HOUSING AND HEALTH IN EUROPE

Report on a WHO Symposium

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ABSTRACT

The Symposium reviewed the current status of research and evidence on the interaction between housing and health in the WHO European Region. Beginning with the global perspective, the Symposium progressed to selected topics of the housing–health relationship, discussing current research approaches, their technical results and the implications for both residential health and urban planning. A housing and health study in panel block buildings functioned as a case study for reviewing the practical impact of housing on health. The overall implications of the results were discussed and compared with the housing and health situation in various countries. The review of national situations and research activities revealed many cases of scientific uncertainty, limited data and poor policies. The Symposium reviewed possible approaches to identifying solutions to these problems, such as surveillance systems and long-term housing stock studies, support to the setting of health-related policies, the application of economic principles and the development of methods and survey tools for local authorities to assess their own needs. Finally, the Symposium agreed on a list of recommendations to countries, to WHO and to other bodies such as local authorities and nongovernmental organizations, indicating a way forward for further research and enhanced international cooperation within the field of housing and health.

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Introduction

Dr Rainer Türck representing the German Federal Ministry of Environment, and Dr Pia Heckes, First Deputy Mayor of the City of Bonn opened the symposium. They welcomed the participants and highlighted the new function of Bonn as a United Nations city. Professor Martin Exner, Director of the Institute of Hygiene and Public Health of the University of Bonn, introduced the cooperation between the University of Bonn and the recently designated World Health Organization (WHO) Collaborating Centre for Health Promoting Water Management and Risk Communication. Finally, Dr Günter Klein, Assistant Director of the WHO European Centre on Environment and Health (ECEH), welcomed all participants to the new WHO premises of the centre.

Dr Romualdas Sabaliauskas, Lithuania, was elected as chairperson and Dr David Cross, United Kingdom, was elected co-chairperson. Dr Steffen Engelhart, University of Bonn, and Mr Mathias Braubach, WHO, were the rapporteurs.

Content and objectives of the meeting

The technical meeting started with a presentation by Mr Xavier Bonnefoy, Regional Adviser for Noise Control, at the WHO Regional Office for Europe. The content and objectives of the meeting were presented. An introduction of the current living conditions of millions of inhabitants in central and eastern European (CEE) countries, highlighted several shortcomings such as living floor space and sanitation. Poor housing and living conditions were presented and recognized as a relevant health determinant. Based on this introduction, the technical and political agenda of the WHO symposium on housing and health was defined, and related to the context of the current accession debate within the European Union and eastern Europe. The aspects of social stability and equity were stressed.

Session 1. Overview

Keynote speech: Housing and health, a global perspective

Professor David Hulchansky from the Centre for Urban & Community Studies at the University of Toronto introduced the topic of housing and health and proposed that housing be considered as a wide and complex factor affecting health and wellbeing. The importance of adequate housing was highlighted, and the various functions of housing were investigated in detail. The presentation marked the failure of the current housing policies to provide adequate housing. Questioning the efficiency of the existing approaches, Professor Hulchansky proceeded to the final question of how these trends can be reversed. The relations between housing, socioeconomic status and health were then presented, arguing that the direct influence of housing quality on health is influenced by socioeconomic status and other-non-housing factors which, in turn, can influence both housing and health. This led to the conclusion that in future, housing and health must be treated on a larger scale with the health sector in an advocacy role, but with increased cooperation and intersectoral awareness.

Housing and health: key figures from the existing literature

Professor Martin Exner from the WHO Collaborating Centre at the University of Bonn described the history of the relation between housing and health. Professor Exner reminded the participants that life expectancy in Europe has almost doubled during the 20th century, and presented improved housing and sanitation standards as one of the reasons for this increase. Based on this history, housing represents a health protection element that “is influenced by individual
behaviour”. Understanding the health protection activities of the states as “hardware”, the lifestyle of people and the way of using the house was defined as the “software”. Both dimensions cannot be separated. The impact of various housing parameters on health was illustrated by charts and statistics, which most often reflected a strong difference between western and eastern Europe. However, it was argued that lifestyle seems to be the major problem of many housing and health issues, and that it is needed to enforce risk communication and health information.

Round-table discussion

It was mentioned that in the future, research on housing and health should focus on disentangling the complex interactions of the different factors. After such an identification of the attributable effects of housing, priority issues for intervention would be easier to select.

The definitions of the home as “hardware” and the residential behaviour as “software”, provided by Professor Exner, were supported and extended to a split of responsibilities: while the state is responsible to provide the adequate hardware, the residents themselves are responsible for the software. However, further research would be required in each of those areas.

Taking the point of subjective behaviour and the underlying risk perception, it was mentioned that very often a technical progress, reducing risk, would be substituted by an increasingly risky behaviour. In this context, the history of health benefits was challenged as the life of an individual might have been evaluated higher in former decades than it is now. The willingness of societies and politicians to reduce health risks is therefore a crucial element.

Another comment was made which also focused on the translation of housing and health research into policies and advocacy. For this, it would be needed to make policy-makers internalise the economic impact of health. True evidence would be the foundation for such attempts. (This statement was widely agreed.) Enhancing this development would therefore be a major task for health research in general.

The importance of evidence was strongly supported by many participants. However, it was warned that evidence would not be enough to provide a balanced development, as evidence is much more heard when large parts of the populations are affected, while it often is not considered as a priority when only a minority is affected.

Anticipating the future health challenges, WHO will be required in addition to the safe territory of evidence to do new things. These include aspects of health that are not fully based on evidence.

Session 2. The existing evidence (1)

The WHO case study in panel block houses: How the work was planned

Providing the background of the study undertaken by Lithuania, Slovakia and Germany, and coordinated by WHO, Mr Mathias Braubach explained the approach that was chosen for the case study, and the different work steps that led to the first provisional results. It was argued that due to the large share of populations living in panel block buildings, this type of housing stock, together with problems of maintenance and material quality, would represent one of the largest housing problems in eastern Europe. This project was based on a literature review of housing and health, of statistical data and of panel-block houses, and the results of this review were used for the development of a survey. A questionnaire and inspection documents were drawn up, and validated with the cooperation of experts and a piloting phase in three countries. The final
survey, undertaken in Germany, Lithuania and Slovakia, aimed at the perception of the living conditions by the occupants, and resulted in 251 inspected flats.

**Slovakia: the Bratislava survey**

Dr Katarina Slotova from the State Health Institute provided the outcome of the survey in Slovakia, which took place in Petrzalka a city quarter of Bratislava. A total of 74 flats were inspected and the households interviewed about living conditions. The inhabitants filled out 210 individual health questionnaires. The results show that living conditions do have an impact on health. This was especially obvious for priority problems such as heating, noise, indoor air quality or pests, where several significant correlations were found. Sixty to seventy per cent of the inhabitants were not satisfied with the immediate surrounding of the buildings. Recommendations were made for the improvement of housing and health policies, and for initiating low-cost renewal projects with broad participation. For this, it would also be necessary to clarify the responsibilities of the official institutions.

**Germany: the Schwedt/Oder survey**

The German survey took place in Schwedt/Oder and had the specific goal of comparing renovated and non-renovated panel block houses. Professor Klaus Fiedler, University of Jena, reported that in total, a number of 83 flat visits and interviews, and 172 individual health questionnaires were done. Professor Fiedler presented several examples of how the modernization of panel block housing can improve living conditions, and highlighted issues such as noise, window quality, draught, ventilation, temperatures, and living floor space. Also, general satisfaction was significantly increased for the inhabitants of renovated buildings. It was concluded that rehabilitation is a good process for upgrading panel block housing and can provide adequate living standards. Professor Fiedler recommended the realization of further studies in CEE countries with an improved survey tool and proposed to undertake the development of a priority list for housing renovation that can be envisaged from the point of view of health.

**Lithuania: the Vilnius survey**

The last case study was held in Vilnius, where various city quarters were selected and 102 flats were inspected, returning a number of 219 individual health questionnaires. Dr Irena Taraskeviciene from the Vilnius Public Health Centre highlighted the priority problems that were identified during the study (such as thermal conditions, unsafe spots and accidents, ventilation, sanitation, living space or pests). From there, it was concluded that although housing does have considerable influence on residential health, it is still a secondary aspect in comparison to age and income parameters. However, the study brought sufficient data to allow for immediate action in health promotion. For housing as such, the recommendations focused on how to include health aspects into renewal projects and proposed that further investigations be made to explore the impact of the immediate environment.

**Round-table discussion**

A French participant defined the WHO study as a good start, although it lacked some epidemiological dimension. Some aspects such as accidents seem to be underestimated.

Within this survey, the influence of socioeconomic status or age is not considered with the proper weight, as it focused too much on housing conditions and only integrated very basic points of socioeconomic status. Age standardization would be absolutely needed.
Responding to the issue of the validity of the results, a Lithuanian participant stated that the study focused on the measurement of perceptions and was not based on measurements. The results therefore are not medical as such, and it was proposed that health research couldn’t limit itself to technical measurements.

The Hungarian representative proposed that for further studies, other building types should be also surveyed in order to (a) benchmark the panel block situation and (b) increase the general knowledge on housing and health linkages.

WHO acknowledged that it had not been an epidemiological study. It was rather planned as a case study for surveying the current situation and identifying the major issues of housing and health from the occupants’ point of view. Serving as a preparation for further studies, the example of the accidents showed that in a second study, the topic of accidents and home safety must be dealt with in a different way.

For the application of the survey results for sophisticated data analysis, WHO acknowledged that the small sample size was the major obstacle. It was however agreed that such work was necessary in future, although not possible within the scope of the work done so far.

Based on the recommendation of experts, no measurements were made, as this would require a longitudinal study. The panel block study being a time-limited pilot study, measurements would have no meaning and thus bring no additional knowledge. However, it was agreed that, if the objective is to link housing and health, measurements and morbidity data would need to be integrated to a certain extent.

Session 3. The existing evidence (2)

The global lessons from the WHO case study

Following the country reports on the national case studies, Mrs Rita Pazdrazdyte from the State Public Health Centre, Lithuania, reported about the analysis of a joint database of all three countries. The findings illustrated that there are both similarities and differences among the countries: noise is a major problem for all countries, especially neighbourhood noise. On the other side, the temperature perception brought very different results for the countries. For some aspects, individual countries showed specific problems, such as the access to hot water in Vilnius.

As a conclusion, the results show that there seem to be some general panel block problems, but that in each country the situation still must be addressed in a specific way. In order to identify such country-based actions, larger national studies would be required.

The view of experts and the reality

Drawing from a research project on large housing estates in CEE countries funded by the EU, Mrs Heike Liebmann from the Institute for Regional Development and Structural Planning, Germany, reported about the current living conditions in panel block estates. Mrs Liebmann stressed that up to 40% of the population in eastern Europe live in such estates. Many of these inhabitants are now affected by the actual restructuring of the housing market: tasks and duties for maintenance were transferred from the state to local authorities or individual citizens. High private ownership ratios now create problems. As a second effect of these changes, the construction of new housing decreased strongly, and housing shortage is becoming a major issue in many countries. This is a specific problem when considering the lack of maintenance within
the existing housing stock. Mrs Liebmann concluded by advocating that research in housing gets a priority status.

**The situation in the United Kingdom**

Mr Geoff Green, University of Sheffield, presented some particularly interesting aspects of the housing stock conditions, which have been identified as a major issue in the United Kingdom. Focusing on the impact of cold temperatures and related excess winter deaths, Mr Green stated that this subject has been used frequently in the United Kingdom as it provides a “catchy phrase” for enhancing the interest of both politicians and citizens into housing rehabilitation and policies. In this context, he stated that the provision of adequate housing standards is a task of local authorities, and presented the concept of the tolerant building (described as a building that can tolerate various life styles and behaviours of the occupants). In a second part, Mr Green highlighted that if there is a triangle between housing, health and socioeconomic status, it might not be possible for many countries to efficiently improve socioeconomic status. Nevertheless, an improvement of housing conditions would be realistic and might help to break the link between socioeconomic status and health.

**Round-table discussion**

A participant asked for the exact status of excess winter deaths, and how many years of life would be lost in average. Large and costly intervention would – seen from economic perspective – only be cost-efficient if several years of life can be saved, which is not necessarily the case if the excess deaths mainly occur within the sick and elderly. It was mentioned that in the case of excess winter deaths, an evaluation of the number of years gained is very difficult. Finally, the minimum temperature was discussed, which is recommended differently in various countries. The need for a general agreement was seen and WHO was requested to put the issue of thermal conditions in housing on its technical agenda.

**Session 4. The challenges ahead in the European Region (1)**

**Keynote speech: assessing conditions and setting standards**

Professor David Ormandy from the University of Warwick tried to propose answers to the question of how to assess building conditions and transfer this into general standards. He stressed the fact that adequate housing standards should be associated with specific risk factors. As several risk factors inevitably exist, the question would then be how to make the settings as safe as possible. In this context, standards and regulations have been found to be inefficient. They guarantee a minimum, but do not provide an incentive for further improvements. Assessments and studies working with a pass/fail system have a similar problem, as they just decide whether a building is inhabitable or not – the severity of potential risk is not assessed. Based on this consideration, Professor Ormandy described the new approach of the United Kingdom. The health and safety rating system considers both the likelihood of health effects and their severity, and provides a clear measure for the assessment of a building. Professor Ormandy stated that, as housing and health problems are international, the system could be transferred to other countries.

**The situation in Portugal**

Mrs Claudia Weigert and Mrs Patricia Pacheco from the Portuguese Ministry of Health reported about the current housing stock conditions in Portugal. As the Ministry has recently decided to start working on housing and health, several preparations have been made which show that the impact of hot temperatures are one of the major health risk factors in Portugal. The materials for housing construction, as well as building regulations, are strongly influenced by the climate.
Further issues such as building materials, noise, density and crowding, and humidity are to be studied. The upcoming housing and health project will therefore deal with these priority aspects.

**Stability Pact: The situation in south-east Europe**

Mr Stefano Dominioni reported about the current work of the Stability Pact, involving several south-eastern European countries. Within the major objective of providing stability and social cohesion, strategies are foreseen in order to improve housing conditions and the health of the population (among other objectives). The Stability Pact social agenda has four technical agendas covered by relevant technical groups; one is related to housing and one to health. These groups should provide politicians with their conclusions before the end of this year, and the housing report is now completed. It is then envisaged to identify how each agenda can support the objectives of the other agendas. In this field, the work on housing and health could result in additional benefits for the population of the participating countries and be extremely relevant for the Stability Pact group. However, for the technical agenda of such cooperation, no decision has been made yet, and there is considerable interest in integrating the WHO work on housing and health into the project.

**The situation in Spain**

Dr Ricardo Iglesias, Head of the Health Office of the Madrid City Council, gave an overview about the Spanish building regulation that mainly focuses on the technical installations. Other points of interest are traffic, water supply and waste disposal, and a survey in 1995 identified noise as a major housing issue. According to the current regulation, all buildings older than 20 years are frequently inspected, and it was intended to integrate health aspects into this inspection during the coming years. The regulation also provides specific rules for buildings with a specific function such as schools or hospitals, and all public financing for the housing sector is linked to the full implementation of the building regulations. Finally, the housing inspection forms used in Spain were presented, which focus on the basic structure, the equipment and the condition of the respective building.

**The situation in Slovakia**

Dr Jaroslava Zapletalova from the Housing Institute in Bratislava highlighted the change of housing policies. She stated that the housing sector was strongly subsidised during the communist era. Now, many problems can be linked to a lack of properly financed mechanisms. Modern life styles created new problems that are felt strongly. The increase of traffic problems and air pollution are among the most important issues. Clear responsibilities for public services and public spaces are missing. For the housing stock, the changes mean that there is considerable loss of housing space, while no investments are made and new construction rates are low. Dr Zapletalova defined privatization as both positive and negative, as it does decrease the influence of the state on housing renewal and living conditions, but also does increase the degree of motivation within the private flat owners to take care of their flat. Energy-saving measures and housing maintenance should be given the highest priority in the future.

**Session 5. The challenges ahead in the European Region (2)**

**The situation in Kazakhstan**

Dr Bakytgul Tleubekova from the Department of Sanitary Hygiene reported that the national regulations cover the major housing and health parameters already during the construction process, and that current research was undertaken to improve this system. In the existing housing stock, regular surveys are carried out, including checks of radiation and harmful agents and a
surveillance of pests and infectious diseases. Thereby, Kazakhstan fulfils the basic requirements for housing standards. However, specific interest was expressed for the rural housing stock.

**The situation in Hungary**

The presentation of Dr Peter Rudnai, Deputy Director of the National Institute of Environmental Health, focused on a recent study undertaken in Hungary. The study measured the prevalence of acute respiratory diseases and allergies in a sample of more than 3000 school children, in relation to the housing and living conditions. Major risk factors, including materials, floor space, heating devices, tobacco smoking, moulds and animals (pests/pets) were identified. The prevalence of asthmatic symptoms was at 14% in average in Hungary. Moulds were the strongest risk factor. In total, 38% of all children showed respiratory symptoms that could be directly correlated with the housing conditions.

**The situation in Armenia**

Dr Sergey Karapetian from the Centre of Hygienic and Anti-Epidemiological Surveillance reported about several surveys that have inspected the influence of housing on health in Armenia. However, he stated that housing has less influence than factors such as nutrition, socioeconomic status or age. The housing problems in Armenia were defined as very basic, as many buildings do not comply with the basic standard and many citizens are only housed provisionally (due to an earthquake which demolished a part of the housing stock). Household size of four people in average enhance the challenge of housing. As specific problems, cold temperatures, water supply and the indoor air quality were mentioned, and the insufficient equipment and resources of national health bodies to carry out the necessary surveys and measurements. Spot measurements, e.g. for radon, showed that the values were above the limit value given by the former USSR standards.

**The situation in Lithuania**

Dr Romualdas Sabaliauskas, Ministry of Health, who explained that in spite of a decreasing population, the average floor space per person has also decreased, illustrated the recent development of Lithuania’s housing stock. This is due to the fact that almost no new construction takes place. Therefore, the fact that 33% of the population lives in panel block houses is seen as an advantage, as these houses basically offer all basic housing facilities. The major housing problems in Lithuania are identified as follows: insufficient quantity of housing supply, high private ownership rate of 97%, low energy-efficiency, unclear responsibilities for common spaces and rural sub-standard housing. Dr Sabaliauskas mentioned that health aspects were currently not integrated in housing policies, and concluded that more national work on housing and health is needed.

**Round-table discussion**

Professor David Ormandy was asked to explain how the new health and safety rating approach helps to identify the threshold level between acceptable and unacceptable housing. It was answered that to some extent, subjective assessments by experts are applied, but in general, the current views of risk perception were used. A risk of 1:10.000 is deemed as acceptable.

As a part of the discussion about the health and safety rating system, a United Kingdom representative added that only time would tell whether the new approach would allow leading to standards. However, it is expected that some changes will be required, and that the ranking system will probably be upgraded later on.
It was mentioned that the financing of investments is a major element of the housing discussion in CEE countries. A case study in Slovakia addressed this issue and showed that large savings up to 60% of the total housing expenses, after basic energy-saving renovation measures were implemented, could be achieved. The saved money could then be used for renovating other parts of the building. This example shows that through investment into housing, a chain of savings can be started that provides the economic resources for housing improvement and thus limits the total expenses.

In the context of the WHO case study and the national challenges, it was proposed that the results of the WHO survey should be disseminated widely and be used as a basis for national studies and the improvement of building regulations.

Concluding the various country presentations, the participants agreed that next to the building itself, aspects of ownership, social context and the housing environment should be integrated in any work attempting to link housing and health.

A specific topic was the question of financial resources. Work into the economics of housing rehabilitation is heavily and desperately needed.

**Session 6. The technical answers (1)**

*The indoor air quality observatory in France*

Mr Eric Giroult from the Ministry of Public Works presented a project that has recently started in France. Based on cooperation between a building research institute and a health institute, an Indoor Air Quality Monitoring System was established as a permanent warning system for indoor air-related health risks. The observatory includes a large number of dwellings and schools, and will focus on measurements of temperatures and humidity, radon, asbestos, Volatile Organic Compounds, classical air pollutants, Particulate Matter, bacteria, moulds and allergens. The objective of the observatory is to identify both the environmental and behavioural determinants of indoor exposures. The housing stock in France was furthermore described. Mr Giroult stated that up to 50% of the housing stock has been built according to regulations that are not acceptable today. In addition, many buildings have not been maintained enough and thus are strongly decayed. Housing rehabilitation is still a problem in France, and clarifying links between housing and health a priority.

*The influence of the immediate environment*

Mr Mathias Braubach, building upon the experiences gained from the WHO case study, showed that the immediate environment was a decisive element of the overall satisfaction with the living place. For the perception of the immediate environment, it is especially the common spaces used by each occupant (such as staircases, parking spots, open spaces, greenery, housing entrance area, etc.) that need to be considered. In that context, aspects of identity, rootedness and security are of major importance and are closely linked to the social context provided by the neighbourhood. Mr Braubach therefore concluded that for further studies, the immediate environment should be included. This requires a spatial and a methodological extension of housing and health studies in order to integrate the functional and the perceptual dimension of the neighbourhood.

*The development of housing indicators (see Annex 1)*

Dr Danute Krapavickaite from the Institute of Mathematics and Informatics in Vilnius presented the opportunities for the development of housing and health indicators, based on the results of
the WHO study. Working with the database made of all countries’ data, Dr Krapavickaite used a multivariate logistic regression model to identify the major dependency between individual health symptoms and factors such as housing conditions or age, gender and income. Based on these general parameters that were applicable in all countries, it could be possible to develop indicators. However, it was required that those main indicators would need to be investigated more closely, as a bigger sample and a more focused questionnaire would be needed for a realistic indicator development. Furthermore, larger studies would require the constant cooperation of health experts, epidemiologists and statisticians. Annex 1 gives the table showing the example of the regression analysis.

**An improved tool in evaluating needs**

The current approach of the British government, the English House Condition Survey (EHCS), was presented by Dr David Cross from the Department of the Environment, Transport and the Regions, United Kingdom. He focused on the national and local level and described the approach of the EHCS, which is carried out every five years. Around 0.1 percent of the national housing stock is surveyed. This approach enables the monitoring of housing conditions over time, and the results can be used for housing policy development as well as for an evaluation of the applied measures. Based on the housing fitness rating system, houses can be declared as unfit for habitation and the measures for improvement can be identified, as well as the related costs. As already presented by Professor Ormandy, health aspects will become an essential part of the new EHCS approach, as the old system did not integrate health-related issues such as low air temperatures. The same approach can be applied at local level, enabling local authorities to assess their situation and use the evidence gained for fundraising. The results then help to prioritise maintenance measures and budget allocation.

**Round-table discussion**

Reviewing the presentations of the last sessions, it appeared that countries have various definitions. A common understanding of what is to be understood by “decent”, “acceptable” or “unacceptable” housing would help to strengthen international cooperation.

The perception of the immediate environment had been presented, and the participants to the meeting were asked for their suggestions for further work. The same was done for the work on potential housing and health indicators. Then, Member States were encouraged to communicate their proposals and interests to WHO.

The environment perception is not easy to research. It can be approached by an “informed subjective judgement” by surveyors (which results in standardised data) or by the “subjective judgement” of inhabitants, which provides non-standardised data. It is also possible to work with both types of data, if the data status is known and treated accordingly. This remains an important issue. Some of the recommendations made during this part of the discussion are included in the “conclusions and recommendations” part of this report.

As a crucial element of all studies, the return and participation rates were mentioned. The preparation of a study should therefore be seen as an important part, as it will be decisive for the final success.

It was suggested that for further studies, also public services located in the neighbourhoods (such as day care centres, shopping places and public traffic systems) should be integrated.
Session 7. The technical answers (2)

Energy, health and housing

Within the field of energy and heating, Dr Lars Gunnarsen from the Danish Building and Urban Research Institute presented a cross-sectional study on moulds and mites presence in Denmark’s housing stock. Several findings were made that sometimes were in line with general research results, but sometimes also questioned current knowledge. However, it was acknowledged that the study was biased because of the very poor response rate. It appeared necessary to conduct further studies. As a basic result, Dr Gunnarsen concluded that humidity problems in Denmark seem to be more often due to building faults and low insulation quality than to life styles.

Economy, health and housing

Apart from medical aspects, Dr Bjorn Larsen presented the application of economic principles in the field of housing and health. Dr Larsen introduced the currently used instruments of economic health research and explained the disability-adjusted life years approach (DALY) and the willingness to pay concept (WTP). For housing and health, the WTP seems to be a useful method as it does include the subjective perception of wellbeing, which can hardly be measured in another way. However, the disadvantages (such as the dependency on risk perceptions and the fact that the costs of disease are not always only paid by the individuals) were also discussed and showed the difficulty of translating health aspects into economic aspects. Suggesting the application of cost-benefit-analyses, Dr Larsen concluded that governments should look into creating efficient market conditions that provide the achievement of social objectives and the avoidance of inequalities. This could be either done by market-based strategies and incentives, or by the setting of regulations and standards.

Information, health and housing

Dr Elizabeth Scott gave an overview of the current status of housing and health research, and focused on the requirement to communicate the research results. Although the findings are rather timely and important, there is a low awareness among both housing and health experts about the topic of housing and health, as well as among most citizens. In this context, the recent privatization turns out as a major obstacle, as the number of people that need to be convinced increases exponentially. As a tool for such communication, brochures and pamphlets represent an opportunity to transfer knowledge and inform both local authorities and private dwellers about the impacts of housing and residential life style on health. Information campaigns such as the International Federation of Housing (IFH) Home Hygiene Guidelines and the WHO pamphlet series on local authorities, health and environment would therefore be suitable communication tools.

Round-table discussion

Referring to the presentation on economic instruments, it was acknowledged that so far, no work was done in the field of economic assessments of the health impact of housing improvement projects. However, it was expected to use the results gained from the upcoming studies with the new health and safety rating system for some similar work to compare the investments of housing improvement with the benefits.

All presentations contained two levels of housing responsibility: the macro level, and the micro level. Understanding the State as the responsible actor on the macro-economic level, it was suggested that first of all, the state has to fulfil its duty by providing adequate housing standards. Only such standards would then enable the individual occupants to act in a deliberate way on a micro-economic level and integrate health aspects into their subjective behaviour.
Session 8. Conclusions and recommendations

The meeting made the following recommendations:

**Recommendations to countries**

Countries should incorporate the housing and health dimension into their national environmental health action plans (NEHAPs). Such a policy document should be based on national surveys, and include all the necessary elements to obtain a comprehensive housing and health policy. The housing and health dimension should also be incorporated into the local environmental health action plans (LEHAPs).

Countries should organize and hold national conferences on housing and health issues.

Countries which participated in the WHO survey in the year 2000 should use the findings and present them to all partners (nongovernmental organizations (NGOs), local authorities, media, etc.). In particular, Lithuania, Slovakia and Germany should draw the conclusions from the results of the WHO survey and join forces with local authorities and group of owners to remedy the identified defects and ensure proper follow-up.

Countries should undertake case studies on cost-benefit aspects of selected housing and health issues (the examples of Hungary, United Kingdom or Bratislava, Schwedt, Vilnius could be considered)

Countries should create an intersectoral institutional framework with clear distribution of responsibility and authority in order to maximise the health gains from studies and projects.

Countries should encourage public participation in planning and housing issues through information and communication. All partners should be given access to advice and the possibility to express their opinions/wishes through adequate communication mechanisms.

**Recommendations to WHO**

WHO should develop all necessary background materials and guidelines to allow countries to develop national health-related housing monitoring programmes on the basis of the survey results and indicators identified.

WHO should support the development of a report on the findings of the current survey and publish it.

WHO should collect available evidence in a systematic way for clarifying the linkages between housing condition improvements and health status. This could eventually lead to proposals for prioritizing housing improvements according to the health gains they generate.

Based on this survey, WHO should develop a survey tool to allow local authorities to self-assess the existing situation in a neighbourhood or at a larger scale in a way that can be compared with other areas. WHO should encourage the implementation of more extensive studies based on the results of the existing one to draw more statistically significant links between housing and health. The support of Member States should be sought in this respect.

WHO is required to establish a relevant Task Force aiming at playing the role of an advisory board for strategic research and development in the area of housing and health.
Accidents and infectious diseases are an underestimated part of the global burden of disease generated by poor housing conditions. WHO should consider including these ill-health aspects into further research and studies.

Extreme high and low temperatures are an underestimated cause of ill health and premature death in many countries. WHO is encouraged to promote international cooperation on this subject in order to obtain a better knowledge of the existing evidence.

Countries belonging to the Stability Pact have performed an analysis of the housing situation as well as of their health system. WHO should support the development of links of these two agendas together with other aspects linked to social cohesion.

WHO is requested to develop technical information documents aimed at local level politicians and technical staff. Topics such as “housing and health”, “housing and security”, “technical aspects of a healthy homes”, “hygiene and housing”, “energy and housing”, “lighting and housing” should be covered.

The meeting recommends the ECEH to consider the issues of housing and health and noise as possible elements on the agenda of the 2004 ministerial meeting on environment and health.

The immediate housing environment (peri-domestic space) is an important element in the perception and satisfaction with housing. Therefore, WHO is asked to integrate this into further studies on housing and health and elaborate a suitable questionnaire for surveying this specific environment.

WHO should pay special attention to the housing requirements for groups at special risk, such as handicapped, elderly or home-care patients.

**Recommendations to others (local authorities, intergovernmental organizations (IGOs), international financial institutions (IFIs), other sectors, etc.)**

Financial mechanisms to support the renovation of panel block buildings should be reviewed. WHO should aim at supporting the incorporation of housing and health issues in all projects funded by IFIs, IGOs and through bilateral cooperation.

Municipalities should be encouraged to participate in maintenance and upgrading of the existing stock. In this respect, Member States could seek the help and support of IGOs and IFIs.

Pilot projects should be carried out, including low-cost renewal projects. Residents should contribute to these costs, especially in case of energy-saving improvements. In this respect, Member States could seek the help and support of IGOs and IFIs.

A review should be undertaken of economic instruments for housing improvements in Europe.

Skilled tradesmen and all workers with access to private homes should be offered the necessary knowledge to perform their task in a healthy way, as well as the capacity to promote a healthy way of using their installations.
Annex 1

FINDINGS FROM WHO PROJECT ON HOUSING AND HEALTH
MAIN INDICATORS

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Institute of Mathematics and Informatics
Lithuania

Some results of the survey “Housing and Health” carried out by WHO in 2000 in three countries: Germany, Lithuania and Slovakia are presented here. The survey population is apartments and inhabitants of some areas of panel block buildings. The aim of this study is to investigate relationships between the health indicators and apartment indicators and to find which of the flat indicators affect one or another health indicator.

Sampling design. The sample of the survey is a simple random sample of apartments selected independently in each area of three cities Schwedt (Germany), Vilnius (Lithuania) and Bratislava (Slovakia). All members of the household living in the apartment selected are included into the sample.

Sample of such kind is called stratified cluster sample of individuals with city areas as strata. Apartments selected from different areas are independent but apartments selected from the same area are dependent elements of the sample. Households are considered as clusters with dependency among its members sharing the same apartment and with the similar, may be, health problems to some extent.

When investigating relationships between apartment and health indicators it has to be kept in mind that part of the relationship found may be due to the dependency of members of the household, so the dependency has to be eliminated. This can be done taking into account sampling design in statistical analysis of survey data.
**Sampling weights**

There were surveyed three areas of panel-block buildings in Schwedt: Talsand, Waldrand and Kastanienallee, four areas in Vilnius: Lazdynai, Virsuliskes, Justiniskes, Pilaite and one area Haje in Bratislava. The size of these areas is quite different although the sample size does not differ much. It has to be paid attention how many apartments in the population are represented by one apartment in the sample in each area. This indicator is called sampling weight and it varies from 52 in Talsand up to 873 in Justiniskes:

<table>
<thead>
<tr>
<th>City</th>
<th>Area</th>
<th>Sampling weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schwedt</td>
<td>Talsand</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Waldrand</td>
<td>164</td>
</tr>
<tr>
<td></td>
<td>Kastanienallee</td>
<td>243</td>
</tr>
<tr>
<td>Vilnius</td>
<td>Lazdynai</td>
<td>605</td>
</tr>
<tr>
<td></td>
<td>Virsuliskes</td>
<td>295</td>
</tr>
<tr>
<td></td>
<td>Justiniskes</td>
<td>873</td>
</tr>
<tr>
<td></td>
<td>Pilaite</td>
<td>191</td>
</tr>
<tr>
<td>Bratislava</td>
<td>Haje</td>
<td>255</td>
</tr>
</tbody>
</table>

**Method of statistical analysis of the relationships between indicators**

It was investigated dependency of some health characteristics on apartment and individual indicators as explanatory variables using logistic regression taking sampling design into account.

Let us denote

\[ y = \begin{cases} 0 & \text{occurrence of some health characteristic for the individual,} \\ 1 & \text{otherwise} \end{cases} \]

\[ x = (1, x_1, ..., x_p)' \] - vector of categories of explanatory variables,

\[ \beta = (\beta_0, \beta_1, ..., \beta_p)' \] - vector of unknown parameters.

Logistic regression model is defined as

\[ P\{y = 1|x\} = \frac{e^{\beta x}}{1 + e^{\beta x}} \]

and it expresses probability for the individual to have some health characteristic \( y = 1 \) if value of explanatory vector \( x \) is known. Components of the vector \( \beta \) are estimated, and hypothesis

\[ H_0: \beta_i = 0, \]

\[ H_1: \beta_i \neq 0 \]

for \( i=0,1,...,p \) is tested with the confidence level 0.1. Significantly nonzero components are denoted in the tables below as marked indicators, included into the model of logistic regression, having significant influence on the health characteristic. The confidence level means probability of the error in announcing explanatory variable as significant when actually it is not so.
Results of statistical analysis
Some of the models of the relationship between the indicators are presented here.

Table 2. Accidents and flat indicators

<table>
<thead>
<tr>
<th>Flat indicators</th>
<th>Accidents at home</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric installation earthed</td>
<td>☒</td>
</tr>
<tr>
<td>Unsafe spots in the flat and on the staircase</td>
<td>☒</td>
</tr>
<tr>
<td>Presence of additional carpets</td>
<td></td>
</tr>
<tr>
<td>Bathroom floor likely to be slippery when wet</td>
<td></td>
</tr>
<tr>
<td>Length of residence</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 shows that occurrence of the accidents at home is affected by the fact of electric installation earthed or not and occurrence of unsafe spots, but at the same time it is not affected by presence of additional carpets, bathroom floor slippery, length of residence and gender.

Table 3. Occurrence of health effects related to the flat

<table>
<thead>
<tr>
<th>Flat and personal indicators</th>
<th>Occurrence of health effects related to the flat</th>
<th>Suffering from asthma</th>
<th>Suffering from respiratory disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature problems in winter</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Humidity problems</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Pest occurrence</td>
<td>☒</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pets in flat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste chute in staircase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual mould growth</td>
<td>☒</td>
<td></td>
<td>☒</td>
</tr>
<tr>
<td>Cigarettes smoked in flat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of residence</td>
<td></td>
<td></td>
<td>☒</td>
</tr>
<tr>
<td>Smoking</td>
<td>☒</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Gender</td>
<td>☒</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There were only a few cases of asthma in the data set, so significant dependency of suffering from asthma and smoking was not found.
The following table shows dependency of suffering from chronic and respiratory diseases on some flat indicators, mainly water supply, and individual indicators.

Table 4. Chronic and infection diseases risk

<table>
<thead>
<tr>
<th>Flat and personal indicators</th>
<th>Suffering from chronic disease</th>
<th>Suffering from respiratory disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy use in kitchen for cooking</td>
<td>☺</td>
<td>☺</td>
</tr>
<tr>
<td>Shortages in the water supply</td>
<td>☺</td>
<td>☺</td>
</tr>
<tr>
<td>Shortages in the hot water supply</td>
<td>☺</td>
<td></td>
</tr>
<tr>
<td>Heating system with/without thermostat</td>
<td>☺</td>
<td>☺</td>
</tr>
<tr>
<td>Mode of payment for the water</td>
<td>☺</td>
<td>☺</td>
</tr>
<tr>
<td>Draught in flat</td>
<td>☺</td>
<td></td>
</tr>
<tr>
<td>Pest occurrence</td>
<td>☺</td>
<td></td>
</tr>
<tr>
<td>Pets in flat</td>
<td>☺</td>
<td></td>
</tr>
<tr>
<td>Length of residence</td>
<td>☺</td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td>☺</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>☺</td>
<td>☺</td>
</tr>
<tr>
<td>Gender</td>
<td>☺</td>
<td></td>
</tr>
</tbody>
</table>

Heating system with or without thermostat means actually how much money is spent for the payment for heating. In the case of absence of thermostat the household may save some money keeping low temperature in the flat. In the case when there is no thermostat the warmth may be even wasted without additional payment. In Lithuania heating system is usually without thermostat, the warmth given by the heating system is not high, and inhabitants usually try to keep warmth as much as possible.

There is investigated dependency of suffering from chronic diseases on indicators of air quality in the flat.

Table 5. Suffering from chronic diseases

<table>
<thead>
<tr>
<th>Flat and personal indicators</th>
<th>Suffering from chronic diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy use in kitchen for cooking</td>
<td></td>
</tr>
<tr>
<td>Unsafe spots in the flat and the staircase</td>
<td></td>
</tr>
<tr>
<td>Dust occurrence</td>
<td></td>
</tr>
<tr>
<td>Difficulties in keeping house clean of dust</td>
<td>☺</td>
</tr>
<tr>
<td>Humidity problems</td>
<td></td>
</tr>
<tr>
<td>Floor surface material</td>
<td></td>
</tr>
<tr>
<td>Indoor air quality in flat</td>
<td></td>
</tr>
<tr>
<td>Possibility of the cross-ventilation in the flat</td>
<td></td>
</tr>
<tr>
<td>Perception of tobacco smell in the flat</td>
<td></td>
</tr>
<tr>
<td>Pets in flat</td>
<td>☺</td>
</tr>
<tr>
<td>Length of residence</td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>☺</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Gender and smoking</td>
<td>☺</td>
</tr>
</tbody>
</table>

It is interesting that in Table 5 suffering from chronic diseases does not depend on the fact of smoking or gender, but depends on their interaction. The category of smoking men is significant in this model of logistic regression.
Table 6. Psycho-emotional impact on health, its estimate and psychological feeling

<table>
<thead>
<tr>
<th>Psycho-emotional indicators</th>
<th>Suffering from chronic disease</th>
<th>Health self-estimate</th>
<th>Psychological self-feeling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise from neighbour flat</td>
<td>☀</td>
<td>☀</td>
<td>☀</td>
</tr>
<tr>
<td>Sound insulation in the flat</td>
<td>☀</td>
<td>☀</td>
<td></td>
</tr>
<tr>
<td>Type of building</td>
<td>☀</td>
<td>☀</td>
<td>☀</td>
</tr>
<tr>
<td>Satisfaction with:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• air quality</td>
<td>☀</td>
<td>☀</td>
<td></td>
</tr>
<tr>
<td>• temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• space and structure</td>
<td></td>
<td></td>
<td>☀</td>
</tr>
<tr>
<td>• noise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• hygiene and sanitation</td>
<td></td>
<td></td>
<td>☀</td>
</tr>
<tr>
<td>• natural light</td>
<td>☀</td>
<td></td>
<td>☀</td>
</tr>
<tr>
<td>• kitchen equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• energy consumption</td>
<td>☀</td>
<td></td>
<td>☀</td>
</tr>
<tr>
<td>• safety from accidents</td>
<td>☀</td>
<td>☀</td>
<td>☀</td>
</tr>
<tr>
<td>Temperature problems in summer</td>
<td></td>
<td></td>
<td>☀</td>
</tr>
<tr>
<td>Temperature problems in winter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunlight in the flat</td>
<td></td>
<td></td>
<td>☀</td>
</tr>
<tr>
<td>Overcrowding in the flat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of residence</td>
<td>☀</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>☀</td>
<td>☀</td>
<td>☀</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Table 7. Psycho-emotional impact on the estimate of health

<table>
<thead>
<tr>
<th>Psycho-emotional indicators</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise from neighbour flat</td>
<td>☺</td>
<td>☺</td>
<td>☺</td>
<td></td>
</tr>
<tr>
<td>Sound insulation in the flat</td>
<td>☺</td>
<td>☺</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of building</td>
<td>☺</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfaction with:</td>
<td>☺</td>
<td>☺</td>
<td>☺</td>
<td></td>
</tr>
<tr>
<td>air quality</td>
<td></td>
<td>☺</td>
<td></td>
<td></td>
</tr>
<tr>
<td>temperature</td>
<td>☺</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>space and structure</td>
<td>☺</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>noise</td>
<td></td>
<td>☺</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hygiene and sanitation</td>
<td></td>
<td>☺</td>
<td></td>
<td></td>
</tr>
<tr>
<td>natural light</td>
<td></td>
<td>☺</td>
<td></td>
<td></td>
</tr>
<tr>
<td>kitchen equipment</td>
<td>☺</td>
<td>☺</td>
<td></td>
<td></td>
</tr>
<tr>
<td>energy consumption</td>
<td>☺</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>safety from accidents</td>
<td>☺</td>
<td>☺</td>
<td>☺</td>
<td>☺</td>
</tr>
<tr>
<td>Temperature problems in summer</td>
<td>☺</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature problems in winter</td>
<td>☺</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunlight in the flat</td>
<td>☺</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overcrowding in the flat</td>
<td>☺</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of residence</td>
<td></td>
<td>☺</td>
<td>☺</td>
<td>☺</td>
</tr>
<tr>
<td>Age</td>
<td>☺</td>
<td>☺</td>
<td>☺</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>☺</td>
<td>☺</td>
<td>☺</td>
<td></td>
</tr>
</tbody>
</table>

I. My health is excellent
II. I am as healthy as anybody I know
III. I seem to get sick a little easier than other people
IV. I expect my health to get worse

The attitude of the respondents was estimated in ranks from very bad to very good. It is pleasing to note that response to the most pessimistic proposition “I expect my health to get worse” does not depend on age.
Conclusions

The indicators that were found to be related to each other may be called the main indicators. They are classified according to the DPSEEA model in the following way:

<table>
<thead>
<tr>
<th>Driving force</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Mode of payment for the water supplies</td>
</tr>
<tr>
<td>Sex</td>
<td>Information campaigns</td>
</tr>
<tr>
<td>Type of building</td>
<td>Building and housing regulations</td>
</tr>
<tr>
<td>Status</td>
<td></td>
</tr>
<tr>
<td>Heating system</td>
<td></td>
</tr>
<tr>
<td>Heating system</td>
<td>without thermostat</td>
</tr>
<tr>
<td>Difficulties in</td>
<td></td>
</tr>
<tr>
<td>keeping house</td>
<td>clean of dust</td>
</tr>
<tr>
<td>Sound insulation</td>
<td></td>
</tr>
<tr>
<td>flat</td>
<td></td>
</tr>
<tr>
<td>Exposure</td>
<td></td>
</tr>
<tr>
<td>Electric installation</td>
<td>earthed</td>
</tr>
<tr>
<td>Unsafe spots in</td>
<td></td>
</tr>
<tr>
<td>flat and in the</td>
<td></td>
</tr>
<tr>
<td>staircase</td>
<td></td>
</tr>
<tr>
<td>Pest occurrence</td>
<td></td>
</tr>
<tr>
<td>Shortages in cold</td>
<td></td>
</tr>
<tr>
<td>and hot water supply</td>
<td></td>
</tr>
<tr>
<td>Temperature problems</td>
<td></td>
</tr>
<tr>
<td>in summer and</td>
<td></td>
</tr>
<tr>
<td>winter</td>
<td></td>
</tr>
<tr>
<td>Sunlight in the flat</td>
<td></td>
</tr>
<tr>
<td>Draught in flat</td>
<td></td>
</tr>
<tr>
<td>Noise from</td>
<td></td>
</tr>
<tr>
<td>neighbour flat</td>
<td></td>
</tr>
<tr>
<td>Overcrowding in the</td>
<td></td>
</tr>
<tr>
<td>flat</td>
<td></td>
</tr>
<tr>
<td>Length of residence</td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
</tr>
<tr>
<td>Effect</td>
<td></td>
</tr>
<tr>
<td>Occurrence of health</td>
<td></td>
</tr>
<tr>
<td>effects</td>
<td></td>
</tr>
<tr>
<td>Suffering from</td>
<td></td>
</tr>
<tr>
<td>respiratory disease</td>
<td></td>
</tr>
<tr>
<td>Suffering from</td>
<td></td>
</tr>
<tr>
<td>asthma</td>
<td></td>
</tr>
<tr>
<td>Accidents at home</td>
<td></td>
</tr>
<tr>
<td>Satisfaction with:</td>
<td></td>
</tr>
<tr>
<td>• air quality</td>
<td></td>
</tr>
<tr>
<td>• temperature</td>
<td></td>
</tr>
<tr>
<td>• space and structure</td>
<td></td>
</tr>
<tr>
<td>• noise</td>
<td></td>
</tr>
<tr>
<td>• hygiene and</td>
<td></td>
</tr>
<tr>
<td>sanitation</td>
<td></td>
</tr>
<tr>
<td>• natural light</td>
<td></td>
</tr>
<tr>
<td>• kitchen equipment</td>
<td></td>
</tr>
<tr>
<td>• energy consumption</td>
<td></td>
</tr>
<tr>
<td>• safety from</td>
<td></td>
</tr>
<tr>
<td>accidents</td>
<td></td>
</tr>
</tbody>
</table>

Only one item “Mode of the payment for the water” depends here to the group of “Action”. The items “Information campaigns” and “Building and housing regulations” may be additionally voluntary joined to this group.

Health professionals, housing institutions have to pay their attention to the main indicators in order their behaviour should influence positively to the health of inhabitants.

The main indicators determined are worthwhile to be investigated deeper in the bigger samples of future surveys, where the more reliable results may be obtained.
Annex 2

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