Progress report – year one (2003)

European Commission - DG Research

Quality of Life and Management of Living Resources

HYPERTENSION AND EXPOSURE TO NOISE NEAR AIRPORTS

HYENA
(QLK4 –CT- 2002 - 02501)

Key Action 4 Environment and Health
## Project Progress Summary

### Section 1: PROJECT IDENTIFICATION

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<td><strong>Title of the project</strong></td>
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### PROJECT COORDINATOR

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<tr>
<th>Name</th>
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<tbody>
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<td>+44 207594 3337</td>
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</table>

### Key words

- Airports; Noise; Air Pollution; Blood Pressure; Stress Hormones

### World wide web address

- www.hyena.eu.com

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- see pages 3-4
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Project Progress Summary

Section 2: Project Progress Report

Objectives:
An increasing number of people live in the vicinity of major airports. They are exposed to and disturbed by noise and air pollution from aircraft and airport associated road traffic. Raised blood pressure is one of the most important underlying risk factors for morbidity and mortality in the world today. Blood pressure is a major risk factor for coronary heart disease and the major risk factor for stroke.

The overall objective of the HYENA project is to assess the impacts on cardiovascular health (primarily reflected by high blood pressure) of noise generated by aircraft and road traffic near airports.

Specifically, we will analyse the exposure-response relationships in adults between long-term exposure to airport related noise and high blood pressure. We will evaluate the modifying effects of traffic related air pollution ($NO_2$, PM) on noise associated cardiovascular risk factors and cardiovascular disease and we will assess the possible modifying effects by annoyance and sleep disturbances due to road and aircraft noise, on blood pressure.

Furthermore, we will analyse the impact of aircraft and road traffic noise on stress hormone levels and analyse the difference in blood pressure resulting from different noise exposure patterns (day and night time exposure).

Results and Milestones:
The scientific work started in January 2003, the first project year being devoted to the detailed design of the various parts of the study. In particular, we have developed protocols for study areas/population sample selection and a comprehensive questionnaire including questions needed for the individual exposure assessment. The questionnaire also includes questions related to disturbance/annoyance, life-style factors (smoking, diet) and health (cardiovascular disease in particular).

Detailed protocols for assessment of blood pressure and stress hormones (saliva cortisol) have been developed as well as a protocol for assessment of acute changes in blood pressure due to short-term changes in noise exposure. A draft protocol for assessment of air pollution exposure has also been produced; the final version of this will be available during the next work period. For the first year of the project, all but one milestone set out in the original work plan has been reached and the corresponding deliverables reported. A draft version of the air pollution protocol has been completed in January 2004, and a final version will be available later in the year. This postponement is due to coordination with other projects and will not delay the analyses in this project.

A project leaflet has been produced, the project website has been launched (www.hyena.eu.com) and is fully operational. The design of the project has also been reported at the International Society for Environmental Epidemiology annual conference in Perth, Australia, in September 2003.
 Benefits and Beneficiaries: The project will provide scientific basis and support for guidelines for a European policy on noise abatement, which will benefit a large part of the EU population disturbed by noise (currently circa 80 million people).

 Future actions (If applicable): The data collection will form the major part of the 2004 work. This fieldwork will commence early 2004, and will be finalised in 2005. The detailed noise exposure assessment protocol will be further discussed at the next project meeting April 2004, and will be finalised and agreed at the mid-term review meeting. Air pollution modelling will commence for the participating airports at the end of 2004 and will be finalised during 2005. A mid-term review is planned to take place in London in late November/early December 2004.
## Progress Report

**Title of the project**  HYpertension and Exposure to Noise near Airports  

**Acronym of the project**  HYENA  

**Type of contract**  RTD Shared Costs  

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**Total project cost**  € 2,273,644  

**Commencement date**  1st December 2002  

**Period covered by the progress report**  1st December 2002 – 30 November 2003

### PROJECT COORDINATOR

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<td>Norfolk Place</td>
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**Key words**  Airports; Noise; Air Pollution; Blood Pressure; Stress Hormones  

**World wide web address**  www.hyena.eu.com  

**List of participants**  see pages 3-4
TABLE OF CONTENTS

1. OBJECTIVES AND EXPECTED ACHIEVEMENTS 9

2. PROJECT WORKPLAN 11

2.1 Introduction 11

2.2 Project structure, planning and timetable 12
  2.2.1 Progress during the first reporting period 12
  2.2.1.1 Discussion-Conclusion 24
  2.2.1.2 Future action 24
  2.2.1.3 Action requested from the Commission 25

2.3 Description of the Work Packages 26
  2.3.1 WP1: Coordination 26
  2.3.2 WP2: Epidemiological study design and data collection via questionnaire 29
  2.3.3 WP3: Assessment of health effects 31
  2.3.4 WP4: Noise exposure assessment based on questionnaires and noise level maps 33
  2.3.5 WP5: Assessment of disturbance/annoyance and modifiers of exposure 37
  2.3.6 WP6: Investigation of confounding/effect modification by air pollution on cardiovascular effects 39
  2.3.7 WP7: Assessment of acute effects on blood pressure after short-term changes in noise levels 41
  2.3.8 WP8: Pooled analysis and overall assessment 46
  2.3.9 WP9: Dissemination 48

3. ROLE OF PARTICIPANTS 51

4. PROJECT MANAGEMENT AND COORDINATION 68

5. EXPLOITATION AND DISSEMINATION ACTIVITIES 69

6. ETHICAL ASPECTS AND SAFETY PROVISIONS 71
1. OBJECTIVES AND EXPECTED ACHIEVEMENTS

Pollution (from noise and aircraft exhaust emissions as well as from the associated road traffic) near airports is considerable. An increasing number of people live in the vicinity of major airports, and are, thus, exposed to and disturbed by noise and air pollution from aircraft and airport associated road traffic. Raised blood pressure is one of the most important underlying risk factors for morbidity and mortality in the world today, being a major risk factor for coronary heart disease and the major risk factor for stroke.

Environmental noise, caused by traffic, industrial and recreational activities is considered to be a significant local environmental problem in Europe. Noise complaints have increased in Europe since 1992 and it is estimated that roughly 20% of the Union’s population or close to 80 million people suffer from noise levels which scientists and health experts consider being unacceptable.

Recent studies indicate that noise exposure may cause hypertension at noise levels already experienced by a large number of Europeans living near major airports. There is a need to strengthen the scientific evidence for these associations to support informed decision-making by public authorities, industry and individual citizens. The HYENA project will create and exploit data and research synergies between leading centres in the relevant disciplines in Europe and will apply methods in the medical, technical, public health and environmental domains with a view to assessing exposure to noise and associated air pollution and the impact on blood pressure and cardiovascular disease. This networking at a European level will contribute towards providing an evidence base for the development of adequate environmental and health policy measures.

The overall objective of the HYENA project is to assess the impacts on cardiovascular health (primarily reflected by high blood pressure) of noise generated by aircraft and road traffic near airports, and to gain insights into prevention from a combined environmental and health point of view. The project will identify and quantify noise exposure in individuals, relating the exposure to the prevalence of high blood pressure. The project will also aim to identify the special needs of high-risk groups to improve the potential for reducing the negative effects of the environment on health. The prevalence of noise related hypertension will be assessed, taking into account geographical variation, to allow comparison of data and interventions at EU level.

The project will adopt standardised methods for assessing exposure and effect, and it will identify exposure-response relationships between environmental noise exposure and health outcomes (primarily high blood pressure, but also IHD). The study results will strengthen the scientific basis for public sector and industrial decision-making in relation to the environmental health effects of noise. This will allow priority setting in environmental and health policy and will support regulatory bodies in their efforts. The results will be directly applicable to the ongoing European risk assessment for noise.

The aim of the Project will be reached by including populations from different parts of Europe representing a wide range of exposure.
The specific objectives are:

- To analyse the exposure-response relationships in adults between long-term exposure to airport related noise and high blood pressure; for aircraft noise, road traffic noise and for combinations of aircraft and road-traffic noise in different populations in six countries across Europe, (Germany, Greece, Italy, the Netherlands, Sweden and the United Kingdom), taking into account social, cultural and meteorological conditions;

- To evaluate the modifying effects of traffic related air pollution (NO\textsubscript{2}, PM) on noise associated cardiovascular risk factors and cardiovascular disease (e.g. high blood pressure, ischaemic heart disease (IHD)) at selected major European airports (Berlin-Tegel, Athens, Malpensa, Schiphol, Arlanda and London Heathrow);

- To analyse the difference in blood pressure resulting from different noise exposure patterns (day and night time exposures, peak versus average exposure levels), for aircraft noise at selected major European airports;

- To assess the possible modifying effects by annoyance and sleep disturbances due to road and aircraft noise, on blood pressure at selected major European airports;

- To analyse the impact of aircraft and road traffic noise on stress hormone levels at selected major European airports;

- To analyse the effect of noise exposure on high blood pressure in subgroups (at risk of future cardiovascular disease) of the population; for aircraft and road traffic noise at selected major European airports;

- To provide scientific basis and support for guidelines for a European policy on noise abatement taking advantage of the cross-border environmental diversity of six European countries.
2. PROJECT WORKPLAN

2.1 Introduction

The project consists of nine work packages (WPs), and is based on a multi-centre approach involving a partnership of scientific expertise from six European countries (Germany, Greece, Italy, the Netherlands, Sweden and the United Kingdom). WP1 defines the management of the project and WP2 includes six similar cross-sectional studies with retrospective exposure assessment to be performed around six European airports (Berlin-Tegel, Athens, Malpensa, Schiphol, Arlanda and London Heathrow), representing a wide variety of exposure to noise and air pollution.

The studies will use uniform methodology for the assessment of noise exposure and health effects. WP3 focuses on the assessment of blood pressure and hypertension, using internationally validated questionnaires and analyses of blood pressure. WP3 also studies changes in stress hormone levels in relation to noise exposure. WP4 deals with noise exposure assessment, using established models for assessing noise levels, in conjunction with questionnaire data such as place of residence and housing conditions. WP5 studies the modifying effects on blood pressure by disturbance/annoyance and WP6 investigates the potential confounding/effect modifying effect of traffic related air pollution on noise exposure and cardiovascular disease. Air pollution exposure will be assessed using methods developed by the UK partner. Although the main thrust of the project is chronic effects on blood pressure of long-term noise exposure, we will also study acute effects associated with short-term changes in noise levels (WP7). In WP8, a pooled analysis and an overall evaluation of the results from work packages WP2 to WP7 is undertaken. Finally, WP9 defines the dissemination procedures that will be adopted for the Project.
2.2 Project structure, planning and timetable

2.2.1 Progress during the first reporting period

The scientific work started two months after the contract start date (1 December 2002); thus, for the scientific work project month 1 is February 2003. The kick-off meeting was held in London 24 January 2003 (project month 0). The deliverables due in the 1st year may thus be up to 2 months 'late' according to the official start calendar. However, all deliverables due for 2003 are included in this annual report (see attachments).

Two meetings (24/1 and 11-12/9) and two conference calls (16/5 and 15/12) have been held during 2003. The main objectives for these conferences have been to design and agree on the study protocols.

A summary of the discussions and agreements for the various work packages/protocols are given below.

WP2: Epidemiological study design and data collection via questionnaire

Some airports have changed or will change during the study period (e.g. by introducing new runways, or in the case of Athens, a shift to a completely new airport). Although it would be desirable to take this into consideration in the selection of study subjects, this is not feasible since existing aircraft noise contours will have to be used for the study population selection. It was agreed that Greece would focus on the new airport, and in Sweden, Bromma airport will be included to get the desired exposed population number.

We are aiming for response rates of 70% or higher. In an effort to ensure this some partners will use incentives (the Netherlands, Germany). However, some partner countries expect lower response rates. Thus, it was decided to increase the initial sample frame to reach the desired total number of study subjects, taking into account the expected response rate in each country. To check the characteristics of non-responders, a proportion of non-responders will be asked to complete a short questionnaire by telephone. The details of this will be discussed further at the next project meeting (14-16 April in Athens).

Study populations will be selected with the aim to maximise exposure contrast within countries, and to use existing data (aircraft noise contours), taking into account (whenever possible):

- No substantial changes in exposure in recent years where feasible
- Use areas with low migration
- Avoid areas with sound insulation programmes
- Use areas with similar socio-economic status within countries
- Avoid areas with other noise exposure (e.g. industrial)

The procedure is described in detail in the protocol for selection of study areas and population sample (D4.1).
It was noted that it might be difficult to select specific vulnerable subgroups in advance, since data required for this are not readily available. The main subgroup of interest is the elderly; it was agreed that stratifying by age would be the best method for including a significant proportion of elderly participants. It was agreed that all partners would stratify by age using random sampling selection. Sample selection will not allow for other subgroups to be defined a priori. However, the questionnaire will allow us to identify other vulnerable individuals (e.g. peoples with heart disease), and this will be used in the analysis.

It was agreed, that ideally, the study should recruit only one person per household. However, where the sample is small, it may be necessary to invite more than one subject per household.

The sampling of study populations for each partner country will be finalised early 2004 as planned, following the guidelines outlined in the protocol (D4.1). The contents and layout of the questionnaire have been extensively discussed, a complete questionnaire was available for the September meeting, and final version agreed at the telephone conference in December 2003 (D2.1). Previously used validated questions have been used whenever feasible.

It was agreed that subjects would complete the questionnaire at the time of interview and that it would not be sent out beforehand. It was also agreed that subjects should be briefed in advance about key questions (such as dates of previous occupation, and details of medication taken) so that valuable time will not be wasted at the time of interview. This will be done when telephoning to arrange the interview. Subjects will also be asked to have all medications available for the interviewer to list at the time of the interview.

Piloting should be implemented as soon as ethical approval has been given. To date, ethical approval has been obtained in Greece, Sweden, Germany and the UK. Submissions to ethical committees have been made in the Netherlands and Italy; response is awaited in January 2004. It was agreed that an in-house pilot for the questionnaire would suffice as all questions are from validated sources.

An instruction manual for the research nurses (interviewers) is under development and will be circulated to all well in advance of the data collections commencement.

(The official ISO country codes for the partner countries (below) will be used in all records): GB: Great Britain/United Kingdom; GR: Greece; DE: Germany; IT: Italy; NL: The Netherlands; SE: Sweden.

Expected timescale for commencement of field data collection is as follows: GB: March/April 2004; GR: February 2004; DE: Summer (not before end June 2004) The completion of fieldwork will not be affected by this later start as Germany intend to use a larger team of interviewers than the other partners; IT: February-March 2004; NL: April 2004 and SE: February 2004.
WP3: Assessment of health effects

The main health effect to be assessed is blood pressure (BP). The protocol for BP assessment is attached (D3.1). Other health effects (primarily cardiovascular disease) will be assessed via the questionnaire. It was initially considered to collect blood (e.g. for the analysis of blood lipids, which may be confounders) and urine (for analysis of e.g. sodium, which also may be a confounder) in some countries, but it was later decided that the benefits of collecting these data were outweighed by the potential disadvantages, and it was agreed that the project would not include the collection of urine or blood samples in any partner country.

It was agreed that there would be no need for repeat visits apart from those relating to Work Package 7. As stated in the BP protocol it is not necessary to use the same brand of BP instruments in all partner countries, but it was emphasised that each partner must use validated instruments, as specified by the European Society for Hypertension.

Saliva samples for analysis of cortisol levels will be collected in a subgroup of 500 individuals (i.e. ca 84 participants per partner country), stratified on aircraft noise contours only, aiming for half the sample to be exposed to aircraft noise, and half to be unexposed to noise. A detailed protocol is attached (D3.2).

WP 4: Noise exposure assessment based on questionnaires and noise level maps

An inventory on airport characteristics was made using a questionnaire developed by the Netherlands. Following the questionnaire results, as mentioned above, a detailed protocol has been prepared to allow each partner to define their study population sampling areas based on noise exposure levels (D4.1).

It was agreed that it was feasible for partners to use different models for exposure contrast providing they are comparable with recalculations. Information required for recalculations include: type of aircraft, flight paths, and numbers of aircraft. It was agreed that this information should be available from the Civil Aviation Authority. It was also agreed that different models would be used to assess road traffic noise.

As noted in the protocol for population sampling (D4.1), the primary aim of the selection process is to create exposure contrast. In the next phase of the exposure assessment the prediction of the individual exposure of the participants will be improved by harmonised modelling of noise exposure (if possible) and by taking into account exposure-modifying factors collected during the home visits.

WP5: Assessment of disturbance/annoyance and modifiers of exposure

Assessment of disturbance/annoyance as well as information related to exposure modification will be collected via questions developed in WP5 and included in the main questionnaire (D2.1). The background and rationale for these questions are given in the protocol for assessment of disturbance/annoyance (D5.1). A brief summary of some important issues is given below.
Since most of the necessary questions are rather of an informational type (e. g. type of window), adjustments to local conditions in different centres can be made. Most questions are taken from existing questionnaires and have been tested elsewhere.

The subjects will be given lists and scales when necessary (complex questions and answer alternatives) to help the subjects to remember the questions and the answer-categories. Some questions refer to personal observations and opinions (e. g. annoyance), others are of informative character and refer to facts (e. g. medical treatment, window opening habits). Whenever informative questions are concerned, the interviewer may help to explain the questions to get an answer from the subjects if they are lost or do not understand what is meant. However, whenever personal attitudes are concerned, the interviewers should strictly refer to the text and reading of the questions as provided in the questionnaire.

WP6: Investigation of confounding/effect modification by air pollution on cardiovascular effects

The importance of air pollution as a confounder on BP has been discussed, although it was recognised that some studies had showed associations between air pollution and BP. However, some partners will also explore relations between noise and other cardiovascular effects, where air pollution will be an important confounder.

This work package will be combined with another EU funded project on Airport Indicators\(^1\). Concerns were noted over the use of different air pollution models and it was agreed that all models must be comparable. To ensure this, the data requirements should be similar for each site. It was agreed that Imperial College London could run models for each of the four sites involved in this work package (Athens, Malpensa, Schiphol and London Heathrow).

WP7: Assessment of acute effects on blood pressure after short-term changes in noise levels

After extensive discussion within the project team, the work package on acute effects (WP7) has been revised to focus on the so-called non-dipper phenomenon in relation to both short-term and long-term exposure to noise (for a detailed background – see the protocol: D7.1). WP7 in its revised form will not be possible to perform at Berlin-Tegel airport, as it does not have any night flights. We will select 25 noise exposed subjects and 25 non-exposed (from the main sample of 1000) living around 4 airports, which have some night flights: Athens, Malpensa, Arlanda and London Heathrow.

It was noted that “continuous” BP measurements may be difficult to perform, since already BP measurements every 15 minutes (using traditional cuff-based techniques) may cause disturbance in itself (especially at night). However, recently developed cuff-less techniques of measuring BP may overcome this problem. The Vasotrac instrument measures BP initially in approximately 12-15 seconds, with

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\(^1\) Developing an environmental health information network for large airport systems in Europe University of Maastricht The Netherlands. Commissioned July 31, 2001
continual updates four to six times a minute. Very slight changes in blood pressure down to 40mmHg systolic can be measured. It should be noted that the Vasotrac device is not ambulant and is therefore feasible for night-time use only. Thus, another, validated device (MobiloGraph) will be used for daytime measurements.

Night-time noise meters will be placed in the bedroom and outside the houses of the selected sample. It was agreed that WP7 should use noise meters giving continuous measurements for the nights, the data to be downloaded onto a PC.

WP9: Dissemination

A leaflet has been produced and distributed to all partners and the EC. The leaflet has also been distributed at various meetings and conferences.

The website is operational (www.hyena.eu.com). All partners and the EC scientific officer have been issued with a password for accessing the private area of the website, which contains project protocols, meeting minutes and other relevant material.

A paper outlining the HYENA study protocol was presented at the ISEE conference in Perth, September 2003².

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</tr>
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<td>9</td>
<td>Dissemination</td>
<td>P1</td>
<td>18 (14)</td>
<td>4</td>
<td>48</td>
<td>D9.1, D9.2, D9.3</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>495 (371)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$^3$ Work package leader listed first in bold

$^4$ Total staff person months (EC funded staff within parentheses)

$^5$ Refer to table 3
Table 2. (As in the technical annex pp28-30) List of Milestones (ordered by Delivery date)

<table>
<thead>
<tr>
<th>M No</th>
<th>Title</th>
<th>Delivery date</th>
<th>Participants</th>
<th>Description</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1.1</td>
<td>Project start</td>
<td>0</td>
<td>All</td>
<td></td>
<td>Official project start: 01-12-2002&lt;br&gt;Real project start: 01-02-2003</td>
</tr>
<tr>
<td>M6.1</td>
<td>Protocol for modelling air pollution</td>
<td>3</td>
<td>P1, P3, P5, P6, P7</td>
<td>A standardised protocol for air pollution modelling will be agreed by participating partners</td>
<td>A protocol has been drafted and will be discussed at the next project meeting. The final protocol (D6.1) will be available by month 18.</td>
</tr>
<tr>
<td>M2.1</td>
<td>Protocol for selection of study population</td>
<td>6</td>
<td>All</td>
<td>A standardised protocol for selection of study subjects will be agreed by all partners</td>
<td>Completed (D4.1)</td>
</tr>
<tr>
<td>M2.2</td>
<td>Questionnaire</td>
<td>6</td>
<td>All</td>
<td>Standardised questionnaires to be translated and back-translated for participating countries</td>
<td>English version completed and agreed (D2.1).&lt;br&gt;Translation complete for most countries; back-translation will be completed before start of field-work</td>
</tr>
<tr>
<td>M3.1</td>
<td>Protocol for assessment of blood pressure</td>
<td>6</td>
<td>All</td>
<td>A standardised protocol for blood pressure assessment will be agreed by all partners</td>
<td>Completed (D3.1)</td>
</tr>
<tr>
<td>M3.2</td>
<td>Protocol for assessment of stress hormones</td>
<td>6</td>
<td>All</td>
<td>A standardised protocol for stress hormone assessment will be agreed by all partners</td>
<td>Completed (D3.2)</td>
</tr>
<tr>
<td>M4.1</td>
<td>Selection of study areas</td>
<td>6</td>
<td>All</td>
<td>Selection of study areas in four exposure groups</td>
<td>See M2.1 (D4.1)</td>
</tr>
<tr>
<td>M. No</td>
<td>Title</td>
<td>Delivery date</td>
<td>Participants</td>
<td>Description</td>
<td>Status</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------------------------------------</td>
<td>---------------</td>
<td>----------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>M5.1</td>
<td>Protocol for assessment of disturbance/annoyance and modifiers of exposure</td>
<td>6</td>
<td>All</td>
<td>A standardised protocol for assessing subjective responses to noise and modifiers of exposure will be agreed by all partners</td>
<td>Completed (D5.1)</td>
</tr>
<tr>
<td>M7.1</td>
<td>Selection of study population for short-term effect study</td>
<td>6</td>
<td>P1, P2, P4, P5, P6, P7</td>
<td>The principles of the study population selection has been agreed (D7.1); the actual sampling can only be done during the initial fieldwork.</td>
<td></td>
</tr>
<tr>
<td>M7.2</td>
<td>Protocol for assessment of short-term noise exposure and blood pressure</td>
<td>6</td>
<td>P1, P2, P4, P5, P6, P7</td>
<td>A standardised protocol for assessment of short-term noise exposure and acute changes in blood pressure will be agreed by all partners</td>
<td>Completed (D7.1)</td>
</tr>
<tr>
<td>M2.3</td>
<td>Selection of study population</td>
<td>12</td>
<td>All</td>
<td>Study population selected according to the standardised protocol</td>
<td>The principles of the study population selection has been agreed (D4.1). The actual sampling is currently being done will be finished by the end of February 2004 in all partner countries.</td>
</tr>
<tr>
<td>M4.2</td>
<td>Protocol for exposure assessment</td>
<td>12</td>
<td>All</td>
<td>A standardised protocol for exposure assessment will be agreed by all partners</td>
<td>The protocol for exposure assessment builds on the protocol for study area selection (D4.1) and the modifiers of exposure developed in WP5 (D5.1). This protocol will be further discussed at the project meeting in Athens (April 2004), and will be finally agreed at the mid-term review meeting in London.</td>
</tr>
<tr>
<td>M9.1</td>
<td>Project web-site</td>
<td>12</td>
<td>P1</td>
<td>HYENA web-site will be available by the 12 month of the project and will then be updated continuously</td>
<td>Operational (<a href="http://www.hyena.eu.com">www.hyena.eu.com</a>)</td>
</tr>
<tr>
<td>M. No</td>
<td>Title</td>
<td>Delivery date</td>
<td>Participants</td>
<td>Description</td>
<td>Status</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------------------------------------</td>
<td>---------------</td>
<td>--------------</td>
<td>------------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>M6.2</td>
<td>Completion of air pollution modelling</td>
<td>18</td>
<td>P1, P3, P5, P6, P7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M6.3</td>
<td>Air pollution modelling validation</td>
<td>24</td>
<td>P1, P3, P5, P6, P7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M7.3</td>
<td>Completion of short-term noise and blood pressure data collection</td>
<td>24</td>
<td>P1, P2, P4, P5, P6, P7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M2.4</td>
<td>Data collection by questionnaire</td>
<td>30</td>
<td>All</td>
<td>Collection of data on health and relevant confounders</td>
<td></td>
</tr>
<tr>
<td>M3.3</td>
<td>Completion of blood pressure data collection</td>
<td>30</td>
<td>All</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M5.2</td>
<td>Disturbance/annoyance analysis</td>
<td>30</td>
<td>All</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M7.4</td>
<td>Completion of analyses of short-term noise exposure and blood pressure effects</td>
<td>30</td>
<td>P1, P2, P4, P5, P6, P7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M2.5</td>
<td>Completion of questionnaire database</td>
<td>33</td>
<td>All</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M4.3</td>
<td>Completion of exposure database</td>
<td>33</td>
<td>All</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M6.4</td>
<td>Completion of data analysis</td>
<td>33</td>
<td>P1, P3, P5, P6, P7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M3.4</td>
<td>Completion of stress hormone data collection</td>
<td>34</td>
<td>All</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M5.3</td>
<td>Completion of disturbance/annoyance database</td>
<td>34</td>
<td>All</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# ANNEX II: Year 1 Progress Report

1st December 2002 – 30th November 2003

<table>
<thead>
<tr>
<th>M. No</th>
<th>Title</th>
<th>Delivery date</th>
<th>Participants</th>
<th>Description</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>M7.5</td>
<td>Report on short-term noise exposure and blood pressure effects</td>
<td>36</td>
<td>P1, P2, P4, P5, P6, P7</td>
<td>A separate report on the acute effects on blood pressure related to short-term changes in noise exposure will be produced</td>
<td></td>
</tr>
<tr>
<td>M8.1</td>
<td>Integrated database</td>
<td>36</td>
<td>All</td>
<td>Database including all information necessary for performing the pooled analysis</td>
<td></td>
</tr>
<tr>
<td>M8.2</td>
<td>Completion of data analyses</td>
<td>46</td>
<td>All</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M1.2</td>
<td>Final report</td>
<td>48</td>
<td>P1</td>
<td>Description of the main results and achievements of the project; comments on possible follow-up</td>
<td></td>
</tr>
<tr>
<td>M6.5</td>
<td>Air pollution exposure report</td>
<td>48</td>
<td>P1, P3, P5, P6, P7</td>
<td>A separate report of the results of the air pollution exposure assessment will be include in the final report</td>
<td></td>
</tr>
<tr>
<td>M9.2</td>
<td>Booklet</td>
<td>48</td>
<td>P1</td>
<td>A booklet for policy makers will be produced in addition to the final report</td>
<td></td>
</tr>
</tbody>
</table>
### Table 3. (As in the technical annex pp31-32) List of Deliverables (ordered by Delivery date)

<table>
<thead>
<tr>
<th>D. No</th>
<th>Deliverable Title</th>
<th>Delivery date</th>
<th>Nature</th>
<th>Dissemination level</th>
<th>Dissemination target</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>D9.1</td>
<td>Project brochure</td>
<td>4</td>
<td>R</td>
<td>PU</td>
<td></td>
<td>Completed</td>
</tr>
<tr>
<td>D6.1</td>
<td>Air pollution modelling protocol</td>
<td>6</td>
<td>O</td>
<td>RE</td>
<td>Consortium</td>
<td>Draft protocol available; will be finalised during the next work period</td>
</tr>
<tr>
<td>D2.1</td>
<td>Standardised questionnaire</td>
<td>6</td>
<td>R</td>
<td>RE</td>
<td>Consortium</td>
<td>Completed (translation and back-translation on-going; will be ready before start of field-work)</td>
</tr>
<tr>
<td>D3.1</td>
<td>Standardised protocol for blood pressure assessment</td>
<td>6</td>
<td>R</td>
<td>RE</td>
<td>Consortium</td>
<td>Completed</td>
</tr>
<tr>
<td>D3.2</td>
<td>Standardised protocol for assessment of stress hormones</td>
<td>6</td>
<td>R</td>
<td>RE</td>
<td>Consortium</td>
<td>Completed</td>
</tr>
<tr>
<td>D4.1</td>
<td>Selection of study areas for noise exposure assessment</td>
<td>6</td>
<td>O</td>
<td>RE</td>
<td>Consortium</td>
<td>Protocol completed. Study area selection ongoing; will be ready before start of field-work</td>
</tr>
<tr>
<td>D5.1</td>
<td>Standardised protocol for assessment of disturbance/annoyance</td>
<td>6</td>
<td>R</td>
<td>RE</td>
<td>Consortium</td>
<td>Completed</td>
</tr>
<tr>
<td>D7.1</td>
<td>Standardised protocol for assessment of short-term noise exposure and blood pressure</td>
<td>6</td>
<td>R</td>
<td>RE</td>
<td>Consortium</td>
<td>Completed</td>
</tr>
<tr>
<td>D9.2</td>
<td>Project web-site</td>
<td>12</td>
<td>O</td>
<td>PU</td>
<td></td>
<td>Operational</td>
</tr>
<tr>
<td>D2.2</td>
<td>Population sample including subsets</td>
<td>12</td>
<td>O</td>
<td>CO</td>
<td>Consortium</td>
<td>Protocol completed. Study area selection ongoing; will be ready before start of field-work</td>
</tr>
<tr>
<td>D4.2</td>
<td>Standardised protocol for assessing noise exposure</td>
<td>12</td>
<td>R</td>
<td>RE</td>
<td>Consortium</td>
<td>Initial part completed; detailed protocol to be agreed at the Athens project meeting (April 2004)</td>
</tr>
<tr>
<td>D1,2.1</td>
<td>Annual report</td>
<td>12</td>
<td>R</td>
<td>RE</td>
<td>EC</td>
<td>Completed</td>
</tr>
</tbody>
</table>

---

6 PU=Public, RE=restricted to a group specified by the consortium (including EC services), CO= confidential, only for members of the consortium (including ECX services)

7 Indicate target audience or the potential users/beneficiaries of such a deliverable
<table>
<thead>
<tr>
<th>D.No</th>
<th>Deliverable Title</th>
<th>Delivery date</th>
<th>Nature</th>
<th>Dissemination level</th>
<th>Dissemination target</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2.3.1</td>
<td>Progress report on health data collection</td>
<td>24</td>
<td>R</td>
<td>RE</td>
<td>Consortium</td>
<td></td>
</tr>
<tr>
<td>D6.2</td>
<td>Air pollution modelling and validation</td>
<td>24</td>
<td>O</td>
<td>RE</td>
<td>Consortium</td>
<td></td>
</tr>
<tr>
<td>D1.1</td>
<td>Mid-term review</td>
<td>24</td>
<td>R</td>
<td>RE</td>
<td>EC</td>
<td></td>
</tr>
<tr>
<td>D1.2.2</td>
<td>Annual report</td>
<td>24</td>
<td>R</td>
<td>RE</td>
<td>EC</td>
<td></td>
</tr>
<tr>
<td>D7.2</td>
<td>Short term effects database</td>
<td>30</td>
<td>O</td>
<td>CO</td>
<td>Consortium</td>
<td></td>
</tr>
<tr>
<td>D2.3.2</td>
<td>Health database (including blood pressure measurements)</td>
<td>33</td>
<td>O</td>
<td>CO</td>
<td>Consortium</td>
<td></td>
</tr>
<tr>
<td>D4.3</td>
<td>Noise exposure database</td>
<td>33</td>
<td>O</td>
<td>CO</td>
<td>Consortium</td>
<td></td>
</tr>
<tr>
<td>D6.3</td>
<td>Air pollution exposure database</td>
<td>33</td>
<td>O</td>
<td>CO</td>
<td>Consortium</td>
<td></td>
</tr>
<tr>
<td>D5.2</td>
<td>Disturbance/annoyance database</td>
<td>34</td>
<td>O</td>
<td>CO</td>
<td>Consortium</td>
<td></td>
</tr>
<tr>
<td>D3.3</td>
<td>Stress hormones database</td>
<td>34</td>
<td>O</td>
<td>CO</td>
<td>Consortium</td>
<td></td>
</tr>
<tr>
<td>D8.1</td>
<td>Integrated database</td>
<td>36</td>
<td>O</td>
<td>CO</td>
<td>Consortium</td>
<td></td>
</tr>
<tr>
<td>D7.3</td>
<td>Short-term effects report</td>
<td>36</td>
<td>R</td>
<td>RE</td>
<td>EC</td>
<td></td>
</tr>
<tr>
<td>D1.2.3</td>
<td>Annual report</td>
<td>36</td>
<td>R</td>
<td>RE</td>
<td>EC</td>
<td></td>
</tr>
<tr>
<td>D9.3</td>
<td>End of project conference</td>
<td>45</td>
<td>O</td>
<td>PU</td>
<td>General Public</td>
<td></td>
</tr>
<tr>
<td>D4.4</td>
<td>Noise exposure assessment report</td>
<td>48</td>
<td>R</td>
<td>RE</td>
<td>EC</td>
<td></td>
</tr>
<tr>
<td>D6.4</td>
<td>Air pollution modelling validation report</td>
<td>48</td>
<td>R</td>
<td>RE</td>
<td>EC</td>
<td></td>
</tr>
<tr>
<td>D9.4</td>
<td>Informative booklet</td>
<td>48</td>
<td>R</td>
<td>PU</td>
<td>Policy makers</td>
<td></td>
</tr>
<tr>
<td>D1.2</td>
<td>Final report</td>
<td>48</td>
<td>R</td>
<td>PU</td>
<td>EC</td>
<td></td>
</tr>
</tbody>
</table>

8 PU=Public, RE=restricted to a group specified by the consortium (including EC services), CO= confidential, only for members of the consortium (including ECX services)
9 Indicate target audience or the potential users/beneficiaries of such a deliverable
2.2.1.1 Discussion-Conclusion

The timetable indicated in the Technical Annex has been kept for most of the work packages as shown in the Annual report, with adjustment for the project start, counting January 2003 as month 0. Thus, most protocols were delivered at the project meeting in London September 2003, and although some protocols have been revised after that date, this annual report includes all deliverables as planned.

Given the availability of data for the selection of study population samples, there is no way to a priori ensure that the selection procedure will lead to inclusion of susceptible sub groups with regard to the health impact of noise (in particular people with noise-induced sleep disturbance and people with cardiovascular disease). However, sleep disturbance and cardiovascular disease are relatively common conditions, especially in the older age groups, and we therefore believe that we will get a sufficient number of study participants in these categories to be able to perform the planned sub-group analyses.

Detailed time-activity data were considered neither feasible to collect, nor necessary for the analysis.

In the initial study plan, we aimed to identify a sub-sample of individuals for saliva cortisol analysis, stratified according to both type and level of noise exposure. The consortium has since agreed that stratifying this sub-sample according to (aircraft) noise level would be sufficient for the purpose of the study.

The main discussion point has been the revision of WP7 as mentioned earlier in this report. The discussion in the consortium has been very fruitful and the revised protocol will add interesting new information to the project as a whole.

The UK partner has experienced unexpected problems with the ethics application, and although the initial application was submitted in July 2003, approval was only received in the beginning of January 2004, after two re-submissions. Very few ethical concerns were raised; most comments were related to the research plan, and clearly showed that the reviewers at the initial committee had not understood the study design. Although this caused a vast amount of unnecessary work, the timing of the approval will not hamper the commencement of the fieldwork. Other partners reported no similar problems.

2.2.1.2 Future action

The data collection will form the major part of the 2004 work, will commence according to the schedule outlined in this report, and will be finalised in 2005. The detailed noise exposure assessment protocol will be further discussed at the project meeting in Greece in April 2004, and will be finalised and agreed at the mid-term review meeting in London. Air pollution modelling will commence for the participating airports in the end of 2004 and will be finalised during 2005. A mid-term review will be planned to take place in London in December 2004.
2.2.1.3  **Action requested from the Commission**

Although outside the current reporting period, it is worth to note that the coordinator requested support for the UK ethics application, and that a letter was produced by the scientific officer and submitted to the ethical committee in December 2003. No further action is requested from the Commission at this stage.
2.3 Description of the Work Packages

(Deletions in red/Additions in blue)

2.3.1 WP1: Coordination

Phase: Year 1
Start date: 0
Completion date: 48
Current status: Ongoing
Partners responsible: P1
Person months per partner¹⁰: P₁scientific (6,5), P₁administration (12,10)
Total person months¹¹: 18 (15)
Already devoted person months per partner¹¹: P₁scientific (3,2), P₁administration (4,4)
Total person months already devoted¹²: 7(6)

Objectives

The objectives of WP1 are:
- to guarantee the scientific and administrative management of the HYENA project resources within the Consortium and towards the EC, according to EC procedures;
- to guarantee a proper interface between the Consortium and the EC;
- to guarantee the proper progress report to EC;
- to coordinate and harmonize partners scientific and administrative activities toward the project objectives, through periodic meetings and communications;
- to define and apply internal quality standard for communication and co-operative work.

Methodology

The HYENA project consists of 7 partners from 6 EC countries. The management of this project can be divided into two levels:
- Overall project management as part of the co-ordinator responsibilities;
- Object oriented project management.

The project is decomposed into objects having well-defined interfaces and it is separated into multiple relatively independent tasks; the management of the project objectives will be realised through the object oriented WPs in which each Principal Contractor shares the responsibility.

WP1 is devoted to the supervision of the overall activities. It will report to the Commission about the achievements of the project, will control and assure the quality of the documentation, the good use of the financial resources, and the fulfilment of timetables and of agreed communications protocols among partners and the Commission.

¹⁰ Person months are given for each WP for total staff (incl. permanent staff) and EC funded staff
¹¹ Total person months for each WP (EC funded staff within parentheses)
Description of tasks

Scientific coordination
1. Deliverables handling and quality assurance. To assure a high technical and scientific quality level of the work-packages achievements. A Steering Committee will be constituted, to which those responsible for each work-package will take part.
2. Information and documentation flow. The communication between partners will be managed via e-mail, telephone conferences and bi-annual meetings. Supervision of quality and completeness of documentation will be performed. During the bi-annual meetings partial results will be presented to stimulate exchange of ideas and problem solving.
3. Scientific reports. Preparation of the scientific parts of the annual progress reports in collaboration with partners.

Administrative coordination
4. Administrative and financial management. To supervise the distribution of work and resources. The completeness of the work of each work-package and the use of the resources allocated to each partner will be checked.
5. Financial reports. Preparation of the financial parts of the annual progress reports in collaboration with partners.
6. Contacts with the Commission. The Commission will be provided with annual progress reports, the agreed deliverables, the annual and mid-term review and the final report. The Commission will be informed in advance about the Consortium meetings, the Scientific Officer will be invited to these meetings and the Commission will be provided with meeting minutes.

A mid-term review of the progress of the project will be required by the Commission services (see Section 4) and is anticipated to take place at the project meeting planned for month 24.

7. Meetings. Nine Eight project management meetings will be held:
   a) Start-up meeting at month 0;
   b) Project management meetings at months 8, 15, 23\(^\text{12}\), 30, 36 and 42;
   c) End of project meeting at month 48

Progress during the first reporting period
The start-up meeting was held in London as planned 24 January 2003 (month 0). We were very fortunate to be able to recruit the scientific coordinator (Ms Dudley) already before the contract had been signed by both parties (January 2003), which was crucial to the efficient and timely start of the project.
A second meeting (first project management meeting was held in London 11-12 September 2003 (month 8).
Furthermore two conference calls have taken place (16 May, and 15 December 2003) to ensure efficient communication between partners between meetings.
Minutes have been prepared for each meeting and conference call, distributed to partners and the EC scientific officer. The minutes are also posted on the private part of the website.

\(^{12}\) Combined with Mid-Term Review Meeting
Deliverables

D1.1. Mid-term review. This review is conducted in order to evaluate the scientific progress of the project by a commission of independent experts chosen in common agreement by P1 and the Commission Services. **Delivery date:** 24 months; **Nature:** Report; **Dissemination level:** Restricted to consortium;

D1.2.1-3. Annual reports. These report will describe the progress of the project to help the consortium and the commission to evaluate project development. **Delivery dates:** 12, 24 and 36 months; **Nature:** Report; **Dissemination level:** Restricted to consortium; D.1.2 Annual report for months 12 completed.

D1.3. Final report. This report will integrate the final report of each work package and will constitute a document illustrating the achievements of the Project. **Delivery date:** 48 months; **Nature:** Report; **Dissemination level:** Public.

Milestones

(M1.1) Project start-up (month 0);
Note that the official start up date for the project was 01-12-2002, but it was agreed with the deputy scientific officer (Mr Callum Searle) that the real project start would be January 2003, given the delay in delivery of the contract from the EC (received in London 09-01-2003).

(M1.2) Final report (month 48);

Periodic/variable milestones: Project annual Reviews and Reports, Periodic Progress Reports and Minutes of meetings.
### 2.3.2 WP2: Epidemiological study design and data collection via questionnaire

<table>
<thead>
<tr>
<th>Phase:</th>
<th>Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start date:</td>
<td>0</td>
</tr>
<tr>
<td>Completion date:</td>
<td>36</td>
</tr>
<tr>
<td>Current status:</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Partners responsible:</td>
<td>P1, P2, P3, P4, P5, P6, P7</td>
</tr>
<tr>
<td>Person months per partner:</td>
<td>P1(28,22), P2(9,4), P3(6,6), P4(4,3), P5(3,2), P6(9,5), P7(6,3)</td>
</tr>
<tr>
<td>Total person months:</td>
<td>65 (45)</td>
</tr>
<tr>
<td>Already devoted person months per partner:</td>
<td>P1(7,5), P2(2,0), P3(1,1), P4(1,0), P5(2,1) P6(4,3), P7(1,0,5)</td>
</tr>
<tr>
<td>Total person months already devoted:</td>
<td>18 (10.5)</td>
</tr>
</tbody>
</table>

**Objectives**

WP2 aims to select study subjects for epidemiological studies of noise exposure and high blood pressure in adult populations living near airports in six European countries (Germany, Greece, Italy, the Netherlands, Sweden and the United Kingdom), focusing on aircraft and road traffic noise. The objectives are:

- To select study subjects living in the vicinity of major European airports (Berlin-Tegel, Athens, Malpensa, Schiphol, Arlanda (including Bromma), and London Heathrow), and a control group;
- To form a sampling frame for study subjects to be investigated in relation to hormonal effects of noise;
- To design a study specific questionnaire for collecting information on environmental exposure and life style factors, based on existing validated questionnaires.

**Methodology and study materials**

A total of around 1,500 - 2,000 persons (men and women, 45-70 years of age), who have lived at least five years in the vicinity of the six major European airports will be selected using noise contours around the airports, maximising exposure contrast (WP4). Assuming a participation rate of between 50%-70%, ca. 1,000 individuals (800 exposed and 200 controls) in each country will be included in the final study population.

A standardised questionnaire will be designed, including validated questions on annoyance and sleep disturbance (WP4) as well as noise disturbance from other sources than air and road traffic (e.g. neighbours). The questionnaire will also assess other major well known confounders (e.g. genetic factors, dietary habits, smoking and other life-style factors) using questions based on protocols previously developed by the UK partner, who has considerable experience in conducting studies on risk factors related to blood pressure. The questionnaire will include time-activity data to account for individual movements during the study period.

The selection procedure will lead to inclusion of susceptible sub groups with regard to the health impact of noise (e.g. people with noise-induced sleep disturbance and people with severe cardiovascular disease). The selection protocol will ensure that a sufficient number of susceptible individuals is included in the study population.
Progress during the first reporting period

A protocol for defining the study areas for selection of the study population has been completed in WP4 (D4.1). Stratification by age will ensure that elderly people likely to be susceptible to noise are included in the study sample. The standardised questionnaire has been completed as planned; validated questions from relevant sources have been used whenever possible.

Deliverables

D2.1: Standardised questionnaires to be used in all partner countries. The questionnaire will be based on questionnaires previously used by P1 (in the so called INTERSALT and INTERMAP projects), who has considerable experience in collecting relevant data on smoking, dietary habits, heredity and other relevant factors determining blood pressure. Questionnaires will be translated and back-translated to ensure validity. **Delivery date:** 6 months; **Nature:** Other; **Dissemination level:** Restricted to consortium;

Standardised questionnaire complete. Translation has been completed in most partner countries; back translation to a lesser extent, but will be completed before start of fieldwork in order to identify any potentially problematic questions.

D2.2: Population sample including subsets. Samples of 1,500 – 2,000 individuals 45-70 years old in each centre with varying levels of noise exposure as well as subsets of study persons for stress hormone analysis (n=500) and acute effects (n=1,800).

**Delivery date:** 12 months; **Nature:** Other; **Dissemination level:** Confidential;

D2:3.1-2. Health database. From the sample in D2.2, each centre will produce a database including ca.1,000 persons. The database will contain information from the questionnaire focusing on individual environmental exposures, socio-economic conditions, diet and smoking as well as on symptoms of cardiovascular disease (e.g. angina). The health database will also include blood pressure measurements collected at the time of interview according to the protocol designed in WP3. **Delivery dates:** 24, 33 months; **Nature:** Other; **Dissemination level:** Confidential;

Milestones

(M2.1) A protocol for selection of study subjects (month 6).
(M2.2) A standardised, translated and back-translated questionnaires (month 6).
(M2.3) Selection of study subjects (including subsets for WP2 and WP4) will take place during the first 12 months of the project.
(M2.4) Data collection via questionnaire will continue until month 30.
(M2.5) A database within each centre will be created by month 33.
### WP3: Assessment of health effects

**Phase:** Year 1  
**Start date:** 0  
**Completion date:** 36  
**Current status:** Ongoing  
**Partners responsible:** P1, P2, P3, P4, P5, P6, P7  
**Person months per partner:** P1(28,22), P2(20,17), P3(21,21), P4(22,17), P5(4,3), P6(26,21), P7(24,21)  
**Total person months:** 145 (122)  
**Already devoted person months per partner:** P1(3,1), P2(0,0), P3(1,1), P4(2,0), P5(1,0), P6(3,2), P7(0,0)  
**Total person months already devoted:** 10 (4)

#### Objectives

WP3 aims to assess blood pressure, hypertension and IHD in the selected study population and in controls. WP3 will also assess stress hormones in a sub-set of the study population.

#### Methodology and study materials

Specially trained staff will assess blood pressure at home visits. The visits will be randomly distributed over the day to account for diurnal variations in blood pressure, when feasible. Repeat visits will be performed in selected areas to assess daily intra-individual variability in blood pressure, in connection with the data collection for WP7. The outcome will be repeated blood pressure readings (at single visit) at the time of interview, using the standard procedure developed for the project. In a sub-sample (n=180), 24h-48h measurements will be performed, using ambulatory equipment during the day and stationary equipment during night, to allow estimates of acute changes in blood pressure following changes in noise exposure (WP7). Information on exposure (address, housing conditions etc) and known risk factors for hypertension (primarily “life style” factors, such as physical activity, diet and smoking, but also occupational exposure, heredity etc) will be collected by interview using the standardised questionnaire developed in WP2. Height and weight will be measured during the home visit. Some risk factors may also be important confounders (e.g. smoking, occupational noise exposure), which will be addressed in the analyses. Medical history including heart disease (angina, IHD) and medication will be taken.

A sub-sample of individuals (n=500) will be identified and stratified according to type and level of noise exposure (WP4). In these subjects, cortisol levels will be measured in saliva samples collected during weekends. Sample tubes and instruction for sampling will either be sent out by post or delivered by the research nurse at the time of interview. The saliva samples will be frozen after collection has been finished, or alternatively, a preservative will be added to permit storage and transportation at room temperature. The samples will be centrifuged and stored at each location in a deep-freezer until transported to the analysing laboratory in Stockholm, which uses a fluoroimmunoassay technique for measuring saliva cortisol. The laboratory is included in a European network for comparisons of saliva cortisol concentration in different populations.
Progress during the first reporting period
Standardised protocols for assessment of BP and stress hormones have been prepared (D3.1, D3.2) in accordance with the work plan.

Deliverables
D3.1: ✔ Protocol for assessment of blood pressure. The protocol will be based on protocols previously used by P1 (in the so called INTERSALT and INTERMAP projects), who has considerable experience in designing blood pressure measurement protocols for international studies. Delivery date: 6 months; Nature: Other; Dissemination level: Restricted to consortium;

D3.2: ✔ Protocol for assessment of stress hormones. This protocol will build on protocols designed by partner P4, who has considerable experience in assessing stress hormones. Delivery date: 6 months; Nature: Other; Dissemination level: Restricted to consortium;

D3.3: Stress hormones database. Delivery date: 34 months Nature: Other; Dissemination level: Confidential;

WP3 will generate a database of around 6,000 individuals containing information on health parameters from questionnaires as well as blood pressure measurements, height and weight. Blood pressure measurements for each individual to be used as the main health outcome measure for further data analysis to be included in D2.3, and for a subset of 500 persons also saliva samples for analysis of stress hormones (D3.3). Each partner will be responsible for data entry of the population studied locally.

Milestones
(M3.1) ✔ A protocol for the assessment of blood pressure (month 6).
(M.3.2) ✔ A protocol for assessment of stress hormones (month 6).
(M.3.3) Collection of blood pressure data at each centre using spot measurements (month 30).
(M.3.4) Collection of stress hormone data (month 34).
2.3.4 WP 4: Noise exposure assessment based on questionnaires and noise level maps

Phase: Year 1
Start date: 0
Completion date: 36
Current status: Ongoing
Partners responsible: P1, P2, P3, P4, P5, P6, P7
Person months per partner: P1(6,4), P2(12,9), P3(18,18), P4(7,6), P5(6,3), P6(9,5), P7(9,6)
Total person months: 67 (51)
Already devoted person months per partner: P1(1,0), P2(1,0), P3(1,1), P4(0,0), P5(0,0), P6(1,0), P7(2,1)
Total person months already devoted: 6 (2)

Objectives
Individual exposure to noise will be assessed by linking the home address to modelled aircraft and road traffic noise levels. Historical data (if possible from 1990 onwards) on noise will be used, allowing for latency time between exposure and health effects. Information on noise-modifying factors will be collected during home visits allowing the individual noise exposure indicators to be refined. Cumulative exposure estimates will be computed by multiplying individual residence noise data by the number of years spent at each address.

Methodology and study materials
Residential areas will be selected and classified into four categories (using existing noise maps) to maximise exposure contrast within centres: 1) predominantly aircraft noise 2) predominantly road traffic noise 3) both aircraft and road traffic noise and 4) absence of aircraft and virtually absence of road traffic noise: < 50-55 dB(A).

Individual exposure to noise will be modelled for 250 subjects per exposure category. From an inventory of the data available on current exposure around the airports, it became clear that around most airports high exposed addresses in category 3 are lacking. Therefore a slightly modified approach for the selection of locations is followed. An exposure contrast will be created for aircraft noise and road traffic noise separately, by selecting sufficient participants above 55 dB(A) for aircraft noise (preferably more than 45%), above 60 dB(A) for road traffic noise (preferably more than 40%), and below 50dB(A) (at least 15%) for both aircraft and road traffic noise. Therefore, some of the participants exposed to aircraft noise are also exposed to road traffic noise, but they will not necessarily have a high exposure from both aircraft and road traffic noise sources.

Aircraft noise exposure will be assessed by linking home addresses to aircraft noise levels, using a Geographic Information System (GIS). Time-weighted equal-energy and/or maximum levels will be computed, based on air traffic statistics (spatial resolution: 250-500 meter). Exposure to road traffic noise will be estimated using information on location of homes in relation to roads, traffic flows and building heights (spatial resolution: 50-150 meter). Retrospective data on aircraft and road traffic may be used to produce historical noise exposure during a relevant time period, e.g. from 1990, allowing exposure classification prior to clinical testing and interview.
Refinement of the exposure estimates will be made during the home visit. Information on home characteristics (e.g. insulation, position of rooms) will be collected, and (where necessary) information on the locations and traffic flows on nearby roads.

Cumulative exposure estimates will be computed by multiplying individual (historical) residence noise data by the number of years spent at each address.

WP4 will start with an inventory and comparison of the models used locally and the data available, followed by development of core protocols, including a validation study and global harmonisation of data to ensure cross-border comparability in the pooled analyses.

**Progress during the first reporting period**

A questionnaire was prepared to gain insight in the possibilities for the harmonisation (or approximation) of methods for the noise assessment in HYENA. The questionnaire focused on airport characteristics, the models used for aircraft and road noise in the participating countries and the availability of data for modelling purposes. In addition, the documentation for the questionnaire included the objectives of the exposure assessment to noise, the proposed noise indicators in HYENA, and a description of the current practice development in the field of environmental noise in the EU. The questionnaire was distributed in April 2003 with responses from partners received over the period May – July 2003.

The results indicated a broad range in the number of people exposed to aircraft noise levels above 55dB(A) near the six airports. $L_{den}$ and $L_{night}$ are the metrics for aircraft noise that are available or will become available in the near future for all participating centres. The noise levels around the six airports are assessed using different models, with the exception of Malpensa and Athens where the Integrated Noise Model (INM) is applied. In Sweden, a model is used that is very similar to INM. The Netherlands has experience in the use of INM.

The following conclusions on aircraft noise have been drawn:

- There are no reservations in the use of current information on aircraft noise levels for the selection of the study population.
- A reasonable estimation of the current aircraft noise situation appears possible, and
- The differences in methods are adjustable, within an accuracy of a few DB’s.

For the main study, it is recommended to verify the adjustment by recalculation of (specific) situations with a “Standard model”. This can be limited to a few common flight paths with a typical aircraft (B747, B737) or expanded to a full evaluation of spatial pattern of noise exposure. This choice will be made once additional information has been received on partners’ access to data on local aircraft noise models.

For road traffic noise, the harmonisation will be more difficult than for aircraft noise, as there are differences in the metrics and methods used in the assessment of road traffic noise in the UK, Sweden, Germany and the Netherlands. There are no
national methods available in Italy and Greece. The conclusions drawn on road traffic assessment noise are:

- There is a reasonable estimation of the current situations in Germany, Sweden, the UK and the Netherlands.
- There are no reservations in the use of current information for the selection of study population in Germany, Sweden, the UK and the Netherlands. A simplified method can be applied in the other locations.
- The partners in Greece and Italy should endeavour to collect data for road traffic noise assessments in the main study. Work Package 6 requires similar (more detailed) information for the modelling of air pollution from road traffic, so the activities of both work packages can be linked.
- The differences in methods are considered adjustable to within a few dB’s.

It is recommended that adjustments are verified following recalculation of specific situations to produce a “Standard model”. The accuracy of the model used in the main study will depend on the number of specific situations identified.

A protocol for the selection of study areas was distributed in September 2003 (D4.1). The selection of the study areas and the addresses identified for HYENA will be determined on the basis of existing data on aircraft noise and road traffic noise levels. According to the Technical Annex, residential areas and addresses are to be selected and classified into four exposure categories:

- Predominantly aircraft noise
- Predominantly road traffic noise
- Both aircraft and road traffic noise
- Absence of aircraft and virtual absence of road traffic noise (Lower than 50-55 dB(A))

The inventory of the models used locally and the data available make it clear that addresses in category three are lacking in some countries. Therefore the selection process has been modified slightly, as documented in the protocol.

Given the results of the inventory of models and their comparability, and the limited time period available for the selection of study areas and population, it has not been possible to use comparable data on noise levels between countries in the selection process. This lack of comparable data is not viewed as a major obstacle in the selection process, providing that each country makes a clear distinction between high and low exposed locations and/or populations.

**Change of plans**

The inventory has revealed that several models for aircraft and road traffic noise are used around the six airports. Several initiatives are under way to harmonise noise modelling in the European Union (for example ENHANCE on aircraft noise and HARMONISE on road traffic and rail noise). For HYENA to benefit from the results of these ongoing projects it is recommended that the development of a standardised protocol be postponed to month 24 (instead of month 12). This postponement will not hinder the progress on any other work package in the HYENA project.
**Deliverables**

D4.1: Selection of study areas for noise exposure assessment. **Delivery date:** 6 months; **Nature:** Other; **Dissemination level:** Restricted to consortium;

D4.2: Standardised protocol for noise exposure assessment. **Delivery date:** 12 months; **Nature:** Other; **Dissemination level:** Restricted to consortium;

D4.3: Noise exposure database. Containing information on long-term exposure to noise from aircraft and road traffic, for a total of 6,000 persons aged 45-70 years, based on the sample from WP2. **Delivery date:** 33 months; **Nature:** Other; **Dissemination level:** Restricted to consortium;

D4.4: Noise exposure assessment report. A full report, including results on the validation procedure will be included in the main project report. **Delivery date:** 48 months; **Nature:** Report; **Dissemination level:** Restricted to consortium;

**Milestones**

(M4.1) Selection of the study areas from four exposure groups (month 6).
(M4.2) Protocol for the exposure assessment of noise from road and air traffic (month 12-24).
(M4.3) Exposure database within each centre on individual exposure to noise (month 33).
2.3.5 WP5: Assessment of disturbance/annoyance and modifiers of exposure

Phase: Year 1
Start date: 0
Completion date: 36
Current status: Ongoing
Partners responsible: P1, P2, P3, P4, P5, P6, P7
Person months per partner: P1(6,4), P2(11,8), P3(3,3), P4(5,4), P5(2,1), P6(6,2), P7(5,3)
Total person months: 38 (25)
Already devoted person months per partner: P1(2,1), P2(2,0), P3(0,0), P4(0,0), P5(0,0), P6(0,0), P7(0,0)
Total person months already devoted: 4 (1)

Objectives
The stress inducing potential of exposure to traffic noise in residents living in the vicinity of airports and associated major roads will be assessed. In particular individuals’ subjective response towards road traffic noise, aircraft noise and other noise sources including occupational noise will be assessed by questionnaire. The relationship between objective (sound level) and subjective (annoyance) exposure will be determined. Information about modifiers of sound exposure in the individual’s homes will be assessed.

Methodology and study materials
Data on subjective noise induced stress reactions (disturbances and annoyance) will be collected by interview. Standardised questionnaires will be used including validated questions on general annoyance, sleep disturbance and odour perception. A distinction will be made between indoor/outdoor, day/night disturbances and open/closed window conditions. The questionnaire will include items of annoyance/disturbance due to road traffic noise and aircraft noise. Furthermore, exposure to and annoyance from other noise sources, including the work place, will be considered.

The role of individual coping strategies (e.g. use of earplugs) on psychological and physiological outcomes (blood pressure and stress hormones) will be assessed. Other modifiers of exposure such as room orientation (living room, bedroom), window-opening habits, and sound insulated windows etc. will also be assessed by the questionnaire.

Progress during the first reporting period
Based on recommendations by the International Commission of the Biological Effects of Noise (ICBEN), standardised questions regarding annoyance and disturbance due to noise were considered when developing the questionnaire for HYENA, which formed the basis for the protocol for assessment of disturbance/annoyance (D5.1).

Deliverables
D5.1: Protocol for assessment of disturbance/annoyance. Delivery date: 6 months;
Nature: Other; Dissemination level: Restricted to consortium;
D5.2: Disturbance/annoyance database. **Delivery date:** 34 months; **Nature:** Other; **Dissemination level:** Confidential;

A report on the associations between objective sound exposure and subjective noise exposure will be given in the final report (D1.2) as well as a report on the association between annoyance/disturbance and blood pressure and other outcomes (stress hormones).

**Milestones and expected results**
(M5.1) ✓ Protocol for the assessment of subjective responses to noise and modifiers of sound exposure (month 6).
(M5.2) Analysis of the questionnaire (month 30).
(M5.3) Data collection and checking, completion of questionnaire database (month 34).
2.3.6 WP 6: Investigation of confounding/effect modification by air pollution on cardiovascular effects

**Phase:** Year 1  
**Start date:** 0  
**Completion date:** 33  
**Current status:** Ongoing  
**Partners responsible:** P1, P3, P5, P6, P7  
**Person months per partner:** P1(9,4), P3(9,9), P5(8,6), P6(1,0), P7(9,6)  
**Total person months:** 36 (25)  
**Already devoted person months per partner:** P1(2,1), P3 (0,0), P5(1,0), P6(0,0), P7(0,0)  
**Total person months already devoted:** 3 (1)

**Objectives**
For selected airports (Athens, Malpensa, Schiphol and London Heathrow), exposure to air pollution from both aircraft and road traffic will be assessed, in order to explore primarily possible confounding, but also the interactive effects of air pollution on cardiovascular disease. For each of these airports, exposures to traffic related air pollutants (\(\text{NO}_2\), \(\text{PM}_{10}\)) will be assessed, using a combination of dispersion and statistical models. If possible, long-term exposure profiles will be modelled, allowing for latency time between exposure and health effects. Exposure estimates will be validated where feasible by comparing modelled data with monitored data. Cumulative exposure estimates will be computed for each person by integrating residence/time activity (e.g. time spent at each address) and exposure data. Possible confounding effects by air pollution will be explored by modelling relationships between noise and cardiovascular disease (IHD, assessed by questionnaire) with and without air pollution terms. Interactions between air pollution and noise will be explored.

**Methodology and study materials**
Modelling of pollutant concentrations from road traffic and aircraft will be undertaken separately. The modelling strategies used will vary, depending on the availability of local data and models. In general, however, locally validated dispersion models will be used to estimate ambient concentrations of key air pollutants (\(\text{PM}_{10}\), \(\text{NO}_2\)) derived from road traffic; empirically developed regression methods will be used to model contributions from aircraft and from far-travelled sources. Both approaches are considered capable of giving reliable measures of pollutant concentrations at spatial scales of ca. 10-100 metres and for averaging periods of one day to one year.

The first task in WP6 will therefore be to evaluate available data and methods and develop an agreed protocol for exposure assessment. This will then be applied retrospectively to determine historic pollution patterns. Inputs to these models will be obtained from local sources, where available, or otherwise estimated using statistics on national trends. Results will be validated by comparisons with routinely monitored data, where available.

Estimates of exposures for each individual (\(n = 4000\)) will be made by modelling mean annual and 95\(^{th}\) percentile concentrations outdoors at the place of the
residence and at other locations where sampled individuals spend significant amounts of time, adjusted for time activity. In selected locations ecological analyses will be performed, studying the association between noise, air pollution and IHD, using routinely collected data (hospital admissions, register data).

**Progress during the first reporting period**

A draft protocol for air pollution modelling has been delivered. As noted earlier in this report (page 11), we are aiming to coordinate this activity with another EU-funded project to gain added value for both projects. We are also in the process of negotiating a study on health effects related to Heathrow airport, within the framework of the Small Area Health Statistics Unit (SAHSU; [www.sahsu.org](http://www.sahsu.org)), which will further enhance the quality of the air pollution modelling. For these reasons the final protocol will be delivered later than anticipated. However, this will not affect the study time schedule, since the air pollution data will only be used in the latter part of the study to assess air pollution exposure for the individuals participating in the study.

**Deliverables**

D6.1: Protocol for assessment of air pollution exposure\(^\text{13}\). **Delivery date:** 6\(\text{18}\) months; **Nature:** Other; **Dissemination level:** Restricted to consortium;

D6.2: Air pollution modelling and validation. **Delivery date:** 24\(\text{30}\) months; **Nature:** Other; **Dissemination level:** Restricted to consortium;

D6.3: Air pollution database. Individual exposure data for selected airports to be used in further data analyses. **Delivery date:** 33 months **Nature:** Other; **Dissemination level:** Restricted to consortium;

D6.4: Air pollution validation report. The results from the validation procedure will, be reported separately, and the air pollution exposure assessment, will be included in the main project report (D1.2). **Delivery date:** 48 months; **Nature:** Report; **Dissemination level:** Public.

The data analysis will give results on the potential confounding/effect modifying effects of air pollution on noise-related cardiovascular disease (IHD).

**Milestones and expected results**

(M6.1) Protocol for modelling exposures to air pollution (month 6\(\text{18}\)).

(M6.2) Results of the air pollution modelling (month 48\(\text{24}\)).

(M6.3) Results of the air pollution modelling validation exercise (month 24\(\text{30}\)).

(M6.4) Data analysis (month 33).

(M6.5) A report of the results will be included in the main project report (month 48).

\(^{13}\) Draft protocol delivered in January 2004
2.3.7 **WP7: Assessment of acute effects on blood pressure after short-term changes in noise levels**

**Phase:** Year 1  
**Start date:** 0  
**Completion date:** 36  
**Current status:** Ongoing  
**Partners responsible:** P1, P2, P4, P5, P6, P7  
**Person months per partner:** P1(13,11), P2(5,3), P4(5,3), P5(11,6), P6(6,4), P7(8,3)  
**Total person months:** 48 (30)  
**Already devoted person months per partner:** P1(2,1), P2(0,0), P4(0,0), P5(2,1), P6(2,1), P7(1.5,0.5)  
**Total person months already devoted:** 7.5 (3.5)  

**Objectives**  
The objective of WP7 is to investigate acute effects of noise on blood pressure by studying populations exposed to short-term changes in noise levels.

**Methodology and study materials**  
We will select 25 inhabitants from our exposed to noise and 25 among non-exposed to noise from the main sample of 1000 in the close vicinity of each of four airports (Athens, Malpensa, Arlanda and London Heathrow), (i.e. a total of 200 persons) among the subjects in the sample selected in WP2.

We will visit these subjects at home and instruct them how to use a portable recorder for continuous measurements of blood pressure, to be carried out for 48 hours (which thus will include nights - especially important in areas with night flights). Night time noise will be measured continuously by monitors placed indoors and outside according to a protocol developed in the initial phase of the project. This will allow us to assess the acute effects of noise on blood pressure. **We will select non-smoking subjects aged between 45 and 55 years of age. All subjects should be non-diabetic, with no diagnosed history of hypertension or apnoea, and should not be taking any medication, which is known to have an effect on blood pressure. The areas will be chosen to reflect where the highest noise levels (during night and/or early morning) have been recorded from take off and landing according to flight paths and noise maps. Ambulatory and nighttime blood pressure monitoring equipment, and noise measuring devices will be purchased and used consecutively in the four sites. Each subject will be monitored over a period of 48 hours. Piloting will take place in Athens.**

The analysis will be based on random effects models, which allow for the fact that repeated measurements will be available for each individual, and between and within-person variance will have to be taken into account. Appropriate adjustment for confounders varying over a period of one day or characterising the subject and its environment will be based on information obtained under the framework of the other WPs.
Progress during the first reporting period

During the kick-off meeting of HYENA partners in January 2003, objections were raised concerning this work package and it was decided to revise it and discuss again. The main problems identified were:

- Numerous experimental laboratory studies have investigated sleep disturbances by acute noise, using various health outcomes. However, very few measured noise effects on BP.
- The indoor noise levels from airplanes flying above are comparable to other noises and it will be difficult to distinguish their effects.
- The availability of appropriate equipment should be investigated.
- The meanings of short-term BP fluctuations for health in the long-term is not clear.

To address the above criticisms, the WP7 protocol was revised and a search for more appropriate equipment was launched.

To establish a possible link between short-term BP increases and longer term health effects, it was decided to take into account the fact that an increase of BP at night leads to an increase of the average nocturnal BP and may eliminate or modify the extent of the so called “dipper” phenomenon for certain individuals. This is an established risk factor for cardiovascular disease and thus provides a link between the acute effects and their long-term health significance. The revised WP7 protocol focuses on this issue.

Rationale
According to the principal reaction model to noise exposure, relatively low level environmental noise affects cognitive and emotional functions causing annoyance and interfering with activities of the individual such as mental tasks, relaxation or sleep. Via the autonomic nervous system (ANS), these disturbances of the central nervous system produce physiologic effects, one of which is elevation of the arterial blood pressure (ABP=BP).

One characteristic of the BP associated with the activity of the ANS, is the absence of decrease of mean BP during the night: the non-dipper phenomenon. Nocturnal decrease of BP and the non-dipper phenomenon will be analysed in the following paragraphs.

The nocturnal decrease of BP has a normal distribution in hypertensive as well as in normotensive individuals; it is caused by sleep and absence of other activity and represents the decrease of the tone of the sympathetic ANS. The rate of nocturnal decrease of BP decreases with age, presence of diabetes mellitus (DM), black race and presence of secondary hypertension. It is more pronounced in smokers due to the absence of the vasoconstrictive effect of nicotine during sleep.

Due to the normal distribution of the decrease of BP during sleep, it would be possible to define the absence of decrease when this is smaller than the 95th percentile position. However, a less strict definition currently is used (absence of decrease of BP
during sleep (decrease that does not exceed 10%) for convenience. The non-dipper phenomenon, defined as decrease of systolic (SBP) and/or diastolic BP (DBP) during sleep ≤10% of the corresponding daytime values, has been repeatedly correlated with severe cardiovascular damage and disease in patients with essential hypertension.

Indeed, a large number of studies provides evidence that the non-dipper phenomenon is an independent risk factor for the development of cardiovascular morbidity in hypertensive patients: left ventricular hypertrophy, end-diastolic volumes, US alterations of the carotid artery wall, more rapid development of renal insufficiency, more frequent and severe ventricular arrhythmias, cerebrovascular disease and retinopathy. Furthermore and most important, in a study the non-dipper phenomenon has been implicated in the development of left ventricular hypertrophy in diabetic non-dipper normotensive patients (compared to diabetic normotensive dipper patients) and in another it is stressed that the prognosis of non dipper patients appears to be rather poor, with a more frequent Target Organ Damage (TOD) and a higher rate of cardiovascular events, as compared to dippers, even in a general population and is proposed that, in order to improve the identification of non dippers, an ambulatory blood pressure monitoring (ABPM) should be performed in patients with ANS impairment and in subjects with TOD more severe than expected from office or home blood pressure measurements. What is new here, apart from the fact that the non-dipper phenomenon appears to affect also apparently non-hypertensive subjects, is the “autonomic nervous system impairment” and its relation to the non-dipper phenomenon, already mentioned in the second and third paragraphs.

In fact, one of the basic causes of the non-dipper phenomenon, as demonstrated by several studies, is ANS dysfunction. In these studies, the assessment of ANS activity is based on the principle that for a given heart rate (HR) two adjacent beats (RR intervals when identified with Holter ECG monitoring) have not exactly the same chronic distance. The RR interval may be a bit longer or shorter from the exact value calculated from HR. This is called HR variability (HRV). Areas with high or low HRV are then calculated. These reflect the activity of sympathetic and parasympathetic ANS. The conclusion of these studies is that decrease in parasympathetic nervous function and/or increase in sympathetic nervous function may contribute to the occurrence of the non-dipper phenomenon in essential hypertension. These alterations are similar to those mentioned in the general stress concept. Moreover, in one study diabetic hypertensive and normotensive patients with demonstrated ANS dysfunction were compared to healthy controls without ANS dysfunction and it was concluded that relative sympathetic overdrive due to parasympathetic impairment of cardiovascular innervation might play a role in early alterations of circadian BP variation in diabetic hypertensive and normotensive patients.

Furthermore, the extent of blood pressure reduction during sleep can be highly variable in an individual subject and the reasons for this variability are not fully understood. There is some evidence that sleep disturbance may be associated with the appearance of non-dipping in a specific night or time-period.

In summary, the non-dipper phenomenon: a) may be observed in the general population, normotensive or hypertensive, b) is caused by alterations of ANS activity like the ones that can be produced by noise, c) probably displays intra-individual
variability, possibly due to specific disturbances and d) is associated, independently from other factors, with severe cardiovascular morbidity. It would be therefore reasonable to investigate the association between acute as well as chronic exposure to noise and the non-dipper phenomenon, comparing the percentages of decrease of BP during sleep of subjects exposed to noise to the percentages of subjects non-exposed.

Methods

Based on the data reported by Staessen et al\textsuperscript{14} and according to our power calculations, a total of 100 subjects exposed to noise from airports at night and 100 non-exposed will give us a power 80\% to detect an increase of 4.8 units in the night/day BP systolic ratio and 5.8 units in the night/day BP diastolic ratio.

We will select 25 subjects among our exposed to noise and 25 among non-exposed (from our main sample of 1000) living around 4 airports which have some night flights: Athens, Malpensa, Arlanda and London Heathrow. For homogeneity we proposed to study subjects between 45 and 55 years old, non-smokers, non-diabetic and not diagnosed with secondary hypertension or chronic renal insufficiency. Also subjects should not be suffering from obstructive sleep apnoea. All subjects should not be taking drugs affecting the sympathetic or parasympathetic ANS nor other drugs affecting BP. During the daytime measurements, the subjects should continue their normal activities and not engage in unusually heavy activity.

Forty-eight hour BP monitoring will be carried out. From that, day time and night time BP will be assessed. Night-time will be defined for each person as sleeping time. Day-time BP will be needed in order to assess the day/night difference and ratio. Noise measurements will only be done during the night.

For BP measurements we will use a validated ambulatory instrument (e.g. MobiloGraph) for the daytime and the Vasotrac during night-time with a precision of 1 mmHg. Noise will be measured only during the night, inside and outside, and also tape-recorded outside for the same time-period, in order to be able to distinguish aircraft noise from other noise sources. Specifically noise measurements will be done simultaneously indoors and outdoors (1 second intervals) during the night (by type 1 noise meter).

Equipment will be rotated over teams and/or use resources of all teams to carry out fieldwork. For this reason, WP7 will be applied sequentially in the four sites. The first site (Athens) will perform a pilot study on five individuals to evaluate and standardise the procedures. Each subject will be studied for 48 hours, thus 2 nights will be included per subject. The pilot study will take place in Athens in February 2004. The main field study will start in April 2004 and finish in September 2004 (6 months). The 3 other field studies (Stockholm, London and Milan) will take place between October 2004 and March 2006.

\textsuperscript{14}Staessen et al. Nocturnal Blood Pressure Fall on Ambulatory Monitoring in a Large International Database, Hypertension, 1997; 29:30-39.
Deliverables
D7.1: Standardised protocol for assessment of short-term noise exposure and blood pressure. **Delivery date:** 6 months; **Nature:** Other; **Dissemination level:** Restricted to consortium;

D7.2: Database on short-term effects. **Delivery date:** 30 months; **Nature:** Other; **Dissemination level:** Confidential;

D7.3: Report on acute effects of aircraft noise on blood pressure. **Delivery date:** 36 months; **Nature:** Report; **Dissemination level:** Restricted to consortium;

Milestones and expected results
(M7.1) Selection of the study population (month 6).
(M7.2) Standardised protocol for assessment of short-term noise exposure and blood pressure (month 6).
(M7.3) Data collection (month 24).
(M7.4) Data analysis (month 30).
(M7.5) Report on short-term noise exposure and acute effects on blood pressure (month 36). The results from WP7 will also feed into the overall assessment made in WP8.
2.3.8 **WP8: Pooled analysis and overall assessment**

- **Start date:** 34
- **Completion date:** 48
- **Current status:** Not yet started
- **Partners responsible:** P1, P2, P3, P4, P5, P6, P7
- **Person months per partner:** P1(13,7), P2(10,8), P3(12,12), P4(6,4), P5(6,4), P6(5,3), P7(8,6)
- **Total person months:** 60 (44)

**Objectives**

This work package will use the databases created by WP2, WP3 and WP4 for a pooled analysis of noise exposure and high blood pressure. Combined analysis of the data in the different countries will greatly enhance the precision of risk estimates and will make it possible to describe an exposure response relationship over a large exposure range.

Furthermore, information will be used from WP5 and WP6 to assess the influence by noise exposure on stress hormones, as intermediate risk factors for hypertension, and the effects on cardiovascular disease (IHD) resulting from combined exposure to noise and air pollution. Acute effects on blood pressure of short-term changes in noise levels will also be assessed (WP7). A final evaluation will indicate priorities for action to reduce noise associated cardiovascular effects.

**Methodology and study materials**

Pooled analysis will be performed based on the information obtained in the studies from the participating partners (WP2, WP3 and WP4). It is expected that the pooled analysis will include a total of about 6,000 persons from noise-exposed areas around airports and controls. Data collection and creation of databases will use a uniform methodology in order to facilitate combined analysis.

Exposure-response relationships for long-term noise exposure and hypertension will be elucidated. The effects on blood pressure by combined exposure to aircraft and road traffic noise will be analysed. The large database used in the combined analysis will facilitate detailed investigations of subgroups, such as assessments of interactions (e.g. between aircraft and road traffic noise).

Based on the results of the pooled analysis, as well as from WP5, WP6 and WP7, an overall evaluation will be performed of the role of noise in hypertension and cardiovascular disease. WP3 and WP5 will assist in understanding the mechanisms of noise-induced hypertension. The overall assessment will also take into account the potential confounding by air pollution on noise associated cardiovascular disease (WP6) as well as the importance of acute changes in blood pressure after short-term changes in noise levels (WP7). Overall, the results will be used to indicate useful directions for prevention of high blood pressure related to noise.
**Deliverables**

**D8.1: Integrated database.** A common database will be created based on the information obtained in WP2, WP3 and WP4. **Delivery date:** 36 months; **Nature:** Other; **Dissemination level:** Confidential;

**D1.3: Final report (see WP1).** Results of the combined analyses and from WP5, WP6 and WP7 will be used to produce a report focusing on strategies for prevention of noise related cardiovascular disease. **Delivery date:** 48 months; **Nature:** Report; **Dissemination level:** Public.

The responsibility for analysis and preparation of reports regarding different parts of the project will be distributed among the partners.

**Milestones and expected results**

(M8.1) Integrated database for the pooled analyses (month 36).

(M8.2) Data analysis will continue for almost a year (month 46).
2.3.9  **WP9: Dissemination**

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**Objectives**

The objective of WP9 is to

- disseminate the project results toward different final users (policy makers at regional and local levels, private citizens and air-port authorities), devoting special care to the scientific foundation of the provided information and to the anonymity requirements;
- produce the exploitation plan of the Project results.

**Methodology and study materials**

The project partners, taking part to WP9, will plan the knowledge transfer of the project results to the policy makers, NGO:s and the general public. This will be done by:

- Participation in to public events on related sectors;
- Publication of technical/scientific papers in peer reviewed journals;
- Production of a glossy leaflet on the project;
- Launching of a Project specific web-site;
- Project follow-up;
- End-of project conference
- A special report aimed at addressing relevant issues for the European Community Directive on Noise;

Prior to the submission of papers to scientific journals reviewers, copies of the work will be sent to the Commission. The support of the *Quality of Life and Management of Living Resources Programme* will be clearly acknowledged.

Scientific publications and presentations at major conferences are aimed at informing academics. The final scientific meeting of the project will be an end-of-project conference, anticipated to be held a few months before the end of the project in London, and will be targeted at and opened to both academics and non-academic user groups (such as public health departments, health authorities and local authorities and other policy makers, including government representatives from partner and other countries). The meeting will be advertised to relevant communities; every effort will be made to ensure that the results of the project are made widely available and accessible to all such user-groups, including, where feasible, web-site access.
The research team will agree a collective strategy on publication at the first planning meeting. Papers deriving from the study will be aimed at major, peer-reviewed international journals in the key fields of interest. Papers will also be widely published as both oral and poster presentations at national and international symposia and conferences.

**HYENA web-site**

Particular attention will be devoted to the development of an official project web site, which will have two functions:

*Standardized data transmission* between Partners;

*Publication of project objectives, methodology, and results.*

The web site will have a communicative style, but a section with high scientific-technical profile will be present. The targeted audience will be:

*Private citizens* (to inform about the consequences of noise exposure on health);

*Scientific community* (to disseminate data about the scientific results).

The web site will be developed by P1 in collaboration with partners, and will be updated regularly to reflect progress of the project.

**Progress during the first reporting period**

Brochure designed and printed. Brochures distributed to all partners and the EC for dissemination at conferences, seminars etc.

The project web site [www.hyena.eu.com](http://www.hyena.eu.com) is operational. The target audience includes private citizens (to inform about the consequences of noise exposure on health) and to outline the nature of the project) and the scientific community (to disseminate data as and when available). The website includes a private area (password protected) for the dissemination of meeting minutes, protocols, presentations, and other information restricted to the consortium. In due course the private area will include datasets and other pooled information.

The design of the HYENA study was presented at the International Society for Environmental Epidemiology Annual conference in Perth, Australia, in September 2003.\(^{15}\)

**Deliverables**

- **D9.1:** Brochure with short description of the project. **Delivery date:** 4 months; **Nature:** Report; **Dissemination level:** Public;
- **D9.2:** Web site. **Delivery date:** 12 months; **Nature:** Other; **Dissemination level:** Public;
- **D9.3.** End of project conference. **Delivery date:** 45 months **Nature:** Other
  **Dissemination level:** Public;
- **D9.4:** Informative booklet for local and regional policy makers. **Delivery date:** 48 months; **Nature:** Report; **Dissemination level:** Public;

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\(^{15}\) Jarup L, Babisch W, Houthuijs D, Pershagen G, Katsouyanni K, Cadum E. Hypertension and exposure to noise near airports – the HYENA study. *Epidemiology* 2003; **14:**S78.
Milestones
(M9.1) Publication of the HYENA web site (month 12).
(M9.2) Delivery of information booklet (D9.3) (month 48).
3. ROLE OF PARTICIPANTS

Participant Number 1

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Scientific Team

Dr. Lars Jarup (Team Leader)
Ms Marie-Louise Dudley (Scientific coordinator)
Prof. Paul Elliott (Head of Department)
Prof. David Briggs (Prof of Environmental Health Sciences)
Dr Cornelis deHoogh (GIS (Geographic Information System ) expert)
Dr Roy Colvile (Senior Lecturer in Air Pollution)

PhD students associated with the project
Ms Pauline Savigny
Mr Anderson Ramdeen

Objectives

- Project coordination and management
- Epidemiological study design
- Assessment of confounding effects of air pollution
- Pooled analyses
- Dissemination

Workplan and contractual links to other participants

ICSTM will be responsible for WP1 (Project coordination) (18 person months). This includes administrative as well as scientific coordination of the project. **Deliverables:** D1.1, D1.2.1✓, D1.2.2, D1.2.3.

ICSTM will be responsible for WP2 (28 person months) **Deliverables:** D2.1✓, D2.2, D2.3.1

ICSTM will take part in WP3 by collecting health data for the UK study population (28 person months) **Deliverables:** D2.3.2, D3.3

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16 In this section both EC funded and permanent staff are included
ICSTM will take part in WP4 by applying the noise exposure models to the UK study area (6 person months)
**Deliverables:** D4.3

ICSTM will take part in WP5 by collecting the questionnaire data for the assessment of disturbance/annoyance (6 person months)
**Deliverables:** D5.2

ICSTM will be responsible for WP6 (Investigation of confounding/effect modification by air pollution on cardiovascular effects) (9 person months)
**Deliverables:** D6.1✓, D6.2, D6.3, D6.4

ICSTM will take part in WP7 by collecting data on short term noise exposure and blood pressure in the UK study population subset (13 person months)
**Deliverables:** D7.2

ICSTM will be responsible for WP8 (Pooled analyses) (13 person months)
Deliverables: D8.1, D1.2

ICSTM will be responsible for WP9 (dissemination) (18 person months)
Deliverables: D9.1✓, D9.2✓

Total person months: 139

**Research activities during the first reporting period UK**

**WP2:** The UK partner has taken the lead in developing the questionnaire using input from other partners, who supplied validated questions from their respective area of expertise. This has been a substantial piece of work, requiring extensive input from both the scientific coordinator and the project coordinator. The final questionnaire contains 129 questions. (D2.1).

The UK partner has defined the study areas in accordance with the protocol developed by the Dutch partner. Noise contour data from Heathrow airport was collected from the Civil Aviation Authority. Data on road traffic flows have also been gathered from the local authorities in the study area. Data on Primary Care Trust (PCT) boundaries were available within the Small Area Health Statistics Unit (SAHU) database. These three datasets were combined using GIS technique to define the geographical areas to be used for the study population selection. We are currently discussing whether to select the final study population using the whole available area (7 PCTs), or a more confined area covered by three PCTs, all of whom have expressed an interest of supporting the study. The latter option would have two major benefits: the data collection logistics would be facilitated and the area is more homogenous in socio-economic status.

**WP3:** Although the Swedish partner has had the main responsibility for developing the protocols for BP assessment and stress hormones, the UK partner has played a major role in this development, particularly the BP assessment protocol, drawing on...
the experience from the large multicentre BP studies (INTERSALT, INTERMAP) with Prof Elliott as the principal investigator.

**WP4:** The UK partner has supplied the questionnaire data required by the Dutch partner for the design of the study area selection protocol.

**WP5:** The UK partner has assisted the German partner in developing the part of the main questionnaire related to disturbance/annoyance and noise exposure assessment modification.

**WP6:** The UK partner has designed a draft protocol for air pollution modelling. As noted earlier in this report (page 11), we are aiming to coordinate this activity with another EU-funded project to gain added value for both projects. We are also in the process of negotiating a study on health effects related to Heathrow airport, within the framework of SAHSU, which will further enhance the quality of the air pollution modelling. For these reasons the final protocol will be delivered later than anticipated. However, this will not affect the study time schedule, since the air pollution data will only be used in the latter part of the study to assess air pollution exposure for the individuals participating in the study.

**WP7:** The UK partner has assisted the Greek partner in suggesting appropriate BP instruments for the acute BP assessment.

**Significant difficulties or delays experienced during the first reporting period**

The UK partner has had significant problems to achieve ethical approval. Since the initial study area includes more than three PCTs, the UK rules require that an application is submitted to a multicentre ethics committee (MREC). The first application was sent in July 2003 to the London MREC, who rejected the application, mainly because of concerns related to the study design, but also a few concerns related to ethical issues. After having addressed all the issues raised a second application was submitted in August. The project coordinator discussed this application with the chairman of London MREC, who seemed satisfied with the amendments made. However, also the second application was rejected, almost solely based on critique of the study design. It was obvious that the London MREC reviewer did not understand the study design (further clarified at a later meeting with the lead reviewer). In spite of this there is no real appeals procedure to allow the applicant to rebut errors made by the MREC. Instead, the UK procedure specifies that a further application (appeal) can be made to another MREC, who will assess the application independently. We asked for a supporting letter from the EC, which was promptly sent to us by the project scientific officer. The appeal application was submitted to the Welsh MREC on 10-12-2003 to be considered at their January meeting. This long and cumbersome preparation of MREC applications has taken a considerable amount of time for the UK partner, in addition to the other project work.

Although outside the current reporting period, we are pleased to announce that the third application was successful, and thus, the project data collection will be able to commence according to the planned time schedule.

**Sub-contracted work during the first reporting period**

None
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Scientific Team
Dr. Wolfgang Babisch (first scientific officer in the unit Environmental Hygiene and Environmental Medicine, Health Effects Assessment)

Objectives
- Protocol for assessment of disturbance/annoyance
- Collecting relevant data for the German study population
- Data analysis

Workplan and contractual links to other participants
UBA will take part in WP2 by collecting questionnaire data for the German study population (9 person months)
**Deliverables:** D2.2✓, D2.3.1

UBA will take part in WP3 by collecting health data for the German study population (20 person months)
**Deliverables:** D2.3.2, D3.3

UBA will take part in WP4 by applying the noise exposure models to the German study area (12 person months)
**Deliverables:** D4.3

UBA will be responsible for WP5 (Assessment of disturbance/annoyance and modifiers of exposure (11 person months)
**Deliverables:** D5.1✓, D5.2

UBA will take part in WP7 by collecting health data for the German study population (5 person months)
**Deliverables:** D7.2

UBA will take part in WP8 (10 person months)
**Deliverables:** D8.1, D1.2

Total person months: 67
Research activities during the first reporting period

WP2, WP4: Study area: 5 dB(A) noise contours were established with the aid of noise maps of the area around Berlin-Tegel. These maps are to be the basis for the selection of subjects drawn from central registers held by the city authorities. Additional information on road traffic noise exposure will be taken from official noise maps available on the Geographical Information System (GIS). Participant information available from these registers includes: Name, address, age and gender. Each individual place of residence will be identified by aerial photographs from the surveyors office in the city of Berlin, and also through street visits.

Ethical approval: The medical department of the Humboldt University of Berlin has been contacted for ethical approval forms which will be submitted as soon as the German translation of the study questionnaire is available. It is anticipated that a decision will be available from the ethical committee by the end of 2003. Although outside the current reporting period, confirmation of ethical approval was indeed given at the end of December 2003.

Questionnaire translation: The questionnaire has been translated into German. In-house piloting will commence by the end of 2003.

Field Work: The training of interviewers will begin during the first half of 2004 with most of the fieldwork completed by the end of that year.

WP5: The protocol for WP5 has been developed by the German partner in collaboration with other partners (D5.1). Although questions on annoyance and disturbance from other relevant questionnaires have been used to a great extent, in accordance with the ICBEN recommendations, considerable amount of time was spent on adapting the questions to HYENA. Also, the questions related to modifiers of noise exposure needed to be adapted to the HYENA consortium requirements.

Significant difficulties or delays experienced during the first reporting period
None

Sub-contracted work during the first reporting period
None
Participant Number: 03
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Ton Dassen (senior noise researcher)
Wim Swart (noise modeller)
Irene van Kamp (psychology researcher)
Jeanne van Loon (health scientist)
Oscar Breugelmans (environmental epidemiologist)
Paul Fischer (senior air pollution epidemiologist)
Jessica Kwekkeboom (environmental epidemiologist)
Carla van Wiechen (GIS)

Objectives
- Protocol for noise exposure assessment
- Collecting relevant data for the Dutch study population
- Data analysis

Workplan and contractual links to other participants

RIVM will take part in WP2 by collecting questionnaire data for the Dutch study
population (6 person months)
Deliverables: D2.2, D2.3.1

RIVM will take part in WP3 by collecting health data for the Dutch study population
(21 person months)
Deliverables: D2.3.2, D3.3

RIVM will be responsible for WP4 (Noise exposure assessment) (18 person months)
Deliverables: D4.1, D4.2, D4.3, D4.4

RIVM will take part in WP5 by collecting data for the Dutch study population (3
person months)
Deliverables: D5.2

RIVM will take part in WP6 by collecting data on exposure to air pollutants for the
Dutch study population (9 person months)
Deliverables: D6.3

RIVM will take part in WP8 (12 person months)
Deliverables: D8.1, D1.2
Total person months: 69
Research activities during the first reporting period

WP2: For the selection of the study population in The Netherlands, address data was collected in the population covering an area of 55 by 55 km around Amsterdam Airport Schiphol. Aircraft and road traffic noise levels was linked to these home addresses using a GIS. With the prepared dataset, addresses can be identified according to the protocol for the selection of the sample.

Local Health Authorities (HA) were visited in September and October 2003 to make preparations for the start of HYENA fieldwork at the beginning of 2004 and to request support in the identification of eligible individuals in the selected areas for the study. This request is currently under consideration by the local HA.

Medical ethical approval is to be sought once discussions with the Health Authority are complete. A separate study on noise exposure and blood pressure among children was approved two years ago and it is not anticipated that there will be any difficulties in getting medical ethics approval for the HYENA study.

WP4: The Dutch partner has developed the protocol for selection of study areas and is currently developing the detailed protocol for noise exposure assessment. As noted above (WP4) a questionnaire was prepared to gain insight in the possibilities for the harmonisation (or approximation) of methods for the noise assessment in HYENA. The questionnaire focused on airport characteristics, the models used for aircraft and road noise in the participating countries and the availability of data for modelling purposes. The questionnaire was distributed in April 2003 with responses from partners received over the period May – July 2003. Based on these responses, a protocol for the selection of study areas was subsequently prepared and distributed to all partners in September 2003 (D4.1).

As noted before, for HYENA to benefit from the results of these ongoing projects it is recommended that the development of the standardised protocol for detailed noise exposure assessment be postponed to month 24 (instead of month 12). This postponement will not hinder the progress on any other work package in the HYENA project.

Significant difficulties or delays experienced during the first reporting period

Due to privacy regulations, RIVM has no direct access to municipal records of the inhabitants of the selected addresses. To select the study population in the proper age range, support is needed from Local Health Authorities. Their answer for this request takes much longer than anticipated, and leads to delay in the submission of the proposal to the medical ethical commission. It is anticipated that this delay will be caught up during the fieldwork.

Sub-contracted work during the first reporting period

None
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Scientific Team

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Gösta Bluhm (Specialist in cardiology)
Jenny Olsson (PhD student)
Prof Töres Theorell (Director of the Institute for Psychosocial Factors and Health at the Karolinska institutet)

Objectives
- Protocol for assessment of blood pressure (in collaboration with ICSTM)
- Collecting relevant data for the Swedish study population
- Data analysis

Workplan and contractual links to other participants

IMM will take part in WP2 by collecting questionnaire data for the Swedish study population (4 person months)
**Deliverables:** D2.2, D2.3.1

IMM will responsible for WP3 (Assessment of Health Effects) (22 person months)
**Deliverables:** D3.1✓, D3.2✓, D3.3

IMM will take part in WP4 by applying the noise exposure models to the Swedish study area (7 person months)
**Deliverables:** D4.3

IMM will take part in WP5 by collecting health data for the Swedish study population (5 person months)
**Deliverables:** D5.2

IMM will take part in WP7 by collecting health data for the Swedish study population (5 person months)
**Deliverables:** D7.2

IMM will take part in WP8 (6 person months)
**Deliverables:** D8.1, D1.2

Total person months: 49
Research activities during the first reporting period

**WP2**: The Swedish partner has contributed to WP2 by suggesting questions (validated and used in other studies on cardiovascular risk factors) to assess relevant cardiovascular health effects for the questionnaire.

The questionnaire has been translated into Swedish. Back translation is yet to be completed.

For the selection process, there have been meetings with the Swedish Civil Aviation Administration (SCAA) and the Environment and Health Administration in Stockholm. The study will now include Stockholm Bromma airport, the second largest airport in the region, as well as Arlanda, to achieve the desired number of exposed individuals. Maps showing noise contours going back over the last five years were received from the SCAA. In accordance with the protocol prepared by the Dutch partner the population sample selection will be made using information from these maps in conjunction with address information from the National Population register held by The Swedish National Bureau of Statistics who will assist in preparing the sample.

There have been some minor problems in the selection process as the noise assessment models differ between Arlanda and Bromma airports. Another problem is that the types of aircraft arriving and departing from Stockholm Arlanda Airport have changed towards smaller and less noisy aircraft during the last few years. This factor is not fully included in all annual noise calculations performed by the Swedish Civil Aviation Administration. However, this change has only minor effects on the noise distribution around the airport and there is confidence that these problems will be solved in the near future.

Birgitta Ohlander, a research nurse with experience in blood pressure measurements, has been recruited for the fieldwork. A research student is also participating in the project.

The application for ethical approval was submitted in November 2003. Although outside the current reporting period, it can be noted that ethical approval was obtained in December 2003. Pilot work will be performed during December and it is planned that the main field work will commence at the beginning of 2004. Additional technical and statistical assistance will be applied to achieve the project deliverables.

**WP3**: The Swedish partner has had the lead role in preparing the protocols for assessment of BP (D3.1) and stress hormones (D3.2). Validated instruments for blood pressure measurements have recently been purchased.

**Significant difficulties or delays experienced during the first reporting period**

Due to the slight delays in the commencement of fieldwork, EU-paid staff to be recruited had not yet been employed.

**Sub-contracted work during the first reporting periods**

None
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Objectives
- Protocol for assessment of acute effects on blood pressure after short-term changes in noise levels
- Collecting relevant data for the Greek study population
- Data analysis

Workplan and contractual links to other participants

NKUA/DHE will take part in WP2 by collecting questionnaire data for the Greek study population (3 person months)
Deliverables: D2.2, D2.3.1

NKUA/DHE will take part in WP3 by collecting health data for the Greek study population (4 person months)
Deliverables: D2.3.2, D3.3

NKUA/DHE will take part in WP4 by applying the noise exposure models to the Greek study area (6 person months)
Deliverables: D4.3

NKUA/DHE will take part in WP5 by collecting health data for the Greek study population (2 person months)
Deliverables: D5.2

NKUA/DHE will take part in WP6 by collecting health data for the Greek study population (8 person months)
Deliverables: D6.3

NKUA/DHE will be responsible for WP7 (Assessment of acute effects on blood pressure after short-term changes in noise levels) (11 person months)
Deliverables: D7.1 ✓, 7.2, 7.3

NKUA/DHE will take part in WP8 (6 person months)
Deliverables: D8.1, D1.2
Total person months: 40

Research activities during the first reporting period GR

Partners 5 and 6 are working in close collaboration and up to now the activities that are reported below have been carried out jointly. Both partners have taken part in the project meetings (Jan 23rd-24th and Sep 10th-11th) and telephone conferences (May 16th and Dec 15th, 2003).

Ethical approval for the project has been obtained.

WP2
The Municipality of Artemis has been selected as study area according to the International Athens Airport’s (AIA) flight paths because it is the most affected by aircraft noise. The settlement’s population exceeds largely the study’s target population. Because of unavailability of catalogues of the settlement’s residents, the Greek team’s researchers have registered with the use of maps the area’s residents by home visit. Around 1600 households matching the criteria of WP2 have been noted so far. The registration is currently being converted into digital form (Excel). For details on noise exposure assessment, cf. WP4.

The agreed, final version of the project’s questionnaire has been translated from English to Greek and back translated successfully. It is ready for copy and use in the fieldwork.

WP3
The research nurses that will carry out the home visits are being trained for BP assessment and filling in of the questionnaire. BP measuring devices, scales, thermometers are currently being purchased.

WP4
For aircraft noise, the Civil Aviation Authority provided noise contour maps. Because of the AIA’s recent operation (3 years), the noise level maps gave estimations of Leq24h made prior to the airport’s operation and according to the INM model. The actual noise level in Lden is measured at several noise measurement terminals (NMT) and published in the AIA Environmental Department’s bulletin. Comparison of the noise contour maps with the actual noise level from NMTs affirmed the accuracy of noise contour maps and the possibility to use them in the assessment of actual noise exposure. Consequently, noise contours were adjusted on the settlement’s map with the use of GIS. With the help of the area’s maps with the noise contours adjusted on them, the Greek team’s researchers made home visits all over the study area and registered the households.

For road traffic, there is no data available. In agreement with the other partners, sampling will be based on aircraft noise and road traffic will be assessed during the home visit.
WP5
Annoyance will be assessed via the questionnaire, as soon as the fieldwork commences.

WP6
Information on air pollution is been collected.

WP7
A standardized protocol for the assessment of short-term noise exposure on BP (D7.1) has been completed, sent out and agreed among partners.

    Piloting will start in Athens as soon as the instruments are purchased and sent by P1. A training session for the other partners that will participate in WP7 is planned for the meeting in Athens (April 2004).

Significant difficulties or delays experienced during the first reporting period
None

Sub-contracted work during the first reporting period
None
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Fotini Tolika (researcher – temporary)
Venetia Velonaki (researcher – temporary)

Objectives
- Protocol for assessment of acute effects on blood pressure after short-term changes in noise levels (in collaboration with NKUA/DHE)
- Collecting relevant data for the Greek study population
- Data analysis

Workplan and contractual links to other participants

NKUA/DNLP will take part in WP2 by collecting questionnaire data for the Greek study population (9 person months)
**Deliverables:** D2.2, D2.3.1

NKUA/DNLP will take part in WP3 by collecting health data for the Greek study population (26 person months)
**Deliverables:** D2.3.2, D3.3

NKUA/DNLP will take part in WP4 by applying the noise exposure models to the Greek study area (9 person months)
**Deliverables:** D4.3

NKUA/DNLP will take part in WP5 by collecting health data for the Greek study population (6 person months)
**Deliverables:** D5.2

NKUA/DNLP will take part in WP6 by collecting health data for the Greek study population (1 person months)

NKUA/DNLP will assist NKUA/DHE in designing WP7 (6 person months)
**Deliverables:** D7.1✓, D7.2, D7.3

NKUA/DNLP will take part in WP8 (5 person months)
**Deliverables:** D8.1, D1.2

Total person months: 62
Research activities during the first reporting period  GR

See report for partner 5 above!

Partners 5 and 6 work closely together, and thus, their activities are also reported together.

Significant difficulties or delays experienced during the first reporting period
None

Sub-contracted work during the first reporting period GR
None
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Moreno Demaria (statistician)
Federica Vigna-Taglianti (epidemiologist)
Alessandro Borgini (biologist)

Objectives
• Protocol for assessment of acute effects on blood pressure after short-term changes in noise levels (in collaboration with NKUA/DHE)
• Collecting relevant data for the Italian study population
• Data analysis

Workplan and contractual links to other participants
ARPA will take part in WP2 by collecting questionnaire data for the Italian study population (6 person months)
Deliverables: D2.2, D2.3.1

ARPA will take part in WP3 by collecting health data for the Italian study population (24 person months)
Deliverables: D2.3.2, D3.3

ARPA will take part in WP4 by applying the noise exposure models to the Italian study area (9 person months)
Deliverables: D4.3

ARPA will take part in WP5 by collecting health data for the Italian study population (5 person months)
Deliverables: D5.2
ARPA will take part in WP6 by collecting health data for the Italian study population (9 person months)

ARPA will assist NKUA/DHE in designing WP7 (8 person months)
**Deliverables:** D7.1 ✔, D7.2, D7.3

ARPA will take part in WP8 (8 person months)
**Deliverables:** D8.1, D1.2
Total person months: 69

**Research activities during the first reporting period**

**WP2:** The Italian partner has contributed to WP2 by suggesting amendments to the questionnaire.

The questionnaire was translated from English to Italian, with the help of an English mother tongue with good proficiency in Italian language. The Italian questionnaire was reviewed from the project staff and all the necessary corrections were made. Back translation is yet to be completed.

**WP3:** An epidemiologist and a biologist have been recruited for the coordination of the field work.

An Italian summary of the project was written and all the necessary documents were arranged to submit the request to the Ethical Committee. The application for ethical approval was submitted, and the answer is expected by the end of February.

Pilot work will be performed during January and it is planned that the main fieldwork will commence immediately after the ethical approval will be obtained.

**WP4:** For the selection process, there have been meetings with the Local Agency for the Environmental Protection in Novara and Milano.

A map of the noise contours in the Malpensa area and some traffic data were obtained from the Local Environmental Agency. In accordance with the protocol prepared by the Dutch partner the population sample selection will be made using information from these data in conjunction with address information from the Health Population Register.

**WP5:** Annoyance will be assessed via the questionnaire, as soon as the field work commence.

**WP6:** Information on air pollution has been collected.

**WP7:** The Italian team participated to the discussion at the project meetings for the design of WP7. Short-term exposure will be assessed in a sample of the selected population.
Significant difficulties or delays experienced during the first reporting period
The Italian partner has had significant problems in finding an Ethical Committee (EC) competent to deal with the study. In fact, in Italy the approval by the Ethical Committee is not necessary for longitudinal studies. A first application was not accepted because the identified EC did not evaluate non-experimental studies. A new application has been submitted to another EC; the answer is expected by the end of February. These problems will cause a slight delay in the starting of the fieldwork. Problems occurred in obtaining traffic data, as well as in the acoustic mapping of the interested area. Due to these problems a delay is expected in the extraction of the population sample.

Sub-contracted work during the first reporting period
None
4. PROJECT MANAGEMENT AND COORDINATION

First reporting period

The kick-off meeting held on 24th January 2003 in London provided a forum for partners and associates to meet and discuss key issues for the successful completion of each work package. This opportunity for a group meeting facilitated the development of a cohesive and supportive working ethos for all concerned with the project.

A telephone conference held on 16th May 2003 provided an interim opportunity to discuss progress.

The second steering meeting was held over two days on 11th and 12th September, also in London, where partners and their associates were able to update the consortium on developments with each of the work packages and, where appropriate, to review any unforeseen difficulties.

Although outside the current reporting period, it can be mentioned that a second telephone conference was held on 15th December 2003.

The UK has successfully acted as the central point for the dissemination of information, with all partners and key personnel involved in the project kept fully informed of developments as soon as they occur via email, Fax and when necessary by telephone. In addition, the project website is fully operational and has a password protected private area where partners’ may access meeting minutes, protocols and other documents relating to the study.

Planned future meetings include a steering group meeting in Athens over 15th –16th April 2004; a telephone conference during early autumn 2004 (dates to be decided), and the mid-term review meeting in late November or early December 2003 (in London, date to be decided).
5. EXPLOITATION AND DISSEMINATION ACTIVITIES

The project study design was presented at the International Society for Environmental Epidemiology (ISEE) Annual Conference in Perth, Australia in September 2003. The abstract cited below was published in Epidemiology.\(^\text{17}\)

**HYPERTENSION AND EXPOSURE TO NOISE NEAR AIRPORTS – the HYENA project**

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An increasing number of people live in the vicinity of major airports, and are, thus, exposed to and disturbed by noise and air pollution from aircraft and airport associated road traffic. Raised blood pressure is one of the most important underlying risk factors for morbidity and mortality in the world today, and a major risk factor for coronary heart disease and stroke. Recent studies indicate that noise exposure may cause hypertension at noise levels already experienced by a large number of people near major airports.

The overall aim of the European Union funded HYENA project is to assess the impacts on cardiovascular health (primarily reflected by high blood pressure) of noise generated by aircraft and road traffic near airports. The project will identify and quantify noise exposure in individuals, relating the exposure to the prevalence of high blood pressure. The project will also aim to identify the special needs of high-risk groups to improve the potential for reducing the negative effects of the environment on health. The project will adopt standardised methods for assessing exposure and effect, and it will identify exposure-response relationships between environmental noise exposure and health outcomes (primarily high blood pressure) in populations from different parts of Europe representing a wide range of exposure.

Specifically the project will:
- analyse the exposure-response relationships in adults between long-term exposure to airport related noise and high blood pressure; for aircraft noise, road traffic noise and for combinations of aircraft and road-traffic noise in different populations in six countries across Europe (Germany, Greece, Italy, the Netherlands, Sweden and the United Kingdom), taking into account social, cultural and meteorological conditions;
- evaluate the modifying effects of traffic related air pollution (NO\(_2\), PM) on noise associated cardiovascular risk factors and cardiovascular disease (e.g. high blood pressure, ischaemic heart disease (IHD)) at selected major European airports (Athens, Malpensa, Schiphol, and London Heathrow);
- analyse the difference in blood pressure resulting from different noise exposure patterns (day and night time exposures, peak versus average exposure levels), for aircraft noise at selected airports;
- assess the possible modifying effects by annoyance and sleep disturbances due to road and aircraft noise, on blood pressure;
- analyse the impact of aircraft and road traffic noise on stress hormone levels;
- analyse the effect of noise exposure on high blood pressure in subgroups (at risk of future cardiovascular disease) of the population; for aircraft and road traffic noise.

The work plan details of the HYENA project will be described and study design issues discussed.


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A copy of the PowerPoint presentation made at the ISEE2003 conference is included in the CD provided with this report.
6. ETHICAL ASPECTS AND SAFETY PROVISIONS

As noted in the progress reports above, most partners (GR, SE, DE and GB) have already obtained ethical approval for the project. Approvals are estimated shortly for the other partners (NL and IT). The ethical committees raised no particular ethical issues.

Guidelines for the safety of the field workers are currently under preparation by the UK partner.