WORLD HEALTH ORGANIZATION
EUROPE

Large analysis and review of European housing and health status (LARES)

Preliminary overview

Address requests about publications of the WHO Regional Office for Europe to:
Publications
WHO Regional Office for Europe
Scherfigsvej 8
DK-2100 Copenhagen Ø, Denmark
Alternatively, complete an online request form for documentation, health information, or for permission to quote or translate, on the Regional Office web site (http://www.euro.who.int/pubrequest).

CONTENTS

Page

The LARES survey of the WHO Regional Office for Europe

A Pan-European housing and health survey has been undertaken from 2002 to 2003 in eight European cities at the initiative of the WHO housing and health programme following a proposal of the WHO European Housing and Health task force. The LARES Survey (Large Analysis and Review of European Housing and Health Status), coordinated by the European Centre for Environment and Health, Bonn Office of the WHO Regional Office for Europe was designed to achieve the following objectives:

- to improve knowledge of the impacts of existing housing conditions on health and mental and physical well-being;
- to assess the quality of the housing stock in a holistic way and to identify housing priorities in each of the surveyed cities, and possibly common trends;
- to develop an "easy to use" tool to assess the impact of housing on health in any city or region in Europe; and
- to prepare the fourth Ministerial Conference on Environment and Health (June 2004, Hungary).

The survey has been carried out in each city according to the same methodology and based on three consistent survey documents:

1. housing questionnaire, used by trained surveyors during the face-to-face interview of a representative of the surveyed households to collect data on the perceived quality and condition of the dwelling and the immediate environment in which they lived;
2. inspection form, used by trained surveyors to collect technical and objective data on the surveyed dwelling; and
3. individual health questionnaire, filled in by/for each inhabitant (including children) of the surveyed dwelling.

Each municipality has been equally supported by WHO in order to use the same procedures:

- before the survey: communication and press release, training of surveyors, guidelines for municipalities on how to provide the sample, recruitment of the surveyors and data entry operators, and the logistic support;
- during the survey: coordination of the field work, contacting of selected households, dwelling visits, quality control of the filled questionnaires/data entry; and
- after the survey: database cleaning, data analysis, preparation of city report.

Each local survey aimed to collect data on roughly 400 dwellings and 1000 inhabitants to achieve statistically significant results. The local surveys were carried out in Angers (France), Bonn (Germany), Bratislava (Slovakia), Budapest (Hungary), Ferreira do Alentejo (Portugal), Forlì (Italy), Geneva (Switzerland) and Vilnius (Lithuania). WHO would like to thank all local authorities for their support in this project. Special gratitude goes to the German Ministry of Health and Social Security for a grant supporting this project.

After the local surveys had been undertaken, and city reports for each individual city had been produced, an expert consortium was established to work on the merged international data set of

all eight cities to precise links between housing and health. The following results provide a first overview of some major findings of the LARES project, taken from the analysis reports of the expert teams and some analyses done by WHO. It is necessary to bear in mind that the findings are not representative of the whole European population.

More detailed information, providing the methodology of the project and statistical analyses as well as discussing and interpreting the results, are currently being compiled in a LARES book edited by members of the expert consortium.

Further information on the LARES project, the participating cities, the applied methodology and survey tools, and the experts and topics of the LARES analysis consortium can be found on the Regional Office web site (http://www.euro.who.int/Housing/activities/20020711_1).

Table 1. Overview of expert teams and topics of the WHO LARES analysis

Team members	Topic	Chapter/Section contribution
Dr Niemann/Dr Maschke, Research Network Noise and Health, Technical University Berlin, Germany	Noise and sleep disturbance	3.3
Dr Croxford, Faculty of the Built Environment, Bartlett School, London, United Kingdom	Hygrothermal comfort and perception	3.3
Dr Ezratty, Service des Etudes Medicales d'EDF et de Gaz de France, Paris, France	Residential energy systems, SES and health	3.3
Dr Fredouille, Hospital Vinatier, France	Housing and mental health	3.2
Dr van Kamp, Mrs Ruysbroek, Dr Stellato, Centre for Environmental Health Research, RIVM, Netherlands	Residential quality of life	2.4
Professor Mesbah, Laboratory of Theoretical and Applied Statistics, University Pierre et Marie Curie, Paris, France	Housing scores	3.2
Dr Annesi-Maesano, Epidemiology of Allergic and Respiratory Diseases Department, UMR-S 707 INSERM and University Pierre et Marie Curie, Paris, France	Allergic and respiratory diseases	3.3
Professor Miles, Department of Urban and Regional Planning and Center for Demography and Population Health, Florida State University, USA	Environmental Tobacco Smoke Exposure	3.3
Mr Terence Milstead/Professor Miles, Department of Urban and Regional Planning and Center for Demography and Population Health, Florida State University, USA	Pests exposure and cockroaches	3.3
Dr Nygren, Department of Clinical Neuroscience, Division of Occupational Therapy, Lund University, Sweden	Functional limitations, design and accessibility	3.3
Dr Davidson, Housing Centre, Building Research Establishment (BRE), Watford, United Kingdom	Fear of crime and perceived safety	3.4
Dr Nicol, Centre for Safety, Health and the Environment, Building Research Establishment (BRE), Watford, United Kingdom	Dampness, mould and housing	3.3
Dr Rudnai, National Institute of Environmental Health, Hungary	Mould growth and health	3.3
Professor Ormandy, School of Law, Warwick University, United Kingdom; with Dr Moore, United Kingdom	Domestic accidents	3.3
Dr Kliemke/Mr Arndt/Mr Daubitz, Institute for Architecture and Institute for Traffic, TU Berlin, Germany	Barrier-free housing and mobility of residents	3.3
Dr Macintyre/Dr Ellaway, Medical Research Council, Glasgow University, United Kingdom	Residential conditions, physical activity and obesity	3.4

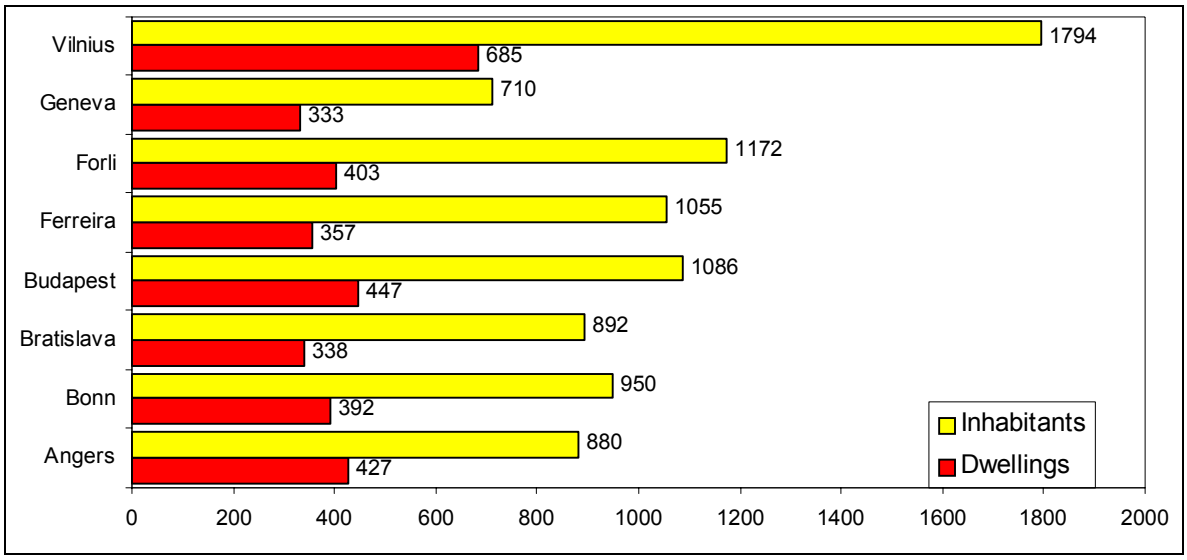
Team members	Topic	Chapter/Section contribution
Professor Leyden, Institute for Public Affairs, West Virginia University, USA	SES, neighbourhood deprivation and health	4
Dr Shenassa/Dr Brown, Brown Medical School, Providence/CDC, Atlanta; USA	Mental health and housing	3.2
Dr Shenassa/Dr Brown, Brown Medical School, Providence/CDC, Atlanta; USA	Neighbourhood safety and physical exercise	3.4
Professor Blackman, School of Applied Social Sciences, University of Durham, United Kingdom	Ecology of smoking behaviour	3.3
Mr Braubach, WHO European Centre for Environment and Health, Bonn, Germany	Residential environments and health	3.4
WHO European Centre for Environment and Health Mr Bonnefoy; Mr Braubach; Mrs Moissonnier; Mr Monolbaev; Mrs Rodriguez; Mrs Röbbel	Overall coordination and implementation of the LARES project	

1. Population and health

1.1 The surveyed population

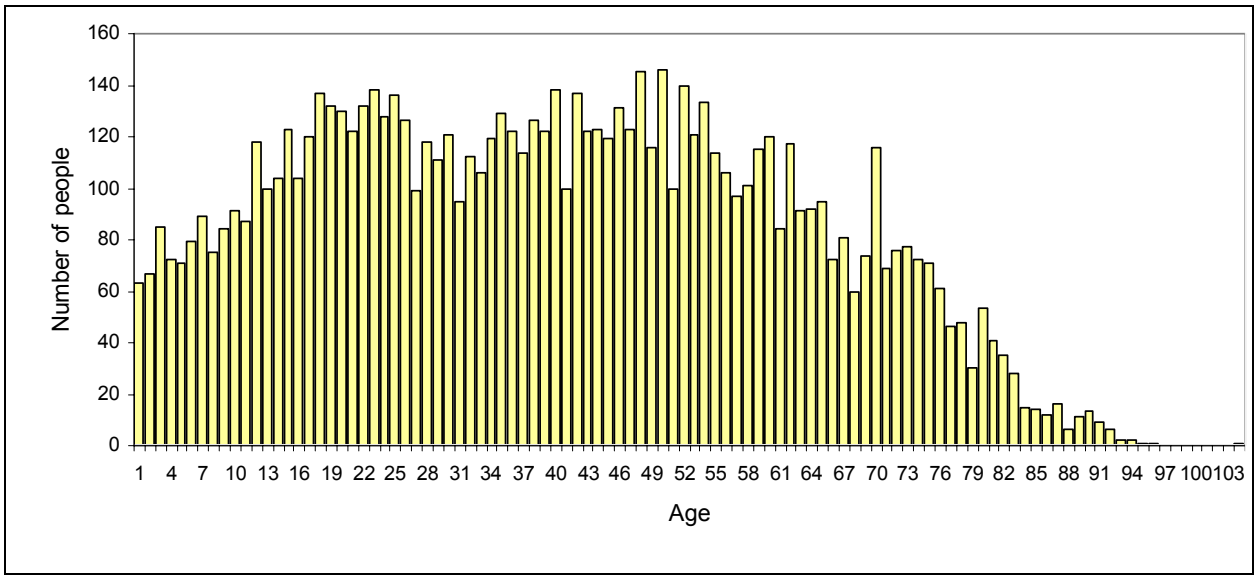
In total, eight European cities took part in the survey. The data set, based on 290 questions with 1095 items, includes information on the condition of 3373 dwellings and the health status of 8519 inhabitants (Fig. 1). In average, the response rate over all cities was at 44.2% of the eligible sample of households.

Fig. 1. Participation in LARES by city



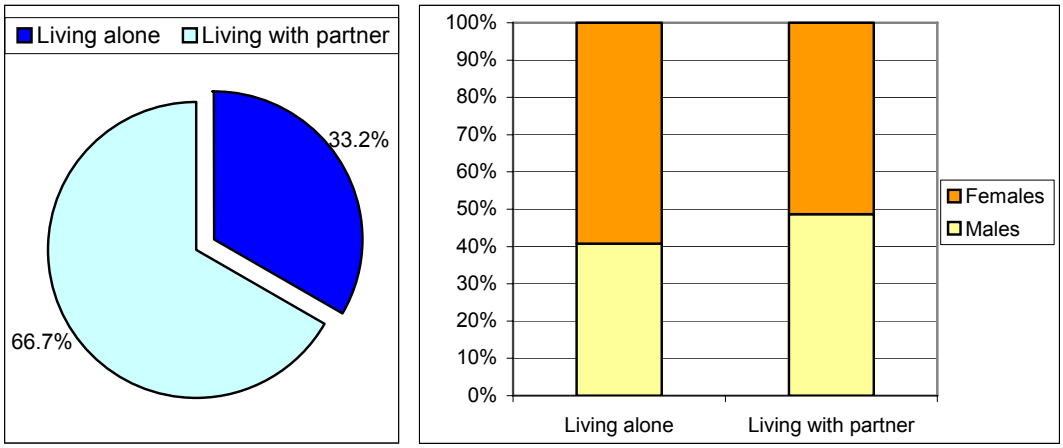
The age of the surveyed individuals ranges from 0 to 104 years, with an average age of 39.8 years (Fig. 2). Twenty-two per cent of the sample are younger than 20 years while 21% are 60 years and older.

Fig. 2. Age distribution of surveyed residents



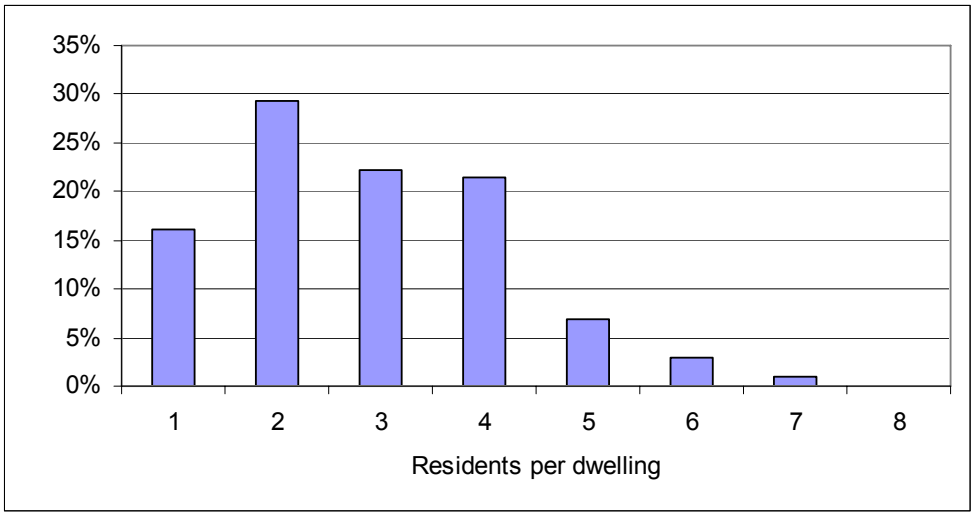
Females were 53.3% of the surveyed residents, although large differences exist for the oldest age group (88% of the people older than 85 years were female). In general terms, two thirds of the surveyed adult population lives with a partner, while one third reports being single, widowed, divorced, or separated. The variation between males and females living alone or with partner is rather small (Fig. 3).

Fig. 3. Marital status of surveyed adults in total and by gender



The number of residents per household ranges from 1 to 8; and the average household size is quite small with 2.87 people; 45% of all households include one or two people; 68% include up to three people (Fig. 4).

Fig. 4. Distribution of household size in surveyed dwellings



Less than 4% of the sample of adults does not have any school education, while about 56% have a school level above the first stage of secondary education (Fig. 5).

Of the adults, 43% were employed full-time, 26% were pensioned and 6.5% unemployed at the time of the survey. Differences according to gender are quoted within employment also (Fig. 6) and are mostly related to the amount of working females (less in general), the ratio of part-time jobs (more common for female residents) and the activity of taking care of other household members (almost exclusively observed for female residents).

Fig. 5. Education level of adult survey participants

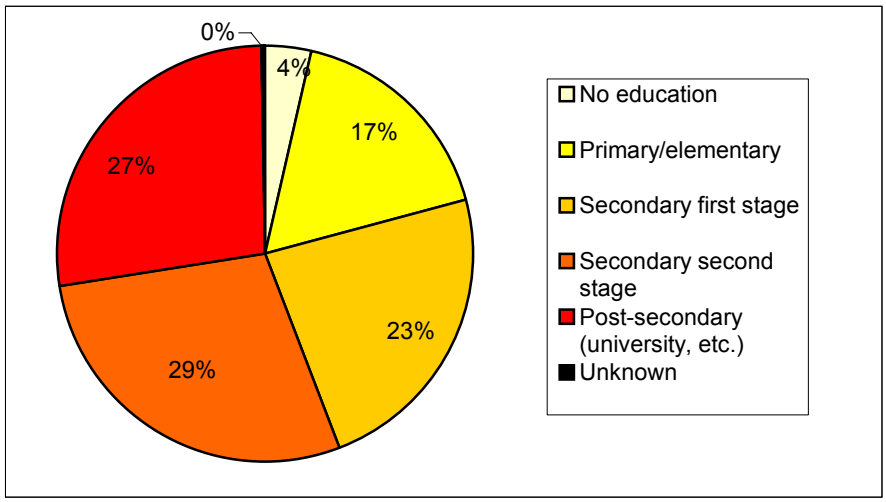
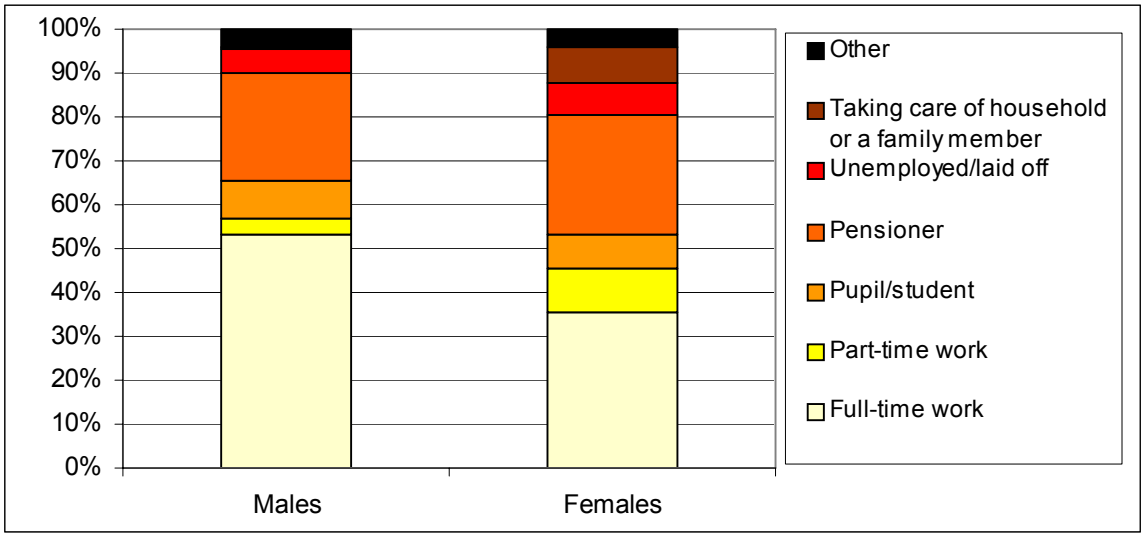


Fig. 6. Employment status of adult survey participants by gender



To measure the socioeconomic status in a more comparable way than it was possible with monetary household income, an integrated socioeconomic status (SES) score has been developed for the LARES data set. The SES score is based on several criteria (employment and unemployment, social benefits, dwelling size etc) that are strongly correlated with income. When applied to the global sample of households, it allows the distribution of households by SES. Fig. 7 describes the distribution of households according to five equally sized SES groups (quintiles).

Fig. 7. SES-distribution of LARES-households

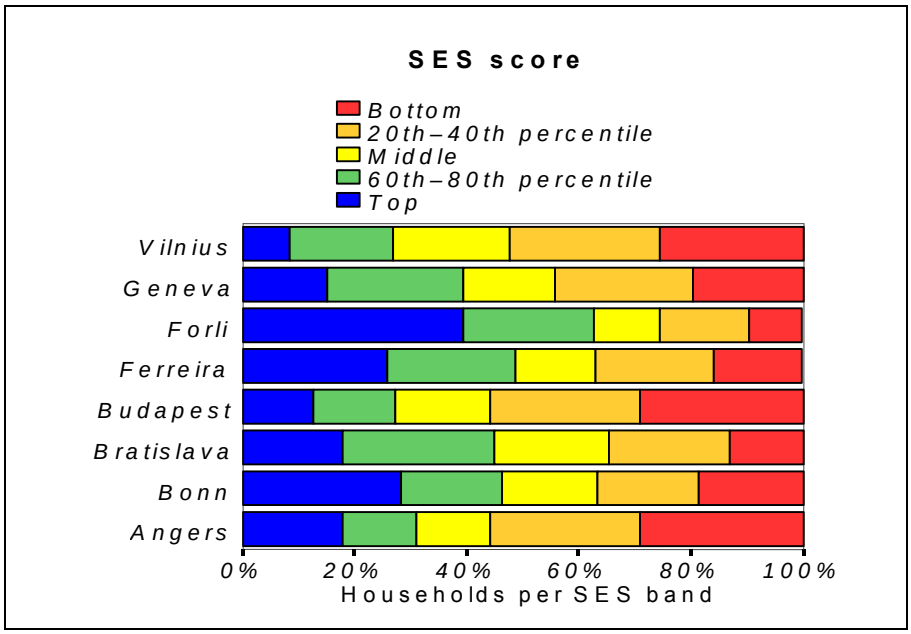
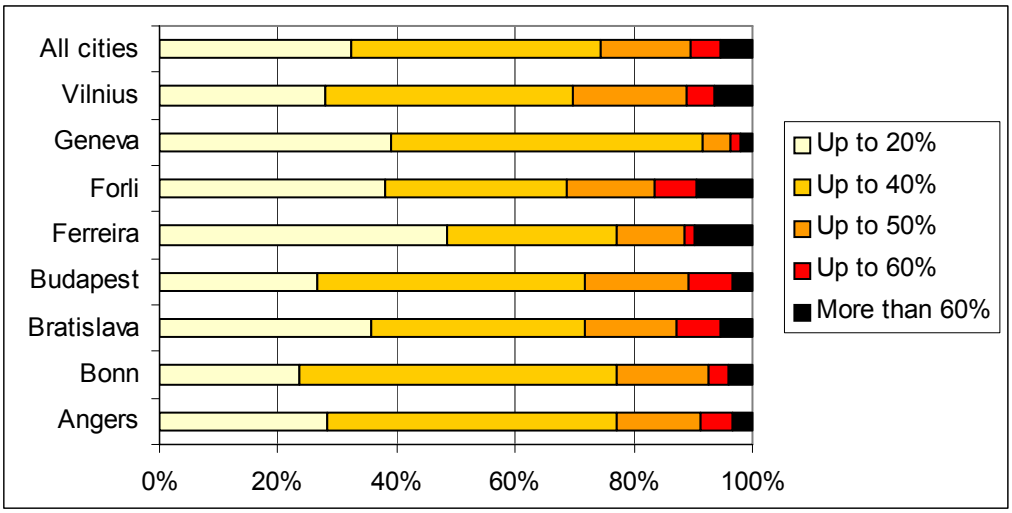


Fig. 8. Housing expenses as percentage of total household income



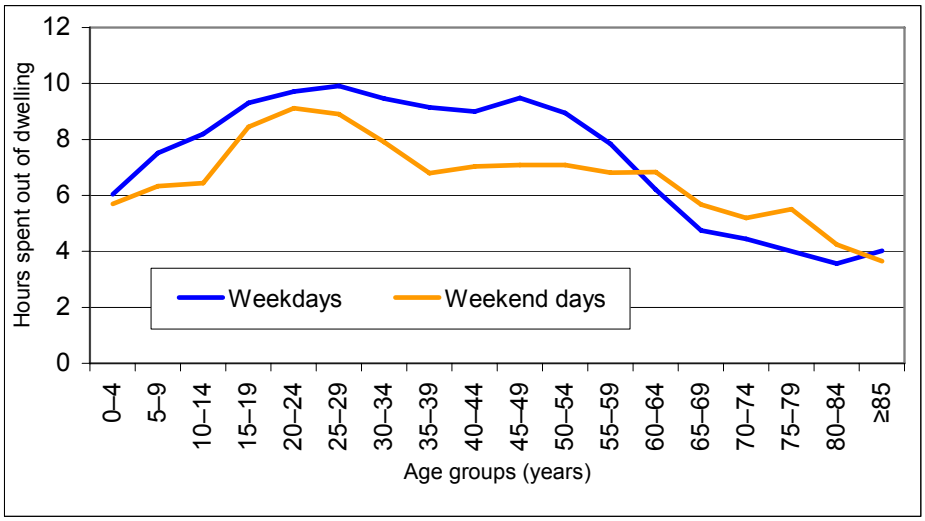
In around one third of all households, the housing expenditures represent up to a maximum of 20% of the disposable household income, while the majority of households (42.4%) need to spend up to 40% (Fig. 8). Nevertheless, 10.4% of all households in the LARES data set need to pay more than half of their income for housing-related expenses.

1.2 Behaviours and individual habits as determinants of health

1.2.1 The main part of the lifetime is spent at home

People spend the main part of their lifetime at home. During working days, the average amount spent out of the home is 8.1 hrs per day, while on weekend days it drops by one hour to 7.1 hrs per day (Fig. 9). In general terms, younger adults spend most time outside of their home.

Fig. 9. Hours spent out of dwelling by age groups



1.2.2 Self-reported healthy lifestyle

Only a good quarter of the surveyed population frequently engages in sport or physical activities, while 42% are not doing any exercise (or not doing exercise anymore) (Fig. 10).

Almost one third of all surveyed people with an age of 16 and older are smoking. Most of them – 20.7% in total – report intense smoking (5 cigarettes per day and more) while 3.4% smoke on a moderate level (up to 4 cigarettes per day) and 8% only smoke occasionally. Alcohol consumption is much more spread, with 62% of the surveyed individuals at an age of 16 and older reporting occasional consumption of alcoholic drinks. 10.7% report daily alcohol consumption (Fig. 11).

Fig. 10. Sports and physical activity (all ages)

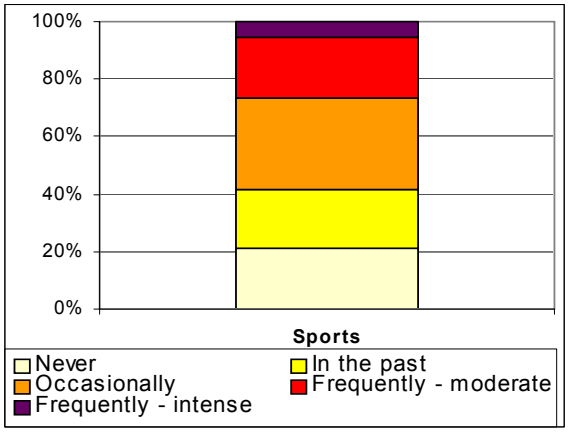
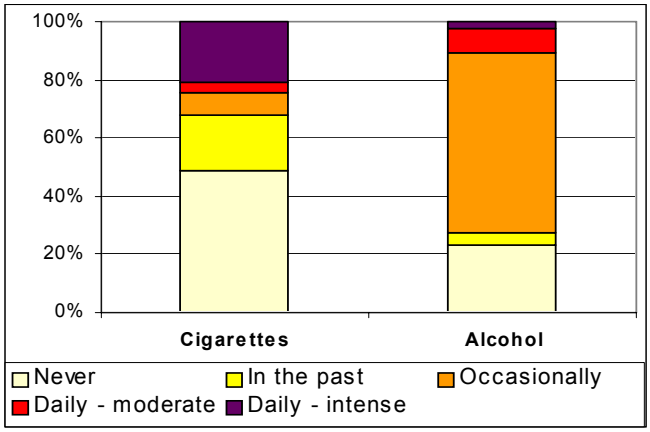


Fig. 11. Tobacco and alcohol consumption (people with an age of 16 years and older)

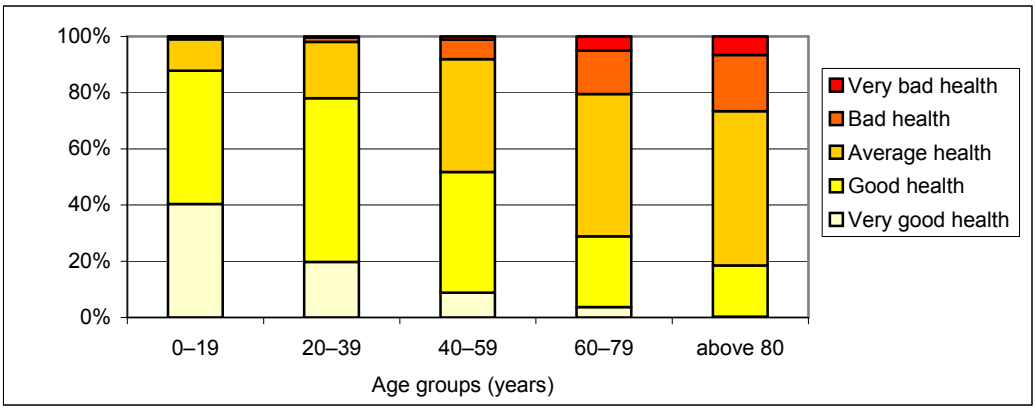


1.3 Selected aspects of health

1.3.1 Self-reported health status

In general terms, the surveyed population considers itself to be rather healthy, as 17.6% of all residents define their health as very good and 44.3% define it as good. 30.5% assess it as average, and only 6% and 1.6% report a bad or very bad health status. Similar to other health surveys, the ratio of people reporting bad health is affected by age: 20.5% of the residents between 60 and 79 years, and 26.7% of the residents of 80 years and older belong to this group (Fig. 12).

Fig. 12. Self-reported health status of the surveyed population, by age group



1.3.2 Problems with weight in adults

Every second person in the age of 20–80 years is affected by some problems with weight: 13.2% are obese, 33.4% are overweight and 3.6% are underweight (Fig. 13). Obese people and overweight are clearly less numerous in the higher economic and social groups (Fig. 14). Obese people are almost four times more likely to never do sport than non-obese people (odds ratio (OR)[1] = 3.9/CI 3.1–5.1). They are 60% time more likely to spend most time at home during the working days and 15% time more likely to live far from a public or green open space.

Fig. 13. Weight distribution of adults (age 20–80)

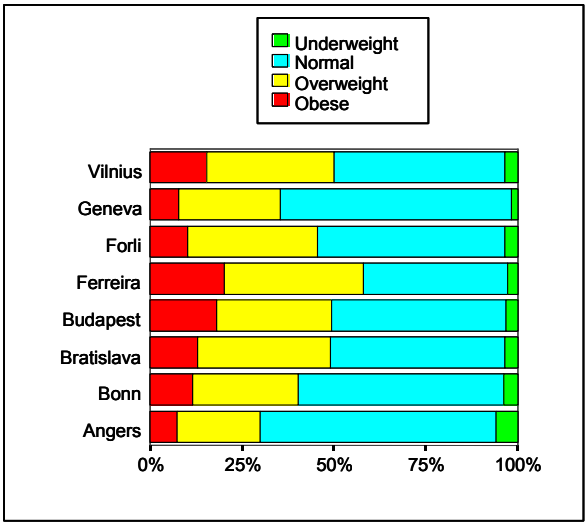
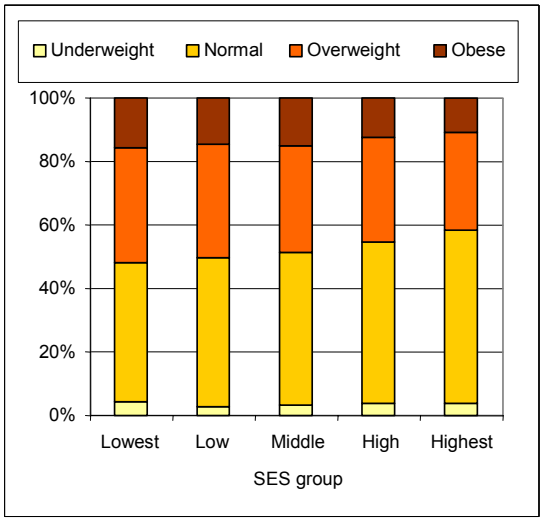


Fig. 14. Weight distribution by SES group



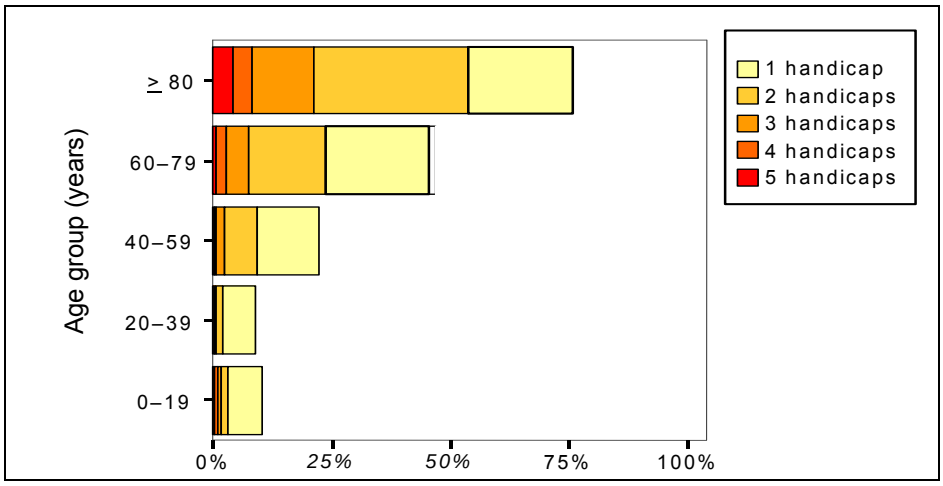
[1] An odds ratio (OR) expresses the chance of an exposed person to be or to become sick in relation to the chance of a non-exposed person. An OR=1.5 means that the chance to be or to become sick is 50% higher.

1.3.3 Handicaps and physical constraints

Of the surveyed population, 10% declares having one or more handicaps. Nevertheless, a larger number of people (22%) give details on specific physical constraints from which they suffer, showing that those affected by physical constraints often do not consider themselves as "handicapped". The elderly are particularly affected by multiple handicaps: more than seven seniors in ten have at least one physical constraint (Fig. 15). The most frequent constraints are problems to bend down (14.3%) and problems to use stairs (10.7%).

Almost one third of all people with a handicap report being unable to use their dwelling in a normal way.

Fig. 15. Handicaps or physical limitations by age group

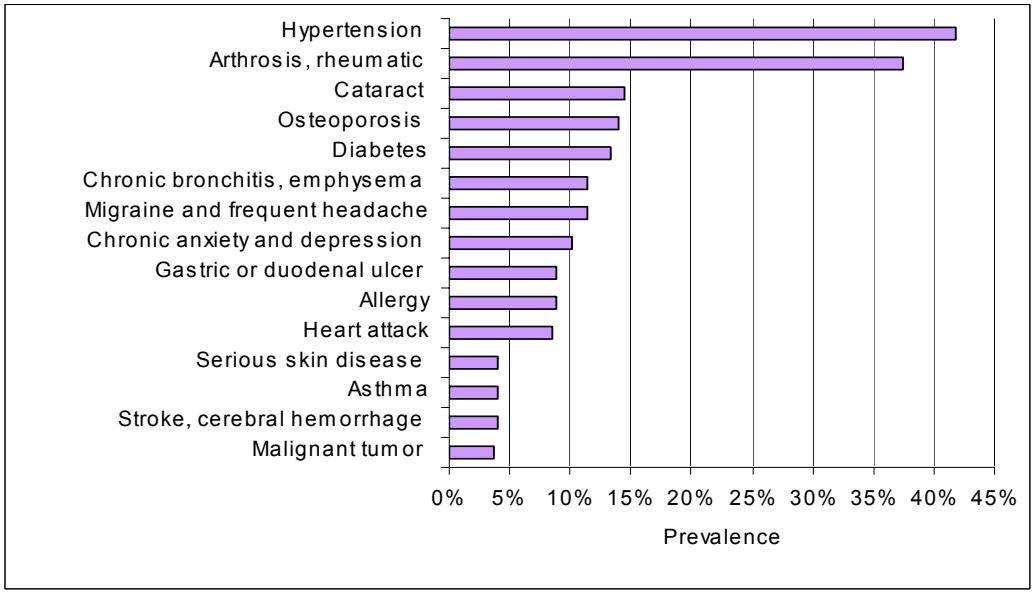


1.4 Disease prevalence

Within the whole surveyed population, hypertension and arthritis are the two most frequent diseases declared as having been diagnosed by a doctor, with a respective prevalence of 16% and 14%.

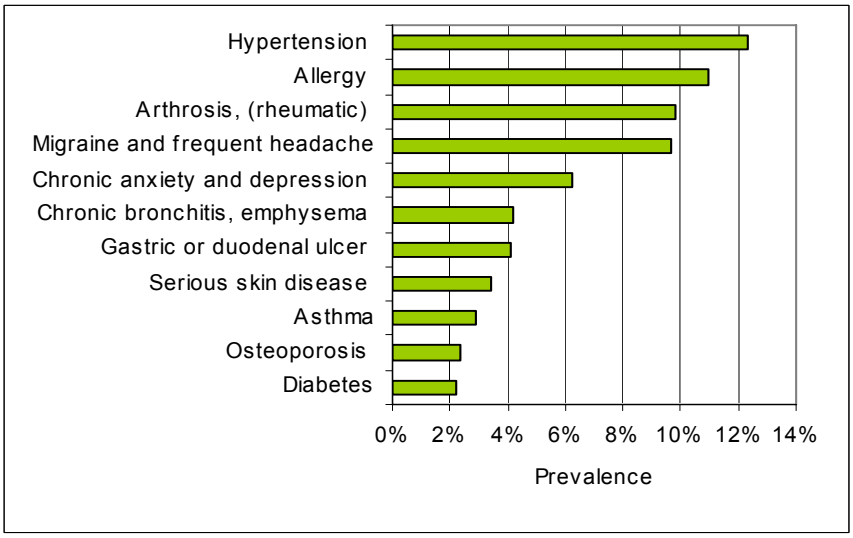
Comparing the prevalence of diseases between age groups provides largely varying results, especially in the elderly where particularly high prevalence of hypertension (42%) and arthritis (35.5%) is found and diseases such as cataract and osteoporosis are most frequent compared to other age groups (Fig. 16).

Fig. 16. Chronic diseases diagnosed by a physician in residents aged 60 years and older



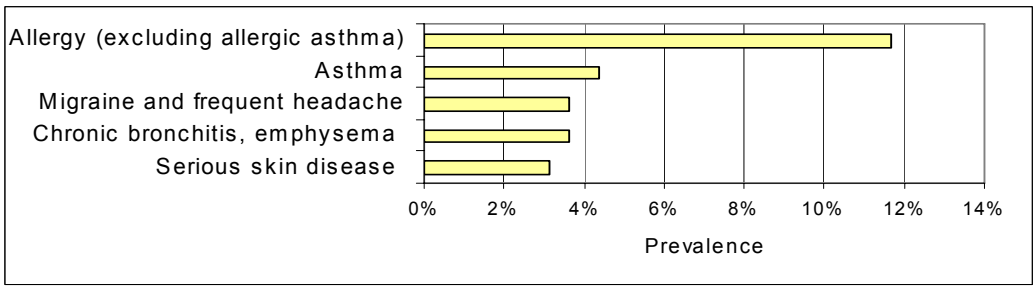
After hypertension, the second-most relevant disease affecting adults up to 59 years is (chronic) allergy (Fig. 17). In general terms, the prevalence levels are much lower than for the elderly.

Fig. 17. Chronic diseases diagnosed by a physician in residents aged 19–59 years



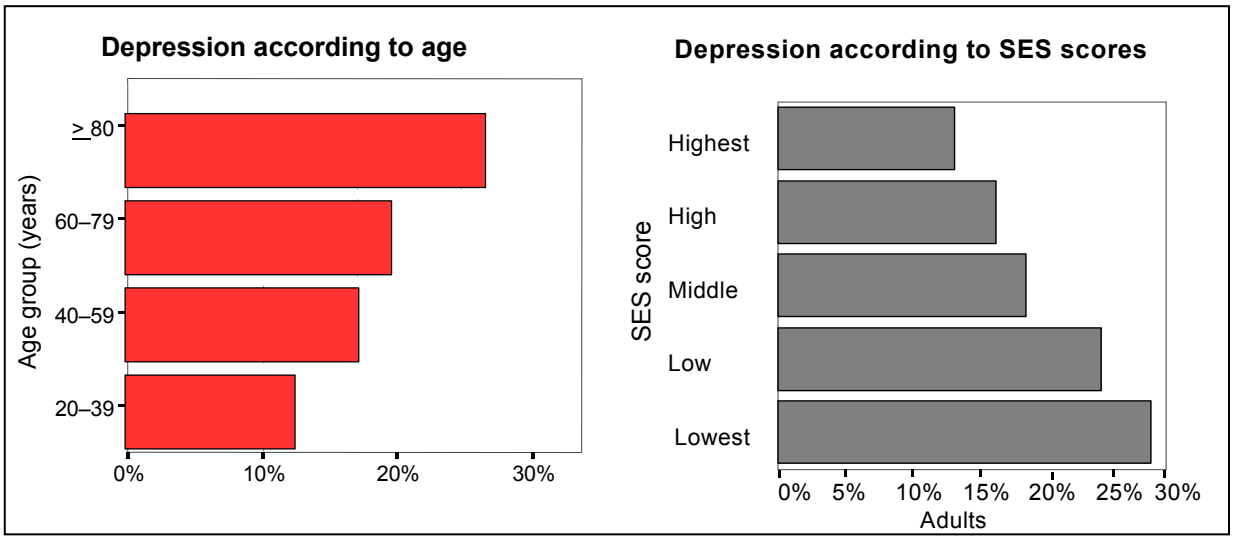
For children and teenagers, allergies (12%) are the major chronic diseases reported by the surveyed population, followed by asthma (4.4%) (Fig. 18).

Fig. 18. Chronic diseases diagnosed by a physician in residents aged 18 years and younger



Depression had been diagnosed by a doctor in 7.2% of all surveyed adults. However, trends of depression identified through a depression screening tool are more important, affecting 19% of the adults in average with strong differences according to age (Fig. 19). The trends define an increasing number of symptoms that – if occurring in parallel over a time period of few weeks – have been defined as an efficient indicator for depression in adults.

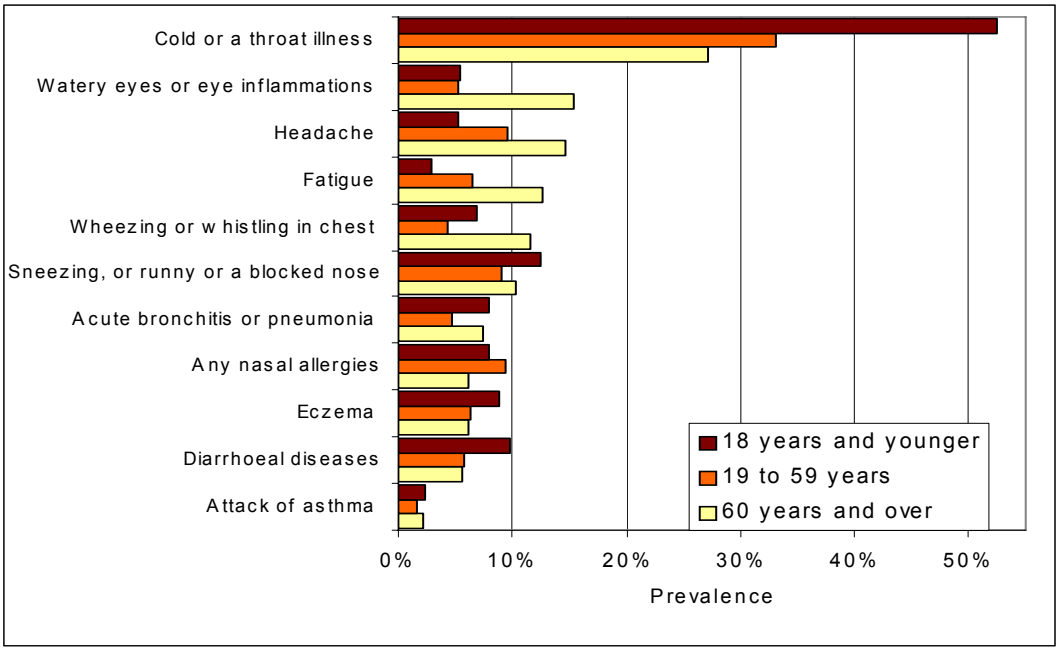
Fig. 19. Trends of depression in adults by age and SES groups



1.4.1 Seasonal diseases, acute illnesses and health symptoms

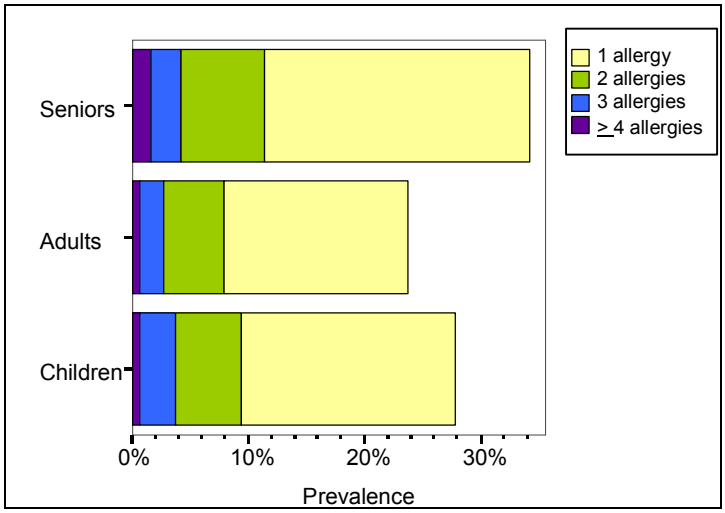
The major seasonal diseases affecting all people – irrespective of age – are cold or throat illnesses (Fig. 20) followed by allergic symptoms such as eye, skin and nose reactions and headache/fatigue. In total, the prevalence of these allergic symptoms affects up to one fourth of the surveyed population, with almost 9% reporting two symptoms at least.

Fig. 20. Seasonal diseases and acute symptoms diagnosed by a physician



Elderly and children are more affected by allergic symptoms than adults, which is both true for the number of people with allergies and for the number of allergies per affected person (Fig. 21).

Fig. 21. Multiple allergies according to age



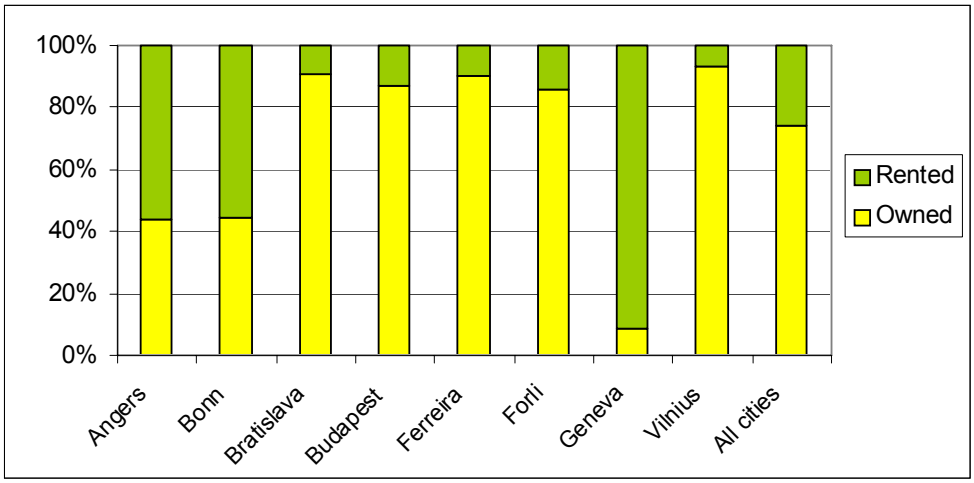
Furthermore, 2.3% of the elderly, 1.5% of the adults and 2.4% of the children have been affected by at least one acute asthma attack during the year before the survey.

2. The housing stock

2.1 The surveyed housing stock

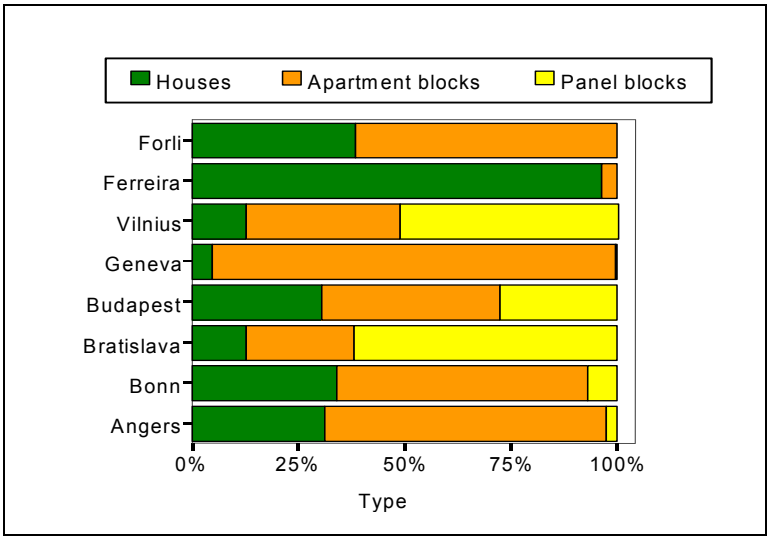
In general terms, the housing stock that was surveyed by the LARES shows a high ownership rate. This is caused by the fact that the housing stock in Eastern Europe has been largely privatized in the 1990s, and the increased ownership rates of the two Southern European cities of Forlì and Ferreira (Fig. 22).

Fig. 22. Housing tenure by city



Due to history and architecture, there are varying housing stock patterns in the eight cities. One-family houses dominate in Ferreira, the smallest of the LARES cities, while Geneva is mostly made up from apartment blocks and multi-family housing. In the three Eastern European cities, the housing stock contains the highest ratio of panel block buildings (Fig. 23). Of all surveyed households, 41% lived on the ground floor, 31% on first and second floor, and 17% on the third and fourth floor level. Only 11% of the dwellings were located in multi-family buildings on the fifth floor or higher. 51% of the dwellings were located in buildings built after 1970, and 19% of the dwellings were built before the end of the Second World War.

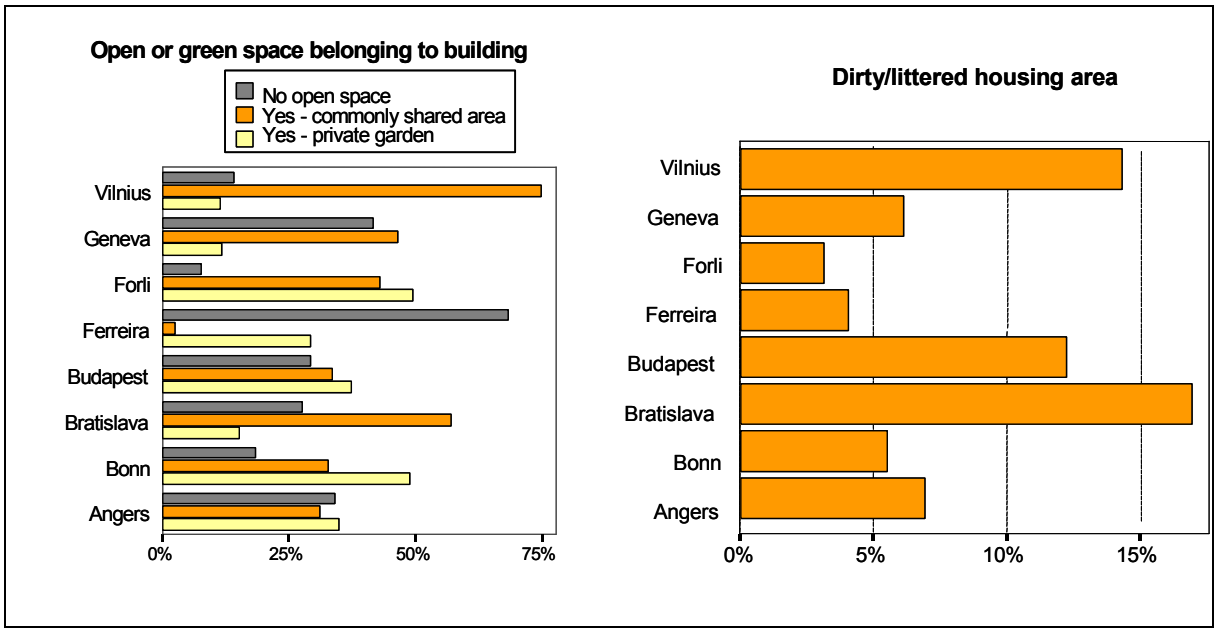
Fig. 23. Housing type of surveyed dwellings



2.2 The housing environment

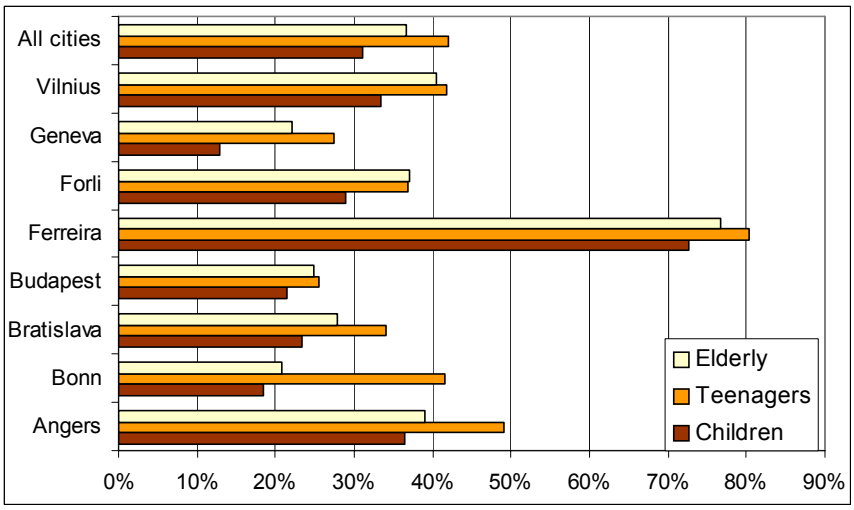
In most – but not all – cities, the major part of the surveyed households has a garden or a shared open or green space belonging to the building at their disposal. However, some problems of maintenance and damage of the immediate housing environment are reported by the surveyors in the cities (Fig. 24). The survey also showed that around 45% of the surveyed population is living close to a street that was identified as busy and noisy by the independent survey teams.

Fig. 24. Conditions of the housing environment



The LARES survey collected data on residential amenities and conditions strongly linked with social activities and the perception of security in the local area. Of the interviewed people, 30% affirmed that there are not enough recreational areas or places to sit and relax in their immediate housing environment. Fig. 25 shows that the lack of recreational spaces is valid for various target groups, but most expressed for teenagers.

Fig. 25. Lack of recreational areas for specific age groups

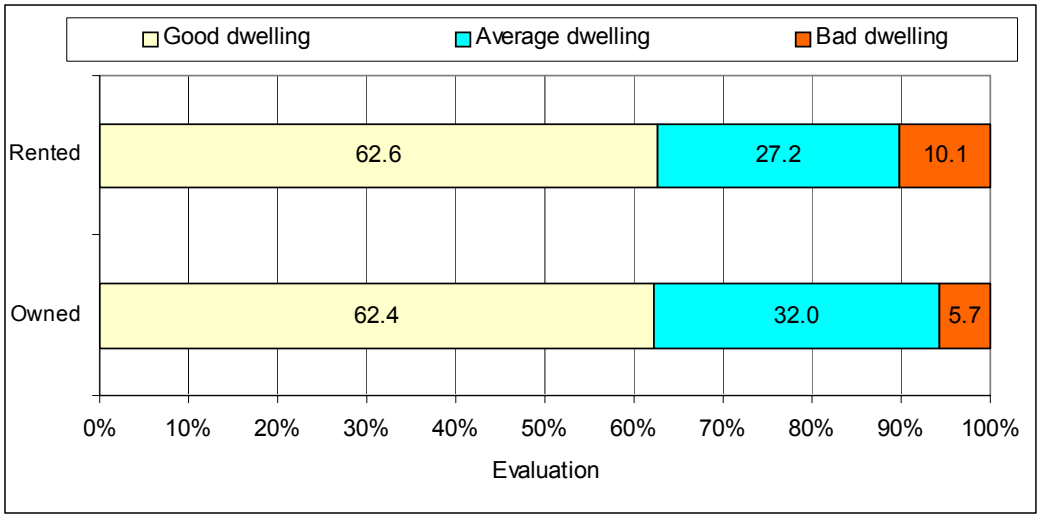


2.3 General satisfaction with the dwelling and the neighbourhood area

Of all residents, 62.2% evaluate their dwelling as “good”, while 30.8% evaluate it as “average”. Only 7% give a negative rating. The elderly, and to some extent also children and teenagers, have a slightly more positive view on their dwelling but the variations are modest and range only within a few percent.

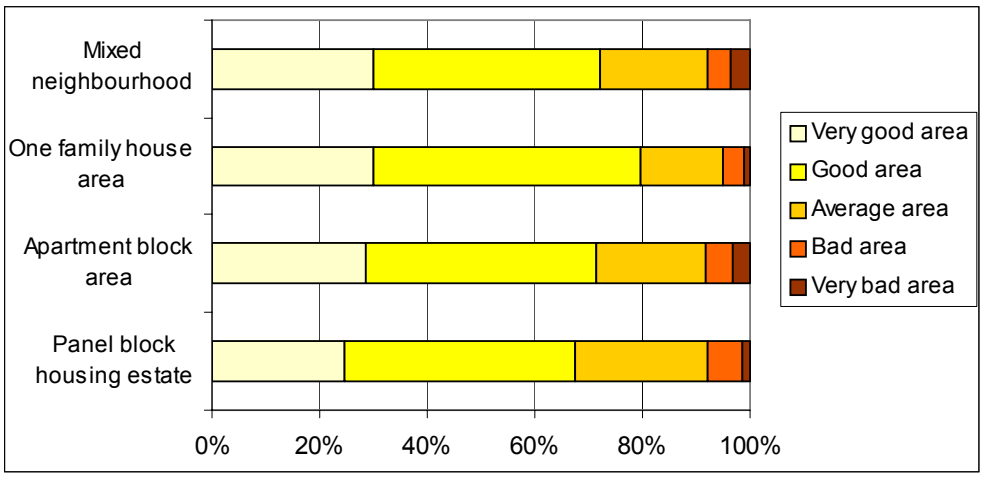
Furthermore, the satisfaction of the residents with their dwelling seems only partially related to tenure: Fig. 26 shows that the large majority of renters and owners is equally satisfied with the dwelling, and differences can only be found within the less positive evaluations, uncovering that 10% of all households in rented dwellings are not satisfied with the dwelling conditions.

Fig. 26. Dwelling evaluation of residents by tenure



Regarding the residential area, the evaluation by the households is slightly more positive than for the dwelling. Only 7.3% are dissatisfied (bad and very bad area assessment), and 19.8% evaluate their residential area as average, while for 72.8% the housing environment is satisfactory (good and very good area assessment). Still, some modest variations exist in relation to the neighbourhood type (Fig. 27).

Fig. 27. Evaluation of residential area types by households



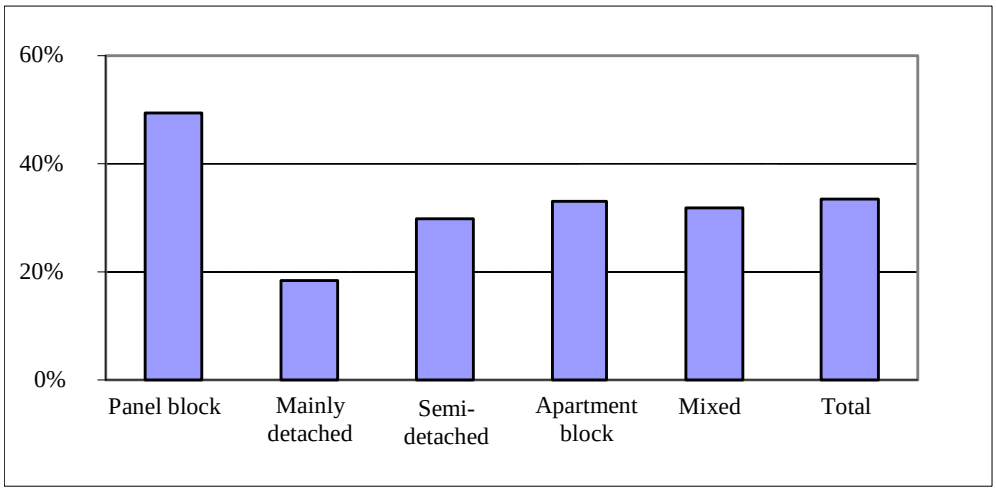
2.4 Residential satisfaction and perceived quality of life in a multi-level approach

Which aspects of the housing condition determine whether people are satisfied with their residential situation and how does this influence their overall well-being? This question underlies a series of multi-level analyses into the association of household related aspects with individual characteristics and judgments. The analyses considered environmental attributes on various spatial scales and included both factual and perceived aspects. At macro level effects of city and degree of urbanisation was accounted for, at micro level visual appearance and amount and quality of green area were considered and at dwelling level type age of the building stock were included as factual features. These were related to residents' perception about environmental quality such as noise exposure, air quality, dust exposure, the view from the dwelling, light through windows and dampness problems. Special attention was paid to the impact of personal characteristics such as age, SES, gender, length of residency.

Overall it shows that aspects of the environmental quality – both indoor and outdoor – determine residential satisfaction and to a lesser degree well-being, whilst accounting for differences at city level and differences due to demographic characteristics, age of building, and level of urbanisation.

Satisfaction with the dwelling is determined by most environmental quality characteristics included in the analysis, such as the number of noise sources, availability and quality of green areas and perceived air quality, dampness of the house, and satisfaction with the view and light. Appearance of the neighbourhood (litter, graffiti etc.) is significantly associated with dissatisfaction before, but not after adjustment, due to the strong association between type of neighbourhood and appearance (see Fig. 28). Age, gender and SES are also significantly associated with dwelling satisfaction. As found previously younger adults and men are less satisfied with their homes than middle-aged and older adults and females, respectively.

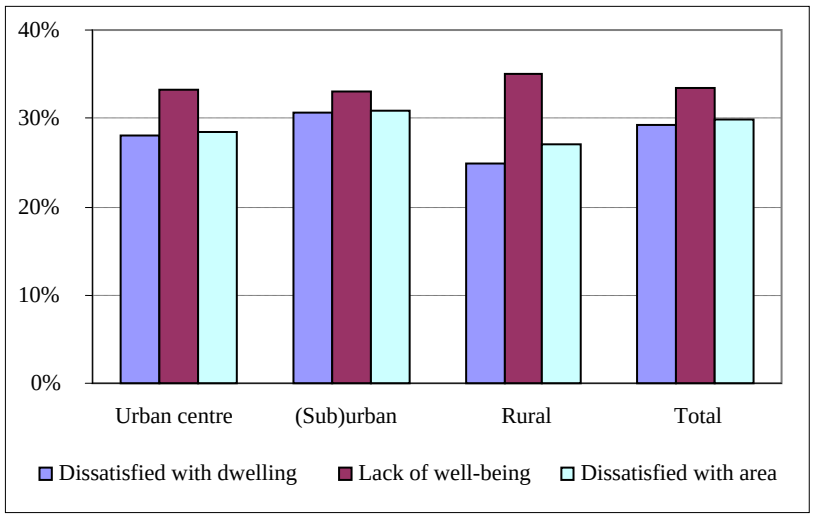
Fig. 28. Unattractive visual appearance by neighbourhood type



City, environmental quality aspects and perceived safety are important predictors of satisfaction with the area. This pattern remains after adjustment for building age and level of urbanisation and aspects as age, gender, SES and length of residency, meaning that including these variables does not really add to the prediction of satisfaction with the area.

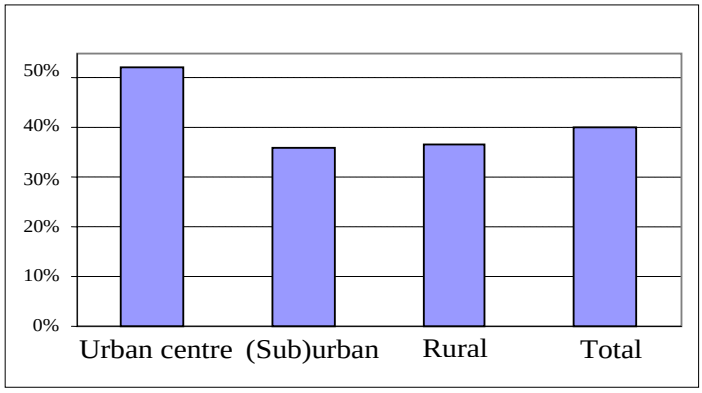
Only some environmental indicators are directly associated with lack of well-being, before and after adjustment for confounders. The most important environmental aspects are number and quality of green areas, dampness, dust and satisfaction with the light in the home. The influence of building age and level of urbanisation (Fig. 29) is no longer significant after inclusion of demographic aspects.

Fig. 29. Dissatisfaction with dwelling and area and lack of well-being by urbanisation level



Women, elderly and households with low SES score significantly lower on the well-being index. Dwelling satisfaction is a strong predictor of well-being. Some aspects (green areas, lack of a view and air quality) indirectly influence well-being via dissatisfaction (Fig. 30), while other indoor environmental qualities (lack of light, dampness, and dust) also have a direct link with levels of well-being.

Fig. 30. Lack of green areas by urbanisation level



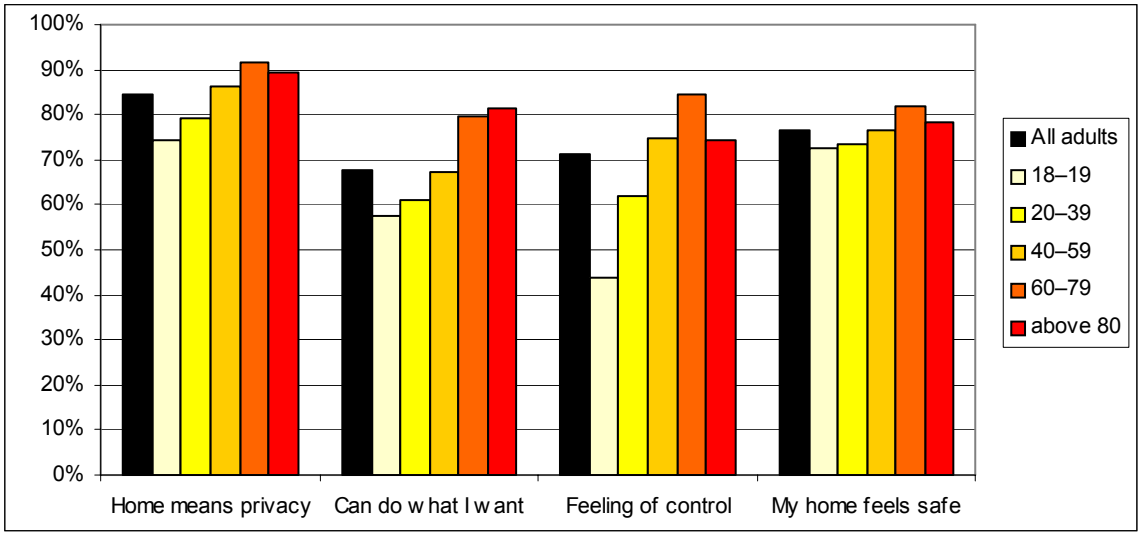
These results support previous findings that environmental quality is strongly associated with residential satisfaction (house and area) and, be it to a lesser degree, well-being. The condition and age of the housing stock and demographic features explain differences between cities to a considerable degree. These results in broad lines confirm the already known residential determinants of satisfaction and well-being. New is the notion that, in spite of some clear differences between European cities, the pattern of correlations is stable across them. The influence of indoor climate, light and the number and quality of green areas on well-being and diagnosed health problems as fatigue and hypertension is noteworthy, as is the strong influence of housing satisfaction on well-being.

3. Housing and health

3.1 Psychosocial benefits of home

Having an adequate home provides a variety of psychosocial benefits to the individual. The knowledge to have a safe space into which one can always retreat provides the feeling of safety, calm and stability. Fig. 31 shows that especially for the elderly, the home has a strong meaning and provides them with a sense of control and safety.

Fig. 31. Psychosocial benefits of the home form all adults and by age groups



There were only small differences between residents living in rented and owned dwellings, as well as between residents with physical handicaps and other residents. However, strong differences were found in relation to housing quality (derived from the visual inspection), which obviously has a huge potential to counteract the feeling of safety and control in one's dwelling (Table 2). The strongest contrast is found for the perception of the home as a safe place, indicating that inadequate housing conditions are not capable to provide a safe harbour for the individual. However, it is also likely that inadequate housing may be found more often in unsafe, deteriorating neighbourhoods.

Table 2. Housing quality and psychosocial benefits

Psychosocial benefits	High-quality housing (%)	Low-quality housing(%)
Home means privacy	90	76
Can do what I want	72	62
Feeling of control	77	59
My home feels safe	87	57

3.2 Mental effects of inadequate housing

The LARES survey has collected data on the mental health effects of deprived or inadequate housing conditions. The first results seem to confirm existing knowledge that various aspects of housing are associated with, and potentially may reinforce or enhance, social pathologies such as

depression, isolation, anxiety, etc. Due to the fact that the survey tool contained a specific tool on depression, the analysis has focused on depression as one indicator of mental well-being. The results have shown a variety of housing factors that are linked to an increased OR for trends of depression, such as “missing daylight” (increasing the chance of depression by 60%); “bad view out of window” (increase of 40%); “disturbance by noise” (increase of 40%); “sleep disturbance by noise” (double chance for depression); “no place in the dwelling to be alone” (increase of 50%) and “extensive exposure to dampness and mould” with an increase of 60%.

The OR for trends of depression are close to the OR for depression diagnosed by a physician and show that housing conditions may be involved in the development process of mental symptoms, or can aggravate the consequences of such.

Furthermore, the LARES findings suggest that mental health may be positively influenced by:

- one-family houses, with some distance between neighbours: not too far (which gives a feeling of isolation) and not too close (potential fear to be invaded);
- low floor levels (not higher than 4 floors);
- lack of deterioration inside the dwelling and in the immediate environment of the dwelling; and
- availability of modern conveniences (hot water in kitchen and in bathroom, well-ventilated, and sufficient number of toilets).

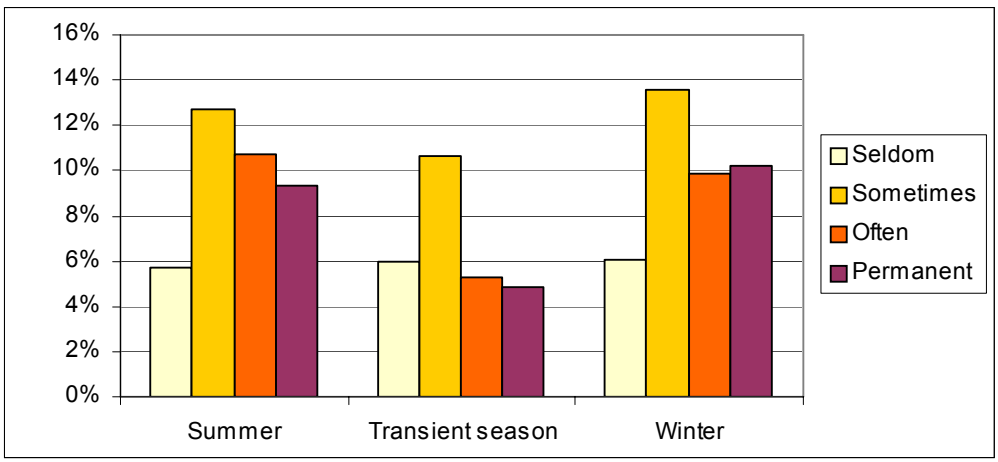
In addition it was found that the perception of control, enabling residents to be influential for the housing or residential conditions, was a significant factor for the prevalence of anxiety or depression.

3.3 Technical indoor aspects of the dwellings

3.3.1 Thermal comfort

Problems with the indoor temperatures are one of the most prominent housing issues identified by the survey. Fig. 32 shows that a substantial amount of the surveyed population reports frequent problems in all seasons, although cold temperatures provide most problems – 47% of all households report too cold temperatures in winter and/or the transient season.

Fig. 32. Percentage of households reporting thermal problems by frequency and season



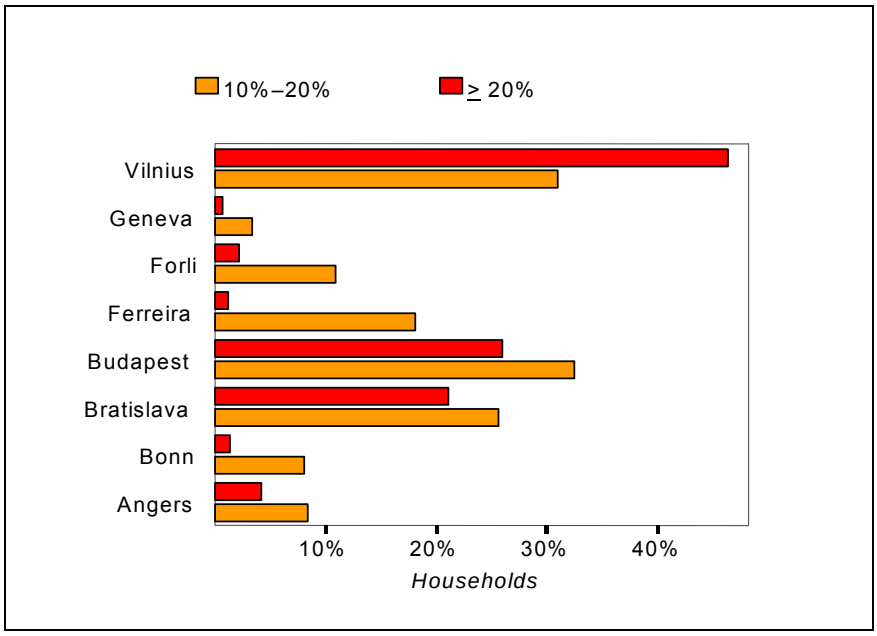
Of all households, 22.5% are dissatisfied with the thermal insulation of their dwelling, and the major reasons for cold indoor temperature were reported to be not tight windows, the low efficiency of heating systems, a lack of heating regulation, or the lack of heating equipment in some rooms. Homes without central heating were more likely to report perceived temperature problems, as well as those in which heating is not available in all rooms. Not tight windows and single-glazed windows almost doubled the perception of temperature problems.

Due to characteristics of heating and insulation being related with building types, the results showed that – compared to multi-family apartment blocks – panel block residents reported significantly more, and one-family house residents reported significantly less problems with indoor temperatures in the cold season.

Three quarters of all households have a central heating scheme providing warmth for the dwelling. For the other dwellings, gas and electricity are the major materials used to heat the dwellings. Still, each third household applies additional heating devices in some rooms, the majority using electricity as energy source.

Of all households questioned, 40% reported to spend more than 10% of the annual disposable household income for heating expenses – for 20% of all households the expenditure even accounts for more than 20% of the annual income. Related to the economic conditions of the households, the expenditure distribution shows large differences between the surveyed cities. The survey data clearly shows that households living in the Eastern cities are facing the largest challenge and are often exposed to a condition defined as "fuel poverty" (Fig. 33)[2]. Almost half of all households in the lowest SES group (47%) report indoor temperature problems in winter, while the ratio is much lower (31%) in households of the highest SES group.

Fig. 33. Heating expenses in % of annual disposable income by city



[2] For the identification of "fuel poor" households, the definition of fuel poverty applied in the United Kingdom has been used. The United Kingdom definition considers households paying more than 10% of the household income on all household fuel consumption as fuel poor (DEFRA, 2004: Fuel poverty action plan for England). Currently there seems to exist no official definition of fuel poverty in any other EU country, so the British definition has been used as an indicator of potential socioeconomic limitations regarding energy and heating supply.

In general terms, thermal comfort-related problems such as cold indoor temperatures, problems with the heating system or inadequate insulation were mostly associated with respiratory problems. Children (0–17 years of age) showed a double prevalence for respiratory problems in homes with low quality of the heating system (OR = 2.1/CI 1–4.4), while elderly (65 years and older) showed increased respiratory problems when living in dwellings with subjectively perceived cold temperature in winter (OR = 2/CI 1–3.8) or inadequate insulation (OR = 2.4/CI 1.1–5.4). For the elderly, there was also a significantly higher reporting of arthritis in homes that were perceived as cold in winter (OR = 1.9/CI 1.2–3.2).

Problems with indoor temperature in winter and transient seasons are significantly associated with diagnosed acute bronchitis and pneumonia. Furthermore, thermal problems in winter are associated with diagnosed cold/throat illness, multiple allergies, asthma attack and asthma prevalence.

The general perception of thermal problems in the dwelling was strongly associated with bad self-reported health (OR = 2.6/CI 2.1–3.1). Further associations of thermal problems were found for hypertension, cold and throat diseases, diagnosed allergies and for asthma.

Residents in dwellings with not tight roofs and not tight or single-glazed windows had an OR of 2.4 (CI 2–3) for bad self-reported health and showed an increased association with hypertension but no significant increase for asthma (all results adjusted for gender, SES, age and smoking).

3.3.2 Natural lighting and view

In every third dwelling it is necessary to turn on the light during the day and each fourth household is dissatisfied with the amount of natural light. Mainly in neighbourhoods dominated by panel/apartment blocks, residents complain about the window view.

Most often, the affected households live in the oldest buildings (before 1945) and the lowest floors.

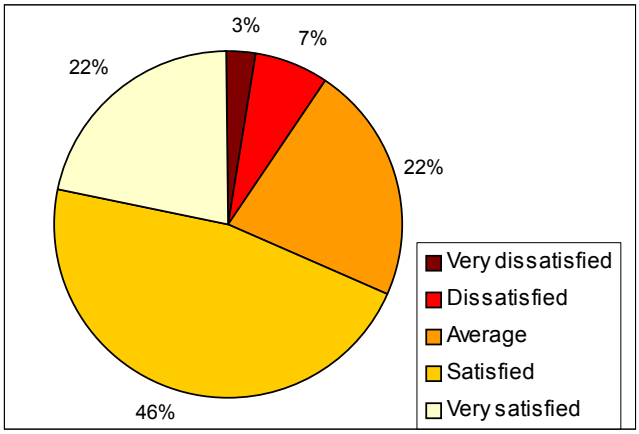
Significant associations have been found between the lack of natural daylight, the dissatisfaction with the view and diseases such as depression. The following effects are related to the lack of indoor natural daylight:

- trends of depression: OR = 1.6 (CI 1.4–1.8);
- diagnosed chronic anxiety or depression: OR = 1.6 (CI 1.3–1.9); and
- depression or chronic anxiety related to flat: OR = 2.6 (1.9–3.7), which is related to those residents that do not only report being sick but also report the dwelling condition as a potential causal factor.

3.3.3 Indoor air quality

Of the interviewed households, 10% are dissatisfied with the indoor air quality in their dwelling (Fig. 34). The major reasons for dissatisfaction are dust (mentioned in 45% of all cases of dissatisfaction), outside air pollution (42%), smells and odours (33%) and dryness (25%). However, detailed analysis showed that air quality dissatisfaction was strongly related to dwellings in which (a) the windows were not tight, (b) humidity and condensation was identified, and (c) mould growth was reported.

Fig. 34. Perception of indoor air quality



Of the dwellings, 40% have no ventilation system, and from the existing ventilation systems only one out of three can be regulated by the residents. Of the households living in dwellings with such a system, 25% report being dissatisfied with it. In general terms, 32% of all households complained about moving air/draught in winter due to not tight or low-quality windows.

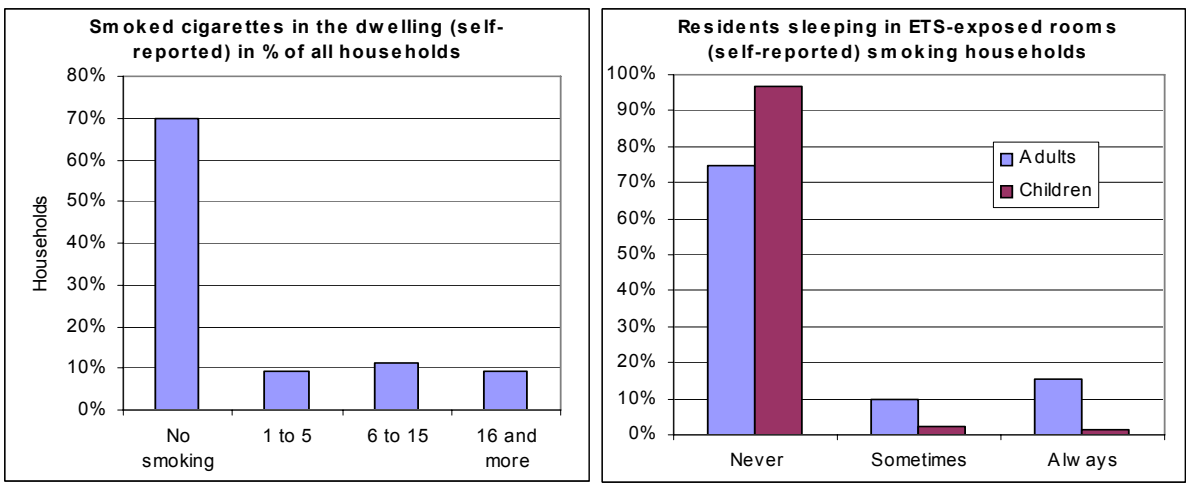
The problem with a lack of ventilation is mostly related to housing types (one-family houses lack adequate ventilation systems most often while they are rather frequent in multi-family buildings) and the age of the buildings (buildings built before the oil crisis in the early 1970s are more often unequipped with adequate ventilation systems).

Inadequate ventilation characteristics of the dwelling are associated with an increase of asthma (OR = 1.5/CI 1.1–2.2), accounting for age, gender, SES and smoking. In addition, the survey found that gas water heaters that are not connected/ventilated to the outside are associated with an increased OR of 2.2 (CI 1.1–4.4) for acute asthma attacks.

According to the answers of the households, only 30% of the dwellings are exposed to environmental tobacco smoke (ETS), not including those smokers that leave the dwelling when smoking. Nevertheless, indoor contamination with ETS takes place in 25% of the bedrooms for adults and in 3.5% of children bedrooms (Fig. 35).

For ETS exposure, the most relevant result showed an OR of 2.6 (CI 1.2–5.3) for acute bronchitis or pneumonia in children younger than 12 years living in homes of smokers.

Fig. 35. Exposure to ETS in the surveyed dwellings



Despite the fact that smoking showed strong associations with individual characteristics (such as age, education, employment etc.), the findings also reveal an impact of neighbourhood quality and disorder (quantified through the amount of graffiti and litter and the lack of greenery on housing grounds and facades). Taking the relevant individual factors into consideration, there was still an independent effect of neighbourhood disorder on smoking prevalence that did increase with the degree of neighbourhood problems: residential areas with "moderate disorder" showed an OR of 1.3 (CI 1–1.7), while residential areas with "high disorder" showed an OR of 1.5 (CI 1.1–2.1).

3.3.4 Dampness and mould

According to the dwelling inspection of the surveyors, visible mould growth was detected in at least one room of almost 25% of all visited dwellings, with highest mould occurrence rates in kitchens (10.5% of all dwellings) and bathrooms (14% of all dwellings). Statistical associations with the presence of visual mould growth can be found for building characteristics such as (a) smells of dampness and condensation signs, (b) building age (old buildings have higher likelihood of moulds), (c) floor level (mould is more prevalent on ground level and in the basement), (d) permanent problems with temperature along the seasons, and (e) cold indoor temperatures in winter and the use of additional heating devices. As well, there is an association between the size of the dwelling and the size of the respective household (the smaller the dwelling and the larger the household, the more likely the presence of mould). However, the LARES data does not provide an indication that ventilation is associated with visual mould growth.

Some associations have been found between exposure factors such as mould growth and dampness, and the health status of the residents.

The main results for exposure to mould and damp (measured by a common index and adjusted for age, gender, SES, city, smoking and ETS exposure) are displayed below.

- Asthma: OR = 1.6 (CI 1.2–2.3)
- Bronchitis: OR = 1.9 (CI 2–3)
- Arthritis: OR = 1.3 (CI 1–1.7)
- Anxiety and depression: OR = 1.6 (CI 1.3–2.2)
- Migraine: OR = 1.7 (CI 1.3–2.2)
- Cold: OR = 1.4 (CI 1.2–1.7)
- Diarrhea: OR = 1.5 (CI 1.2–2)

Furthermore, residents living in mould-exposed dwellings were significantly more likely to report their health status as bad (OR = 1.7/CI 1.4–2) than residents living in dwelling with no visual mould growth identified.

3.3.5 Noise exposure and sleep

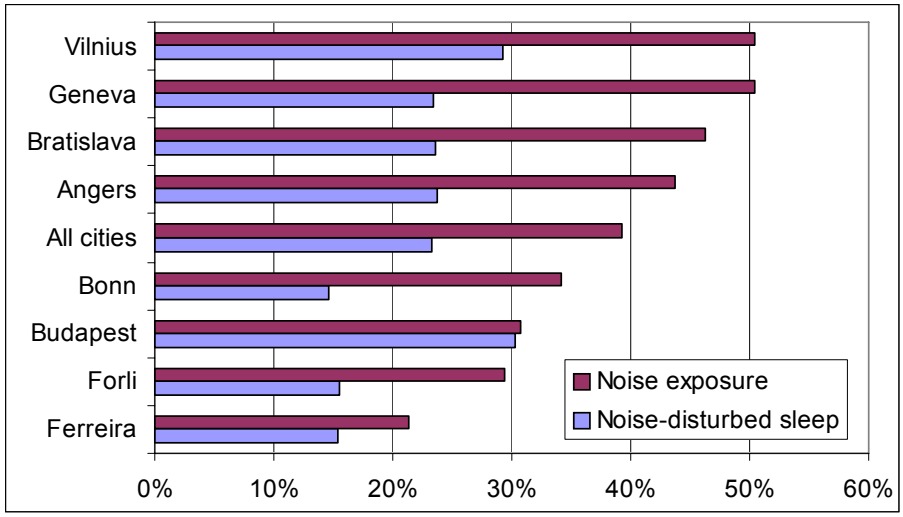
Only 45% of all surveyed households reported not being disturbed by noise in their dwelling (with closed windows). 15.7% report being disturbed seldom, while 18.3% define the disturbance as "sometimes". 13.4% of all households feel disturbed rather often, while 7.5% report a permanent disturbing exposure to noise within the dwelling.

In general terms, the most relevant sources of noise perceived in the dwellings are traffic (38% of all surveyed households report traffic noise as a problem), neighbours and neighbouring flats

(32%), parking (17%), aircraft noise (13%) and noise from the surrounding area and businesses in the neighbourhood (11%).

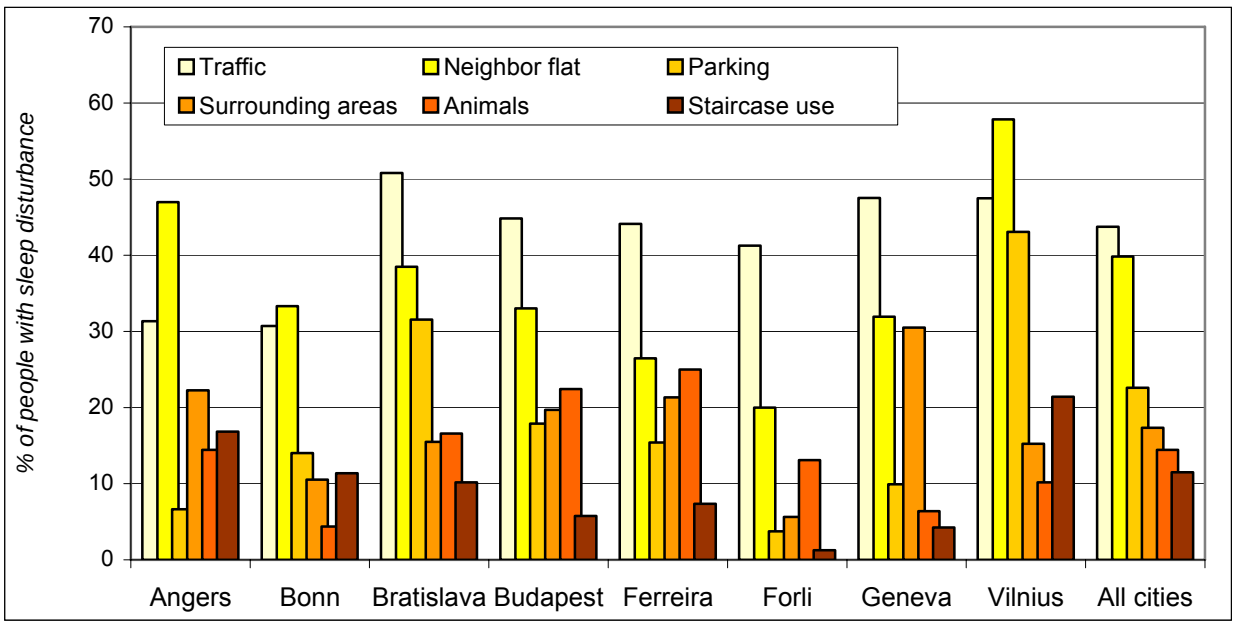
Of all questioned residents, 24% reported that noise exposure at night is a reason for sleep disturbance. Depending on the city, some differences can be observed: the percentage of residents reporting a noise-disturbed sleep ranges from 16.5% in Ferreira to 30% in Budapest. Fig. 36 shows that – except for Budapest – there is some relation between sleep disturbance caused by noise, and the distribution of the noise exposure in general.

Fig. 36. Percentage of residents reporting sleep disturbance due to noise and percentage of households reporting exposure to noise in the dwelling (sometimes, often and permanent)



In most of the cases, the disturbance of sleep is attributable to excessive noise coming from traffic, neighbour flats, parking and surrounding areas (Fig. 37). Detailed analysis showed that residents living close to busy streets are significantly more likely to be sleep disturbed.

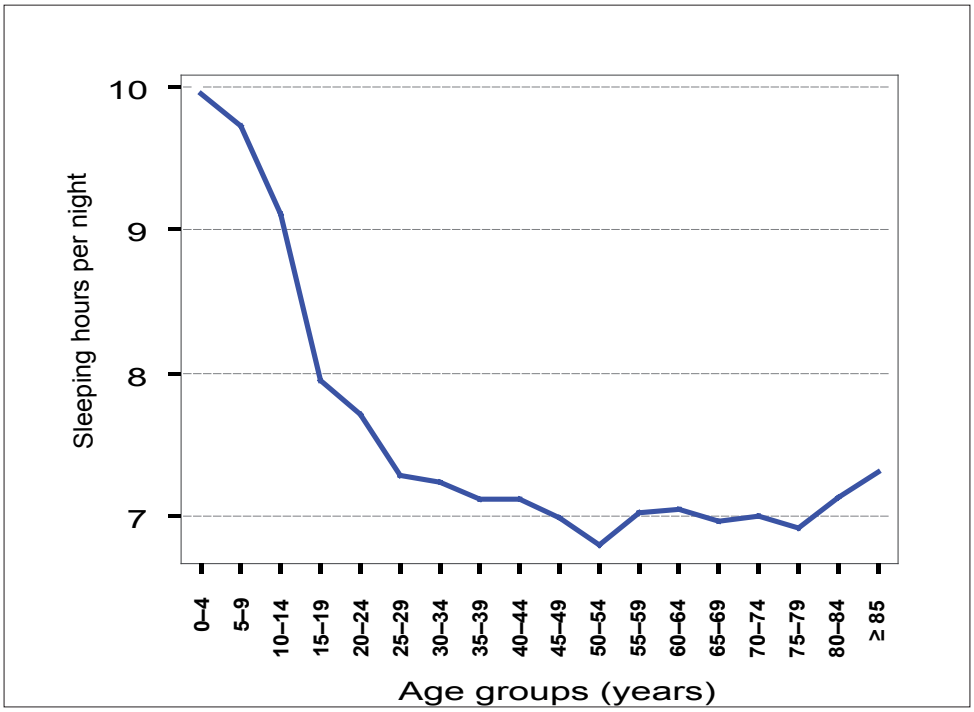
Fig. 37. Sleep disturbance in adult residents: main sources of disturbing noise



Furthermore, the results show that noise exposure is also a question of social inequity. Households with the lowest SES score were two times more often disturbed by noise in their dwellings than households with the highest score. Consequently, noise-induced sleep disturbances were significantly more often (OR = 1.6/CI 1.4–2.0) reported by poor households.
57% of the households assume that part of the noise disturbance is caused by an insufficient sound insulation of their dwelling, and especially of the windows (indicated by 45% of the households complaining about the dwelling insulation), followed by ceilings (40%) and walls to other dwellings and staircases (32%).

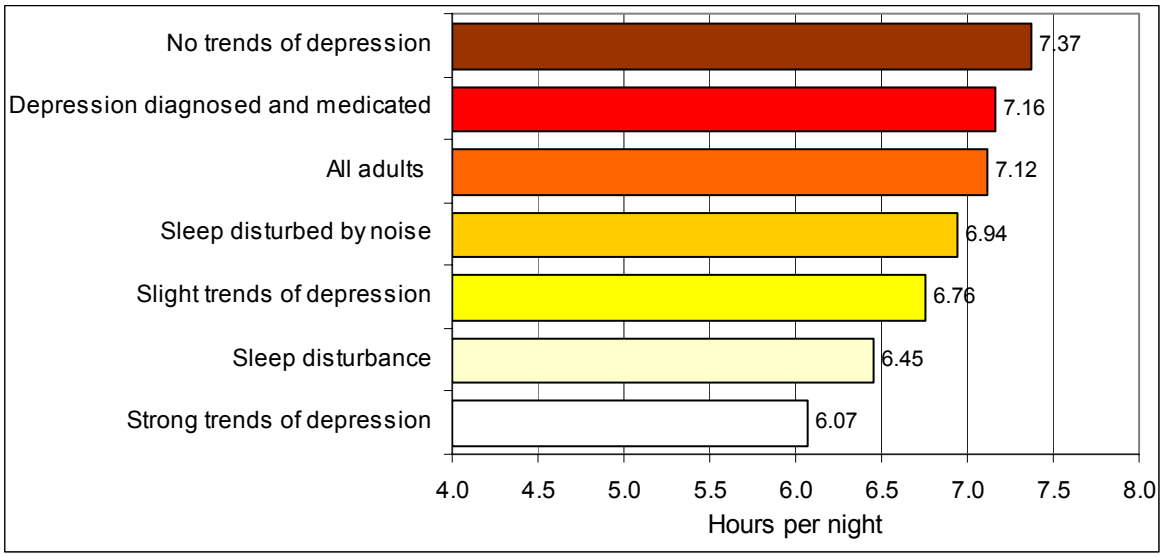
In average, the surveyed LARES population sleeps 7.5 hours per night. However, there are large variations that can be identified for different age groups (Fig. 38), and – in relation to health – for residents with mental conditions as well as noise exposure at night (Fig. 39).

Fig. 38. Average sleeping hours per night by age group



The comparison below shows that adults with diagnosed and medicated depression sleep longer than adults with trends of depression that are not medically treated. In parallel, the results show (a) the relevance of night noise exposure, which shortens sleep in comparison to all adults (and especially in comparison to healthy adults), and (b) the impact of sleep disturbance problems in general terms (i.e., not related to noise), which seems to be more severe than slight trends of depression.

Fig. 39. Sleeping hours for adults – comparing mental conditions and noise disturbance



A variety of strong links have been found between sleep disturbance and sleep disturbed by noise, and the health status. Below are some of the most relevant results for adult residents:

1. sleep disturbance:
   - hypertension: OR = 2.4 (CI 2.1–2.7)
   - depression diagnosed by a physician: OR = 5.2 (CI 4.3–6.3)
   - frequent migraine: OR = 3.2 (CI 2.7–3.8)
   - gastric or duodenal ulcer: OR = 2.7 (CI 2.2–3.3)
   - asthma: OR = 1.6 (CI 1.2–2.1)
   - attack of asthma: OR = 2.1 (CI 1.4–3.0)
   - fatigue: OR = 4.1 (CI 3.4–4.9)
   - trends of depression: OR = 28.0 (CI 23.9–32.9)
2. sleep disturbed by noise
   - frequent migraine: OR = 1.5 (CI 1.3–1.8)
   - chronic allergy: OR = 1.5 (CI 1.2–1.7)
   - asthma: OR = 1.6 (CI 1.2–2.2)
   - gastric or duodenal ulcer: OR = 1.7 (CI 1.4–2.2)
   - attack of asthma: OR = 1.7 (CI 1.2–2.5)
   - fatigue: OR = 1.6 (CI 1.3–1.9)
   - trends of depression: OR = 2.1 (CI 1.8–2.4)
   - accidents: OR = 1.6 (CI 1.4–1.9).

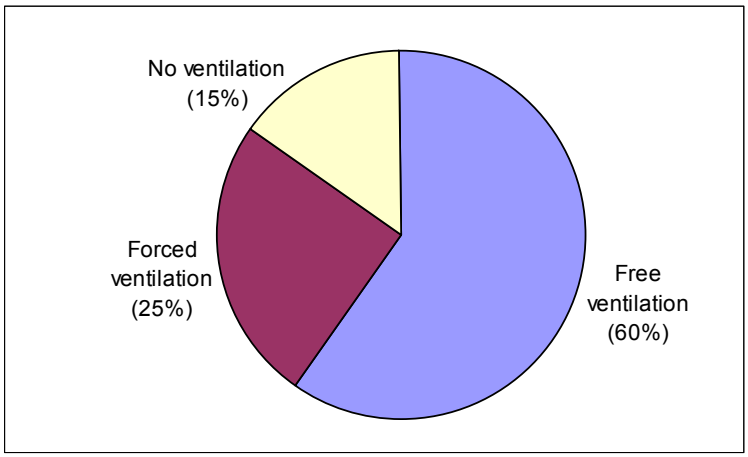
3.3.6 Sanitary installations

Some basic hygiene and sanitation equipments do not exist in all of the dwellings: bathrooms and toilets are missing in 3% and kitchen in 1% of the surveyed dwellings, with an unequal repartition between the cities (most often, it is due to old houses in which bathrooms are outside in the yard or have to be shared with other residential units).

Access to water and hot water is available in 99% of all dwellings. Roughly 50% of all dwellings do not have an exhaust system above the cooking place (for dwellings with gas stoves, this figure is slightly lower – 47% – and only 56% of these exhaust systems are connected to the outside). There is a gas water heater in 21% of the kitchens but one in five heaters is not connected to the outside and can be assessed as dangerous. According to the inspection done by the surveyors, each fourth dwelling does not have sufficient workspace in the kitchen.

There are no windows in 58% of the bathrooms, and Fig. 40 shows that 15% of the bathrooms without window do not have any ventilation system.

Fig. 40. Ventilation systems in bathrooms without window



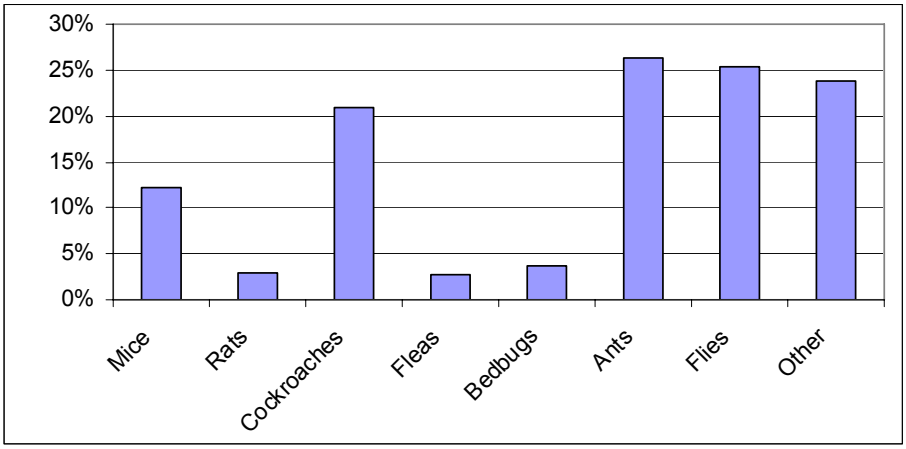
Detailed analysis shows the importance of adequate ventilation means in the bathroom, as the general prevalence of moulds in bathrooms (14%) strongly increases for bathrooms with no ventilation system (18.5%) and is highest for bathrooms without ventilation system and without window (22.7%). Bathrooms without windows that are equipped with a forced ventilation system only have a mould prevalence of 10%.

Roughly 10% of all bathrooms are equipped with a gas water heater, of which – similar to the kitchens – each fifth is not connected to the outside.

3.3.7 Infestations

According to the information of the households, only 62% of all dwellings have been exposed to pests or infestations in the 12 months prior to the survey. This figure might be related to the fact that the sample contained many dwellings located in multi-family housing blocks (one infestation in the building may affect several households). Fig. 41 shows that ants and flies are among the most frequent pest types, followed by cockroaches and mice.

Fig. 41. Infestation rates for pest types during the last 12 months



Detailed analysis for cockroaches, one of the most health-relevant pests with strong impacts on allergies, showed that a variety of housing faults are associated with cockroach presence. For example, there is an increased risk for cockroach infestation in apartment blocks when there is a waste chute in the staircase, or in case of kitchen windows that do not close tightly.

The size of the apartment block does also matter, as the risks for cockroach infestation were higher in large multifamily buildings with more than 6 dwellings (OR = 2.3/CI: 0.98–5.4) and in panel block buildings (OR = 2.9/CI: 1.3–6.8) than in small multifamily buildings with up to 6 dwellings. Vice versa, the survey found that for those dwellings in multifamily housing which were maintained by private cleaning services (compared to public sector responsibility), the risk for infestations was decreased by more than 50%.

8.2% of all households reported that in the recent year, non-chemical physical traps were used in their dwelling to get rid of the infestations. In 8.6% of the dwellings, baits for ingestion by the pests were laid out, and 28% of all households used insecticide spray or contact poison to control infestations.

3.3.8 Accessibility

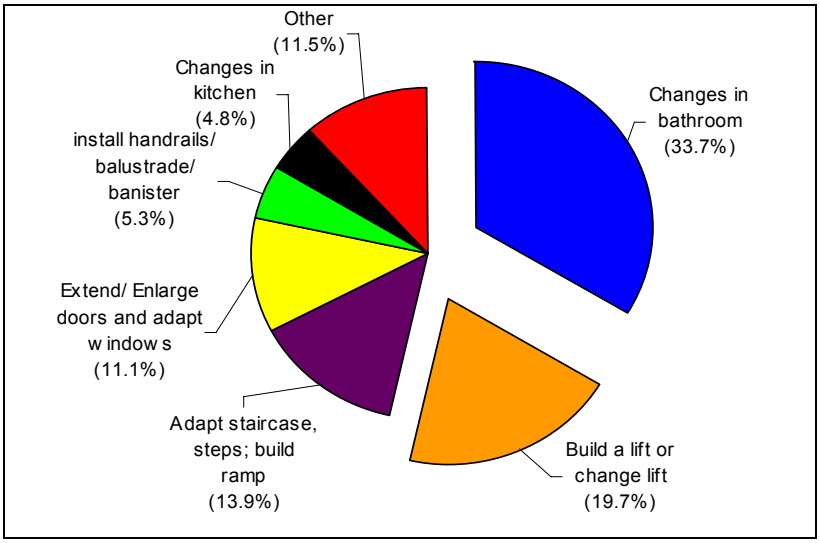
In 76% of all dwellings, there are doorsteps in the dwelling that can provide dangerous spots for children, elderly and residents with physical or visual constraints. Furthermore, seven in ten residential buildings have steps or height differences at their main entrance, and 72% of the dwellings are not easily accessible for people with wheelchair, or with walking aids like canes etc. 30% of all residents with functional constraints – and 10% of all residents without constraints but possibly some mobility limitations – affirm that they cannot make a normal use of their dwelling due to their age or general fitness.

Of the questioned residents, 6% state that they would need specific home modifications and adaptations in order to make the best-possible use of the dwelling. Although 6% seems to be a rather low number, this result is important as it is mostly related to the relatively small group of residents with functional limitations. Within this specific group, the ratio of residents requiring such home modifications is significantly increased and as high as 18%. The highest demand is found for the elderly suffering from mobility constraints: one in four residents in this group express a direct request for home modifications to be done.

The most required adaptations needed by handicapped residents are linked with changes in bathrooms and toilets to make them more accessible and comfortable, with the accessibility of the building or the dwelling, or with the enlargement of doors and the adaptation of windows etc. (Fig. 42).

In addition to the dwelling, residents with physical constraints are also disadvantaged in outside activities and mobility and report an increased dissatisfaction with the availability of public transportation services and the accessibility of shopping or service centres. Still, handicapped people preferred the use of public transportation to mobility by car.

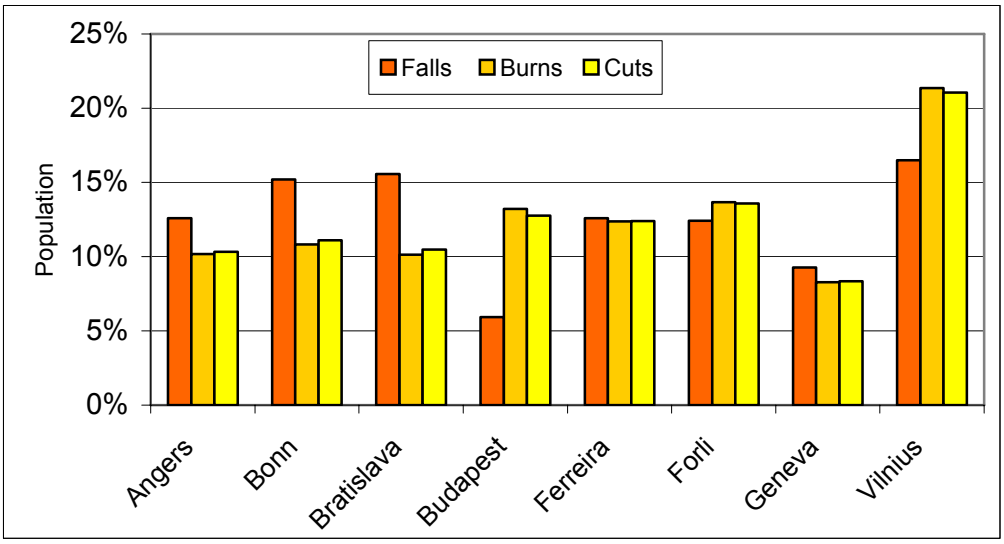
Fig. 42. Required home modifications in dwellings of handicapped residents



3.3.9 Home accidents and security issues

Almost 25% of all surveyed residents have had a home accident during the year prior to the survey, with a number of ca. 3200 accidents reported in total (some individuals reporting two or more accidents). Although self-help was in most cases sufficient to deal with the resulting injuries, these accidents lead to 390 visits to a doctor and 131 hospitalizations. The most frequent accident types are cuts, followed by falls and burns (Fig. 43).

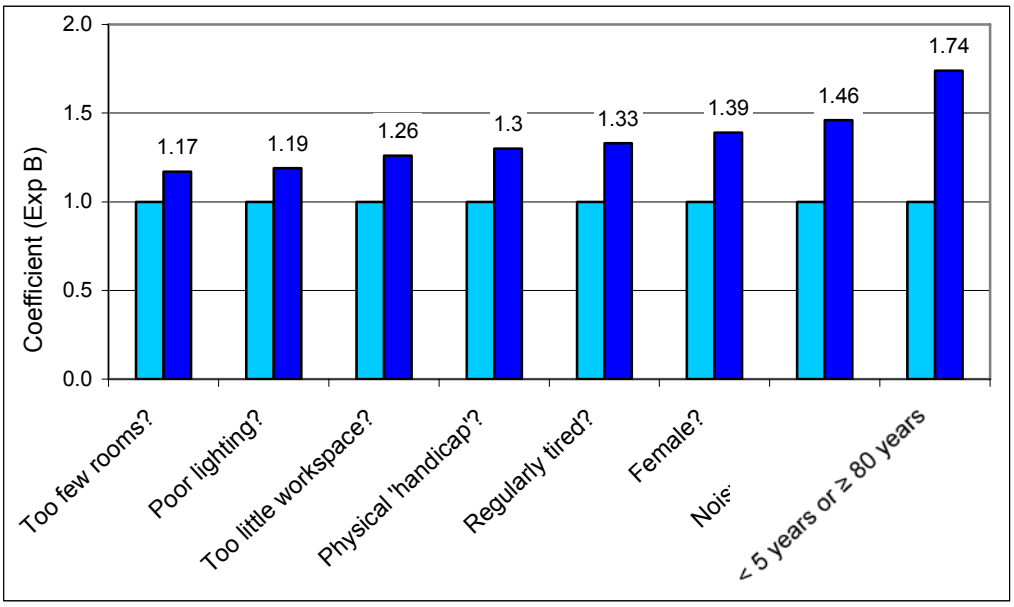
Fig. 43. Occurrence of most frequent home accidents by city



Analysis results showed that housing conditions are strongly related to the risk of accidents and injuries. The more dangerous spots were reported by the housing inspection carried out by trained survey teams, the higher was the number of accidents in the respective household.

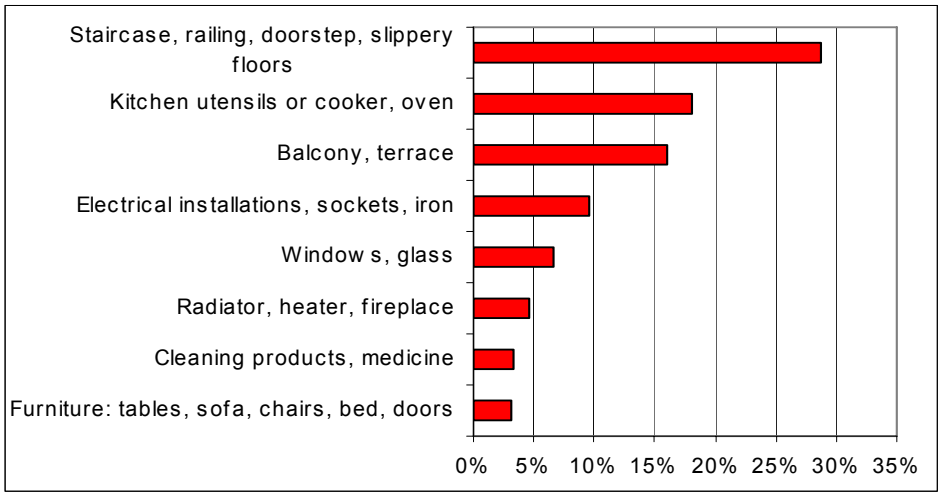
Predictor variables and coefficients for all accidents are linked with age (the youngest and oldest residents experience relatively more accidents), gender (females suffer from accidents more often), functional limitations (people with constraints have more accidents), dwelling design and layout (crowded households and lack of kitchen workspace lead to increased accident numbers), lighting (bad light is associated with more accidents), and with noise at night and fatigue (more noise and less sleep is related to more accidents) (Fig. 44).

Fig. 44. ORs for all accident types



Of the dwellings, 22% are equipped with electrical installations that are not at all or only partially earthed. Furthermore, only 9% of the buildings and dwellings are equipped with a fire detection device although one interviewed resident out of three thinks that the household members cannot easily escape from the house in case of fire in the building. More than 25% of the households reported the existence of places or items in the dwelling that are especially dangerous for children (Fig. 45), while the surveyors found generally unsafe spots (unfixed carpets, open electricity installations, etc.) in many rooms of the dwellings. Another key problem identified is the safety of stairs and steps within dwellings, where – different from staircases in apartment blocks for which a regulation exists – 30% of all stairs are insufficiently equipped with railings and balustrades.

Fig. 45. Main sites and items assessed as dangerous for children by the household



3.4 The housing environment

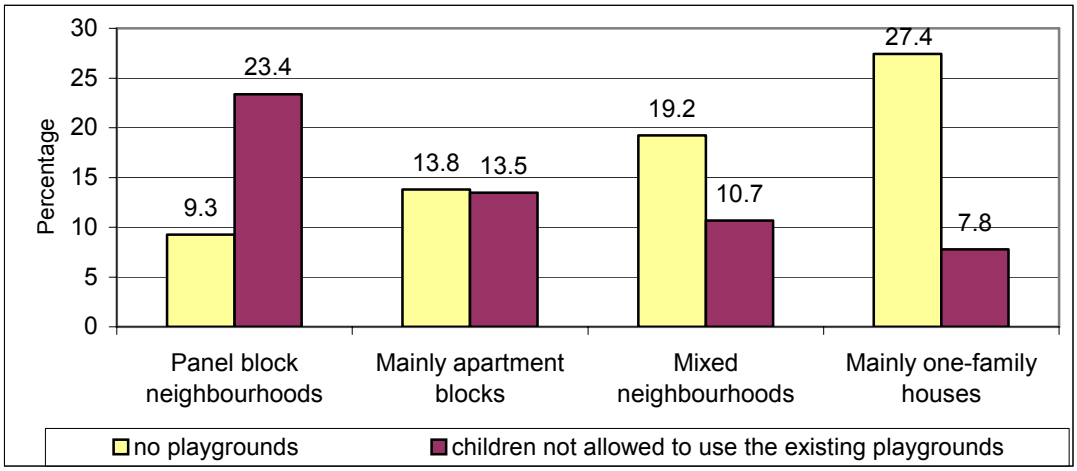
The immediate housing environment represents the “extended” living space of each household and also shapes the residential quality of life. The LARES survey has looked into the housing environment in detail and has found a number of effects on health, well-being and residential satisfaction. Among the most relevant residential factors were noise from traffic, neighbours and public areas, the perception of fear and crime indicating the social dimension of the neighbourhood, the availability of residential amenities such as parks and playgrounds etc., and the general level of maintenance of the residential area (graffiti, pollution, etc.).

3.4.1 Playgrounds, green spaces and perceived safety

Next to the key problems of noise and perceived safety (which are dealt with in other parts of this document), the LARES survey identified a third residential area challenge: the lack of recreational facilities for children, teenagers and the elderly, and the resulting impact on the residential quality and the satisfaction with the living area. Taking the example of recreational areas for children, the survey found that the households which live in a neighbourhood with enough recreational areas for children report a low level of dissatisfaction with the residential area (21%), while the ratio is more than double (47%) for households living in neighbourhoods with an insufficient provision of such spaces. The biggest problem with a lack of playgrounds exists in one-family house areas while – most likely related to the increased population density – it is less a problem in multi-family house areas (Fig. 46). However, the chart also shows that the provision of play areas is not exclusively a quantitative, but also a qualitative issue: not all parents would allow their children to use the existing playgrounds, which is most likely due to quality, safety and visual impression of the play areas.

In the specific case of elderly residents, the data showed that it is most of all a lack of places for social exchange that is considered a problem.

Fig. 46. Existence and acceptance of playgrounds for children by neighbourhood type



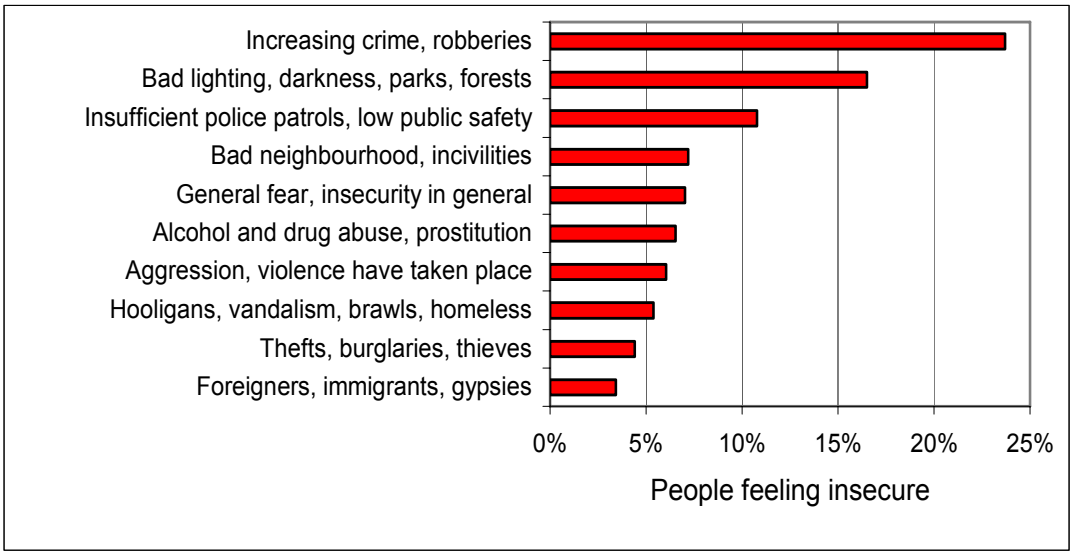
Connected to the lack of recreational areas, there is a general issue with the physical activity within neighbourhoods. The LARES data provides evidence that the residential environment and its perceived quality are associated with physical activity and – to some extent – with the prevalence of obesity in adults (the BMI percentiles for children could not be applied within the LARES data set). Perception of incivilities and a lack of maintenance, indicating insecurity in the residential area, and the existence of greenery in the neighbourhood are both associated with the level of physical exercise of the respective area's residents. The trend displayed remains valid after adjustment for SES, age and gender, showing that the quality of the residential area has a direct impact on lifestyle and behaviour.

In-depth analyses found that in women, the perception of safety increased the odds of occasional or frequent exercise by 22% and 40% respectively, while in men an increase was only found for occasional exercise (39%) but not for frequent exercise. This confirms that women are more affected by the perception of safety than men, and suggests that especially occasional exercise – which is more public-health relevant than frequent exercise of active sportsmen and women – is promoted or constrained by the residential environment conditions.

The LARES data shows various impacts of incivilities on physical activity, which could operate through the above mentioned mechanisms of perceived safety. Such incivilities can be of physical nature (deterioration of houses/gardens, graffiti, broken windows, litter etc.) or of social nature (signs of violence, anti-social behaviour, crime), and have a large impact on the quality of life of the residents. In neighbourhoods affected by such problems, there was a significantly decreased level of physical activity as well as a significantly increased level of obesity. In the LARES data set, only 59% of all residents questioned reported feeling safe when returning at home in the dark, while 22% only feel safe to a limited extent and 19% do not feel safe at all (women are slightly more affected).

High variations for this perception of fear were found in relation to cities and neighbourhoods, with a higher percentage of residents feeling insecure in the Eastern cities than elsewhere. However, there was some kind of consensus regarding the reasons for feeling unsafe, which are mostly related to crime rates and dangerous, dark areas in which residents feel like an easy victim, and insufficient police presence (Fig. 47).

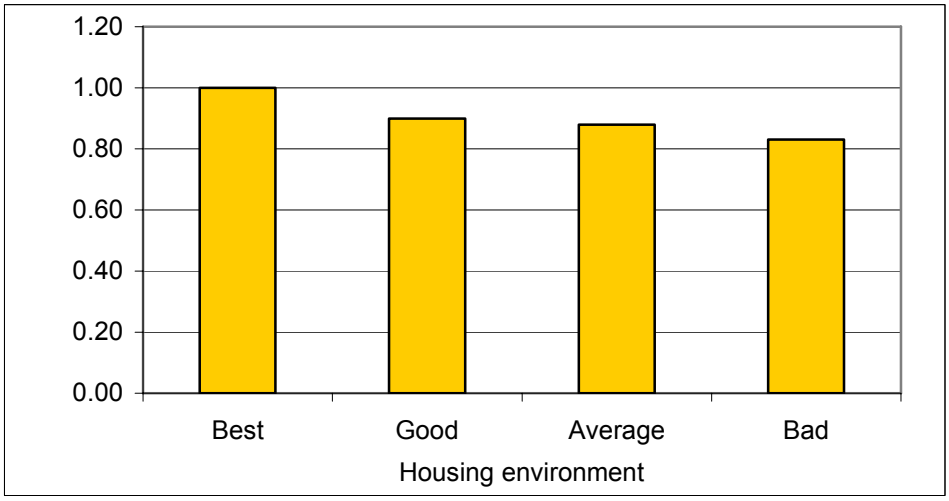
Fig. 47. Reasons for the perception of insecurity in the residential area at night



3.4.2 Residential quality and health

Based on all housing environment information gathered from the residents and the survey teams, a housing environment index was developed as a composite indicator of the residential quality. The index reflected a variety of problems such as noise; graffiti, trash and litter; lack of green and public spaces or playgrounds; perceived security; and the general evaluation of the residential area. This composite indicator was strongly associated with the self-rated health status of the residents, and the worst housing environment category provides a significant OR decrease (OR = 0.8/CI 0.7–0.97) for good self-rated health even after adjustment for SES, age, gender and city (Fig. 48).

Fig. 48. OR for good self-rated health status in relation to housing environment categories



The residential characteristics (graffiti, litter, no place to sit and relax, not enough greenery) are not only associated with measurable health outcomes, but are most relevant for satisfaction, annoyance, well-being and quality of life outcomes. The major direct health effects that can be associated to individual residential characteristics are displayed below and show the magnitude of health-relevant conditions within the housing environment:

- low self-rated health status:
  - traffic noise: OR = 1.3 (CI 1.1–1.7)
  - Litter and trash: OR = 1.3 (CI 1.0–1.6)
  - feeling of insecurity in the area at night: OR = 1.6 (CI 1.3–1.9)
- sleep disturbance:
  - not enough play areas for kids: OR = 1.3 (CI 1.1–1.5)
  - traffic noise: OR = 6.4 (CI 5.4–7.7)
  - surrounding area noise: OR = 6.0 (CI 4.2–8.7)
- depression:
  - traffic noise: OR = 1.4 (CI 1.1–1.7)
  - surrounding area noise: OR = 2.1 (CI 1.5–3.0)
  - feeling of insecurity in the area at night: OR = 1.3 (CI 1.1–1.6)
- cardiovascular symptoms:
  - feeling of insecurity in the area at night: OR = 1.2 (CI 1.0–1.5).

Traffic noise, considered as a causal factor for cardiovascular effects, provided an even higher OR for cardiovascular symptoms (OR=1.24) but the lower CI level was at 0.98 only.

4. Summary

The descriptive results of the survey provided in this document have shown that housing and health interact with each other in various ways. Associations can be found in many technical areas, sometimes supporting and sometimes extending current knowledge. The survey therefore provided evidence that – irrespective of individual and sectoral issues – housing conditions are related to health and well-being.

Fig. 49 describes the general association between the quality of the dwelling (as assessed by the residents) and the self-reported health status of all surveyed residents. The data clearly shows that a decreased quality of the dwelling is associated with decreased health.

Fig. 49. Housing conditions and self-reported health status – full LARES sample

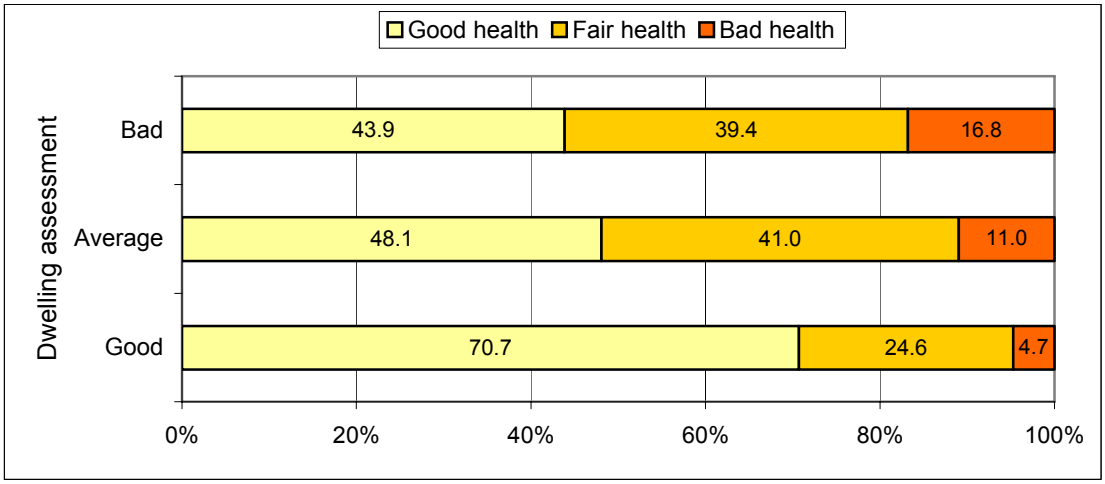
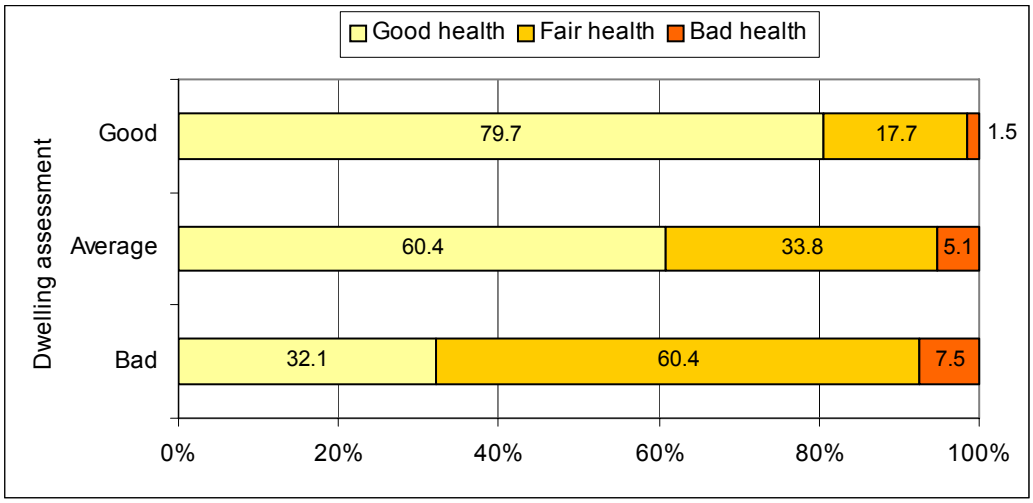


Fig. 50 shows the same chart for the highest SES-group, in which socioeconomic conditions should have no impact on housing quality anymore and for which poverty and purchase power should not have a direct bearing on housing conditions. Nevertheless, we find – as within other SES-groups – a gradient between housing and health. The gradient is less expressed, but still existing.

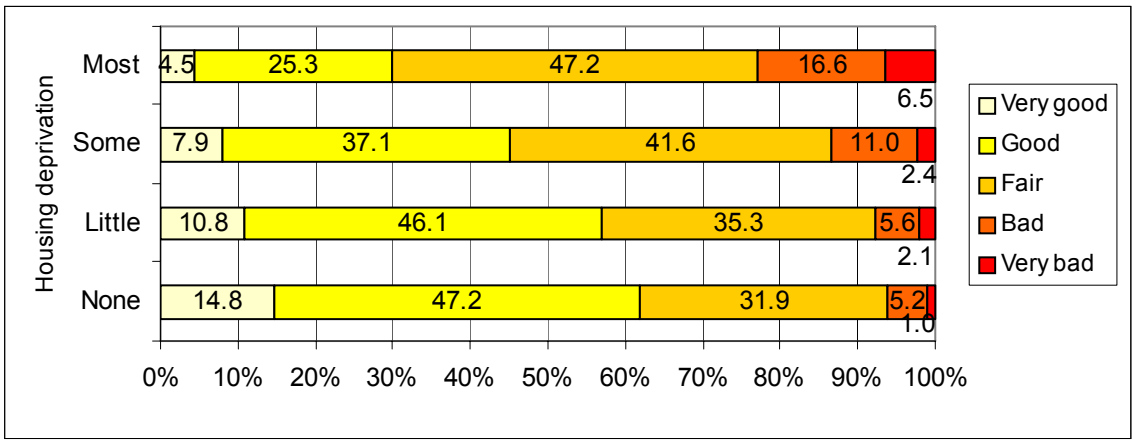
Fig. 50. Housing conditions and self-reported health status – highest SES group



In similar terms, the health status is associated with a general “physical housing quality score” that has been developed based on the results of the visual dwelling inspection by the survey teams. The housing quality score is therefore not affected by potentially biased perceptions and attitudes of residents. In addition, it is based on “hard” data such as the physical condition of the dwelling, e.g. windows, doors, walls, floors and ceilings. Perceptive data such as noise or air quality has not been integrated in this score.

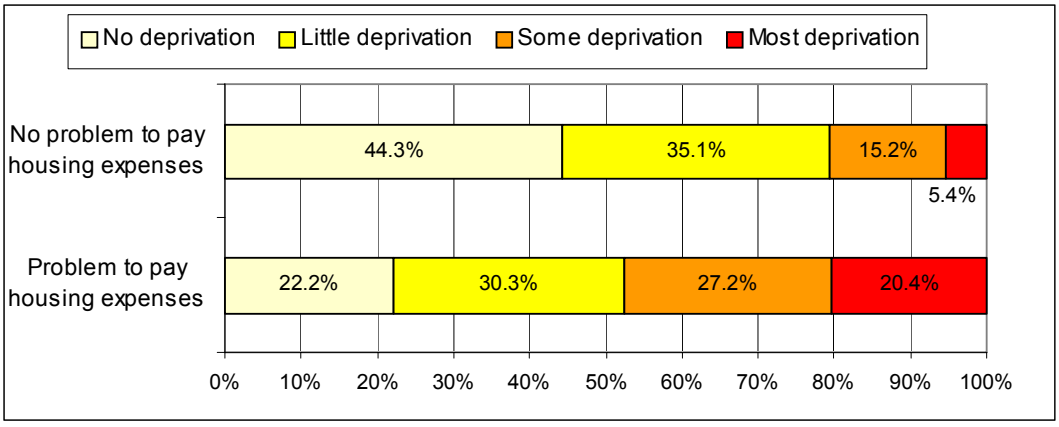
Fig. 51 shows that almost one fourth of all residents living in dwellings of lowest quality report their health status as bad or very bad, while this is only true for 6.2% of the residents living in dwellings with no symptom of decay. Vice versa, the ratio of “very healthy” residents increases by a factor of more than three in high-quality dwellings when compared with low-quality dwellings.

Fig. 51. Housing quality score and self-reported health status – all households



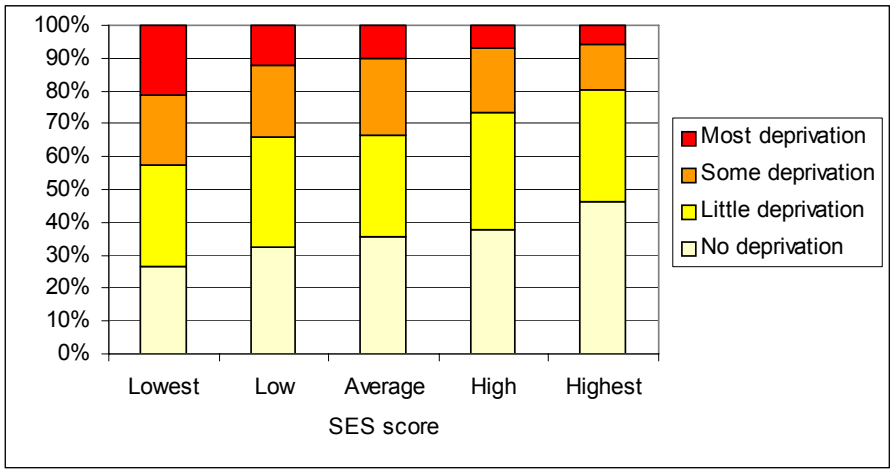
The tenure status (dwelling owned or rented) had little impact on the housing quality score, as for all four deprivation categories the percentages for owned and rented dwellings differ only by 2% or 3% However, a considerable impact was identified for the economic position of the household: while the percentage of households living in high-quality dwellings is double for households without problems to pay housing expenses, it is decreased by almost a factor of four for the category with most deprivation symptoms (Fig. 52). The LARES data therefore clearly indicates that poverty is strongly related to bad housing conditions, and may – to an extent that cannot be quantified – be at the source of various health problems.

Fig. 52. Housing quality score and economic housing problems – all households



Rather similar results are found for socioeconomic status of the households, which is strongly associated with the deprivation category of the dwellings (Fig. 53).

Fig. 53. Housing quality score and SES score, all households



All in all, the results suggest that bad housing does affect health and that the socioeconomic status is only one out of several mechanisms to explain this link. While it is therefore necessary to acknowledge that SES plays a major role in the housing-health relationship, it remains to be discussed through which mechanisms exactly the impact of inadequate housing is realized in pragmatic terms. The mechanisms of this housing and health relationship are – most likely – diverse and interactive, and relate to one or more of the existing housing threats described in earlier sections of this document.

The findings of the WHO LARES therefore clearly indicate two major points:

- inadequate housing can be considered as one of the possible mechanisms through which poverty can affect health and well-being of the population, especially for vulnerable and marginalized population groups; and
- irrespective of poverty and socioeconomic issues, and therefore valid for all population groups, housing problems having direct or indirect health relevance can be found in dwellings. They are mainly linked to insufficient construction and maintenance, but also residential lifestyle.

Action on housing and health can therefore be taken to achieve two objectives:

1. improvement of inadequate housing in general as a means to mitigate social and health inequities within a population; and
2. improvement of specific key housing problems as a preventive strategy against housing-related health effects and injuries.

5. Conclusion

The WHO pan-European LARES survey in eight cities points out a number of emerging or existing housing problems. It provides evidence that housing and health is a complex interaction, and covers a variety of health-relevant housing factors that have so far been neglected or underestimated. In each city as well as for the whole sample, there are important and health-relevant trends (accessibility and ageing, noise and sleep, mental health, accidents, heating and fuel poverty, allergies, perceived safety, indoor air and moulds, physical activity etc.) that need to be considered in both public health and housing policies.

Human beings spend a large part of their life at home. Thus, the exposure facilitated through housing conditions is the longest in the human life cycle, exacerbating the threats of bad conditions of housing on health. In addition, the vulnerable parts of any population (the sick, the elderly, the children, the unemployed and the poor) are the ones most exposed – both on a quantitative level (more time spent at home) and a qualitative level (worse housing conditions).

Looking back in time, the housing stock development does not match the social changes and the gain in life expectancy of the last decades. Today, people spend years and years in dwellings that have not been designed to meet the needs and lifestyles of the moment as well as the needs and lifestyles of the future.

Societal changes and the ageing of the population lead to new challenges in the housing stock, such as home care, home function adaptation, and healthy and hygienic homes. However, it is difficult to adapt the housing stock, for which the average "annual renewal rate" by new housing construction is at 1–1.5%, to meet the fast-changing needs of modern societies characterized by social and demographic changes, increased mobility, and changing household sizes and social paradigms. A house built in 2005 may last for 100 years to come, and will see three to four generations living in it. Roughly 50% of the housing stock that some European countries will have in 2050 is already built today. These data illustrate that the challenge of healthy housing will not cease, but will remain for the future and will require constant adaptation of the housing stock.

Urgent action on housing issues is therefore necessary – both on short-term and long-term perspectives – to provide adequate housing and social stability to countries, regions and cities. The report at hand has identified a number of problems faced by the housing stock in European countries, and calls for immediate action by local and national housing authorities and health agencies.

Even if more precise results have to be explored, the WHO LARES affirms that the main features of housing impacting health are often, but not exclusively, linked with thermal comfort, indoor air quality (dampness, moulds, indoor emissions, infestations etc.), noise, environmental barriers, home safety, and the social and physical quality of the housing as well as the immediate environment.

The results of the survey provided additional evidence to ground the development of strong policy measures aiming at the following objectives:

- ***objective 1***: reducing exposure:
  - reduction of the prevalence of fuel poverty
  - reduction of noise exposure in the home

  - reduction of exposure to harmful indoor compounds (e.g. mould or indoor pollutants);
- ***objective 2***: tackling key housing-related health effects:
  - prevention of home accidents
  - reduction of respiratory diseases, allergies and asthma
  - minimization of depression and social pathologies
  - mitigation of the obesity epidemic and physical inactivity;
- ***objective 3***: Improving the accessibility and usability of housing:
  - adaptation of housing to the needs of elderly and functionally limited residents.

These objectives can be reached through:

- adequate and evidence-based interventions in the housing stock and the construction sector;
- information and awareness campaigns on healthy housing and healthy living; and
- addressing inequities in housing policies and housing conditions.

To achieve these objectives, it will become increasingly relevant to consider housing as an substantial element of public health and social welfare, and to integrate health aspects into strategies of sustainable housing construction and neighbourhood or urban planning.

Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

Housing is the conjunction of dwelling, home, immediate environment and community. The role of public health is to provide circumstances under which people can be healthy.

6. Sources and information products

LARES-related publications, reports and products developed by the WHO Housing and Health programme and the experts of the LARES consortium (as of October 2011).

1. Annesi-Maesano I and Moreau D., Potential sources of indoor air pollution and asthma and allergic diseases, Ormandy, D. (ed.) *Housing and Health in Europe – The WHO LARES project*, Abingdon and New York, Routledge 2009. Pages 111-125

2. Arndt, W.-H. Barrierefreie Mobilität. *Schriften des Fachgebietes Integrierte Verkehrsplanung*. Technische Universität Berlin, 2005.

3. Arndt, W.-H. Mobilitätsbarrieren im öffentlichen Verkehrssystem und der Wohnumgebung – eine Bestandsaufnahme. *Verkehrsforschung online*, 2005, 2(1).

4. Bonnefoy, X., Braubach, M., Krapavickaite, D., Ormandy, D., Zurlyte, I.. Housing conditions and self-reported health status: A study in panel block buildings in three cities of Eastern Europe. *Journal of Housing and the Built Environment*, 2003, 18:329–352.

5. Bonnefoy, X., Braubach, M., Moissonnier, B., Monolbaev, K., Röbbel, N. Housing and health in Europe: Preliminary results of a pan-European study. *American Journal of Public Health*, 2003, 93:1559–1563.

6. Bonnefoy X., Braubach M., Moissonier B., Röbbel N. and Ormandy D. The LARES survey – Background and Introduction. Ormandy, D. (ed.) *Housing and Health in Europe – The WHO LARES project*, Abingdon and New York, Routledge 2009. Pages 3-79

7. Bonnefoy X et al. Review of evidence on housing and health. Background document for the Fourth Ministerial Conference on Environment and Health. *Copenhagen, WHO Regional Office for Europe*, 2004.

8. Bonnefoy X., Braubach, M., Davidson, M., Röbbel, N. A Pan-European Housing and Health Survey – Description and Evaluation of Methods and Approaches, *International Journal of Environment and Pollution*, 2007, 30(3/4):363-383.

9. Bonnefoy X, Braubach M, Röbbel N. Wohnbedingungen und ihre Auswirkungen auf die Gesundheit. *Internistische Praxis*, 2006, 46(1)219–232 und *Arzneimittel-, Therapie-Kritik & Medizin und Umwelt*, 2006, 38(1):83–96.

10. Bonnefoy X, Braubach M. The case of panel block buildings. *European Bulletin on Environment and Health*, 2001, 8(3):2.

11. Bonnefoy X. et al. Habitat et Santé: état des connaissances. *Les Echos du Logement*, 2004, 4:5–12.

12. Bonnefoy X., Inadequate housing and health – an overview. *International Journal of Environment and Pollution*, 2007, 30(3/4):411-429.

13. Boutin-Forzano S. et al., Reported prevalence and co-morbidity of asthma, chronic bronchitis and emphysema: a pan-European estimation. *International Journal of Tuberculosis and Lung Disease*, 2007, 11(6):1-8.

14. Braubach M., Bonnefoy X., Housing and Health: The Eastern European challenge. *Open House International*, 2001, 26(2):8–22.

15. Braubach, M. Residential conditions and their impact on residential environment satisfaction and health: results of the WHO large analysis and review of European housing and health status (LARES) study. *International Journal of Environment and Pollution*, 2007, 30(3/4):384–403.

16. Braubach, M., Preventive applications of the Therapeutic Landscapes concept in urban residential settings: a quantitative application. In: Williams, A. (ed.)(2007*): Therapeutic Landscapes*. Ashgate Publishing, Hampshire. Chapter 8, pages 111-132.

17. Braubach M., The health relevance of the immediate housing environment, Ormandy, D. (ed.) *Housing and Health in Europe – The WHO LARES project*, Abingdon and New York, Routledge 2009. Pages 247-275

18. Braubach M., Savelsberg J., *Social inequalities and their influence on housing risk factors and health. A data report based on the WHO LARES database.* Copenhagen, WHO Regional Office for Europe, 2009.

19. Braubach M., Power A., Housing Conditions and Risk: Reporting on a European Study of Housing Quality and Risk of Accidents for Older People. *Journal of Housing for the Elderly*, 2011, 25(3): 288-305.

20. Brown, MJ., Jacobs, DE., Residential Light and Risk for Depression and Falls: Results from the LARES Study of Eight European Cities. *Public Health Reports*, 2011, Supplement 1. Vol. 126: 131-140.

21. Croxford B., The effect of cold homes on health: evidence from the LARES study, Ormandy, D. (ed.) *Housing and Health in Europe – The WHO LARES project*, Abingdon and New York, Routledge 2009. Pages 142-155.

22. Davidson M., Perceptions of safety and fear of crime, Ormandy, D. (ed.) *Housing and Health in Europe – The WHO LARES project*, Abingdon and New York, Routledge 2009. Pages 168-184.

23. Duburcq A., Emery C., Ezratty V. and Lambrozo J., Residential energy systems: links with socio-economic status and health in the LARES study, Ormandy, D. (ed.) *Housing and Health in Europe – The WHO LARES project*, Abingdon and New York, Routledge 2009. Pages 155-168.

24. Ezratty V., Duburcq A., Emery C., and Lambrozo J., Liens entre l'efficacité énergétique du logement et la santé des résidents : résultats de l'étude européenne LARES. *Environnement, Risques & Santé* 2009, 8(6): 497-506.

25. Ellaway A, Macintyre S, Bonnefoy A. Graffiti, greenery, and obesity in adults: secondary analysis of European cross sectional survey. *British Medical Journal* 2005, 331:611–612.

26. Fredouille J., Laporte E. and Mesbah M., Housing and mental health, Ormandy, D. (ed.) *Housing and Health in Europe – The WHO LARES project*, Abingdon and New York, Routledge 2009. Pages 184-200.

27. *Housing and Health in Europe. Report on a WHO symposium, Bonn, Germany, June 2001*, Copenhagen, WHO Regional Office for Europe, 2001.

28. *Housing and health*. Copenhagen, WHO Regional Office for Europe, 2004 (Local authorities, environment and health briefing pamphlet series No. 41.

29. *Housing and health. Working paper for the Fourth Ministerial Conference on Environment and Health.* Copenhagen, WHO Regional Office for Europe, 2004.

30. *Housing and health: Identifying priorities. Meeting report*. Copenhagen, WHO Regional Office for Europe, 2003.

31. *Housing and health: Third technical consultation on the analysis of the evidence. Report of a WHO expert meeting.* Bonn, WHO European Centre for Environment and Health, 2004.

32. *Integrated approaches to housing and health. Report on a WHO expert meeting*. Copenhagen, WHO Regional Office for Europe, 2000.

33. Jacobs, DE., Environmental Health Disparities in Housing. *American Journal of Public Health*, Published online ahead of print May 5, 2011: e1–e8. doi:10.2105/AJPH.2010.300058

34. van Kamp I., Ruysbroek A. and Stellato R., Residential environment quality and quality of life, Ormandy, D. (ed.) *Housing and Health in Europe – The WHO LARES project*, Abingdon and New York, Routledge 2009. Pages 220-247.

35. Keall MD, Ormandy D, Baker MG. Injuries associated with housing conditions in Europe: a burden of disease study based on 2004 injury data. *Environmental Health*, 2011: 10(98). doi:10.1186/1476-069X-10-98

36. Klein G. Wohngesundheit – Erste Ergebnisse einer Studie der WHO. *Umwelt-Medizin-Gesellschaft*, 2004, 3:16–19.

37. Maschke, C., Niemann, H. Health Effects of Annoyance Induced by Neighbour Noise, *Noise Control Engineering Journal*, 2007, 55(3): 348-356.

38. Maschke C. and Niemann H., Noise effects and morbidity, Ormandy, D. (ed.) *Housing and Health in Europe – The WHO LARES project*, Abingdon and New York, Routledge 2009. Pages 275-295.

39. Mesbah M., Building Quality of Life-related Housing scores using the LARES study, Ormandy, D. (ed.) *Housing and Health in Europe – The WHO LARES project*, Abingdon and New York, Routledge 2009. Pages 200-220.

40. Miles R., Neighborhood disorder and smoking: findings of a European urban survey. *Social Science and Medicine*, 2006, 63(9):2464-75.

41. Miles R., Jacobs D.E., Future directions in housing and public halth: findings from Europe with broader implications for planners. *Journal of the American Planning Association*, 2007, 74(1): 77-89.

42. Milstead TM, Miles R, Röbbel N., Housing and Neighborhood Conditions and Exposure to Cockroaches in Three Central and Eastern European (CEE) Cities. *Journal of Housing and Built Environment*, 2006, 21(4):397-411.

43. Milstead T, Miles R., DIY Home Improvements in a Post-Soviet Housing Market: A Socio-Spatial Analysis of Vilnius, Lithuania. *Housing Studies*, 2011, 26(3): 403-421.

44. Miles R., Neighborhood Disorder, Perceived Safety and Readiness to Encourage Use of Local Playgrounds. American Journal of Preventive Medicine, Special Issue on Active Living Environmental and Policy Research, 2008, 34(4): 275-281.

45. Moore R., Domestic accidents, Ormandy, D. (ed.) *Housing and Health in Europe – The WHO LARES project*, Abingdon and New York, Routledge 2009. Pages 295-319.

46. Niemann H, Maschke C, Hecht K., Fluglärmbelästigung und Erkrankungsrisiko – Teil-Ergebnisse aus der LARES-Studie. *Umweltmedizinischer Informationsdienst*, 2004, 2:6–9 (http://www.umweltbundesamt.de/umid/archiv/umid0204.pdf, accessed 5 January 2007).

47. Niemann H., Maschke C., Hecht K., Lärmbedingte Belästigung und Erkrankungsrisiko – Ergebnisse des paneuropäischen LARES-Survey. *Bundesgesundheitsblatt -Gesundheitsforschung-Gesundheitsschutz*, 2005, 48:315–328.

48. Niemann H., Bonnefoy X., Braubach M., Hecht K., Maschke C., Rodrigues C., Röbbel N., Noise-induced annoyance and morbidity results from the pan-European LARES study. *Noise and Health*, 2006, 8(31):63-79.

49. Ormandy D., A brief résumé of recommendations, Ormandy, D. (ed.) *Housing and Health in Europe – The WHO LARES project*, Abingdon and New York, Routledge 2009. Pages 319-323.

50. *Proceedings of the 2nd WHO International housing and health symposium*. Bonn, WHO European Centre for Environment and Health, 2004.

51. Röbbel N. The LARES survey – The surveys. Ormandy, D. (ed.) *Housing and Health in Europe – The WHO LARES project*, Abingdon and New York, Routledge 2009. Pages 94-103.

52. Rudnai P., Varro M.J., Malnasi T., Páldy A., Nicol S. and O'Dell A., Damp, mould and health, Ormandy, D. (ed.) Housing and Health in Europe – The WHO LARES project, Abingdon and New York, Routledge 2009. Pages 125-142.

53. Shenassa E.D., Daskalakis C., Liebhaber A., Braubach M., Brown M., Dampness and mold in the home and depression: An examination of possible pathways. *American Journal of Public Health*, 2007, 97(10):1893-1899.

54. Shenassa E.D., Liebhaber A., Ezeamama A., Perceived Safety of Area of Residence and Exercise: A Pan-European Study. *American Journal of Epidemiology*, 2006, 163(11):1012–1017.

55. Shenassa E.D., Frye M., Braubach M., Daskalakis C., Routine stair climbing in place of residence and Body Mass Index: a pan-European population based study. *International Journal of Obesity*, 2008, 32(3):490-494.

56. *Wohnen und Gesundheit - Von der Evidenz zur Anwendung. WHO Symposium.* Bonn, WHO European Centre for Environment and Health, 2005.

For further information on LARES, please visit:

- www.euro.who.int/housing
- www.euro.who.int/en/what-we-do/health-topics/environment-and-health/Housing-and-health/activities/the-large-analysis-and-review-of-european-housing-and-health-status-lares-project