

## Night noise and health - First Results of the WHO LARES (Large Analysis and Review of European housing and health Status) study

Célia Rodrigues<sup>1</sup>; Xavier Bonnefoy<sup>1</sup>; Christian Maschke<sup>2</sup>; Hildegard Niemann<sup>3</sup>; Richard Moore<sup>4</sup>

<sup>1</sup>World Health Organization, Regional Office for Europe, European Centre for Environment and Health Bonn, Germany  
Email: cer@ecehbonn.euro.who.int; <sup>2</sup>Forschungs- und Beratungsbüro Maschke, Berlin, Germany; <sup>3</sup>Berliner Zentrum Public Health, Berlin, Germany; <sup>4</sup>University of Warwick, School of Law, Coventry, United Kingdom

### Background – Housing and health

For many years, the housing environment has been acknowledged as one of the main settings that affects human health – due to the amount of time that people spend in their homes, as well as to the number of aspects that can have an impact on health. Living and housing conditions are the basis for many aspects that affect residential health: indoor air quality, accidents, noise, humidity, low temperature, asbestos, VOC and overcrowding are only a few of the possible health threats to be found in dwellings. Mental and social health both are affected by the living conditions but no straightforward mechanisms have yet been established. Furthermore, the immediate housing environment represents an everyday-landscape which can also support or limit our physical, mental and social well being.

The quality of housing conditions plays a decisive role in the health status of the residents, because many health problems are either directly or indirectly related to (a) the building itself, (b) the construction materials that were used, (c) the equipment and (d) the size or structure of the individual dwellings. Although such impacts are broadly accepted, the concrete relationship between environmental quality and well being has so far not been fully understood.

### Objective of LARES (Large Analysis and Review of European housing and health Status) study

The purpose of the LARES is to gain knowledge about the relationship between housing and health. A survey tool was applied aiming at:

- To oversee and assess the quality of the housing stock in a holistic way;
- To identify avenues that would allow to set priorities among the individual problem areas of housing and health;
- To design a tool that would allow local authorities to assess the prevailing housing and health conditions within their cities or regions;
- To produce a more comprehensive evidence database;
- And to develop guidelines and recommendations for policy-making.

### Approach

Housing surveys were held in case cities in several European countries. These case studies focused on a variety of housing aspects that might be of importance for the health status of the inhabitants, and collected data on:

- the individual perception of the housing conditions through the resident's eyes;

- the objective standards and conditions of the building through an inspection checklist;
- the health status of the residents (both perceived and objective health measures)

Using a descriptive and explorative study approach, the project followed the structure and guidelines given below:

1. The project focused on empirical research in the field. A selected parameter set was transferred into two questionnaires and a dwelling inspection sheet, focusing on aspects of building quality, living conditions and health symptoms;
2. Per country, a time period of two to four weeks was necessary for the field work, during which the case study was carried out by WHO and national cooperation partners;
3. As this survey was seen as an explorative study no large-scale measurements are done;
4. The data analysis is currently being carried out for: noise, environmental quality of life, safety issues, moulds, hydrothermal comfort, mental health, accidents, accessibility, housing scores, quality scores, allergies and environmental design by an international consortium of research institutions.

### Participants

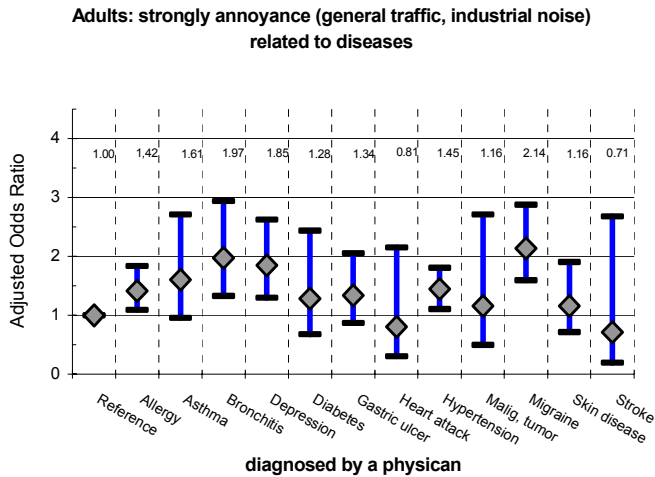
The study was implemented in Angers (France), Bonn (Germany), Bratislava (Slovakia), Budapest (Hungary), Ferreira do Alentejo (Portugal), Forli (Italy), Geneva (Switzerland) and Vilnius (Lithuania) and it contains a total number of 8519 individual residents in 3373 households.

### Noise and health – 1<sup>st</sup> findings on noise of the WHO LARES study for adults

Strong annoyance from noise is clearly associated with health. Annoyance express itself e.g. by malaise, fear, threat, trouble, uncertainty restricted liberty experience, excitability or defencelessness. At an individual level, at least 30% of the causes of annoyance may be explained by noise.

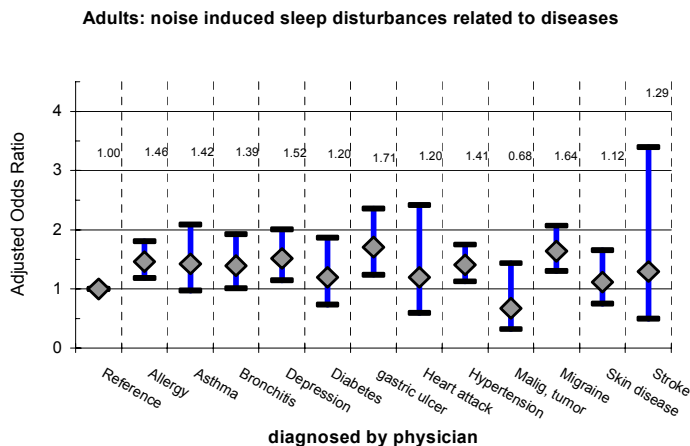
Night noise exposure disturbs sleep, and is a relevant risk factor for stress related diseases. The association between noise induced sleep disturbance and ill health are comparable with the association between annoyance induced by daytime noise and health, nevertheless, in the sample surveyed, there are more people affected by night time noise than by daytime noise. Particular attention should therefore be paid to night time noise in homes.

The effect of environmental noise on sleep and annoyance and many pathologies were surveyed in the LARES study. Therefore it was possible to examine the strength of the association between noise induced annoyance or noise induced sleep disturbances with stress mediated diseases diagnosed by physicians. Some findings are briefly introduced below. A relative risk is statistically significant if the drawn confidence interval did not include the value 1. The analysis was adjusted for "age", "gender", "socio-economic "consumption of alcohol", " smoking behaviour", "sports", "body mass index", "size of town", "established or new in EU", "marital status" and flat problems, problems with living environment etc.



**Figure 1** - Relative disease risks for adults which indicated strongly noise induced annoyance by general traffic, commercial and industrial within the last 12 months in comparison with adults without noise induced annoyance. (N=3994). Source: Niemann et al

The study found that for allergy, bronchitis, depression, hypertension, and migraine there is a significant increased risk if adults are strongly annoyed by traffic and/or industrial noise in comparison to people not annoyed by traffic and/or industrial noise (figure 1). In comparison to people without noise induced sleep disturbances (reference category) the occurrence of noise induced sleep disturbances show for adults significantly elevated risks of allergy, bronchitis, depression, gastric ulcer, hypertension, and migraine (figure 2).

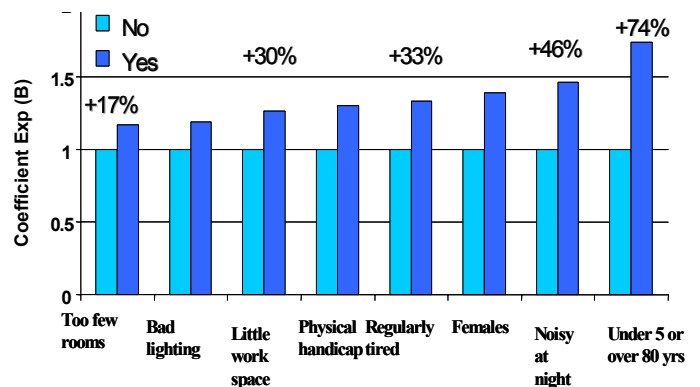


**Figure 2** - Relative disease risks for adults that indicated sleep disturbances every day for a period of 4 weeks or more in comparison with adults without sleep disturbances. (N=4252). Source: Niemann et al

The association between noise induced sleep disturbance and ill health are comparable with the association between annoyance induced by daytime noise and health, nevertheless, in the sample surveyed, there are more people affected by night time noise than by daytime noise. Particular attention should therefore be paid to night time noise in homes.

### Noise and home accidents

The results suggest that the likelihood of any accident is significantly greater where the individual was tired all the time or most of the time. There also appeared to be a link between sleep disturbance and accidents, with 22% of those reporting an accident also reported having their sleep disturbed during the previous 4 weeks. Figure 3 shows the predictor variables and the exposure coefficient generated by the multiple regression model for a number of the main independent social and housing variables for each of the dependent home accident types. This constitutes a very interesting development that will deserve further research in order to identify the accident related burden of diseases attributable to noise during night time, which is currently quite overlooked in the scientific literature.



**Figure 3** - Logistic Regression: Predictor variables and coefficient (Exp B) values for all home accidents. Source: Moore et al

### Conclusions

The results on annoyance and sleep disturbance induced by noise and the way they interlink with health aspects are one of the most important findings of the LARES study. Approximately 21% of the people surveyed in this study claims being disturbed by noise in their dwelling and 1 out of 10 adults claims having their sleep disturbed by noise. The analysis for all the different themes is currently being performed and the results will be published soon.

#### References:

- [1] X. Bonnefoy et al, "Review of evidence on housing and health", WHO Bonn, 2004 ULR: [http://www.euro.who.int/document/ehec/4thigoprepmeet\\_bd01.pdf](http://www.euro.who.int/document/ehec/4thigoprepmeet_bd01.pdf)
- [2] Niemann H., Maschke, C.; Interdisciplinary research network "noise and health" WHO LARES study – 1<sup>st</sup> interim report – noise effects and morbidities", 2004.
- [3] R. Moore, D. Ormandy - "WHO Pan-European Housing and Health Survey, Home Accidents (Unintentional Home Injuries)", 2004