	.0010	.0102**	-.0985***	-.0100	-.0263	.0183***
	Smoke	(.0196)+	-.0031	.3222***	.0964	.0496	.0424***
Girls	SO2	.0007	.0069	-.0570	-.0195	.0099	.0219***
	Smoke	(.0446)**	-.0080	.2101**	.2050	.0591*	.0468***

+ Insufficient pollution data for FRG meant that these effects had to be estimated separately with an assumption that the other was zero.

* p<.05 ** p<.01 *** p<.001

Table 52

Regression coefficients representing the rate of change in the prevalence of breathlessness on the logistic scale per unit increase in pollutant.

		FRG	FRANCE	ITALY	BELGIUM	UK	IRELAND
Boys	SO2	.0022*	.0086***	-.0714**	-.0230	-.0392	.0022
	Smoke	(.0421)	.0083*	.2524***	.1973	-.0046	.0134
Girls	SO2	.0033**	.0072**	-.1094***	-.0381*	-.0406	.0106
	Smoke	(.0623)	.0025	.3740***	.3725**	.1044*	.0331**

* p<.05 ** p<.01 *** p<.001

Table 53

Regression coefficients representing the rate of change in the prevalence of greater than average breathlessness on the logistic scale per unit increase in pollutant levels.

		FRG	FRANCE	ITALY	BELGIUM	UK	IRELAND
Boys	SO2	.0008	.0054	-.0702*	-.0284	.0059	.0057
	Smoke	(.0152)	.0015	.2198	.2277	-.0726	-.0223
Girls	SO2	.0019	.0056	-.0778*	-.0520	-.0254	.0090
	Smoke	(.0363)	-.0067	.2857*	.4441*	.0428	.0080

*p<.05

Table 54

Regression coefficients representing the rate of change in the prevalence of wheezing on the logistic scale per unit increase in pollutant levels.

		FRG	FRANCE	ITALY	BELGIUM	UK	IRELAND
Boys	SO2	-.0013	-.0037	-.0867***	-.0421**	.0034	.0030
	Smoke	(-.0250)	.0053	.2184**	.3742***	-.0481*	.0343***
Girls	SO2	-.0010	.0072**	-.0958***	-.0464**	.0137	.0128**
	Smoke	(-.0194)	-.0015	.2554**	.3707**	-.0351	.0546***

*p<.05 **p<.01 ***p<.001

Table 55

Regression coefficients representing the rate of change in the prevalence of frequent wheezing on the logistic scale per unit increase in pollutant levels.

		FRG	FRANCE	ITALY	BELGIUM	UK	IRELAND
Boys	SO2	.0010	.0005	.0162	.0023	-.0527	-.0044
	Smoke	(.0184)	.0037	-.0827	.1483	.0351	.0130
Girls	SO2	.0003	.0198	.0101	-1.9530	-.0701*	-.0136
	Smoke	(.0061)	-.0349	-.0857	12.6500	.1074	.0600**

*p<.05 ** p<.01

Table 56

Regression coefficients representing the rate of change in the prevalence of CNSLD on the logistic scale per unit increase in pollutant levels.

		FRG	FRANCE	ITALY	BELGIUM	UK	IRELAND
Boys	SO2	.00001	.0034*	-.0904***	-.0142	-.0094	.0075*
	Smoke	(.0001)	.0015	.2833***	.1723*	-.0129	.0387***
Girls	SO2	.0007	.0060**	-.0758***	-.0346**	.0192	.0166***
	Smoke	(.0140)	-.0051	.2362***	.2950**	-.0122	.0465***

* p<.05 ** p<.01 ***p<.001

Table 57

Regression coefficients representing the rate of change in the prevalence of CNSLD on the logistic scale per unit increase in pollutant levels.

		SMOKE	SO_2	SO2xSMOKE
Domestic Pollution Areas	Boys	-.0648**	-.0217*	.000646*
	Girls	-.1284***	-.0561***	.001376***
Industrial Pollution Areas	Boys	-.2378**	-.0366	.001734
	Girls	-.1163	-.0098	.004891

* p<.05 ** p<.01 ***p<.001

Table 58

Regression coefficients indicating the change in mean PEFR associated with 1 unit change in pollutant level.

	FRG	FRANCE	ITALY	BELGIUM	UK	IRELAND
SO2	-.0029	.0030	.2677	-.2386**	.4084**	-.2734***
Smoke	(-.0452)	-.1631***	-.5275	+1.9376**	1.4807***	.0806***

Table 59

Summary of results from the WHO study of chronic respiratory disease in children in relation to air pollution, for countries where annual median values of both smoke and SO_2 were available

Country (age range)	No. of children	Annual Median Pollution Category	Smoke ug/m^3	SO2 ug/m^3	Result Symps	PEFR
Denmark	1852	"High"	29	69		
(8-11yrs)	1142	Low	17	28	NS	NS
	635	Low	7	9		
Netherlands	2198	High	29	148		
(9-11yrs)	276	Low	9	48	NS	NS
Poland	1921	High	187	124		
(8-10yrs)	1319	Low	82	57	*	*
	565	Low	53	41		
Romania	1141	High	353	161		
(?)	1910	Low	37	9	*	*
Yugoslavia	2023	High	137	175	Significantly higher symptom prevalence in low area	
(8-10yrs)	1896	Low	?	?		

* p<0.5 for difference between high and low pollution areas

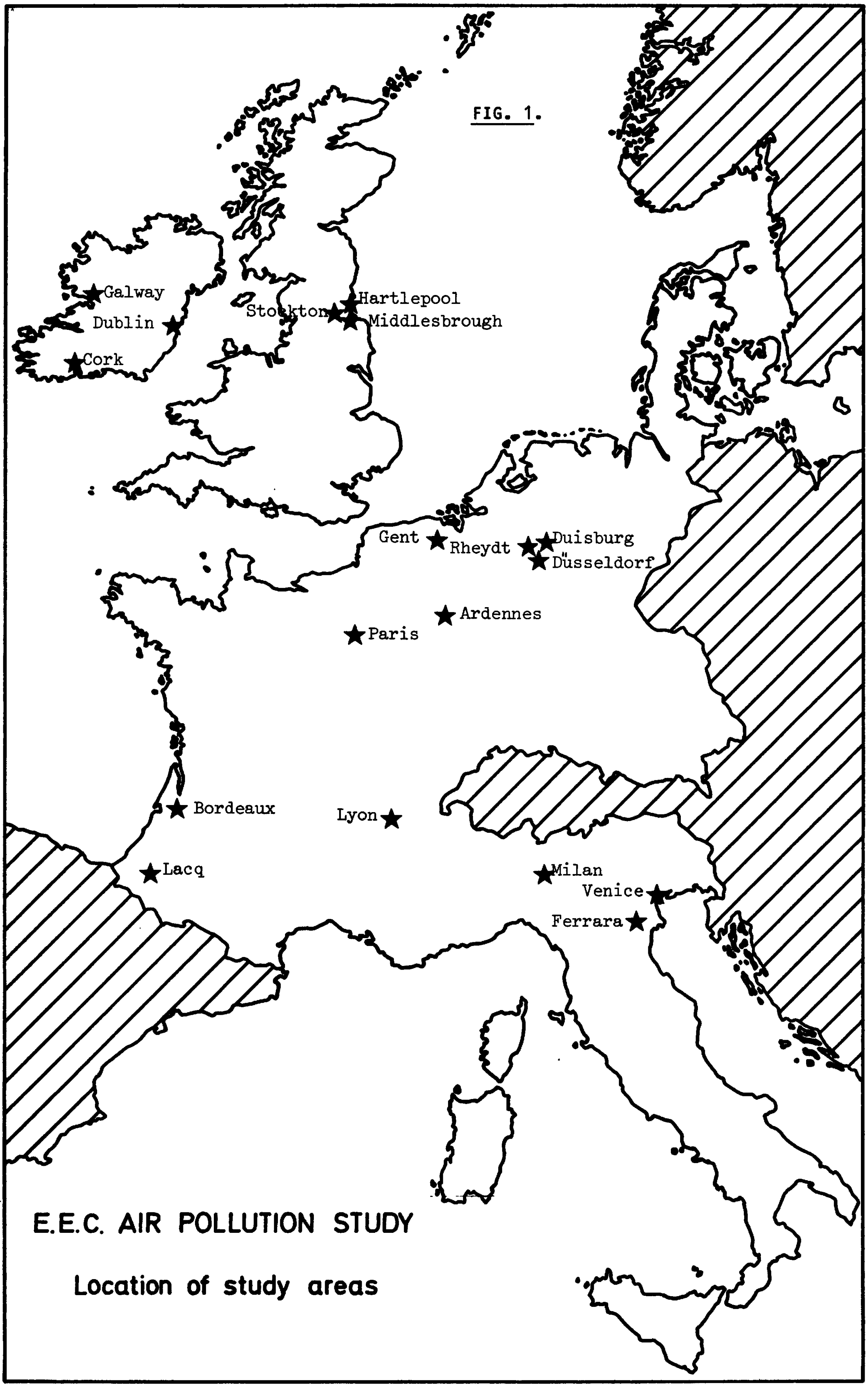
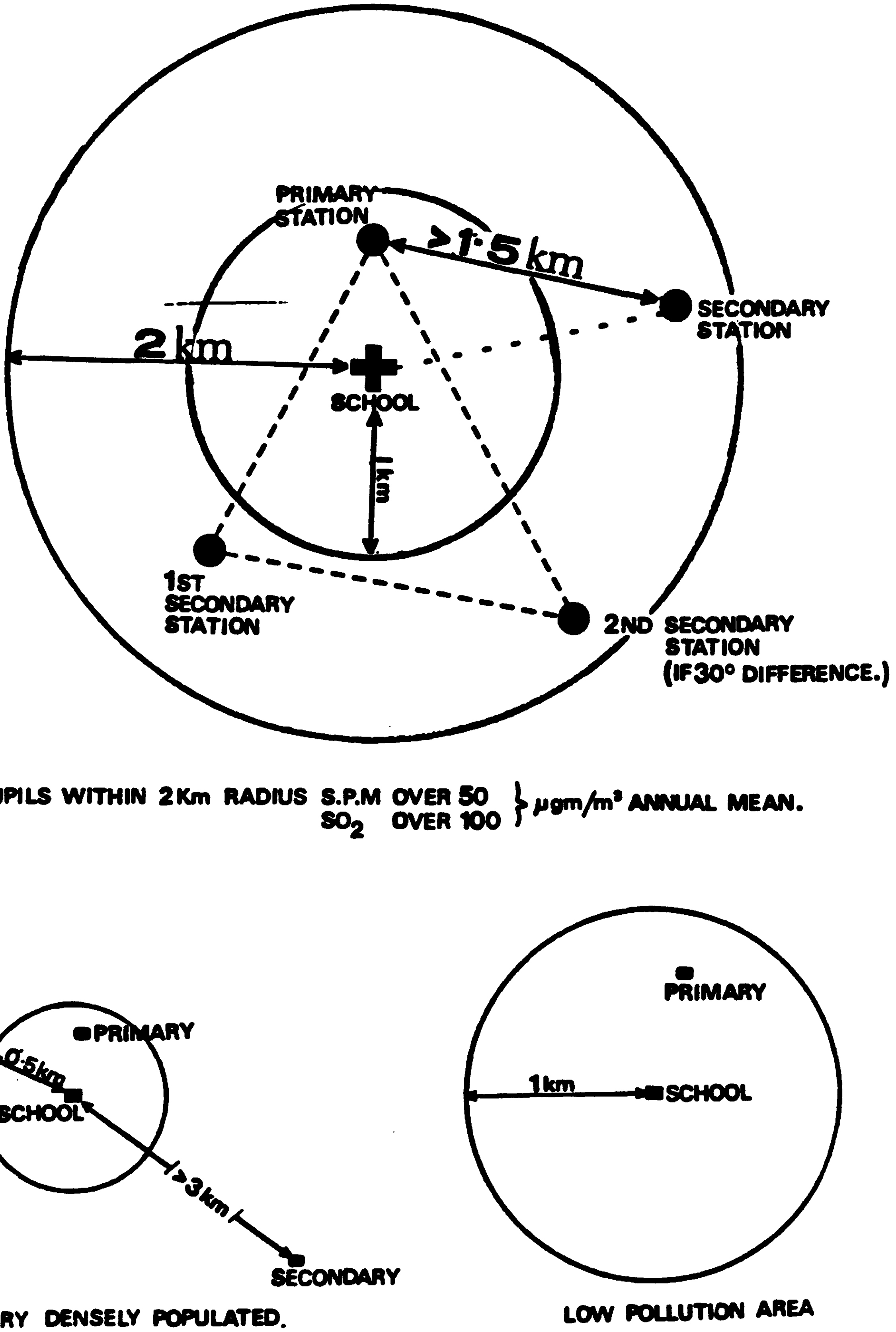


FIG. 1.

E.E.C. AIR POLLUTION STUDY

Location of study areas

FIG. 2

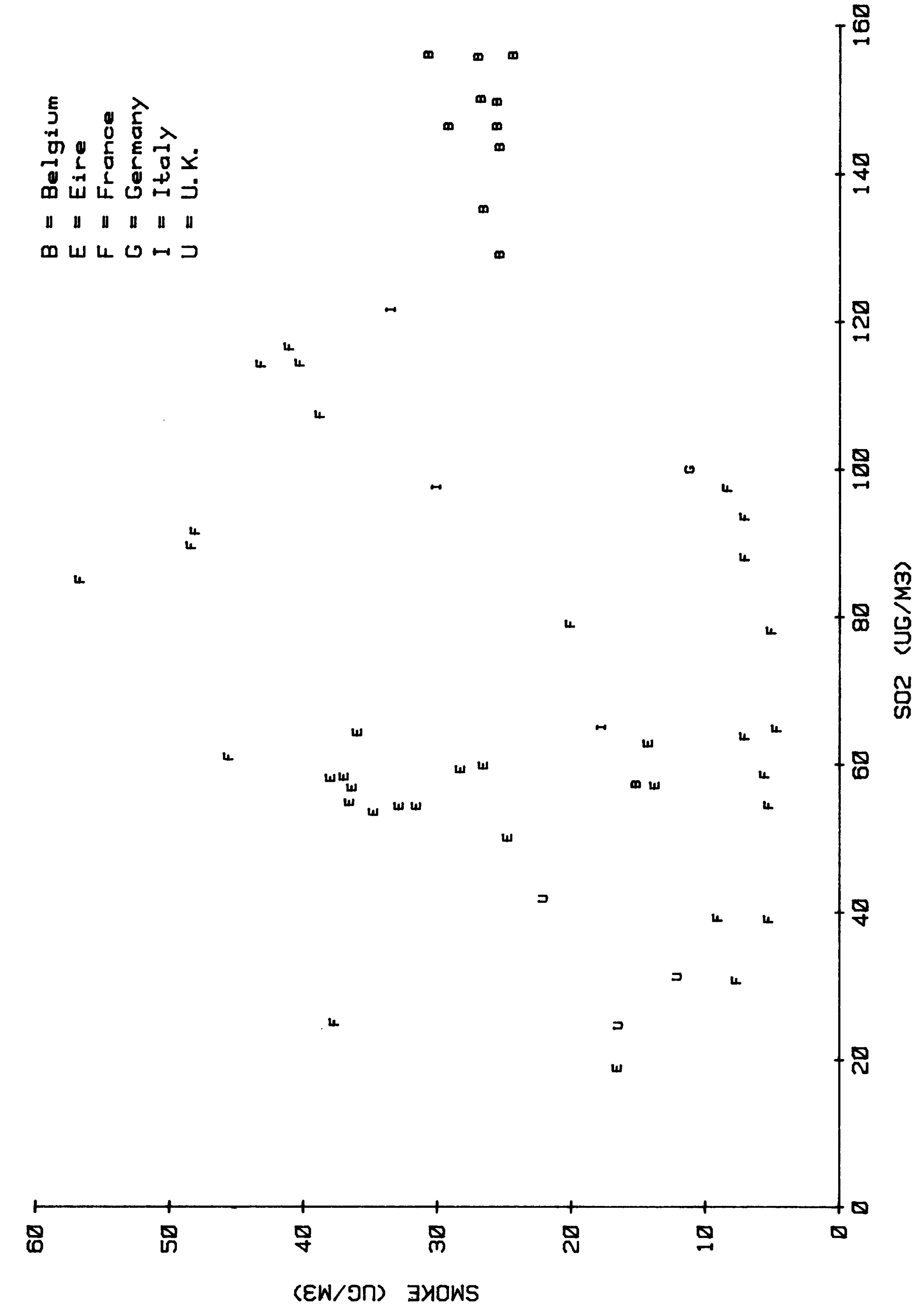


PUPILS WITHIN 2 Km RADIUS S.P.M OVER 50, SO_2 OVER 100 } μgm/m³ ANNUAL MEAN.

VERY DENSELY POPULATED.
ANNUAL MEANS OF PRIMARY SHOULD NOT VARY BY MORE THAN 30% OF SECONDARY.

LOW POLLUTION AREA
S.P.M < 30, SO_2 < 50 } μgm/m³ ANNUAL MEAN.

Fig 3


B = Belgium
E = Eire
F = France
G = Germany
I = Italy
U = U.K.
SO2 (UG/M3)
SMOKE (UG/M3)

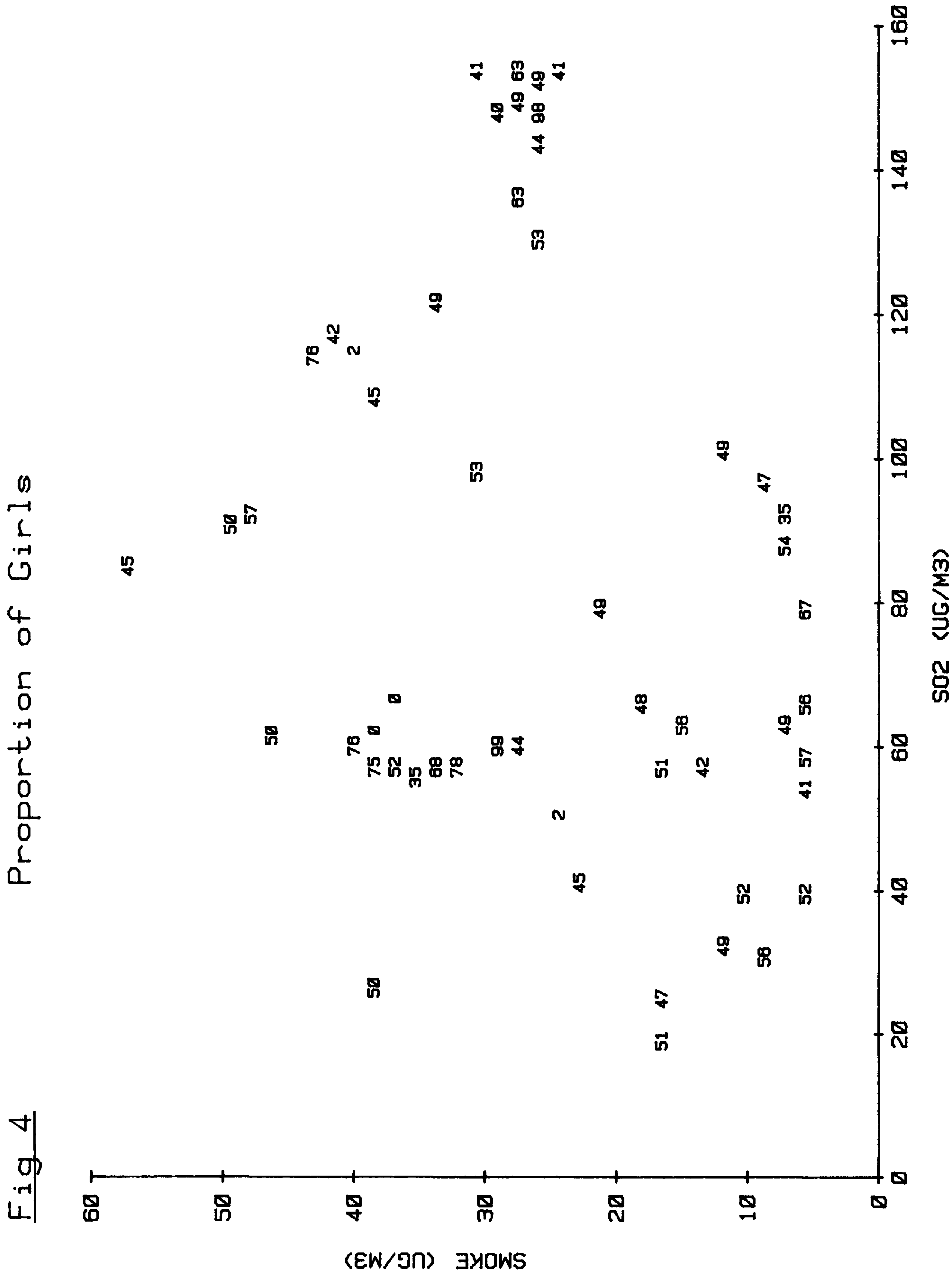


Fig 4
Proportion of Girls
SMOKE (UG/M3)
SO2 (UG/M3)

Fig 5. Proportion with 4 or more in bedroom

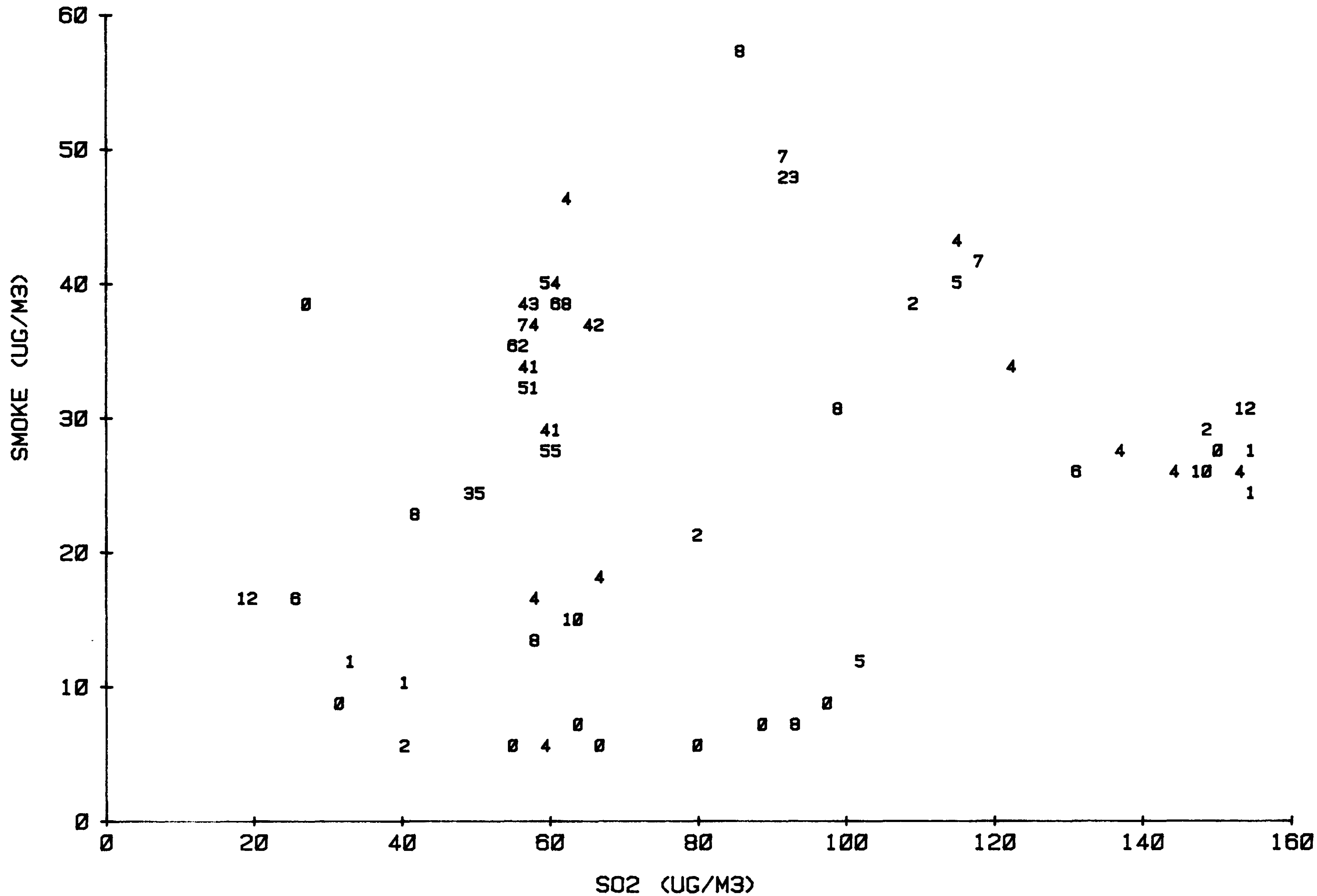


Fig 6. Proportion Exposed to Cigarette Smoke at Home

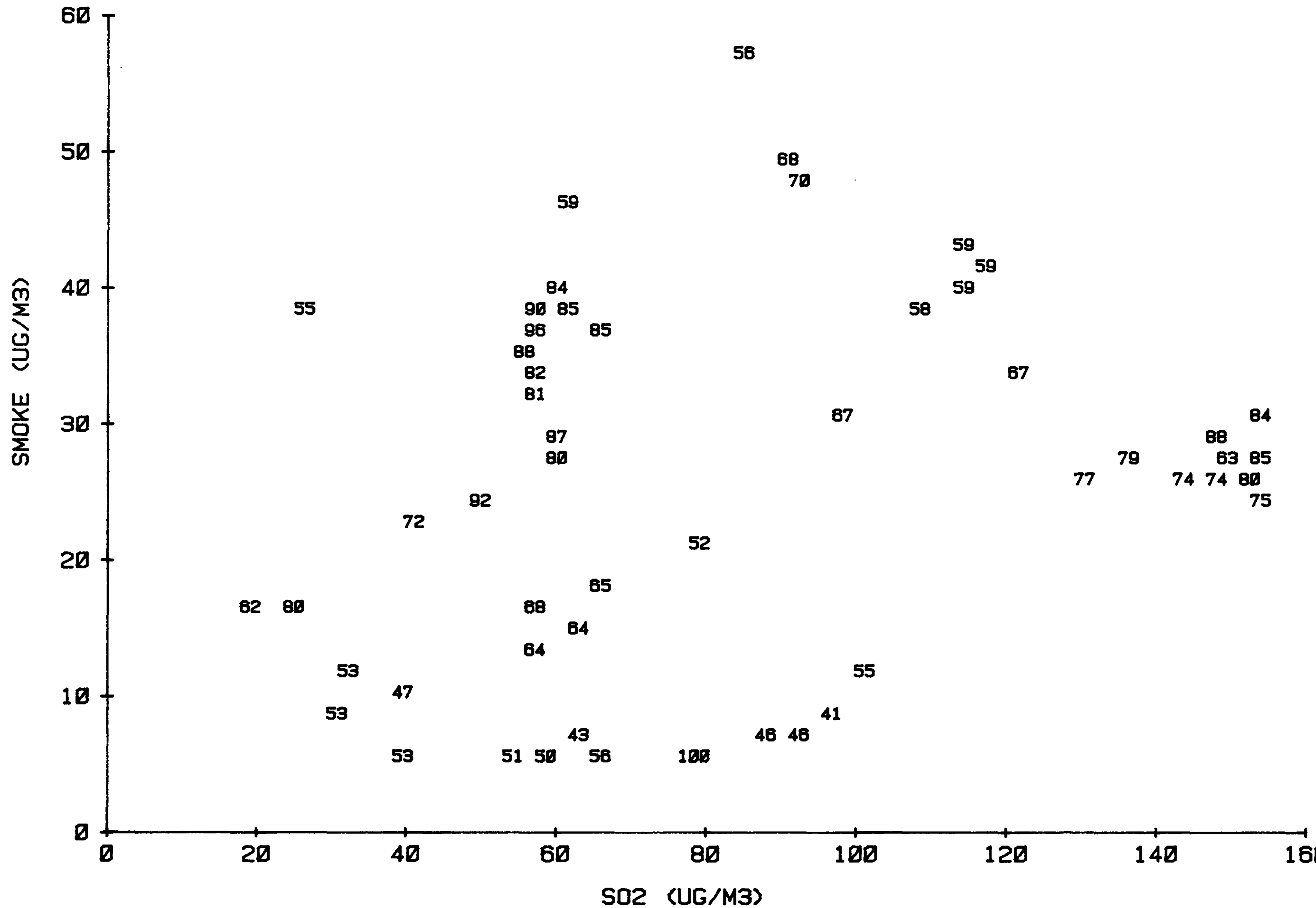


Fig 7. Proportion of Fathers with Occupation Code 500 or more

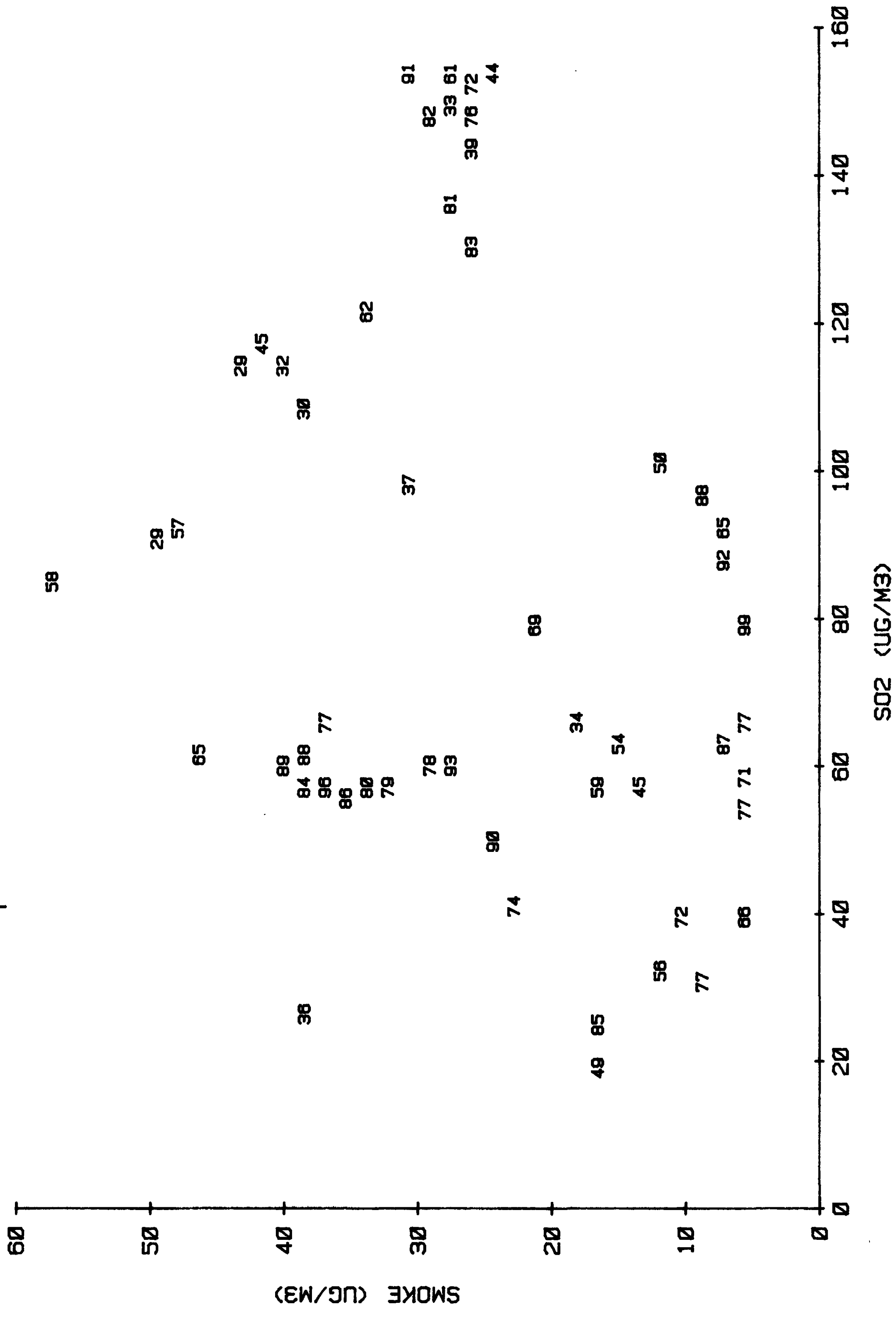


Fig 8. Proportion with Unemployed Fathers

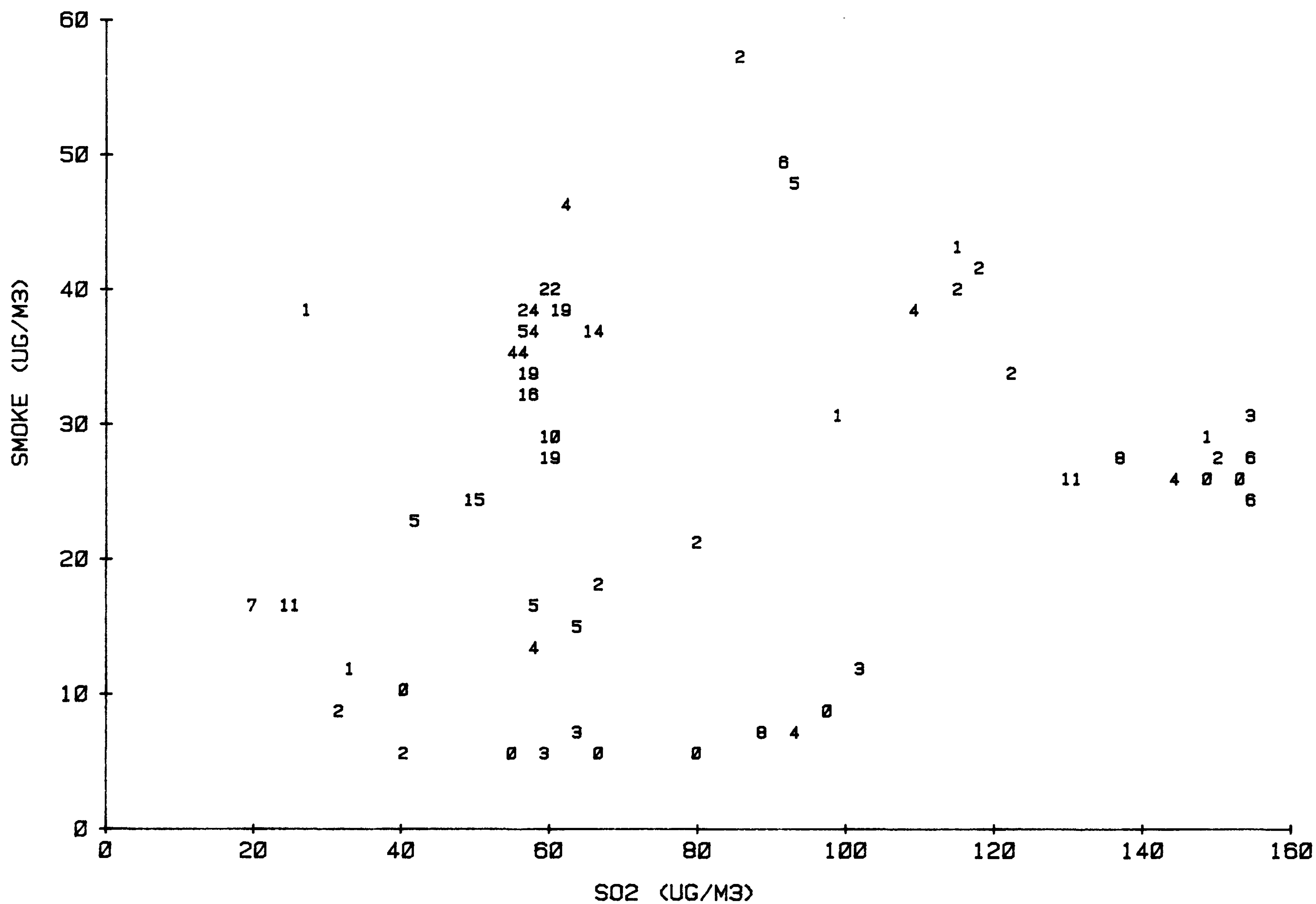
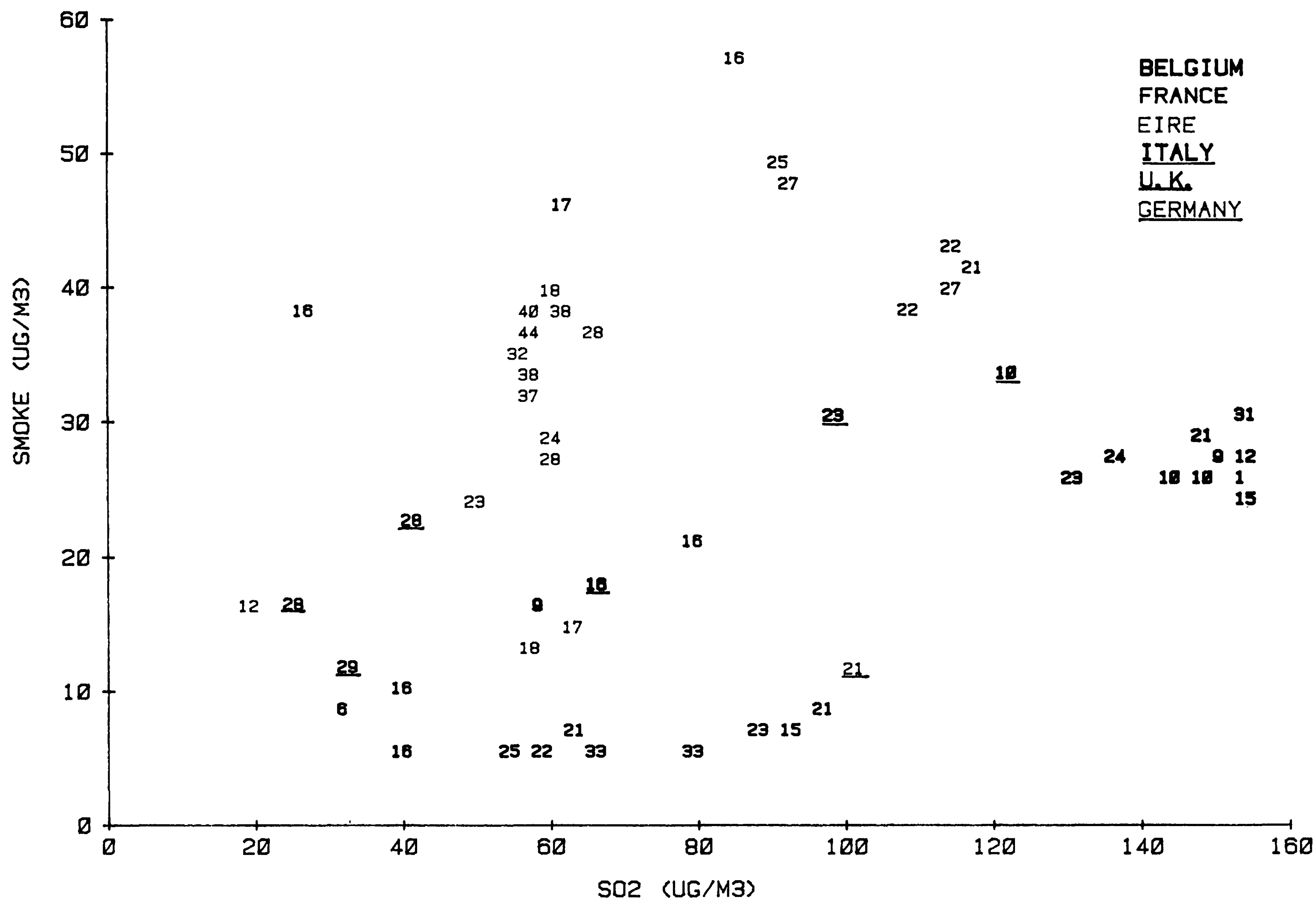


Fig 9 Prevalence of CNSLD



Appendix I

Publications and oral communications concerning the European Survey

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Bourdeau P, Di Ferrante E, Guillot P, Ott H, Berlin , Hunter W. Smeets J. La pollution atmosphérique: object d'actions communautaires. Presented at the Symposium of La Recherche en Matière de Pollution Atmosphérique, Les Arcs, France, November 1976.

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Gepts LF, Minette A. Invloed van ouderlijke rookgewoonten op CARA symptomen bij kinderen. Tijdschr. voor Geneeskunde 1976; 32: 1247-1250.

Gepts LF, Minette A. The relationship between host factors of allergic nature and respiratory symptoms. Rev. Inst. Hyg. Mines. 1977; 32: 28-35

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Holland WW. (on behalf of project leaders and C.E.C.) Air pollution and the health of schoolchildren in the European Community Presented at the Intern. scientific meeting of the Intern. Epidemiological Association, San Juan, Puerto Rico. September 1977.

Di Ferrante E, Berlin A, Bourdeau P, Smeets J. Environmental epidemiology: The European Community approach. Presented at the Intern. scientific meeting of the Intern. Epidemiological Association, San Juan, Puerto Rico. September 1977.

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Perdrizet S, Liard R, Cooreman J. Symptômes respiratoires chez les enfants d'âge scolaire, dans 7 zones d'enquête françaises Archives françaises de Pédiatrie, 1979, 36. pages 940-048.

Liard R, Bourdeix J, Gally N, Perdrizet S. Symptômes respiratoires chez les enfants d'âge scolaire dans deux quartiers de Lyon (données extraites d'une enquête européenne sur les relations entre la pollution de l'air et les affections respiratoires de l'enfant) Lyon médical, 1979, 241, pages 269-272.

Liard R, Bourbon P, Bouteille L, Vranken L, Giroux M, Poey JL. Pathologie respiratoire chez les enfants d'âge scolaire dans trois zones d'enquête des régions Midi-Pyrénées et Aquitaine (données extraites d'une enquête européenne sur les relations entre la pollution de l'air et les affections respiratoires de l'enfant) Revue médicale de Toulouse, 1981, 17, pages 75-81.

Swan AV, A Collaborative Study of Air Pollution and Respiratory Disease in Children. Presented at the XIth International Biometric Conference Toulouse, 9 September 1982

Appendix II

EUROPEAN COMMUNITY ENVIRONMENTAL RESEARCH PROGRAMME

EPIDEMIOLOGICAL SURVEY

Questionnaire

Country [1 | 2] *Area* [3 | 4] *School* [5 | 6] *Child* [7 | 8 | 9 | 10]

Child's name: ..../../..
(Surname) (First name) (Initial)

Date of interview: Day [11 | 12] Month [13 | 14] Year [15 | 16]

Fieldworker: [17 | 18]

I am going to ask you some questions about the child's health.
Would you please try to answer with «YES» or «NO».

COUGH

	YES	NO	
1. Does he/she **usually** cough in the morning? (exclude clearing throat or single cough)	1	2	19
2. Does he/she **usually** cough during the day or night? (exclude clearing throat or single cough)	1	2	20

If the answer to either questions 1 or 2 is «YES»:

	YES	NO	
3. Does he/she cough like this on most days or nights for as much as three months in a row each year?	1	2	21

BREATHLESSNESS

	YES	NO	
4. Do you notice that he/she is short of breath when playing with other children?	1	2	22

If the answer is «YES»:

	YES	NO	
5. Do you think this is more than in other children of the same age?	1	2	23

WHEEZING

	YES	NO	
6. Does his/her chest ever sound wheezy or whistling?	1	2	24

If the answer is «YES»:

	YES	NO	
7. Does he/she get this **most** days or nights?	1	2	25
8. Has he/she suffered from asthmatic attacks in the last twelve months?	1	2	26

ILLNESSES

9. Has he/ she ever had eczema?	YES 1	NO 2	27
10. Has he/ she ever had hay fever?	YES 1	NO 2	28
11. Has he/ she had any cold in the last twelve months?	YES 1	NO 2	29
If the answer is «YES»:			
12. Did the cold **usually** go to his/her chest?	YES 1	NO 2	30
13. During the last twelve months has he/ she had a period of cough and phlegm (spit from the chest) lasting for three weeks or more?	YES 1	NO 2	31
14. During the last twelve months has he/ she had any chest illness, for example, bronchitis or pneumonia which kept him/her at home or in bed for one week or more?	YES 1	NO 2	32

SOCIAL ENVIRONMENT

Now I would like to ask you a few questions about your home and family.

HOUSE

15. How many **bedrooms** do you have in your house? (Include all bedrooms whether or not in use at the moment)	.... *(write in number)*	33 34
16. How many **other** rooms including the kitchen have you in your house? (Do not include bathroom)	.... *(write in number)*	35 36

17. How is the house mostly heated? (Please circle only one)

Open fire	1	
Stove	2	
Central heating	3	37
Other	4	
None	5	

FAMILY

18. How many people live in the same household? (Including the child)	.... *(write in number)*	38 39
19. How many children under age 15 are there amongst them? (Including the child)	.... *(write in number)*	40 41
20. How many other people sleep in the same room as the child?	.... *(write in number)*	42 43

21. Does anyone smoke regularly at home? YES 1 NO 2 [ ] 44

I would like to ask a few questions about the child's parents.

22. Is the father or male guardian living with the child? [ ] 45

Father	1
Guardian	2
Neither	3

If neither, go to question 26

23. Is his/her father/guardian currently employed? YES 1 NO 2 [ ] 46

(If he is not currently employed, the following question refers to his last employment)

24. What type of work does/did he do?

....

....

....

Job Code [ ][ ][ ] 47 48 49

25. What kind of school or college did he last attend? [ ] 50

None	1
Primary or Lower Secondary	2
Higher Secondary	3
University	4

26. Is the mother or female guardian living with the child? [ ] 51

Mother	1
Guardian	2
Neither	3

If neither, go to question 30

27. Is his/her mother/guardian currently employed? YES 1 NO 2 [ ] 52

(If she is not currently employed, the following question refers to her last employment)

28. What type of work does/did she do?

....

....

....

Job Code [ ][ ][ ] 53 54 55

29. What kind of school or college did she last attent? [ ] 56

None	1
Primary or Lower Secondary	2
Higher Secondary	3
University	4

Now I would like to finish by asking a few questions about the places where the child has lived.

30. How long has the child lived at his/her present home?

Yrs.		Mths.	
57	58	59	60

31. If less than 3 years: where did he/she live during the last 3 years, and for how long in each place?

Full address	**N° of years at address**
....	....
....	....
....	....
....	....

32. Where did he/she live during the first months of life?

....

(Town) *(Country)*

☐ 61

33. Finally, can you tell me what your relationship to the child is?

Mother or female guardian	1
Father or male guardian	2
Other .... *(Please specify)*	3

☐ 62

Card Number | 0 | 2 |
79 80

Appendix III

EUROPEAN COMMUNITY ENVIRONMENTAL RESEARCH PROGRAMME

Epidemiological Survey on the Relationship between Air Pollution and Respiratory Disease in Children

I N S T R U C T I O N M A N U A L

Introduction

The data about the children will be collected in three parts: Identification, symptom and social items and physical measurements.

The identification data should include name and address. Since it may be desired to keep physical measurements and symptom and social items confidential, no space is provided on the relevant documents for recording address. It is therefore the responsibility of the project leader to ensure that sufficient information is recorded elsewhere so that the parents of each child can be located.

The instructions below apply to the questionnaire on symptom and social items and to the form for recording physical measurements. As the questionnaire and measurement form are completed at different times, it is the responsibility of each team to see that the two sets of data for each child have the same identification number so that they can be collated later. The method adopted must ensure that there are no mismatches.

The Questionnaire

The questionnaire should be completed by a fieldworker during an interview with the child's mother. If the child has no mother, the female guardian should answer the questions. If the mother or female guardian cannot be contacted then the father or male guardian should be interviewed.

If the mother is available but she has difficulty with the local language, you should arrange for another member of the family who is more familiar with the local language to assist in the interview.

Before the interview, introduce yourself to the respondent. You should remind her of the study, that she has already had a letter explaining its purpose and that it is an international investigation to determine the respiratory health of children living under different conditions in the countries of the Common Market. You should not mention that interest centres on air pollution as this may bias the answers, particularly in heavily polluted areas.

At the beginning of the interview hand a copy of the questionnaire to the respondent so that she may read each question as you say it aloud.
Each question should be read aloud without altering the wording. If the question is not understood you may use the explanations given under "Instructions for individual questions". If no instruction is given, repeat the question in its original form and do not probe for an answer. THIS IS VERY IMPORTANT, as answers you obtain with your own probing questions may not be comparable to those obtained by other fieldworkers. Nevertheless, you should listen to additional comments as this will improve your rapport with the respondent.

Coding Instructions

a) Each child is identified by a number made up of four items.

1) The Country Code

01 Germany	02 France
03 Italy	04 Netherlands
05 Belgium	06 Luxembourg
07 Great Britain	08 Ireland
09 Denmark	

2) Area Code

This code is unique to each country. Each study area, defined by homogenous air pollution, must be given a number. Within a country every area must have its own number to distinguish it from the other areas in the same country.

3) School Code

This code is unique to each area. Each school within an area should be given its own number.

4) Child's Code

This code is unique to each school. Each child within a school should be given its own number.

b) Every fieldworker in each country should have her own identification number.

c) The Codes for questions 1-14, 17, 21-23, 25-27,29 and 33 are pre-coded. Circle both the appropriate answer and code for question.

When you have completed the questionnaire you should write the codes which you circled into the spaces provided down the right hand margin of each page. When you have completed this, go through the questionnaire again and check that you have copied the codes correctly. This second step is most important since errors made at this stage may be carried right through the final analyses with disastrous results.

If a number is to be transferred to the coding boxes (as in questions 15,16,18-20,24,39 and 31) put the units digit in the furthest right hand box, the tens digit in the box to the left of this and the 100's digit to the left of tens. For example:-

2 would be coded 2

13 would be coded 1 3

104 would be coded 1 0 4

Instructions for individual questions

1. Use the exact words as printed. "Usually" implies five or more days a week.

2. As. Q.1.

3. No comment.

4&5. These are subjective questions. There is no definition of shortness of breath.

6. No comment.

7. "Most days" implies five or more days in each week.

8. Asthmatic attacks are not defined. The answer to this question depends on the respondent's own understamding of the words. If the words are not understood at all, describe the attacks as: "attacks of breathlessness with wheezing or whistling".

9. As Q.8. but if the respondent does not know what eczema is circle "NO".

10. As Q.8. but for hay fever.

11. No comment.

12. "Usually" here means quite often.

13. No comment

14. No comment

15. A bedroom is defined as any room specifically set aside for sleeping. A sitting room which is also used for sleeping is not counted as bedroom.

16. "Other rooms" refers to rooms used for daily living. Examples of rooms to be excluded are: bathrooms, toilets, workshops, stores and garages. If you are unsure whether a room should be included, always exclude it.

17. No comment.

18. Household is defined as any group of people, whether related or not, who live together and benefit from a common housekeeping. Living includes sleeping "under the same roof". Paying guests who share at least one meal (including breakfast) are members of the household.

19. Children are defined as all people under 15 years of age.

20. No comment.

21. "Regularly" means 5 cigarettes or more a day.

22+26. No comment.

23+27. No comment.

24+28. This question attempts to find exactly what the father/mother does and must be answered as specifically as possible. Words like - Engineer, Civil Servant, Machinist etc., require precise qualification so that the job can be correctly coded.

The job code has 3 digits and can be obtained from the appendix.

25+29. "Lower secondary" schooling refers to secondary schooling up to the legal age for compulsory education. "Higher secondary" refers to any education after this age (including technical colleges etc.) except at university.

30+31. These two questions are used to determine whether the child has lived in the area of defined air pollution (study area). If the answer to question 30 is less than 3 years, go immediately to question 31.
Obtain addresses for the last 3 years at least and find from your map whether they lie in the study area. Total the number of years spent in the area and record them in boxes 57 to 60.

32. The coding for this question is 1: If the town of birth is the same as the town of survey.

2: If it is not.

33. You will probably already know the answer to this question. If you do, do not ask it but circle code the correct reply.

<u>Physical Measurement Form</u>

Complete boxes 1-10 as described under coding instructions for the questionnaire (page 2). For each child the numbers in these boxes must match <u>exactly</u> those in the same boxes as his/her questionnaire.

Code the sex in box 11 and write the child's date of birth directly into boxes 12-17. Box 18 is for origin. Origin is coded:

White	1
Negro	2
Asian	3

The appropriate code is made by observation only during the examination. Do not ask the child what his origin is. This item is included because peak expiratory flow rates differ between the groups even after adjustment for age, height and weight differences.

The rest of the form is self-explanatory.

MEASUREMENT OF HEIGHT AND WEIGHT

Notes on Measurement Techinques — The person reading the scale of any measuring instrument must also record the result. He must NOT call out the reading for someone else be record.

WEIGHT (Note: The scales must not be used on a carpet or other soft surface).

1. Please weigh the child in underpants or knickers only. (No shoes or socks).

2. Ask the child to stand on the platform.

3. Adjust the weights on the lever arms, kilogram, then gram until the pointer balances. Check that the child is standing free.

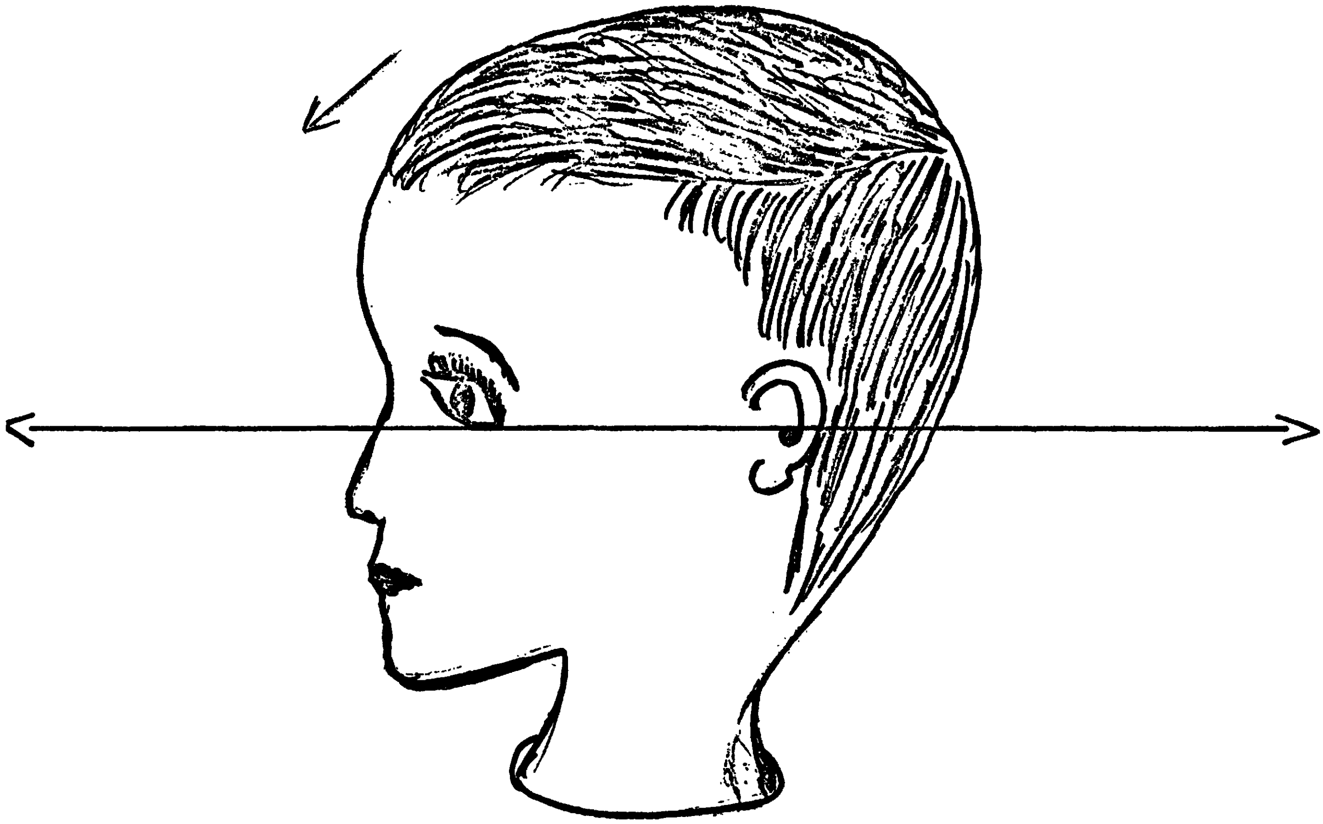
4. Take the reading in kilograms and grams to the nearest 100 grams below and record, then release the child.

HEIGHT

1. Please measure the child without shoes or socks.

2. Ask the child to stand on the platform with feet parallel and pointing forwards, heels touching the base plate and back against the upright.

3. Ask the child to stand as tall as possible. Position the head so that the line between the lower border of the left orbit and the upper margin of the external auditory meatus (Frankfort plane) is horizontal. (see illustration). Lower the headpiece to touch the child's head.



THE FRANKFORT PLANE

4. Now ask the clerk to come and stand directly in front of the child and gently to stretch the child as tall as possible, holding the child's head at each side over the mastoid process (just behind the ear). She should maintain her hold and keep the child stretched until the measurement has been taken, always maintaining her position directly in front of tbe child. Similarly, the nurse must remain standing at right angles to the child to:-

5. Check that the child's heels are still on the ground and that the Frankfort plane is horizontal.

6. Take the reading to the nearest 0.5 centimeters below on the scale and record.

MEASUREMENT OF PEAK EXPIRATORY FLOW RATE

The measurement required is called the Peak Expiratory Flow Rate (P.E.F.R.) which is the fastest speed at which air can be blown out of the lungs. This is easily measured by the Wright Peak Flow Meter.

Instruction for use of the Wright Peak Flow Meter

The explanation must be accompanied by a demonstration.

1. The child must be standing.

2. Explain that the meter measures how hard and fast the subject can blow. Say "You hold the meter like this". showing the child how you hold it between your hands with the dial vertical and facing to the right. The part of the meter marked "TOP" should then be uppermost.

3. Say "Then you take in a deep breath, put your mouth tightly around the tube and blow out as hard and fast as you can into the meter". Demonstrate all the above steps. This is best done while sitting so that the child can easily see the demonstration.

4. Cancel the reading by pressing the lever next to the mouthpiece.

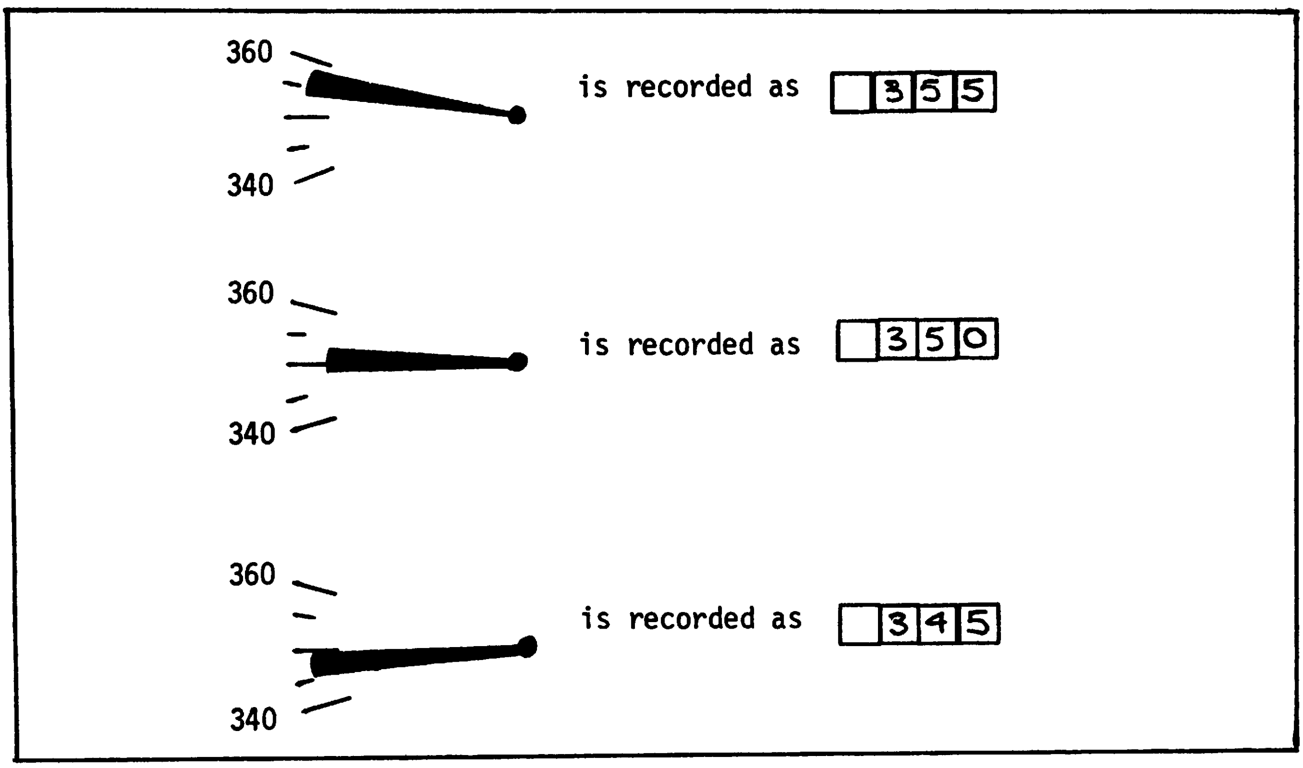
5. Fit a new disposable mouthpiece for the child.

6. Ask the child to hold the meter.

7. Say "Now take a deep breath and put your mouth tightly around the tube. Blow out as hard and fast as you can". Ensure that all these instructions are followed. It is especially important to see that the child's lips are tightly sealed around the mouthpiece.

8. Decide on whether the blow is technically satisfactory. The only reason for deciding a blow is unsatisfactory are:-

   a) the child did not breath in deeply before the blow
   b) he did not close his mouth tightly around the mouthpiece so that some of the air escaped.
   c) the breath out was very slow and prolonged.


360
340
is recorded as
355
360
340
is recorded as
350
360
340
is recorded as
345

9. Only read the dial of the meter after deciding that the blow was satisfactory. The method for reading is given below.

10. Explain again any points which the child did not seem to understand.

11. Cancel the dial reading and allow the child to repeat the procedure.

    Repeat this until a total of 5 measurements have been recorded always allowing some time between blows for the child to recover. Blows unsatisfactory on the 3 criteria listed under 8 are not recorded. No measurement must ever be dicarded on the basis of being too low:- the decision on whether a blow is satisfactoru is to be made before the dial is read. Once the dial is read, the measurement must be recorded.

12. Record the meter number in the space provided. The number is on the bottom of the meter (the last two digits).

<u>RECORDING THE RESULT</u>

<u>Restyled Wright Peak Flow Meter</u>

The scale is marked in divisions of 5 litres per minute. The pointer has a broad tip which moves along the side of the scale. To read this meter, use the following rules.

1. If any part of the broad tip of the pointer is opposite a scale marking, record the value of that marking.

2. If the broad tip of the pointer lies between two markings, record the value of the lower marking. Thus:-

NOTES ON THE USE AND CARE OF THE PEAK FLOW METER

1. Check the meter daily or more frequently if there is a query about its accuracy. This is done by measuring your own P.E.F.R. which should not vary from day to day unless you have some respiratory ailment.

2. Clean and dry the removable mouthpiece filter after every 50 subjects. This tends to become clogged by moisture and fluff from the disposable mouthpieces.

3. When not in use, leave to drain and dry by standing the meter on its mouthpiece with the filter removed.

   The meter must be serviced and re-calibrated by the manufacturer after measuring approximately 1000 children or annually, whichever comes first. If it is dropped or otherwise roughly handled, servicing will be needed.

Appendix IV

EUROPEAN COMMUNITY ENVIRONMENTAL RESEARCH PROGRAMME

EPIDEMIOLOGICAL SURVEY

Measurement data

Country [ ][ ] 1 2 *Area* [ ][ ] 3 4 *School* [ ][ ] 5 6 *Child* [ ][ ][ ][ ] 7 8 9 10

Child's name : .... / .... / ....
(Surname) (First name) (Initial)

Sex { *Male* 1 / *Female* 2 } [ ] 11

Date of birth — Day [ ][ ] 12 13 — Month [ ][ ] 14 15 — Year [ ][ ] 16 17

Origin [ ] 18

Date of Examination	Day / Month / Year	19 20 / 21 22 / 23 24
Fieldworker		25 26
Height	cms / tenths	27 28 29 / 30
Weight	kgs / tenths	31 32 / 33

PEAK EXPIRATORY FLOW RATE

Machine Number		34 35
1. Reading	Litres/Minute	36 37 38 39
2. Reading		40 41 42 43
3. Reading		44 45 46 47
4. Reading		48 49 50 51
5. Reading		52 53 54 55

Card Number [0][1] 79 80

XII/134/75-E

APPENDIX V

Area Characteristics Requested Concerning Air Pollution Measurements

Complete details were supplied by those responsible for the local air pollution measurements as follows:

(i) The characteristics of the area: whether densely populated highly polluted etc.

(ii) The number of children living within 2 kilometres and within 1 kilometre of each school in the survey.

(iii) A general classification of the area around each individual school as to whether it was:-
urban residential
urban commercial
industrial
suburban residential
rural
other (specified)

(iv) The specific nature and distance from all sources of pollution within 2 kilometres of each school.

(v) The exact site of each monitoring station, analytical method used, date installed and annual mean pollutant levels.

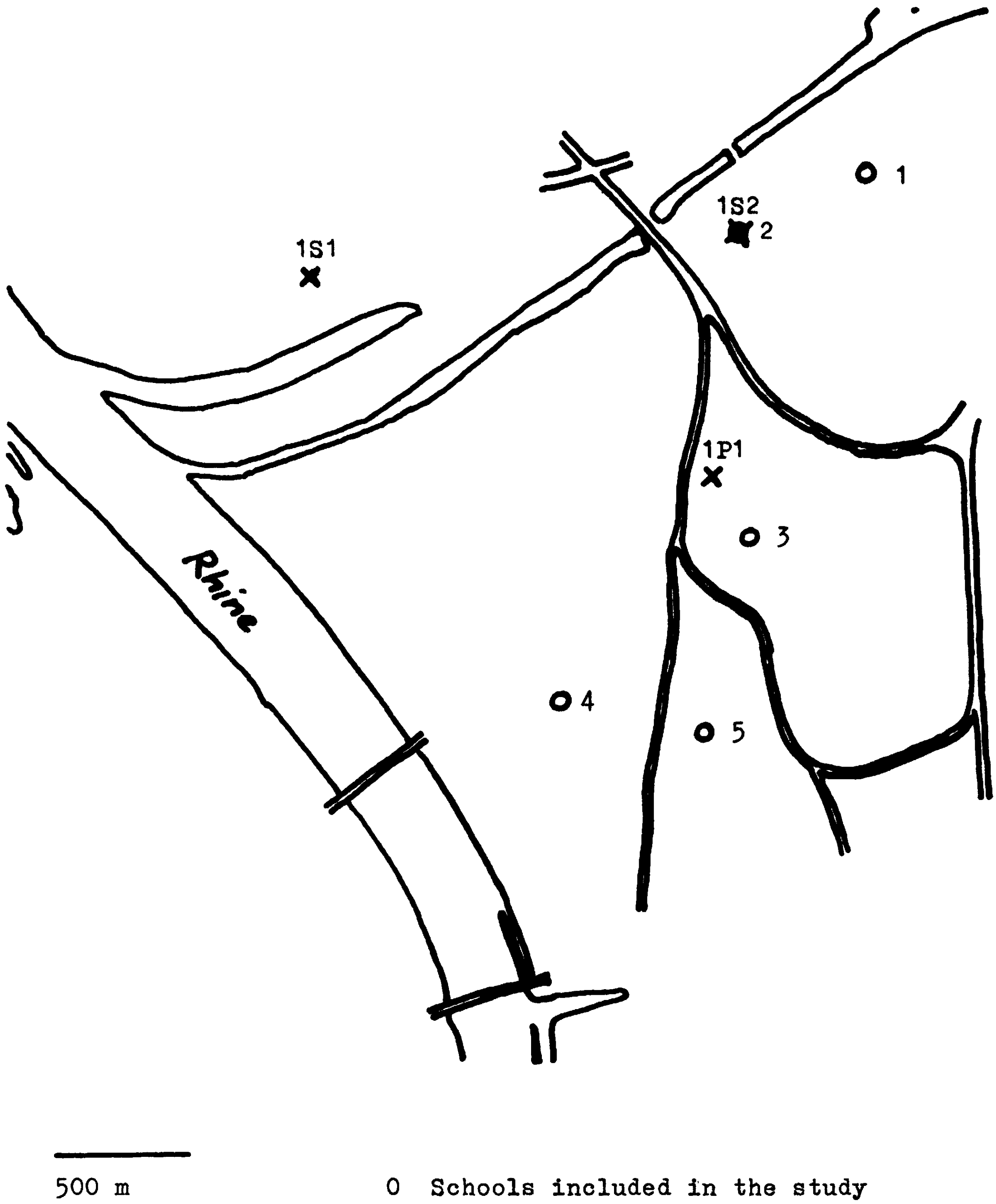
(vi) Any pollutants measured other than SO_2 and suspended particulates.

(vii) The exact site of the nearest meteorological station in relation to each school and details of temperature, relative humidity, precipitation, wind speed and wind direction.

Appendix VI

MAPS OF AREAS

DUISBURG



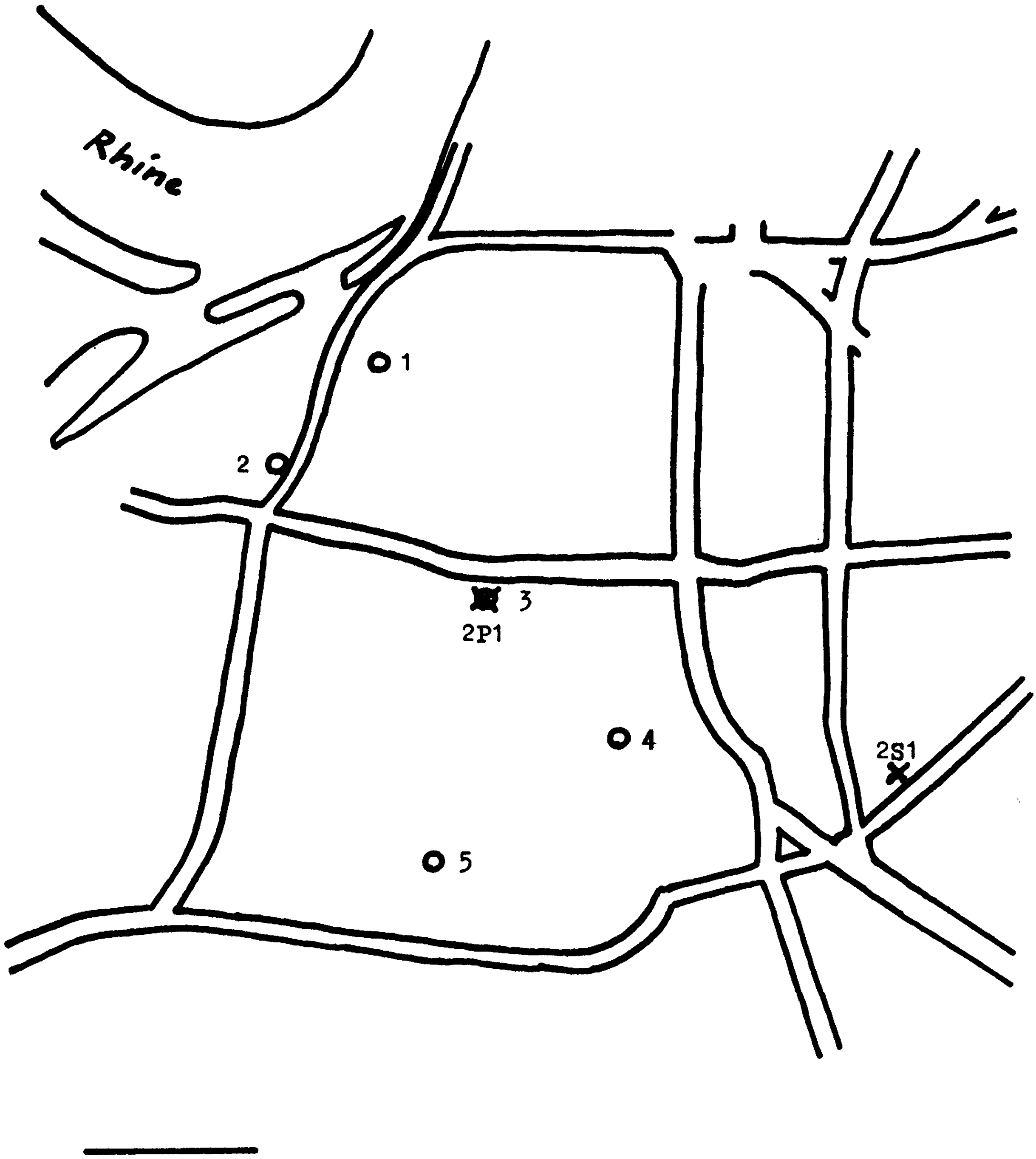
500 m

O Schools included in the study

X Air pollution monitoring sites

1)

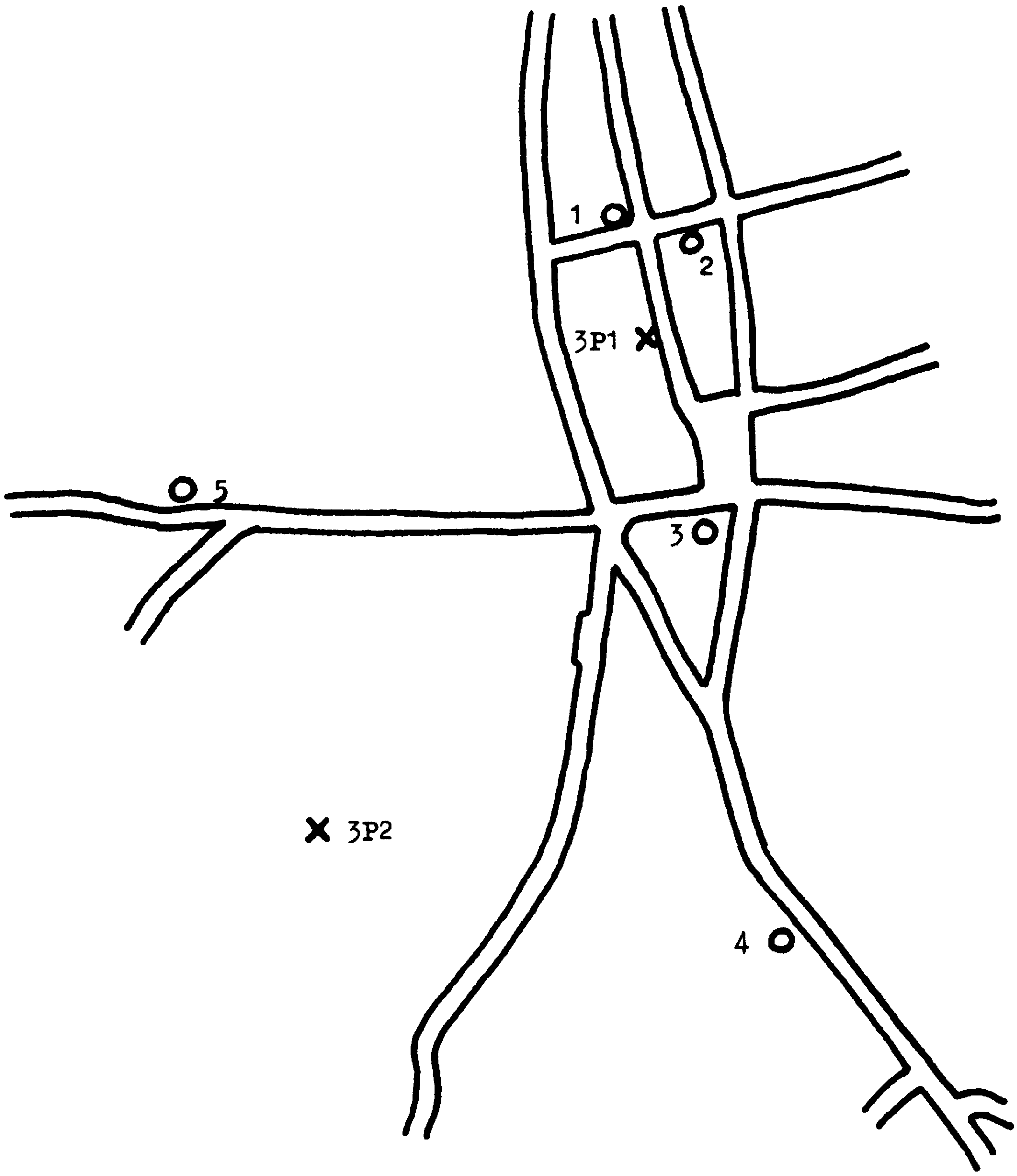
DÜSSELDORF



O Schools included in the study

X Air pollution monitoring sites

R H E Y D T



500 m

O Schools included in the study

X Air pollution monitoring sites

CAUDERAN
ECHELLE : 1/13500 env.
point de mesure
ECOLES
Commune d' EYSINES
Commune de MERIGNAC
Commune du BOUSCAT
AVENUE DU MARECHAL
DE LATTRE DE TASSIGNY
AVENUE DE VERDUN
PARC BORDELAIS
LESTONAT
Golf
Pins Francs
CES
Piscine
Stade Stehelin
G.S St André
CEG
Centre de form. Prof. du Bâtiment
Chapelle Ste Monique
Lycée Ste Marie
Stade Raoul Botany
Ecole Ste Famille
Ecole Bon Pasteur
Ecole St Joseph
Institut des Jeunes Aveugles
Barrière de St Médard
Barrière du Médoc
Barrière Judaïque
BOULEVARD
PRESIDENT
WILSON
BORDEAUX

ville de lyon

bureau d'hygiène

60 rue de sèze 69006
tél 7/852 13 24

LYON

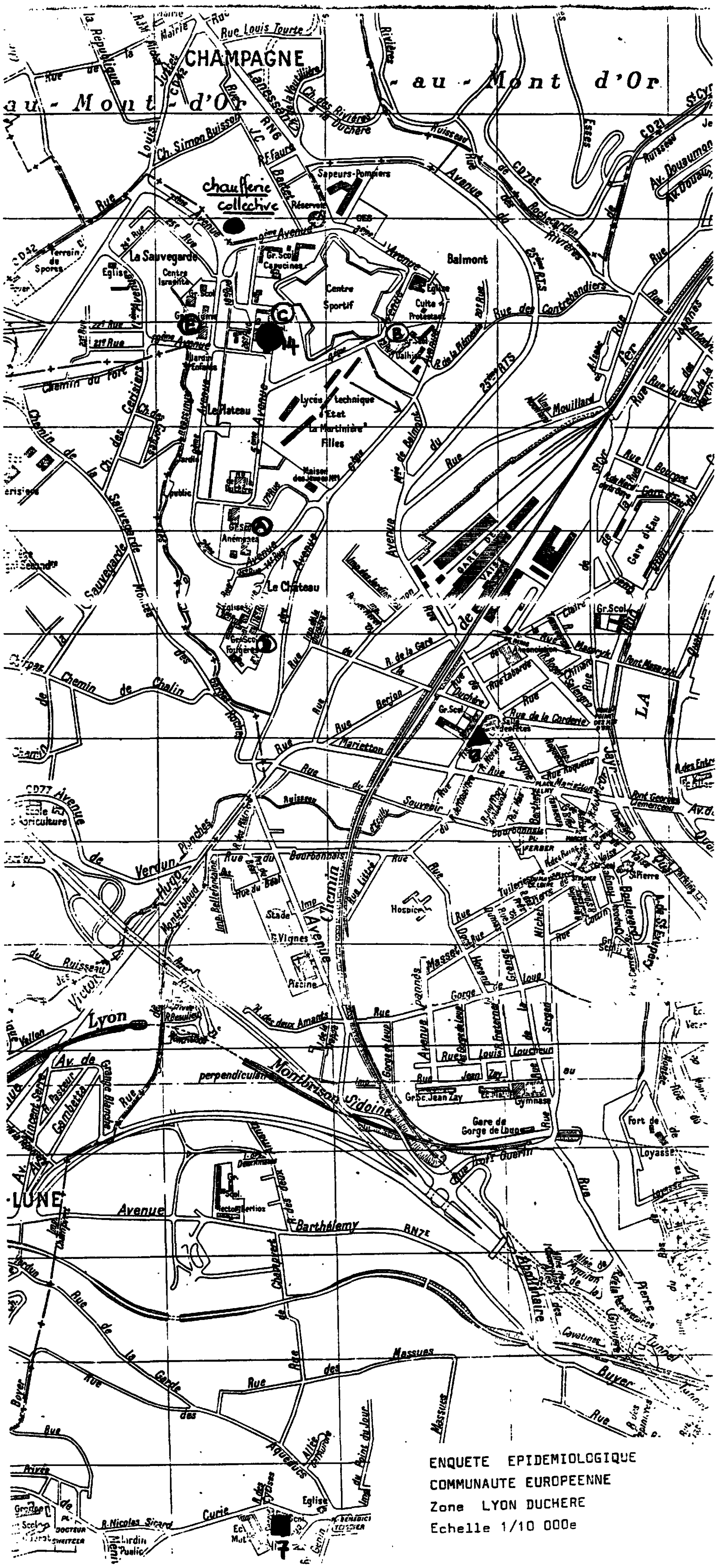
ENQUETE EPIDEMIOLOGIQUE

COMMUNAUTE EUROPEENNE

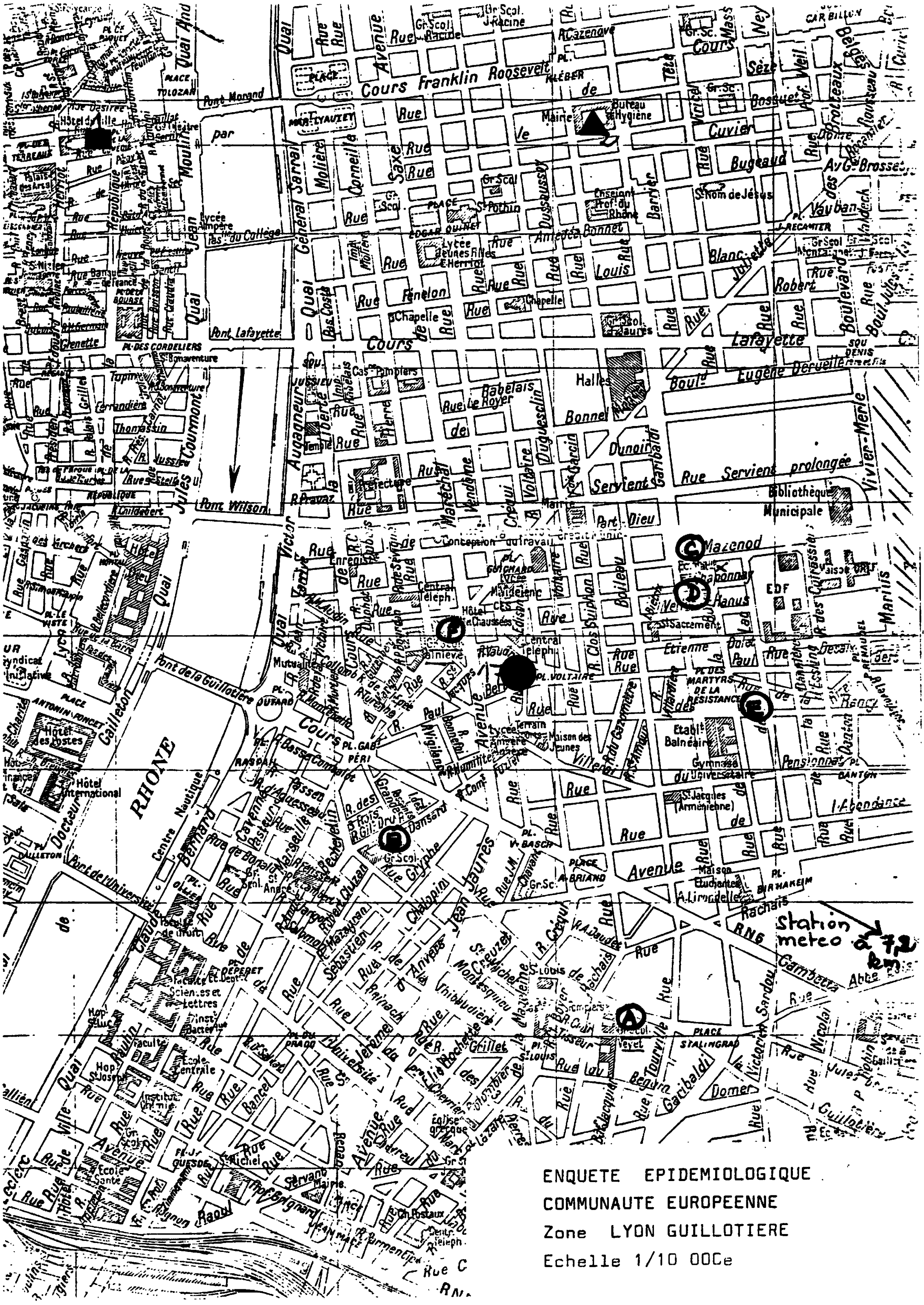
LEGENDE DES PLANS

Ⓐ Ⓑ etc.........	Emplacement des écoles
●	Station de mesure primaire
▲	Première station de mesure secondaire
■	Deuxième station de mesure secondaire
●	Source ponctuelle importante

laboratoire de chimie de l'environnement - désinfection - 35 rue bossuet - tél. 852.32.27



ENQUETE EPIDEMIOLOGIQUE
COMMUNAUTE EUROPEENNE
Zone LYON DUCHERE
Echelle 1/10 000e

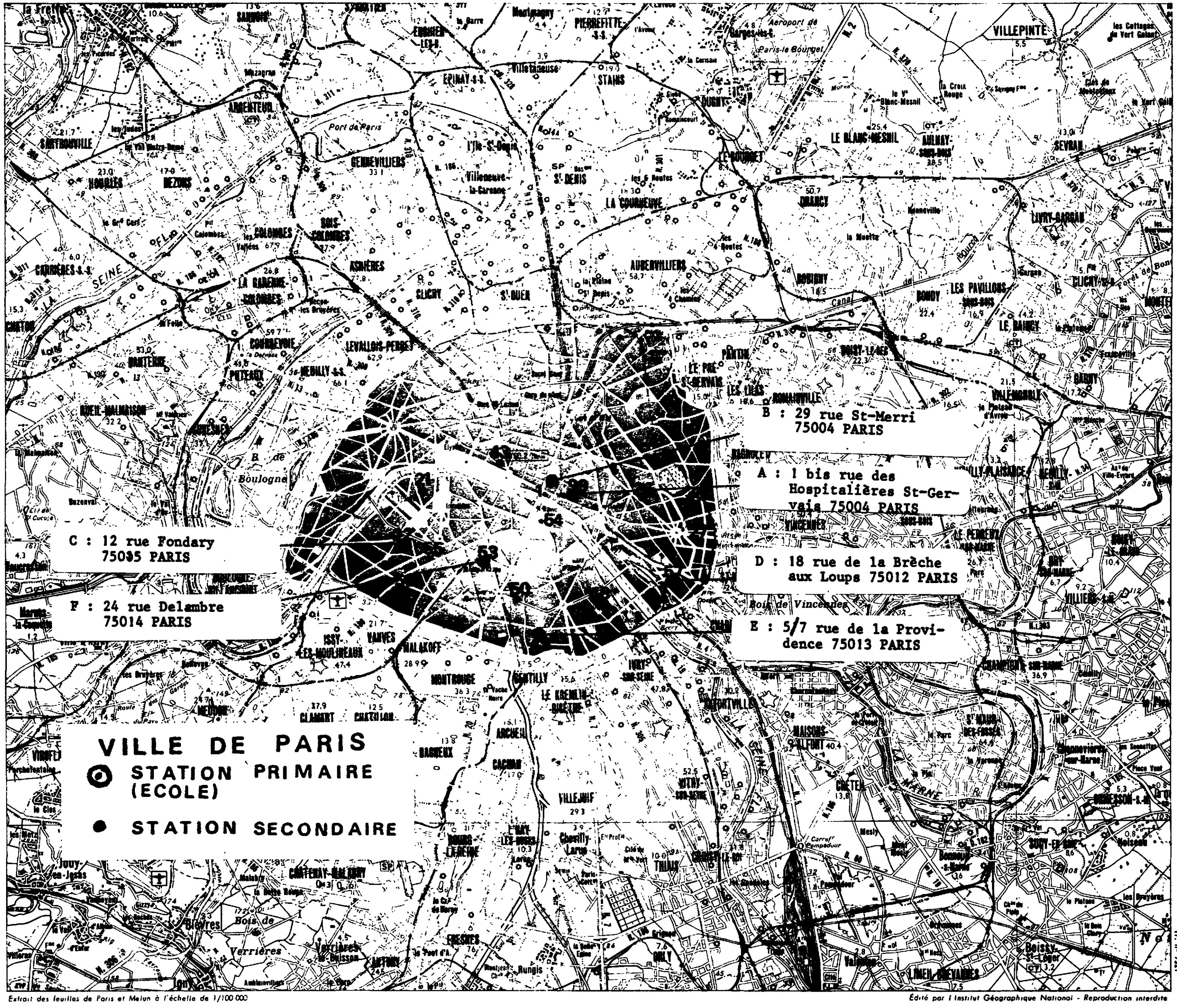


ENQUETE EPIDEMIOLOGIQUE

COMMUNAUTE EUROPEENNE

Zone LYON GUILLOTIERE

Echelle 1/10 000e



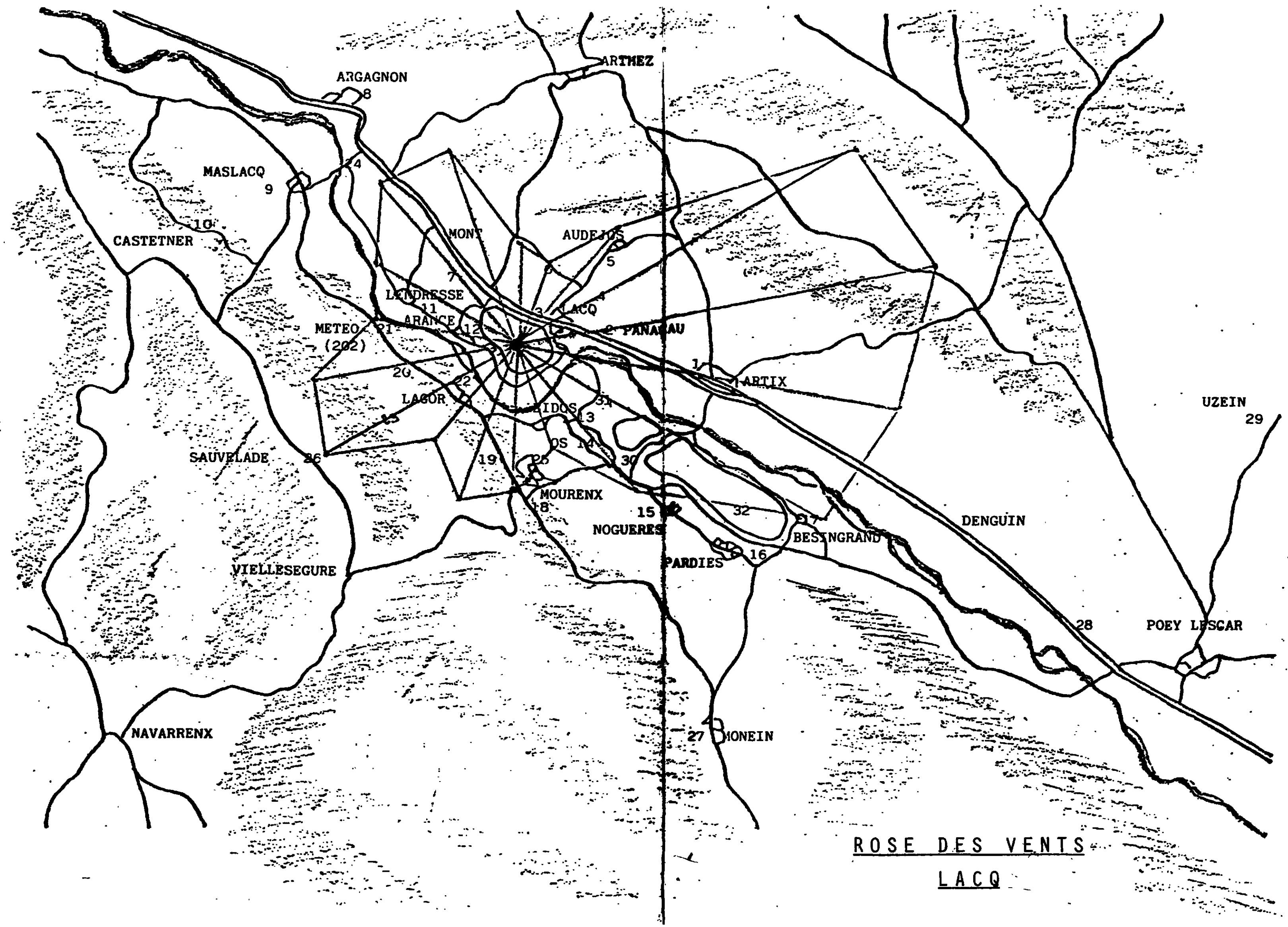
Extrait des feuilles de Paris et Melun à l'échelle de 1/100 000

Tr. n° 7321


Aérodrome de Pau-Pont-Long-Uzein
MOURENX
Lacq
Arance
Artix
Mont
Puits de Gaz
Dressé en 1971, dessiné et publié par l'Institut Géographique National - France
Projection Lambert III - Ellipsoïde de Clarke - Nouvelle triangulation

L A C Q

2)

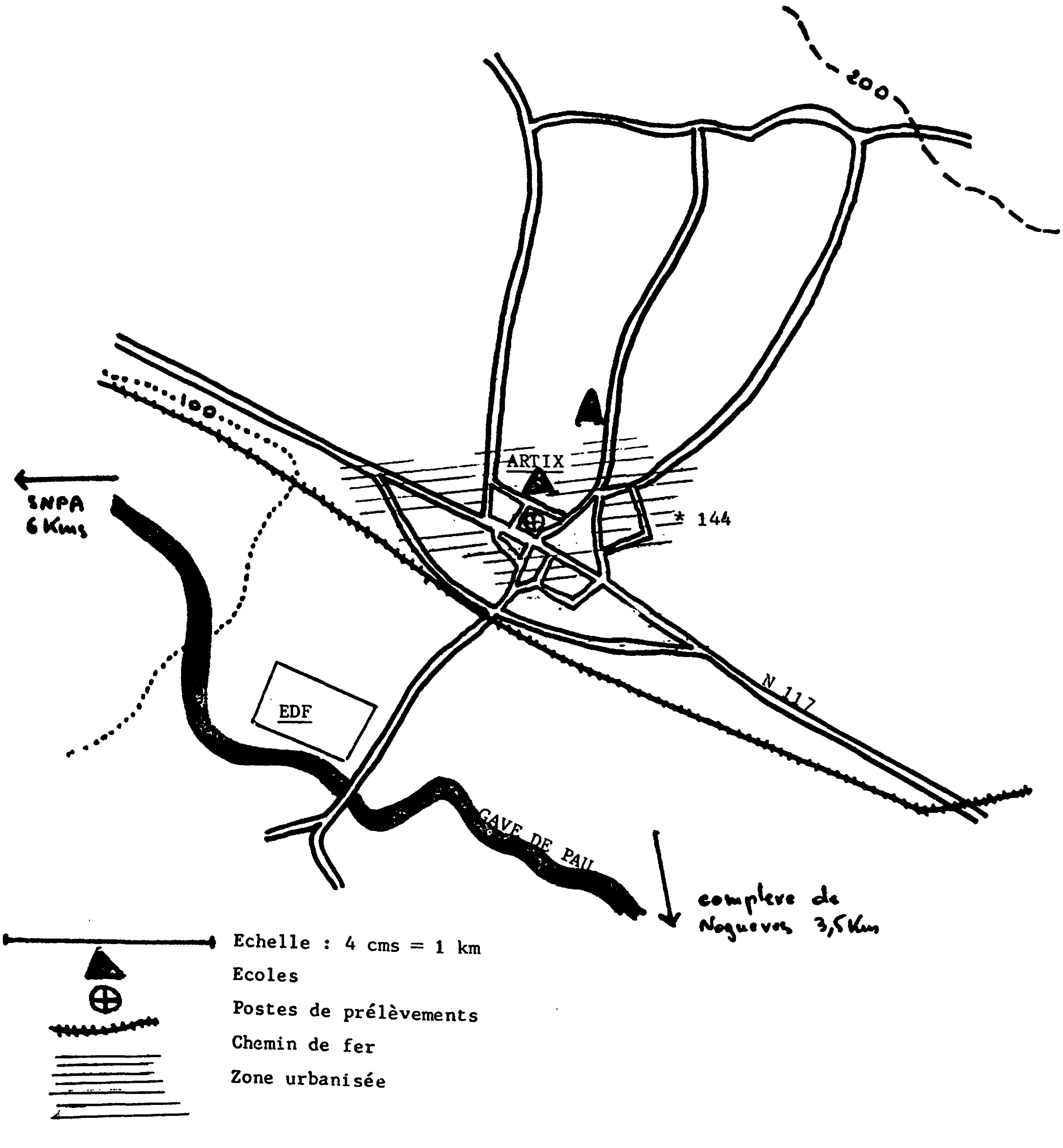


ROSE DES VENTS

LACQ

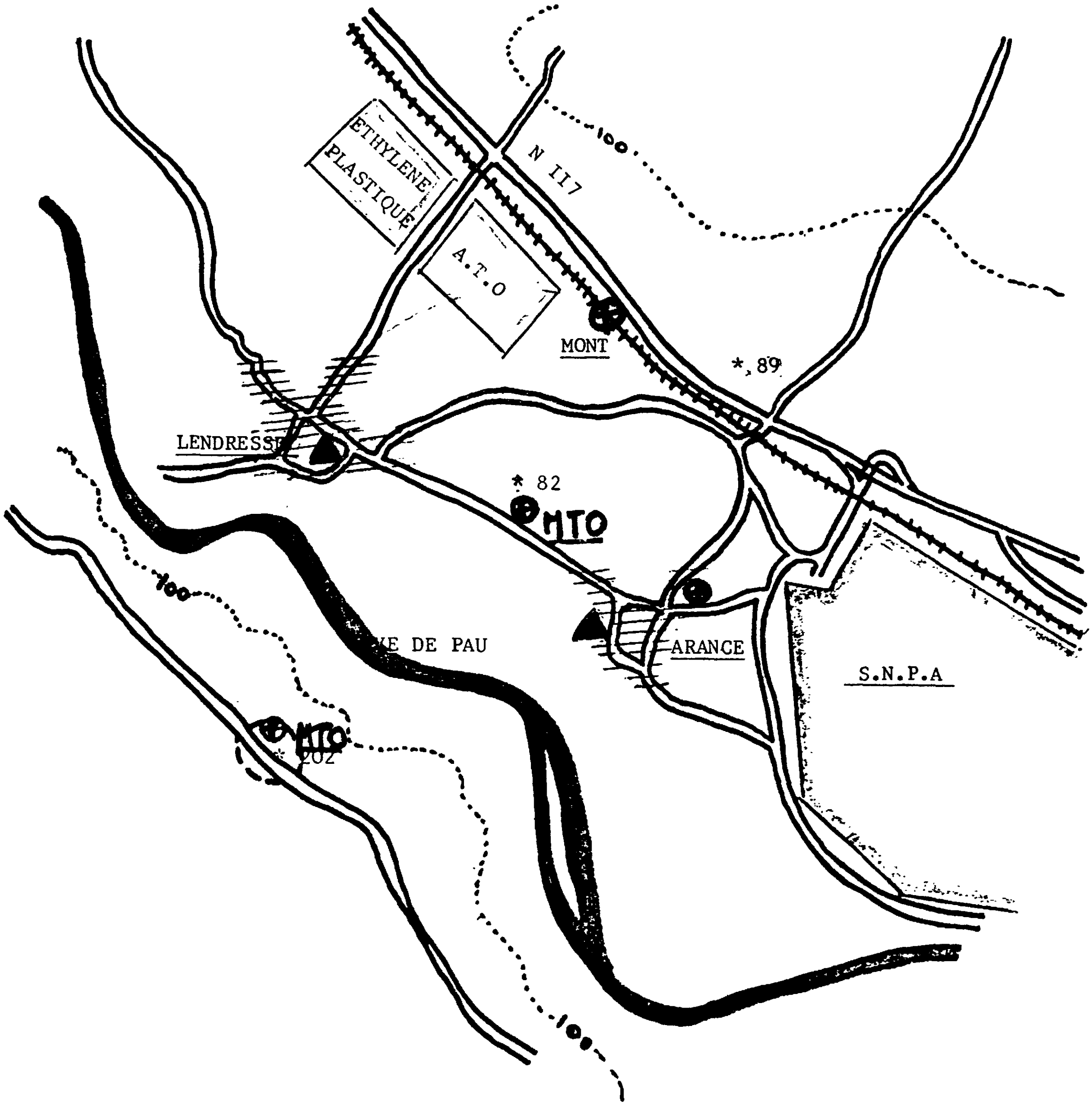
ENQUETE EPIDEMIOLOGIQUE DE LA REGION DE LACQ

ECOLES D'ARTIX (403 élèves)



ENQUETE EPIDEMIOLOGIQUE DE LA REGION DE LACQ

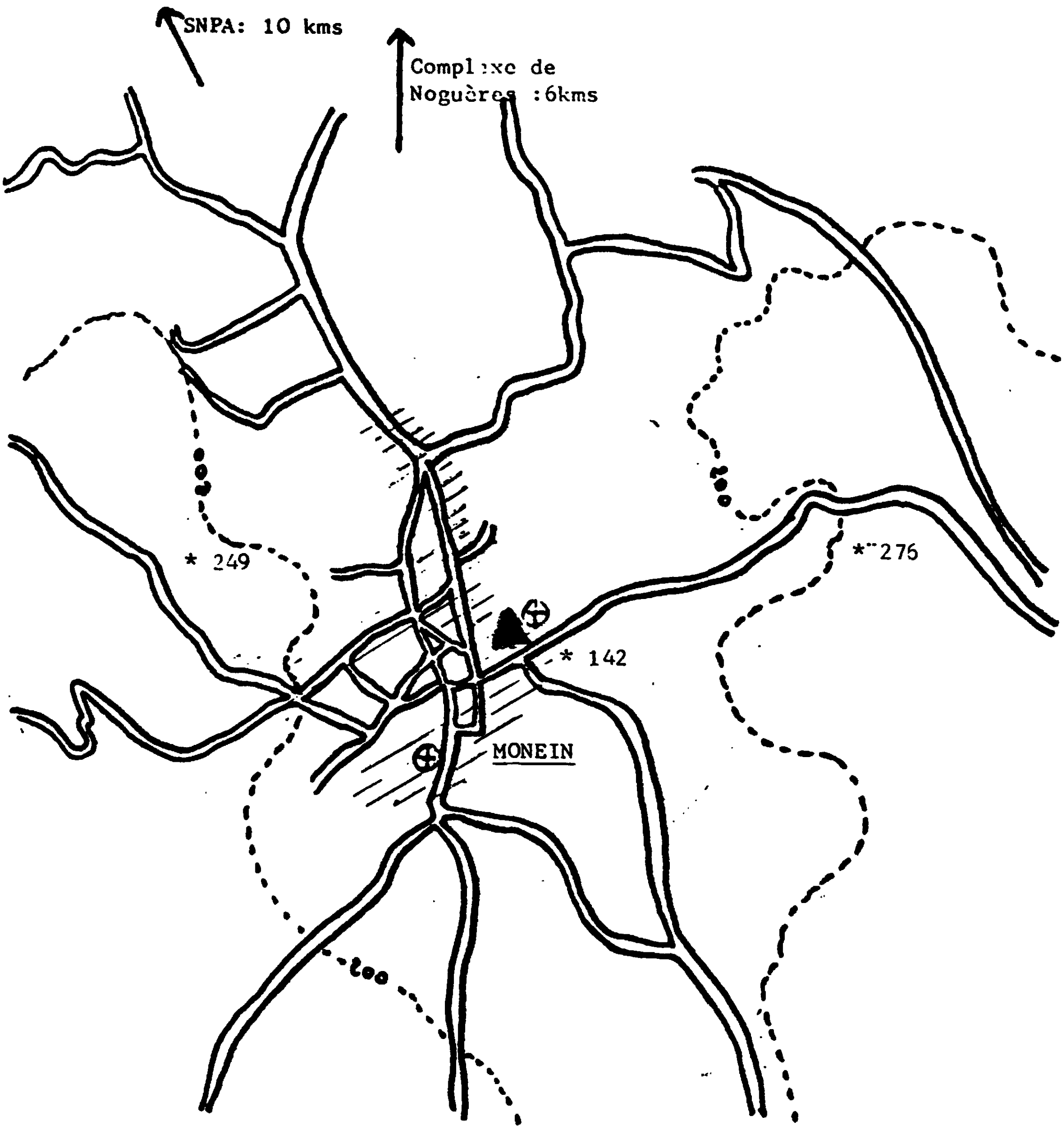
ECOLES DE LENDRESSE (15 élèves) ET D'ARANCE (7 élèves)



Echelle : 4 cms = 1 km
ECOLES
POSTES DE PRELEVEMENT
POSTES METEOROLOGIQUES
Zones urbanisées
Chemin de fer

ENQUETE EPIDEMIOLOGIQUE DE LA REGION DE LACQ

ECOLE DE MONEIN : 378 élèves



Echelle : 4 cms = 1 km

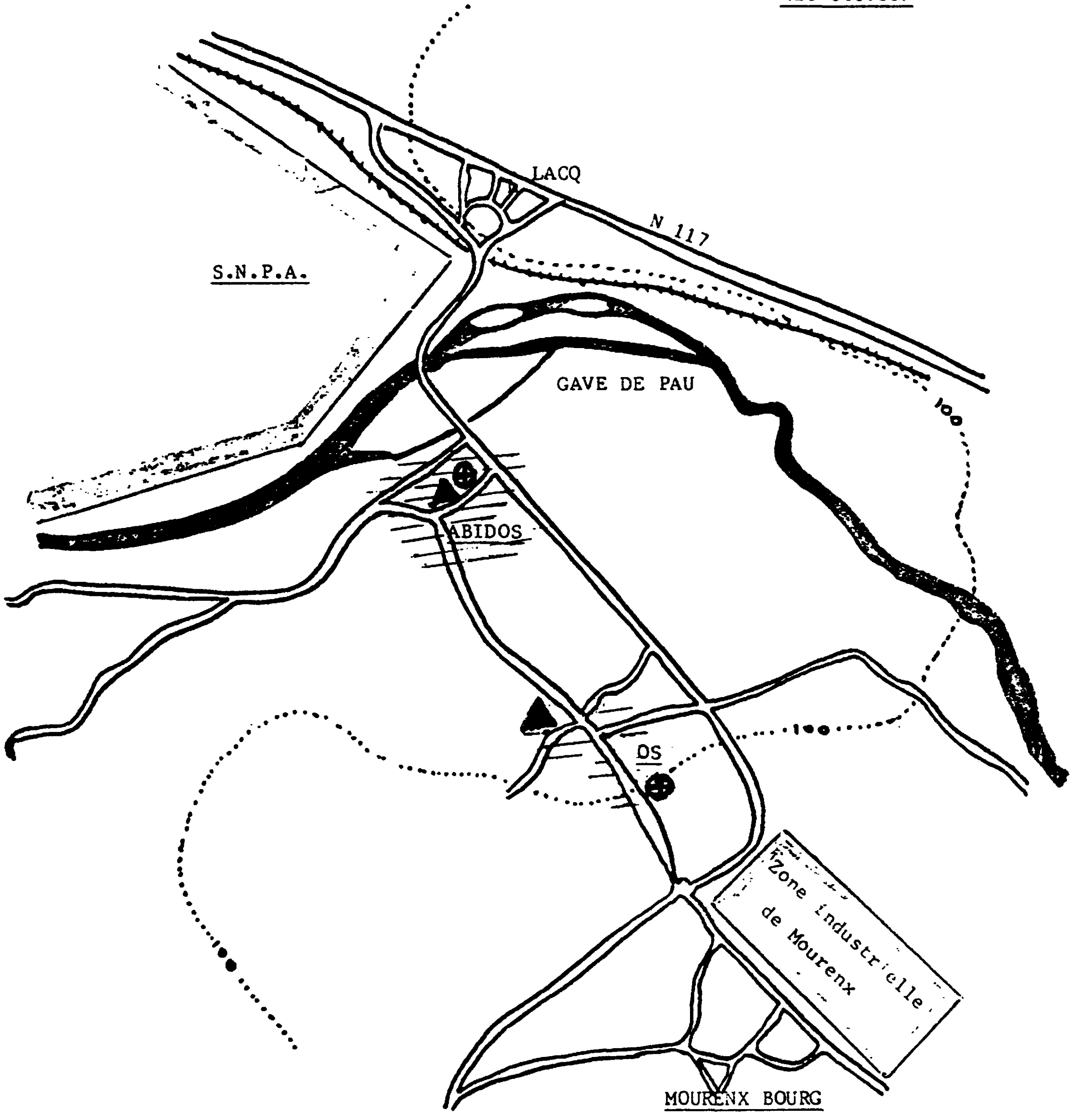
Ecole

Postes de prélèvements

Zone urbanisée

ENQUETE EPIDEMIOLOGIQUE DE LA REGION DE LACQ

ECOLES D'OS (19 élèves) ET D'ABIDOS (28 élèves)



Echelle : 4 cms = 1 km

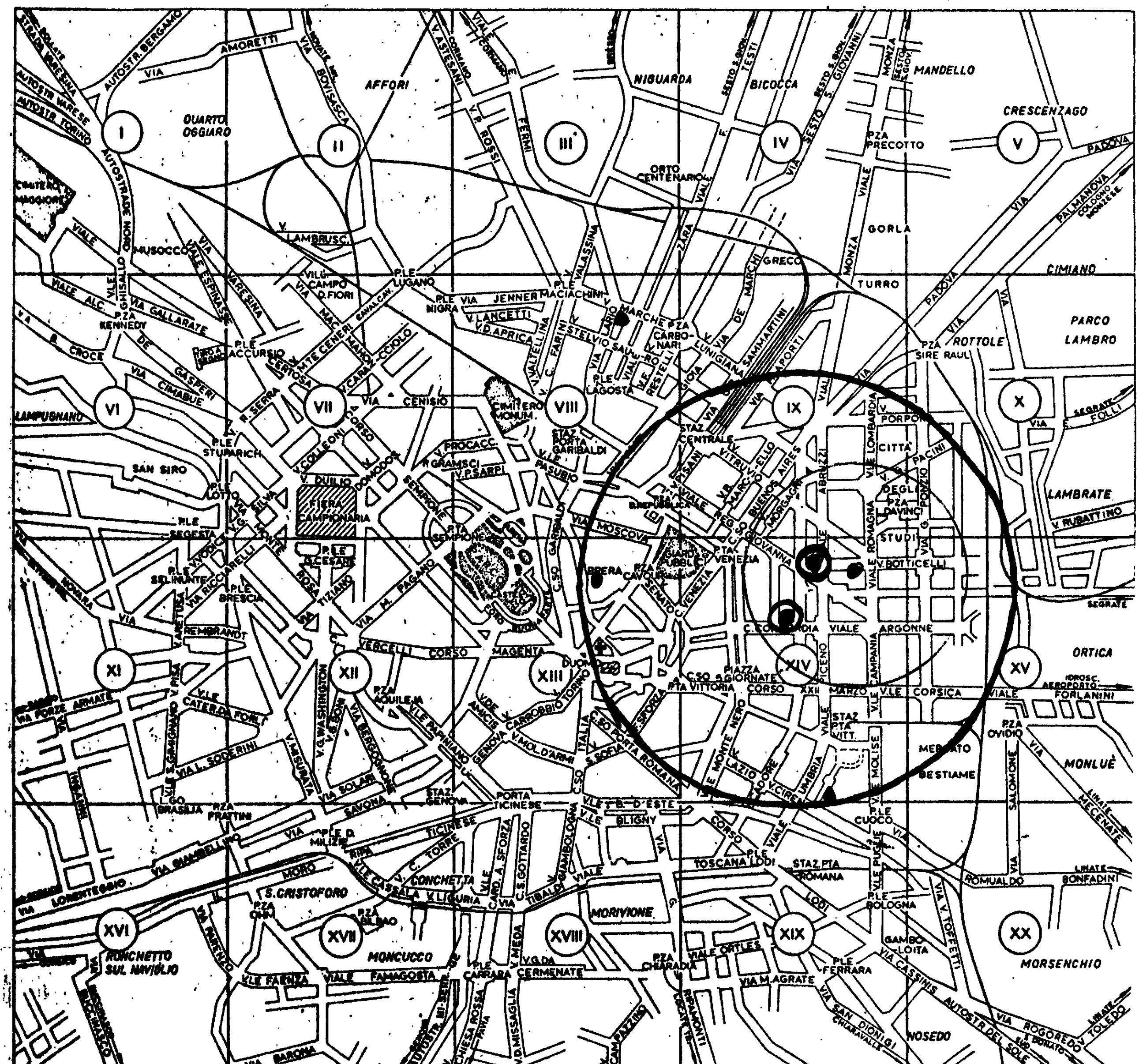
Ecoles d'OS et d'ABIDOS

Postes de prélèvements atmosphériques

Chemin de fer.

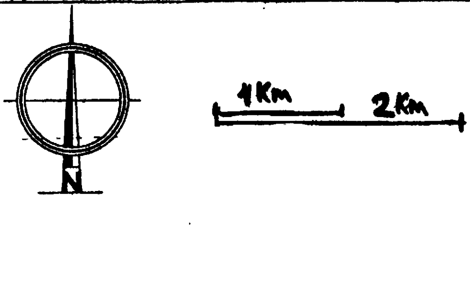
Zone urbanisée

QUADRO DI UNIONE
delle "Tavole topografiche della Città di Milano„



◉ SCUOLE

● STAZIONI DI RILEVAMENTO SO_2



LEGGENDA

O postazioni di rilevamento SO_2 nell'area di Venezia di cui le seguenti interessanti il presente rapporto:

A CA' EMILIANI (zona mista con prevalenza industriale)

B MARGHERA (zona mista con prevalenza industriale)

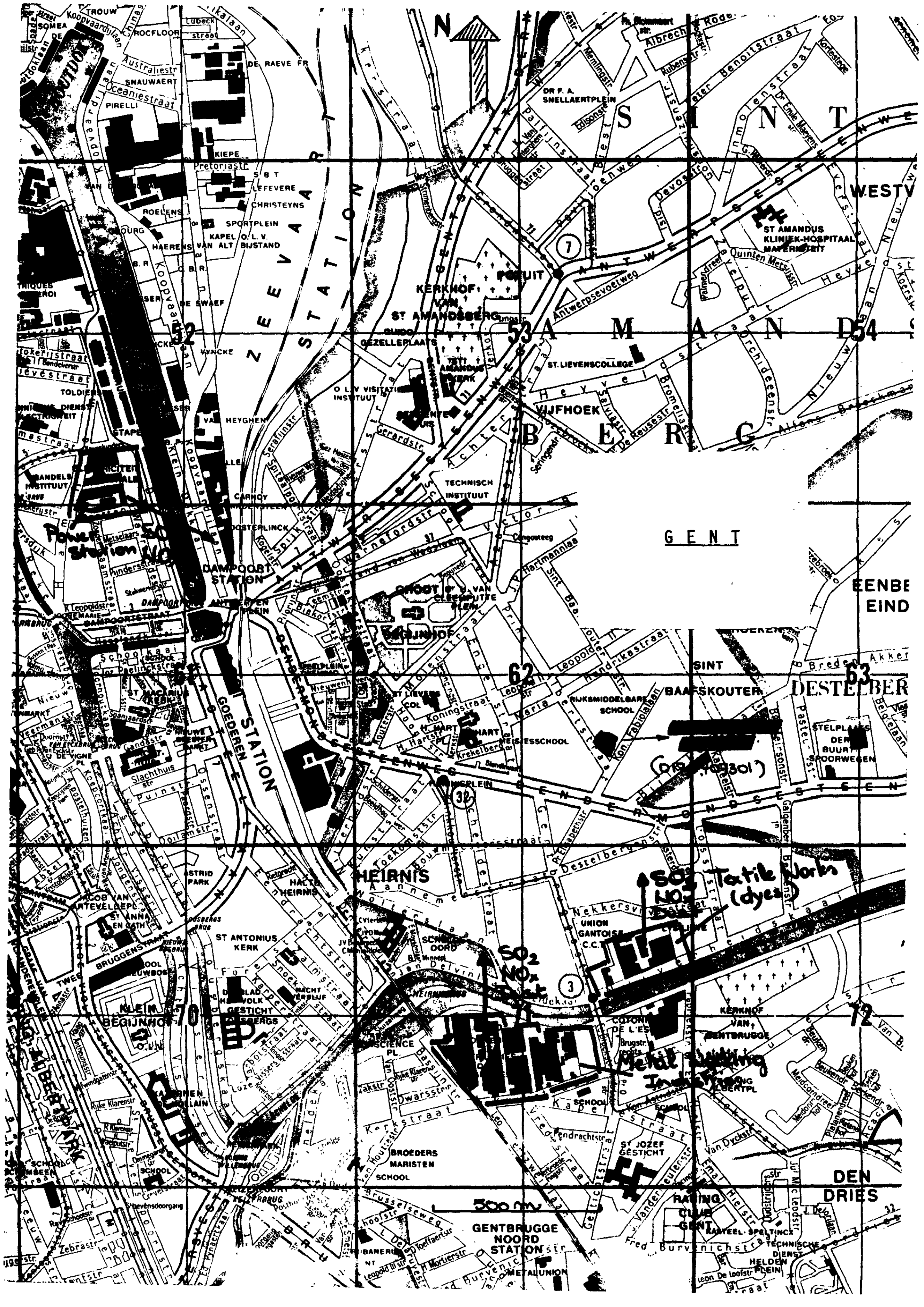
C ISTITUTO STEFANINI - MESTRE (zona mista con prevalenza urbana)

D VIALE S.MARCO - MESTRE (zona mista con prevalenza urbana)

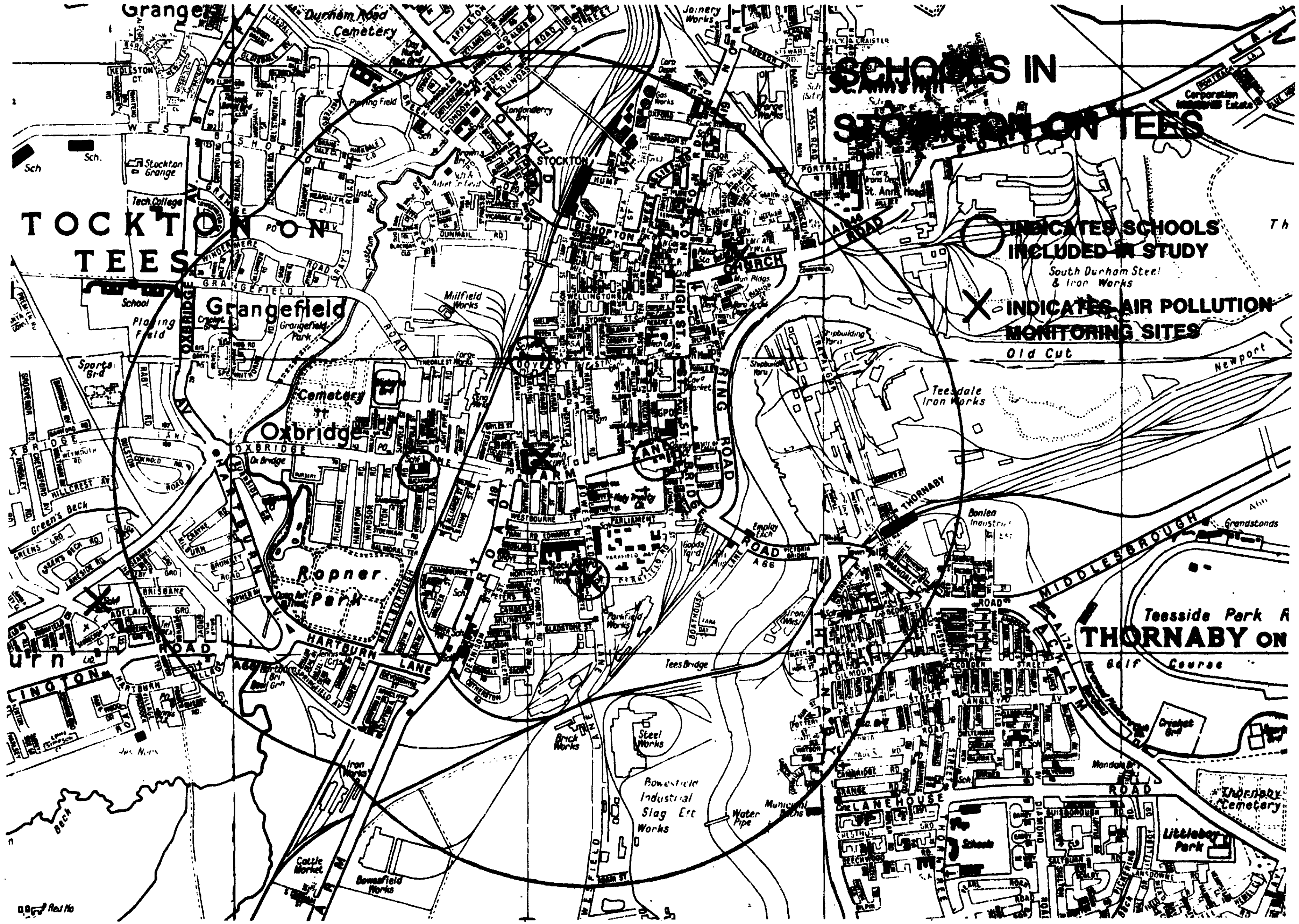
(1) scuola GRIMANI

(2) scuola VISENTINI

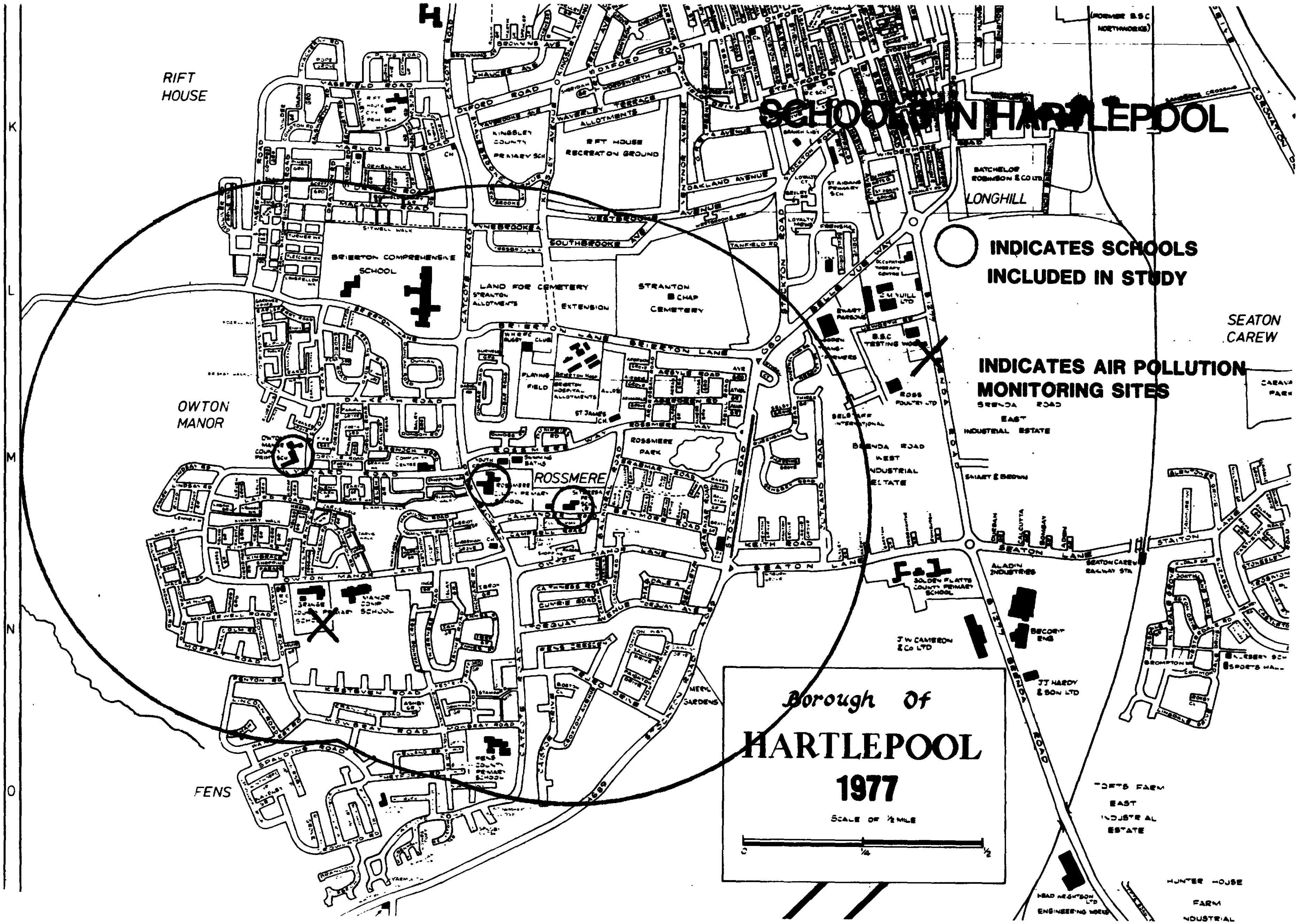
VENEZIA

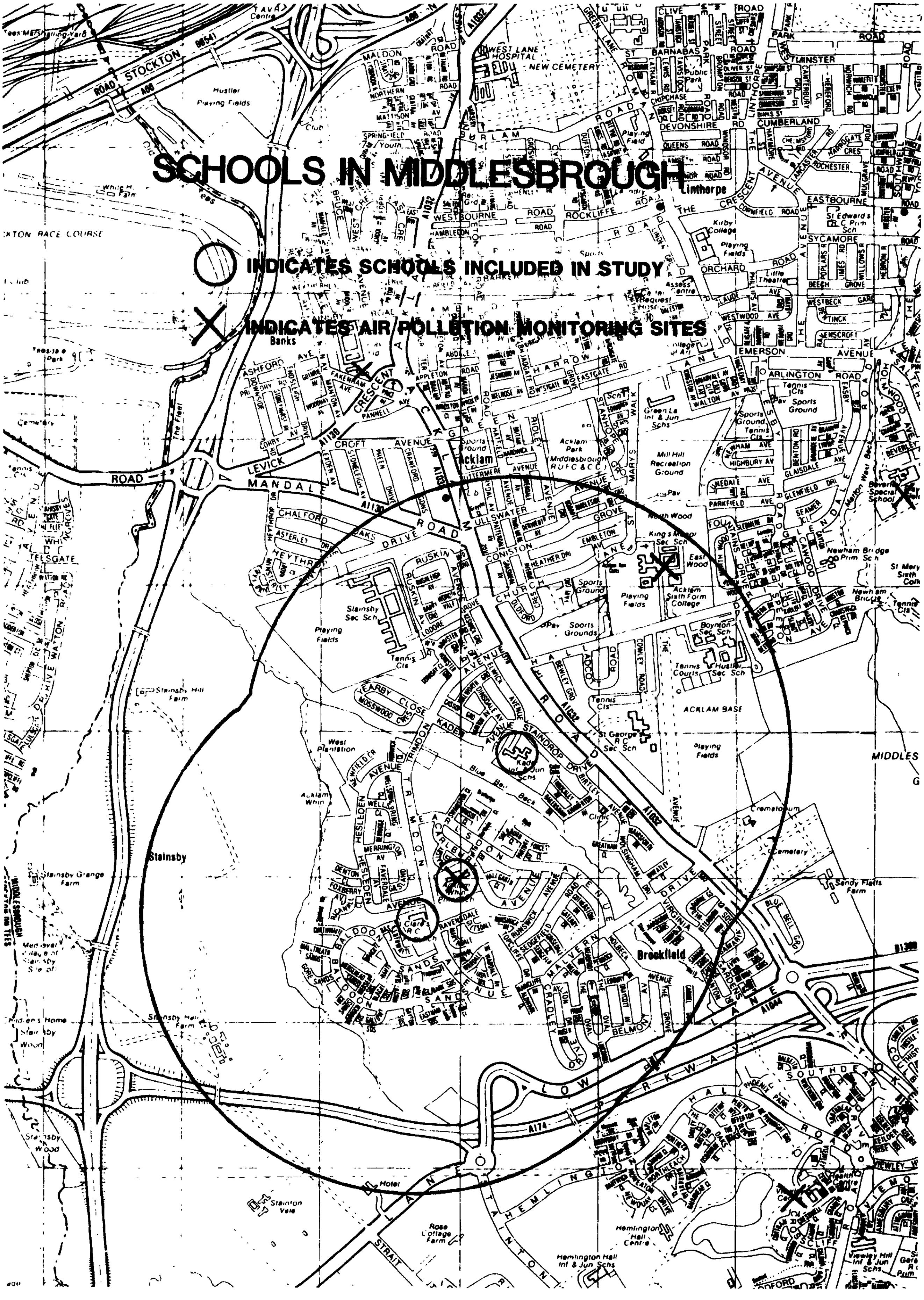

N
GENT
S I N T
A M A N D
B E R G
ZEEVAART STATION
GOEDEREN STATION
DAMPOORT STATION
GENTBRUGGE NOORD STATION
KERKHOF VAN ST AMANDSBERG
ST AMANDUS KLINIEK-HOSPITAAL MATERNITEIT
ST LIEVENSCOLLEGE
VIJFHOEK
TECHNISCH INSTITUUT
BEGIJNHOF
HEIRNIS
UNION GANTOISE C.C.
KERKHOF VAN GENTBRUGGE
ST ANTONIUS KERK
KLEIN BEGIJNHOF
ASTRID PARK
BROEDERS MARISTEN SCHOOL
RACING CLUB GENT
ST JOZEF GESTICHT
DEN DRIES
SINT BAAFSKOUTER
DESTELBERGEN
RIJKSMIDDELBARE SCHOOL
PIRELLI
SNAUWAERT
DE RAEVE FR
KIEPE
PORTUIT
METALUNION
52
53
54
62
63
70
72
Power SO2 Station NOx
SO2 Textile Works NOx (dyes)
SO2 NOx
Metal Industry
500 m

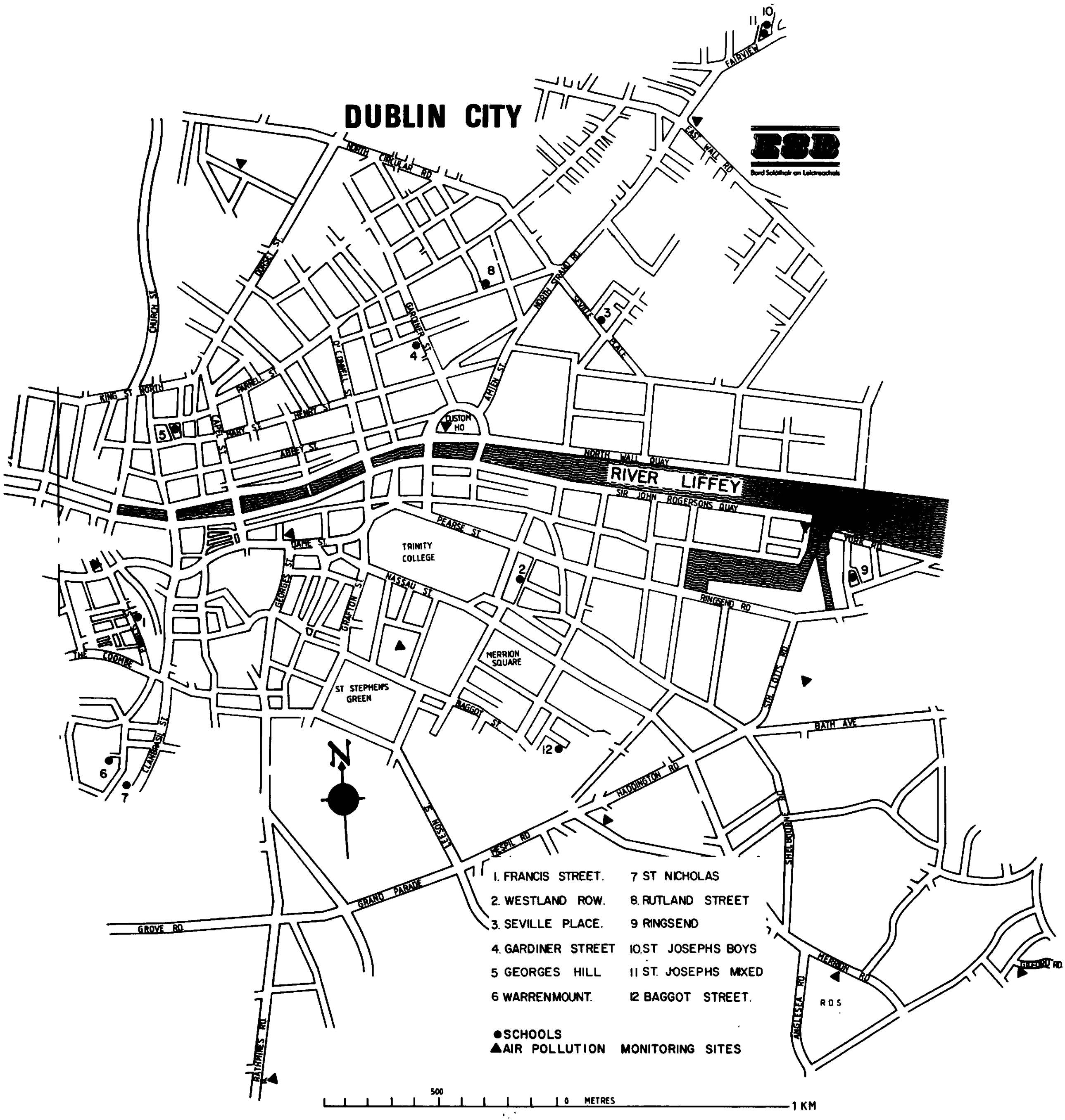
(13)

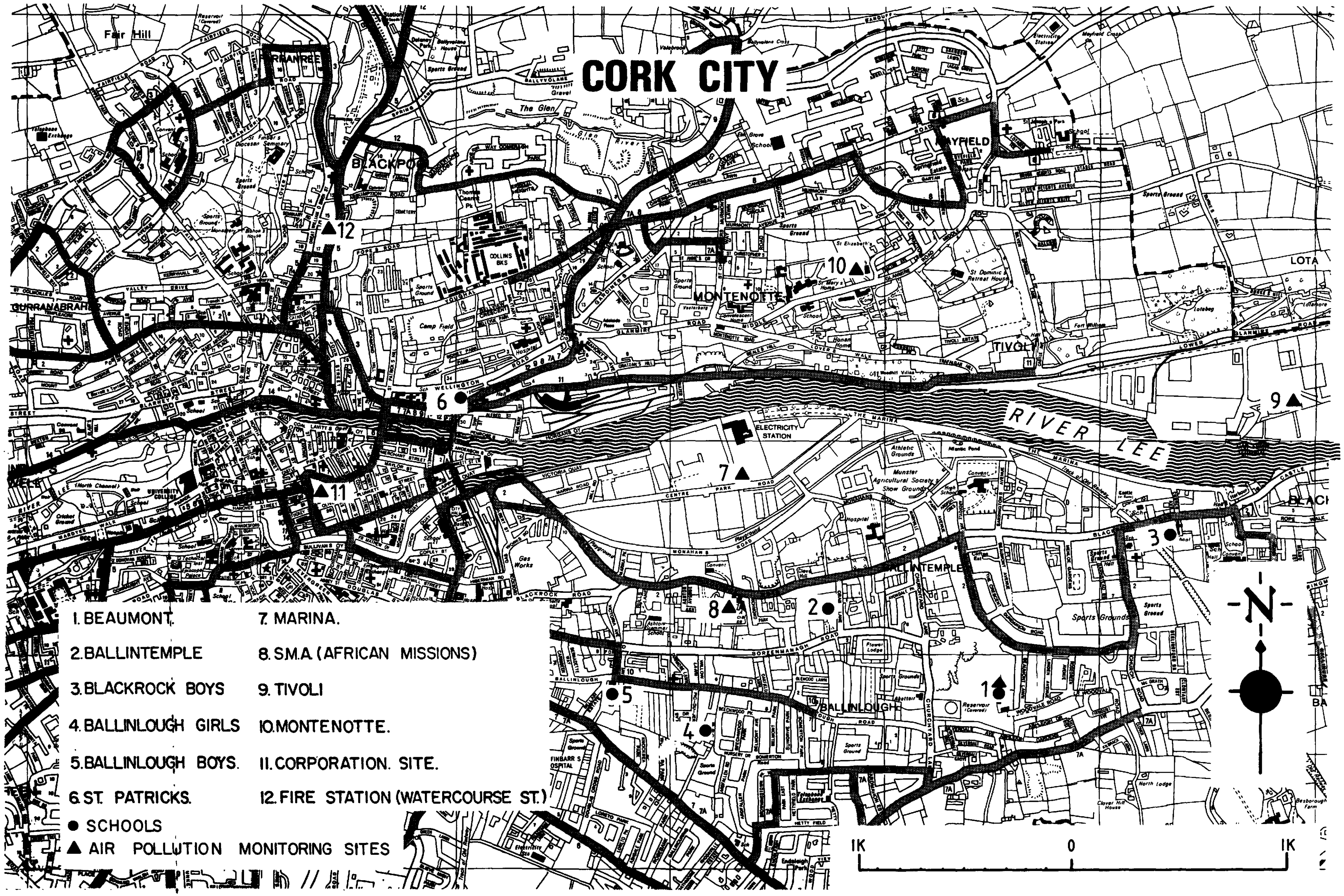

SCHOOLS IN STOCKTON ON TEES
INDICATES SCHOOLS INCLUDED IN STUDY
INDICATES AIR POLLUTION MONITORING SITES
STOCKTON ON TEES
THORNABY ON
Grangefield
Oxbridge
Ropner Park
Teesdale Iron Works
South Durham Steel & Iron Works
Teesside Park
Old Cut
RING ROAD
HIGH ST
MIDDLESBROUGH
Tees Bridge
Steel Works
Bowesfield Industrial Slag Est Works
Durham Road Cemetery
Tech College
Stockton Grange

4)


SCHOOLS IN HARTLEPOOL
INDICATES SCHOOLS INCLUDED IN STUDY
INDICATES AIR POLLUTION MONITORING SITES
Borough of HARTLEPOOL 1977
SCALE OF ½ MILE
0
¼
½
RIFT HOUSE
OWTON MANOR
FENS
ROSSMERE
LONGHILL
SEATON CAREW
BRIERTON COMPREHENSIVE SCHOOL
LAND FOR CEMETERY EXTENSION
STRANTON CEMETERY
ROSSMERE PARK
RIFT HOUSE RECREATION GROUND
KINGSLEY COUNTY PRIMARY SCH
STOCKTON ROAD
SEATON LANE
BRENDA ROAD
CATCOTE ROAD
BRIERTON LANE
OWTON MANOR LANE
K
L
M
N
O


SCHOOLS IN MIDDLESBROUGH
INDICATES SCHOOLS INCLUDED IN STUDY
INDICATES AIR POLLUTION MONITORING SITES


DUBLIN CITY
ESB
Bord Soláthair an Leictreachais
NORTH CIRCULAR RD
DORSET ST
CHURCH ST
KING ST NORTH
PARNELL ST
O'CONNELL ST
GARDINER ST
NORTH STRAND RD
SEVILLE PLACE
AMIEN ST
EAST WALL RD
FAIRVIEW
CAPEL ST
MARY ST
HENRY ST
ABBEY ST
CUSTOM HO
NORTH WALL QUAY
RIVER LIFFEY
SIR JOHN ROGERSONS QUAY
PEARSE ST
TRINITY COLLEGE
DAME ST
GEORGES ST
GRAFTON ST
NASSAU ST
YORK RD
RINGSEND RD
MERRION SQUARE
ST STEPHENS GREEN
BAGGOT ST
THE COOMBE
CLANBRASSIL ST
LEESON ST
HADDINGTON RD
BATH AVE
SHELBOURNE RD
HERBERT RD
ANGLESEA RD
RDS
GROVE RD
GRAND PARADE
RATHMINES RD
1. FRANCIS STREET.
2. WESTLAND ROW.
3. SEVILLE PLACE.
4. GARDINER STREET
5 GEORGES HILL
6 WARRENMOUNT.
7 ST NICHOLAS
8. RUTLAND STREET
9 RINGSEND
10.ST JOSEPHS BOYS
11 ST. JOSEPHS MIXED
12 BAGGOT STREET.
●SCHOOLS
▲AIR POLLUTION MONITORING SITES
500
0 METRES
1 KM


CORK CITY
RIVER LEE
1. BEAUMONT.
2. BALLINTEMPLE
3. BLACKROCK BOYS
4. BALLINLOUGH GIRLS
5. BALLINLOUGH BOYS.
6. ST. PATRICKS.
7. MARINA.
8. S.M.A (AFRICAN MISSIONS)
9. TIVOLI
10. MONTENOTTE.
11. CORPORATION. SITE.
12. FIRE STATION (WATERCOURSE ST.)
● SCHOOLS
▲ AIR POLLUTION MONITORING SITES
N
1K
0
1K

Appendix VII

The regression analyses were performed using the package GLIM (Baker and Nelder 1975) to fit a sequence of models, linear on the logistic scale, describing the variation in the prevalences of CNSLD and a number of separate symptoms. The simplest models found to fit the data adequately are given below in terms of the regression coefficients of the factors included in the model.

The factors in the models are as follows

<GM	A reference value which is the log-odds for country 1 at zero pollution	
SM(2)	Cigarette smoke - not exposed v exposed	
BD(2)	Sharing bedroom with 3 or more v less	
PE(2)	Father employed v father not employed	
	Fathers occupation	
PJ(2)	Mid-group v professional	
PJ(3)	Manual v professional	
AG(2)	Age group 7-8.9 v 5-6.9yrs	
AG(3)	9-9.9 v 5-6.9yrs	
CY(2)	.	
CY(3)	. Estimated differences between countries	
CY(4)	. 2,3,4,5,6 and 1 at zero pollution.	
CY(5)	. Since the trends are not parallel these	
CY(6)	. have no sensible intepretation.	
CY(1).SO2		Germany
CY(2).SO2	Estimated change in log-odds	France
CY(3).SO2	per unit change in SO2	Italy
CY(4).SO2		Belgium
CY(5).SO2		UK
CY(6).SO2		Eire
CY(1).SMK	There is insufficient data to estimate two trends for Germany	
CY(2).SMK		
CY(3).SMK		
CY(4).SMK	Estimated change in log-odds	
CY(5).SMK	per unit change in smoke.	
CY(6).SMK		

The estimated parameters are all differences on the log-odds scale. This means that they are the logarithms of odds ratios. Negative values correspond to a reduction in prevalence. Since the prevalences are quite high (CNSLD is about 20%) the odds ratio is not a good estimate of relative risk. The effect on risk can be assessed approximately by noting that a change of .1 on the log-odds scale alters estimated prevalences of this order by about a twelfth.

```
 GLIM 3.11 (C)1977 ROYAL STATISTICAL SOCIETY, LONDON

BOYS          CNSLD

$FIT SM+BD+PE+PJ+AG+CY+CY.(SO2+SMK)  $
      SCALED
 CYCLE  DEVIANCE     DF
    4    1188.      1078

     ESTIMATE         S.E.       PARAMETER
  1  -.9086         .2017       <GM
  2  -.1090         .5585E-01   SM(2)
  3   .1406         .9775E-01   BD(2)
  4  -.4784E-01     .1183       PE(2)
  5  -.3319E-01     .7729E-01   PJ(2)
  6   .6009E-03     .7494E-01   PJ(3)
  7  -.1401         .5841E-01   AG(2)
  8  -.2625         .7205E-01   AG(3)
  9  -.6235         .1961       CY(2)
 10   .3936         .3635       CY(3)
 11  -3.003         .6247       CY(4)
 12   .6776         .3708       CY(5)
 13  -1.494         .2412       CY(6)
 14   .7972E-05     .6063E-03   CY(1).SO2
 15   .3418E-02     .1734E-02   CY(2).SO2
 16  -.9042E-01     .1456E-01   CY(3).SO2
 17  -.1420E-01     .9251E-02   CY(4).SO2
 18  -.9353E-02     .1218E-01   CY(5).SO2
 19   .7483E-02     .3460E-02   CY(6).SO2
 20    ZERO      ALIASED        CY(1).SMK
 21   .1500E-02     .2972E-02   CY(2).SMK
 22   .2833         .4817E-01   CY(3).SMK
 23   .1723         .6950E-01   CY(4).SMK
 24  -.1286E-01     .2030E-01   CY(5).SMK
 25   .3872E-01     .6652E-02   CY(6).SMK
  SCALE PARAMETER TAKEN AS     1.000
```

```
GIRLS          CNSLD

$FIT SM+BD+PE+PJ+AG+CY+CY.(SO2+SMK)  $
        SCALED
 CYCLE  DEVIANCE      DF
    4    1280.      1148

         ESTIMATE       S.E.       PARAMETER
  1  -1.153         .2200        <GM
  2  -.1866         .5980E-01    SM(2)
  3  -.4022E-01     .1026        BD(2)
  4  -.3416         .1146        PE(2)
  5  -.4406E-01     .8735E-01    PJ(2)
  6   .1596         .8243E-01    PJ(3)
  7  -.2266         .6130E-01    AG(2)
  8  -.3542         .7745E-01    AG(3)
  9  -.1588         .2188        CY(2)
 10   .5998         .4123        CY(3)
 11  -3.015         .7165        CY(4)
 12   .2559         .3987        CY(5)
 13  -1.600         .2767        CY(6)
 14   .7465E-03     .6925E-03    CY(1).SO2
 15   .6000E-02     .1959E-02    CY(2).SO2
 16  -.7579E-01     .1549E-01    CY(3).SO2
 17  -.3458E-01     .1145E-01    CY(4).SO2
 18   .1922E-01     .1314E-01    CY(5).SO2
 19   .1657E-01     .3684E-02    CY(6).SO2
 20    ZERO       ALIASED        CY(1).SMK
 21  -.5138E-02     .3115E-02    CY(2).SMK
 22   .2362         .5156E-01    CY(3).SMK
 23   .2950         .8480E-01    CY(4).SMK
 24  -.1220E-01     .2142E-01    CY(5).SMK
 25   .4651E-01     .6687E-02    CY(6).SMK
   SCALE PARAMETER TAKEN AS    1.000
```

BOYS COUGH (Q1 + 2)

```
$FIT SM+BD+PE+PJ+AG+CY+CY.(SO2+SMK)  $
         SCALED
 CYCLE  DEVIANCE      DF
    4     1012.      1078
```

	ESTIMATE	S.E.	PARAMETER
1	-1.886	.2668	<GM
2	-.1171	.7704E-01	SM(2)
3	.2545	.1232	BD(2)
4	-.1070	.1481	PE(2)
5	-.4298E-01	.1094	PJ(2)
6	.1051	.1042	PJ(3)
7	-.1889	.7783E-01	AG(2)
8	-.4382	.1008	AG(3)
9	-.8282	.2763	CY(2)
10	.2955	.5236	CY(3)
11	-2.805	.8861	CY(4)
12	.4442	.4581	CY(5)
13	-2.051	.3700	CY(6)
14	.1047E-02	.7912E-03	CY(1).SO2
15	.1024E-01	.2477E-02	CY(2).SO2
16	-.9852E-01	.1974E-01	CY(3).SO2
17	-.2275E-03	.1226E-01	CY(4).SO2
18	-.2625E-01	.1482E-01	CY(5).SO2
19	.1830E-01	.5550E-02	CY(6).SO2
20	ZERO	ALIASED	CY(1).SMK
21	-.3062E-02	.4216E-02	CY(2).SMK
22	.3222	.6485E-01	CY(3).SMK
23	.9638E-01	.9245E-01	CY(4).SMK
24	.4957E-01	.2631E-01	CY(5).SMK
25	.4244E-01	.8669E-02	CY(6).SMK

SCALE PARAMETER TAKEN AS 1.000

GIRLS COUGH (Q1 + 2)

```
$FIT SM+BD+PE+PJ+AG+CY+CY.(SO2+SMK)  $
        SCALED
 CYCLE  DEVIANCE      DF
    4     1018.      1148

       ESTIMATE       S.E.        PARAMETER
    1  -2.225        .2926        <GM
    2  -.9521E-01    .7906E-01    SM(2)
    3   .2044        .1238        BD(2)
    4  -.3497        .1401        PE(2)
    5   .4624E-01    .1202        PJ(2)
    6   .2201        .1131        PJ(3)
    7  -.2894        .7929E-01    AG(2)
    8  -.4981        .1042        AG(3)
    9   .3121E-01    .3009        CY(2)
   10  -.1367        .5834        CY(3)
   11  -2.444        .9340        CY(4)
   12  -.2673        .4788        CY(5)
   13  -1.733        .4006        CY(6)
   14   .2377E-02    .8942E-03    CY(1).SO2
   15   .6922E-02    .2740E-02    CY(2).SO2
   16  -.5701E-01    .1903E-01    CY(3).SO2
   17  -.1946E-01    .1424E-01    CY(4).SO2
   18   .9940E-02    .1588E-01    CY(5).SO2
   19   .2193E-01    .5474E-02    CY(6).SO2
   20    ZERO      ALIASED        CY(1).SMK
   21  -.7987E-02    .4296E-02    CY(2).SMK
   22   .2101        .6591E-01    CY(3).SMK
   23   .2054        .1061        CY(4).SMK
   24   .5914E-01    .2722E-01    CY(5).SMK
   25   .4676E-01    .8479E-02    CY(6).SMK
   SCALE PARAMETER TAKEN AS      1.000
```

```
BOYS          BREATHLESSNESS (Q4 + 5)

$FIT SM+BD+PE+PJ+AG+CY+CY.(SMK+SO2)  $
        SCALED
 CYCLE  DEVIANCE      DF
    4    960.8      1078

       ESTIMATE       S.E.       PARAMETER
   1   -3.068        .3774       <GM
   2   -.7097E-01    .8308E-01   SM(2)
   3    .3427        .1414       BD(2)
   4   -.8853E-01    .1778       PE(2)
   5    .1176        .1202       PJ(2)
   6    .2205        .1159       PJ(3)
   7    .1730        .9179E-01   AG(2)
   8    .2932        .1061       AG(3)
   9   -.2348        .3639       CY(2)
  10   -.6105E-01    .6624       CY(3)
  11   -1.863        .9790       CY(4)
  12    1.476        .7337       CY(5)
  13   -.3952        .4403       CY(6)
  14    .4210E-01    .1605E-01   CY(1).SMK
  15    .8289E-02    .4149E-02   CY(2).SMK
  16    .2524        .7582E-01   CY(3).SMK
  17    .1973        .1116       CY(4).SMK
  18   -.4648E-02    .3753E-01   CY(5).SMK
  19    .1335E-01    .1120E-01   CY(6).SMK
  20     ZERO      ALIASED       CY(1).SO2
  21    .8631E-02    .2312E-02   CY(2).SO2
  22   -.7146E-01    .2228E-01   CY(3).SO2
  23   -.2300E-01    .1513E-01   CY(4).SO2
  24   -.3916E-01    .2150E-01   CY(5).SO2
  25    .2208E-02    .5744E-02   CY(6).SO2
  SCALE PARAMETER TAKEN AS       1.000
```

```
GIRLS          BREATHLESSNESS (Q4 + 5)

$FIT SM+BD+PE+PJ+AG+CY+CY.(SMK+SO2)  $
       SCALED
 CYCLE  DEVIANCE      DF
    4    977.3      1148

        ESTIMATE       S.E.       PARAMETER
    1   -3.164         .4111      <GM
    2   -.1572         .9058E-01  SM(2)
    3   -.6720E-01     .1628      BD(2)
    4   -.2491         .1827      PE(2)
    5    .3368E-01     .1344      PJ(2)
    6    .2692         .1263      PJ(3)
    7   -.2405E-01     .9609E-01  AG(2)
    8    .4105E-01     .1156      AG(3)
    9    .4181         .3967      CY(2)
   10    .6296         .7364      CY(3)
   11   -3.969        1.138       CY(4)
   12   -.8292E-01     .7848      CY(5)
   13   -.9947         .5308      CY(6)
   14    .6231E-01     .1754E-01  CY(1).SMK
   15    .2459E-02     .4264E-02  CY(2).SMK
   16    .3740         .7699E-01  CY(3).SMK
   17    .3725         .1270      CY(4).SMK
   18    .1044         .4806E-01  CY(5).SMK
   19    .3305E-01     .1210E-01  CY(6).SMK
   20     ZERO       ALIASED      CY(1).SO2
   21    .7203E-02     .2572E-02  CY(2).SO2
   22   -.1094         .2319E-01  CY(3).SO2
   23   -.3809E-01     .1759E-01  CY(4).SO2
   24   -.4063E-01     .2488E-01  CY(5).SO2
   25    .1056E-01     .6909E-02  CY(6).SO2
   SCALE PARAMETER TAKEN AS    1.000
```

BOYS GREATER THAN AVERAGE BREATHLESSNESS (Q5)

```
$FIT SM+BD+PE+PJ+AG+CY+CY.(SO2+SMK)  $
        SCALED
 CYCLE  DEVIANCE      DF
    4    714.7      1078

        ESTIMATE      S.E.        PARAMETER
   1   -3.023        .3855        <GM
   2   -.6427E-01    .1089        SM(2)
   3    .2720        .1882        BD(2)
   4   -.1716        .2283        PE(2)
   5    .1377        .1613        PJ(2)
   6    .2991        .1543        PJ(3)
   7    .9157E-01    .1222        AG(2)
   8    .3886        .1355        AG(3)
   9   -.5564        .3645        CY(2)
  10   -.1501        .8588        CY(3)
  11   -2.435        1.195        CY(4)
  12    .6850        .8552        CY(5)
  13   -.1981        .4661        CY(6)
  14    .8100E-03    .1065E-02    CY(1).SO2
  15    .5430E-02    .3247E-02    CY(2).SO2
  16   -.7022E-01    .3489E-01    CY(3).SO2
  17   -.2836E-01    .1949E-01    CY(4).SO2
  18    .5900E-02    .2776E-01    CY(5).SO2
  19    .5682E-02    .6482E-02    CY(6).SO2
  20     ZERO      ALIASED        CY(1).SMK
  21    .1518E-02    .5545E-02    CY(2).SMK
  22    .2198        .1156        CY(3).SMK
  23    .2277        .1424        CY(4).SMK
  24   -.7263E-01    .4432E-01    CY(5).SMK
  25   -.2228E-01    .1424E-01    CY(6).SMK
  SCALE PARAMETER TAKEN AS       1.000
```

```
GIRLS          GREATER THAN AVERAGE BREATHLESSNESS (Q5)

$FIT SM+BD+PE+PJ+AG+CY+CY.(SO2+SMK)  $
        SCALED
 CYCLE  DEVIANCE      DF
    5    699.4      1148

       ESTIMATE       S.E.        PARAMETER
    1  -3.460        .4637        <GM
    2  -.6087E-01    .1253        SM(2)
    3   .1026        .2247        BD(2)
    4  -.2060        .2560        PE(2)
    5  -.4344E-01    .1925        PJ(2)
    6   .2849        .1761        PJ(3)
    7   .1913E-01    .1347        AG(2)
    8   .7418E-01    .1616        AG(3)
    9   .2513        .4288        CY(2)
   10  -.7568        1.118        CY(3)
   11  -4.450        1.533        CY(4)
   12   .3038        .9186        CY(5)
   13  -.8626        .6300        CY(6)
   14   .1936E-02    .1330E-02    CY(1).SO2
   15   .5553E-02    .3668E-02    CY(2).SO2
   16  -.7781E-01    .3507E-01    CY(3).SO2
   17  -.5201E-01    .2626E-01    CY(4).SO2
   18  -.2544E-01    .2940E-01    CY(5).SO2
   19   .8974E-02    .8845E-02    CY(6).SO2
   20    ZERO      ALIASED        CY(1).SMK
   21  -.6696E-02    .5721E-02    CY(2).SMK
   22   .2857        .1214        CY(3).SMK
   23   .4441        .1860        CY(4).SMK
   24   .4276E-01    .5284E-01    CY(5).SMK
   25   .8024E-02    .1704E-01    CY(6).SMK
   SCALE PARAMETER TAKEN AS       1.000
```

```
BOYS          WHEEZE (Q6 + 7)

$FIT SM+BD+PE+PJ+AG+CY+CY.(SO2+SMK)  $
        SCALED
 CYCLE  DEVIANCE      DF
    4     1010.      1078

        ESTIMATE         S.E.        PARAMETER
    1   -1.153         .2435         <GM
    2   -.1148         .6930E-01     SM(2)
    3    .2710E-01     .1204         BD(2)
    4   -.1572         .1382         PE(2)
    5   -.1148         .9333E-01     PJ(2)
    6   -.1752         .9104E-01     PJ(3)
    7   -.1983         .7115E-01     AG(2)
    8   -.3503         .8950E-01     AG(3)
    9   -.5113         .2454         CY(2)
   10    1.324         .4987         CY(3)
   11   -4.559         .8306         CY(4)
   12    .9175         .4334         CY(5)
   13   -1.072         .2793         CY(6)
   14   -.1334E-02     .7879E-03     CY(1).SO2
   15   -.3685E-02     .2248E-02     CY(2).SO2
   16   -.8672E-01     .2377E-01     CY(3).SO2
   17   -.4205E-01     .1385E-01     CY(4).SO2
   18    .3393E-02     .1399E-01     CY(5).SO2
   19    .2986E-02     .3876E-02     CY(6).SO2
   20     ZERO       ALIASED         CY(1).SMK
   21    .5334E-02     .3878E-02     CY(2).SMK
   22    .2184         .7459E-01     CY(3).SMK
   23    .3742         .9915E-01     CY(4).SMK
   24   -.4808E-01     .2262E-01     CY(5).SMK
   25    .3427E-01     .7729E-02     CY(6).SMK
   SCALE PARAMETER TAKEN AS          1.000
```

```
GIRLS          WHEEZE (Q6 + 7)

$FIT SM+BD+PE+PJ+AG+CY+CY.(SO2+SMK)  $
        SCALED
 CYCLE  DEVIANCE      DF
    4     1059.      1148

        ESTIMATE       S.E.        PARAMETER
    1   -1.629        .2794        <GM
    2   -.2748        .7823E-01    SM(2)
    3   -.2494        .1308        BD(2)
    4   -.9311E-01    .1452        PE(2)
    5   -.1179        .1097        PJ(2)
    6   -.5014E-01    .1043        PJ(3)
    7   -.2743        .7743E-01    AG(2)
    8   -.4629        .1008        AG(3)
    9   -.6823        .2870        CY(2)
   10    1.307        .6093        CY(3)
   11   -3.651        .9622        CY(4)
   12    .6292        .4924        CY(5)
   13   -1.601        .3366        CY(6)
   14   -.1037E-02    .9393E-03    CY(1).SO2
   15    .7242E-02    .2570E-02    CY(2).SO2
   16   -.9583E-01    .2740E-01    CY(3).SO2
   17   -.4640E-01    .1625E-01    CY(4).SO2
   18    .1365E-01    .1585E-01    CY(5).SO2
   19    .1279E-01    .4413E-02    CY(6).SO2
   20     ZERO      ALIASED        CY(1).SMK
   21   -.1514E-02    .4234E-02    CY(2).SMK
   22    .2554        .8519E-01    CY(3).SMK
   23    .3707        .1179        CY(4).SMK
   24   -.3509E-01    .2532E-01    CY(5).SMK
   25    .5456E-01    .7912E-02    CY(6).SMK
   SCALE PARAMETER TAKEN AS     1.000
```

BOYS FREQUENT WHEEZE (Q7)

```
$FIT SM+BD+PE+PJ+AG+CY+CY.(SO2+SMK)  $
        SCALED
 CYCLE  DEVIANCE       DF
    5     512.9      1078
```

	ESTIMATE	S.E.	PARAMETER
1	-2.308	.4298	<GM
2	-.2459	.1566	SM(2)
3	.2234	.2352	BD(2)
4	-.3352	.2612	PE(2)
5	.7048E-01	.2267	PJ(2)
6	.1531	.2157	PJ(3)
7	-.3945	.1548	AG(2)
8	-.4597	.1951	AG(3)
9	-2.242	.6645	CY(2)
10	-1.082	1.162	CY(3)
11	-5.570	2.172	CY(4)
12	.6328	.8942	CY(5)
13	-.8796	.5063	CY(6)
14	.9830E-03	.1076E-02	CY(1).SO2
15	.4994E-03	.8073E-02	CY(2).SO2
16	.1615E-01	.6036E-01	CY(3).SO2
17	.2348E-02	.2749E-01	CY(4).SO2
18	-.5268E-01	.2777E-01	CY(5).SO2
19	-.4411E-02	.8000E-02	CY(6).SO2
20	ZERO	ALIASED	CY(1).SMK
21	.3675E-02	.1379E-01	CY(2).SMK
22	-.8272E-01	.2085	CY(3).SMK
23	.1483	.2002	CY(4).SMK
24	.3514E-01	.5113E-01	CY(5).SMK
25	.1295E-01	.1669E-01	CY(6).SMK

SCALE PARAMETER TAKEN AS 1.000

GIRLS FREQUENT WHEEZE (Q7)

```
$FIT SM+BD+PE+PJ+AG+CY+CY.(SO2+SMK)  $
        SCALED
 CYCLE  DEVIANCE      DF
   10    402.9      1148
----- NO CONVERGENCE BY CYCLE 10
(Results here must be treated with caution)
```

	ESTIMATE	S.E.	PARAMETER
1	-3.188	.5294	<GM
2	-.3250	.1947	SM(2)
3	.2669	.2538	BD(2)
4	-.9062E-01	.3004	PE(2)
5	.3761	.3120	PJ(2)
6	.3951	.3016	PJ(3)
7	-.2731	.1846	AG(2)
8	-.2296	.2301	AG(3)
9	-2.521	.8510	CY(2)
10	-.1833	1.229	CY(3)
11	-83.10	56.27	CY(4)
12	.1011E-01	1.075	CY(5)
13	-1.399	.5764	CY(6)
14	.3261E-03	.1342E-02	CY(1).SO2
15	.1982E-01	.1193E-01	CY(2).SO2
16	.1007E-01	.6349E-01	CY(3).SO2
17	-1.953	1.437	CY(4).SO2
18	-.7014E-01	.3396E-01	CY(5).SO2
19	-.1355E-01	.9807E-02	CY(6).SO2
20	ZERO	ALIASED	CY(1).SMK
21	-.3489E-01	.1839E-01	CY(2).SMK
22	-.8570E-01	.2151	CY(3).SMK
23	12.65	9.146	CY(4).SMK
24	.1074	.6766E-01	CY(5).SMK
25	.5999E-01	.1946E-01	CY(6).SMK

SCALE PARAMETER TAKEN AS 1.000

BOYS ASTHMA (Q8)

```
$FIT SM+BD+PE+PJ+AG+CY+CY.(SO2+SMK)  $
        SCALED
 CYCLE  DEVIANCE       DF
    5    611.1       1078

       ESTIMATE       S.E.        PARAMETER
    1  -3.857         .6185       <GM
    2  -.5304E-01     .1308       SM(2)
    3   .2116         .2557       BD(2)
    4   .2256         .3557       PE(2)
    5  -.4032         .1607       PJ(2)
    6  -.6716         .1637       PJ(3)
    7   .1345E-01     .1433       AG(2)
    8   .8960E-01     .1673       AG(3)
    9   1.134         .5483       CY(2)
   10   .5728E-01     .8280       CY(3)
   11  -.7280         2.014       CY(4)
   12   .3820         1.014       CY(5)
   13   .5266E-01     .7082       CY(6)
   14   .5750E-04     .2001E-02   CY(1).SO2
   15  -.8827E-02     .3658E-02   CY(2).SO2
   16   .3219E-02     .2908E-01   CY(3).SO2
   17   .4234E-02     .2771E-01   CY(4).SO2
   18  -.5202E-01     .3179E-01   CY(5).SO2
   19   .1681E-01     .8291E-02   CY(6).SO2
   20    ZERO       ALIASED       CY(1).SMK
   21   .4311E-02     .6267E-02   CY(2).SMK
   22   .1062E-01     .1021       CY(3).SMK
   23  -.4283E-02     .2186       CY(4).SMK
   24   .1121         .6040E-01   CY(5).SMK
   25  -.2163E-01     .1795E-01   CY(6).SMK
   SCALE PARAMETER TAKEN AS       1.000
```

GIRLS ASTHMA (Q8)

```
$FIT SM+BD+PE+PJ+AG+CY+CY.(SO2+SMK)  $
       SCALED
 CYCLE  DEVIANCE      DF
    7     476.4      1148
```

	ESTIMATE	S.E.	PARAMETER
1	-3.319	.7871	<GM
2	-.2066	.1766	SM(2)
3	-.4819E-01	.3236	BD(2)
4	-.6501	.3063	PE(2)
5	-.4833	.2412	PJ(2)
6	-.2637	.2192	PJ(3)
7	-.2180	.1830	AG(2)
8	-.1386	.2197	AG(3)
9	1.070	.7655	CY(2)
10	.2083	1.215	CY(3)
11	-9.351	5.556	CY(4)
12	-1.875	1.312	CY(5)
13	-.2421	.9634	CY(6)
14	-.2464E-02	.3248E-02	CY(1).SO2
15	-.2181E-02	.4878E-02	CY(2).SO2
16	-.5694E-02	.4220E-01	CY(3).SO2
17	-.1822	.1253	CY(4).SO2
18	-.6237E-02	.4434E-01	CY(5).SO2
19	.1839E-01	.1055E-01	CY(6).SO2
20	ZERO	ALIASED	CY(1).SMK
21	-.7855E-02	.7405E-02	CY(2).SMK
22	.2325E-01	.1467	CY(3).SMK
23	1.254	.8296	CY(4).SMK
24	.1474	.8685E-01	CY(5).SMK
25	-.1572E-01	.2081E-01	CY(6).SMK

SCALE PARAMETER TAKEN AS 1.000