Electromagnetic fields in homes

We humans have no sensory organ by which we can feel or sense electromagnetic fields (EMF); in this aspect we differ from some other species, e.g. from migratory birds. As obscure, unknown, not well defined risks and threats are liable to produce angst, some people fear negative effects on well-being and health, even within their own protecting domestic walls. Extremely low frequency fields (ELF) (50 Hz) and high frequencies (HF) (in the kHz – MHz – range) are those to be discussed when domestic settings are considered.

EMF exist wherever electricity is generated and transmitted, through power lines, cables, or wirelessly. Electricity being an integral part of modern lifestyle, we are exposed to it constantly and ubiquitously. The existence of electric cables and the use of electrical appliances is one important source of domestic EMF. Also, high voltage power lines give reason for discussion. At any time and place we are surrounded by high frequency EMF, providing e.g. television and radio programs. The installation of widespread wireless telecommunication services (mobile phones and their base stations, DECT phones, WLANs) have been in the focus of many discussions during the last two decades.

There exist no known mechanisms by which EMF (below certain well-established thresholds for field strengths) should be pathogenic (carcinogenic, mutagenic, tumour-promoting) or should influence behaviour or well-being. Many studies done in vitro and in animals are performed under conditions which differ largely from those under which humans are exposed in their daily lifes. Intensities of experimental fields are often magnitudes of order higher than those occurring in our environment, and the duration of exposure must be considered. As also species differences are to be taken into account, many published results must be interpreted cautiously. Overall, investigations in animals or on in vitro cell cultures that try to establish whether EMF can induce cancer or are tumor-promoting, have yielded no or no consistent effects. Much of the information on possible health effects comes from epidemiological studies. Results are mostly inconsistent, often contradictory, and adverse health effects – if there are any – would be so small as to be detectable only with difficulty, even in large epidemiological studies.

According to each one’s personal bias and to scientific or ideological backgrounds, either results of studies that demonstrate some effect are stressed and are brought forward, or those that show the absence of correlation.

Electrosensibility (ability to feel EMF of low intensity) and electrosensitivity (becoming ill due to EMF) are self reported phenomena. Those who suffer from their postulated
Electrosensitivity are reporting sleep disturbances, headaches, vertigo, cardiac dysrhythmias, depression and a number of further complaints. So far, there has been no proof or demonstration that EMF with the intensities encountered in our daily life are the reason for such disturbances of health and well-being. National and international agencies, as WHO, SCENHIR, and most scientists are convinced that electrosensibility and –sensitivity do not exist. In contrast, people who believe that their health is impaired by EMF estimate that 10% of the population may be electrosensitive.

People that want to be – somewhat irrationally – on the very safe side can install in their homes appliances that turn off all voltage whenever it is not needed and thus reduce the electric fields in homes. There is no practicable means to totally avoid ELF magnetic fields from cables used to provide electricity in household appliances when these devices are in use. One can keep, if possible, as much distance as feasible to the electric household appliances. Neither, the magnetic field emitted by high-voltage power lines can be shielded, be they overhead or underground.

HF fields (radio and mobile phone frequencies) are quite effectively absorbed by concrete and steel. Further shielding using metalized wallpapers and/or curtains is of questionable benefit and may produce other environmental problems. DECT telephones with ECO mode might be preferred to conventional DECT phones. WLANs can be switched off when not in function, and one may use mobile phones as briefly and rarely as possible.

Electromagnetic fields become markedly weaker with increasing distance from the source. This fact is also of importance when the impact of high voltage power lines is discussed. At very close distance (below 200 m), domestic magnetic fields with intensities of approximately 0.4 µT are sometimes encountered, and in larger epidemiologic studies such fields have been associated with childhood leukemia. This has not been found, however, at larger distances. These observations have resulted in the classification of low frequency low intensity magnetic fields as “possibly carcinogenic” (group 2B) by the International Agency for Research on Cancer (IARC). Recently, the IARC has also classified HF-generated EMF as group 2B, i.e. as possibly carcinogenic, a decision not uniformly accepted in the scientific community.

It might be wise to keep in mind that, if EMF really should be carcinogenic or tumor promoting, any such effects must be very small; in many investigations they cannot be demonstrated, or in others only marginally and inconsistently. There are certainly more important environmental factors that really threaten or damage health and well-being and should be worth our attention.

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EMF-Portal - Comprehensive information about research on electromagnetic fields

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The Research Center for Bioelectromagnetic Interaction (femu) as part of the Institute of Occupational Medicine in Aachen, Germany, is the University Hospital’s department which conducts interdisciplinary research on biological and medical effects of electric, magnetic, and electromagnetic fields (EMF). In the electromagnetic spectrum, these fields belong to the range of non-ionizing radiation (Figure 1).
Electric, magnetic, and electromagnetic fields arise as a result of natural processes such as lightning, radiation from the sun, thunderclouds, and the earth’s magnetic field, or they are artificially created in association with technical processes or devices. The electromagnetic fields are classified according to their frequency, for example, radio frequency (RF) EMF (emitted e.g. from mobile phones or microwave ovens), and low frequency (e.g. extremely low frequency magnetic fields, ELF-EMF, emitted from power lines or electrical household devices). With an interdisciplinary approach, femu covers scientific information on non-ionizing radiation in its open-access internet information platform “EMF-Portal” as well as active research in clinical provocation studies on electromagnetic interference with cardiac implants as pacemakers or defibrillators.

EMF-Portal

The EMF-Portal (www.emf-portal.org) is the most comprehensive scientific literature database on biological and health-related effects of non-ionizing electromagnetic radiation (frequency range 0-300 GHz) with unrestricted access (Figure 2). It has been run and administered at femu since 2005. In this English/German internet information system, scientific publications are collected, categorized according to the EMF-emitting source (devices or other technical set-ups) and investigated endpoint, and summarized in a way that makes the scientific content easily comprehensible for users. As of October 2013, the database included a total of more than 18,400 scientific paper entries and other relevant publications (e.g. laws, recommendations, and guidelines) that can be searched by elaborate routines. The user can get additional information via the extensive directly text-linked glossary (2,900 entries), graphical and tabular overviews of certain research topics, and a database of electromagnetic field emitting sources. Many open-access journal articles are directly linked. The web portal addresses equally scientists, politicians, physicians, lawyers, journalists, and the interested public.
Figure 2: EMF-Portal homepage

The WHO references the EMF-Portal on their website under the topic “Electromagnetic fields (EMF)”\(^1\). On request, *femu* provides tailored packages or lists of EMF literature serving specific needs of working groups and committees, as e.g. done for the below mentioned Monograph Vol. 102 Meeting at the International Agency for Research on Cancer (IARC) in 2011, published 2013\(^2\).

Overview of mobile phone related research

Out of 18,400 publications in the database, 6,194 are attributable to the radio frequency range (> 10 MHz), and further 1,470 publications can be attributed to radio frequency as well as to the low-frequency range. In the range of radio frequency EMF, research on possible health effects of mobile communication technologies (e.g. mobile phones) has raised much attention in the world over the last two decades. On this subject, 782 experimental studies and 179 epidemiological studies are included in the EMF-Portal database (as of October 2013). Both of these study types are fully extracted into comprehensive summaries in the EMF-Portal. Interactive pie charts in the website area “Graphical Overviews” lead to different subject areas, e.g. comprehensive overviews of all mobile phone related experimental or epidemiological studies. From here the user can explore the categorized data content on themes such as “brain cancer”, “health”, or “cell functions”. Further categorized topics lead to a list of studies on a certain topic (e.g. “hypersensitivity”), a table with further details, and to background information about this topic, e.g. “Terminology”, “Evaluation of existing studies”, or “Evaluation by national and international organizations”(Figure 3). All data is always automatically generated in real time from the current content of the database in order to provide the complete and most current list of available information on a certain investigated endpoint. From the list and from the table, the user can further proceed to the summarized details of each displayed publication by one click. All this information enables non-expert users to find an easy introduction to the subject.

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Extremely low frequency (50/60 Hz) related research

In the range of extremely low frequency EMF (ELF-EMF), research on possible effects of 50/60 Hz magnetic and electric fields from power lines, machines, household devices, and inhouse wiring raises currently much interest in Germany. Regarding this research area, about 1,590 experimental studies and about 400 epidemiological studies have been published so far.

An initial exploration of 50/60 Hz publications revealed that the main focus of experimental studies is on in vitro studies dealing with cell proliferation, apoptosis (programmed cell death), cell properties, genotoxicity, and gene expression (Figure 4a). Effects on the central nervous system and behaviour or cognition have also been frequently investigated. In epidemiological studies, childhood leukemia is the most investigated endpoint, followed by leukemia/lymphoma in adults, brain tumors, breast cancer, and brain or central nervous system tumors in children (Figure 4b).
A detailed analysis of the whole database of 50/60 Hz studies is currently ongoing as part of a project funded by the German Federal Office for Radiation Protection (BfS). The aims are to provide a comprehensive overview of the general public exposure to extremely low-frequency fields based on reliable scientific data and to clearly present the whole range of scientific literature on possible environmental or health effects of 50/60 Hz fields. The results will be shown as interactive graphical overviews, as described above for mobile phone and children related studies. It shall meet the information demands of citizens about possible health effects of EMF and shall also support national and international expert commissions in their efforts to assess possible threats based on the latest scientific knowledge, enabling the recommendation of adequate safety limits. The project will continue until mid-2015. First results are expected to be published mid-2014 on the websites of the EMF-Portal. Until then, users can find these studies easily by using the search routine of the EMF-Portal. The search can be narrowed according to author(s), year of publication, keywords, and furthermore according to the frequency range (e.g. 50/60 Hz power frequency) and single research topics.
**Classification of static, extremely low-, and radio frequency EMF by the IARC**

A prominent example of careful evaluation of the literature by expert groups and thus thorough assessments of the current scientific evidence is the Monograph Programme of WHO’s International Agency for Research on Cancer (IARC). In this programme, IARC performs and publishes a series of extensive scientific expert reviews that identify environmental risk factors for cancer. To this day, the IARC Monographs have reviewed more than 900 agents and have identified more than 400 known, probable and possible carcinogens.³ Static, extremely low-frequency electric and magnetic fields, and radio frequency EMF have been reviewed in 2002 (Volume 80) and 2013 (Volume 102), respectively⁴. Radio frequency EMF (RF-EMF) were classified by the IARC working group as “possibly carcinogenic to humans”, based on limited evidence in humans and in experimental animals for the carcinogenicity of radiofrequency radiation (IARC 2013)⁵. Epidemiological studies that focused on mobile phone use and the risk for brain tumors were most relevant for this classification. Although these studies “are susceptible to bias – due to recall error and selection for participation – the Working Group concluded that the findings could not be dismissed as reflecting bias alone, and that a causal interpretation between mobile phone RF-EMF exposure and glioma is possible” (Baan 2011). A similar conclusion was drawn for acoustic neuroma, although the case numbers were substantially smaller than for glioma. For other tumor types and for the possible association between environmental exposure to RF-EMF and cancer, the working group found the results were inconsistent, or the available evidence was insufficient for any conclusion (Baan 2011).

Extremely low-frequency (ELF) magnetic fields were also classified as “possibly carcinogenic to humans” (IARC 2002)⁶. In this context, a possible association between ELF magnetic fields and the occurrence of childhood leukemia was (and still is) a crucial element of evidence. Results of a number of epidemiological studies indicated a raised risk of leukemia in children if they were chronically exposed at home to 50/60 Hz magnetic flux densities above 0.3-0.4 Microtesla (µT). In adults, and in general for ELF electric fields, there is no such association. Also, there is no consistent evidence of increased childhood brain tumor risk associated with ELF magnetic field exposure (Kheifets 2010). However, the validity of epidemiological studies is often limited by methodological problems, such as selection bias (i.e., a systematic error by different participation behaviour of case and control groups). Furthermore, a plausible underlying mechanism of interaction between weak magnetic fields and the processes or structures in cells relevant for the development of leukemia has not been found so far. In 2007, a WHO task group updated the IARC review from 2002 and another related review by the International Commission on Non-Ionizing Radiation Protection (ICNIRP 2003). The former conclusions were confirmed (WHO 2007): “The Task Group concluded that additional studies since then do not alter the status of this classification. Thus, if there were any effects from exposures to these low-level fields, it would have to be through a biological mechanism that is as yet unknown. Additionally, animal studies have been largely negative. Thus, on balance, the evidence related to childhood leukaemia is not strong enough to be considered causal.”⁷

Static electric and magnetic fields and extremely low-frequency electric fields were evaluated by the IARC working group in 2002 as “not classifiable as to their carcinogenicity to humans” (Group 3).⁸

International research is currently focusing on possible interaction mechanisms between exposure to ELF magnetic fields and the development of leukemia by applying new experimental methods and computer simulations (ARIMMORA, a collaborative project funded by the European Commission within the 7th Framework Program)⁹. Another current research focus is the investigation of possible effects of ELF electric and magnetic fields on the development of neurodegenerative diseases, as Alzheimer’s disease or amyotrophic lateral sclerosis (ALS).

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Health risk perception of electromagnetic fields

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Nowadays, wireless communication services (high frequency fields, e.g. mobile phones and base stations) as well as all forms of electricity (low frequency fields, e.g. power lines and electrical devices) are frequently discussed topics in context of health risk perception of electromagnetic fields (EMF).

High frequency fields have become more relevant due to the increase of the mobile communication network since the end of the last and the beginning of this century. Especially base stations and their locations have been subject of media publications and public meetings. Still there is a great gap between meanwhile enormous scientific knowledge and the risk perception in the population.

So far, numerous studies regarding risk perception were carried out, taking not only biological but also sociological and psychological aspects into account. Furthermore, this topic became a focus of interest in the German Mobile Telecommunication Research Programme. In the years 2003 to 2006 as well as in 2009 the infas – Institute for Applied Social Sciences – conducted numerous telephone interviews on behalf of the Federal Office for Radiation Protection (BfS) to assess the public’s opinion concerning possible risks of EMF. Due to their results the use of mobile phones is still increasing. Reasons for not using this technology were e.g. lack of need (52 % of the non-users) and in a small fraction health problems (3 % of the non-users). Furthermore approximately 31 percent of the population is concerned about the potential health effects EMF and 11 percent feel impaired due to the exposure to EMF. In this latter group headache with 18 percent and sleeping problems with 12 percent are most common, and interestingly more than 50 percent cannot specify a disorder caused by EMF. The group of the concerned population was particularly in fear of getting cancer and headache. However, in comparison to other factors like consumption of meat of unknown origin, genetically modified food, air pollution, side-effects of medication, UV-radiation, heavy cigarette smoking and immoderate consumption of alcohol, EMF is rated as a minor potential health risk. Nevertheless the population’s interest in EMF seems to be increasing during the last years, 33 percent of the respondents ask for further information about this topic.
In the context of low frequency fields particularly power lines are subject of discussion. Previous studies showed that the distance of the home to a power line may be relevant for risk perception. The smaller the distance between home and power lines is, the more people are concerned and impaired, especially if the power line is in their visibility range. Furthermore an increase in the subjective impairment is associated with rising information demands as well as the desire to communicate with others about health concerns. Generally, besides personal factors like age, sex and education, the subjective perception of the exposition (in terms of individual manageability, benefit) is very important in the risk perception of EMF.

In summary, risk perception concerning EMF has been intensively looked into by scientific studies and influencing factors are known quite well. Further risk communication has to take this knowledge into account. Besides scientific aspects also technical and physical aspects of EMF should be communicated due to the fact that the knowledge of these aspects is limited in the population so far.

**Literature**


Ermittlung der Befürchtungen und Ängste der breiten Öffentlichkeit hinsichtlich möglicher Gefahren der hochfrequenten elektromagnetischen Felder des Mobilfunk- jährliche Umfragen; Deutsches Mobilfunk Forschungsprogramm (DMF), Bundesamt für Strahlenschutz (access: 05.11.13)  
Deutsches MOBILFUNK Forschungsprogramm

Ermittlung der Befürchtungen und Ängste der breiten Öffentlichkeit hinsichtlich möglicher Gefahren der hochfrequenten elektromagnetischen Felder des Mobilfunk. Bundesamt für Strahlenschutz (BfS) Hartmann, M, Belz, J. BFS-RESFOR-30/10 (access: 05.11.13)  

Risikowahrnehmung und Risikokommunikation im Bereich Niederfrequenter Felder (Im Auftrag des Bundesamtes für Strahlenschutz, BFS. S30015 Abschlussbericht (access: 07.11.13)  
B. Brohmann, C. Küppers, V. Ustohalova, F. Faulbaum, D. Schreckenberg  
[http://doris.bfs.de/jspui/handle/urn:nbn:de:0221-2009100601](http://doris.bfs.de/jspui/handle/urn:nbn:de:0221-2009100601)

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**Publications and Resources**

"City” instead of “Noise”

Noise is a major environmental and health problem, especially in cities and metropolitan areas. Therefore, urban planning must develop and implement measures to prevent and protect against noise. In practice, however, noise reduction is often not a leading thought in urban planning. To reduce noise effectively, public authorities and the general public need to work together closely and holistically.

An integrated urban, transport and environmental planning should cover aspects of clean air planning, noise reduction planning, climate protection and, possibly, urban redevelopment in this context. Overall, ambitious noise reduction concepts are urgently needed, because less noise primarily means health protection, health-related quality of life and lower costs and thus comprises many economic, environmental and social synergistic effects.

The new issue of the journal "Information on Spatial Development " shows the noise situation in Germany, describes the legal framework and the health consequences. It also shows solutions and ideas for policy makers and professionals both in the administrative and the private sector, however also illustrates the constraints of political action and planning.  
[BBSR Homepage - Veröffentlichungen - Stadt statt Lärm](http://www.bfr.bund.de/cm/343/elektromagnetische-felder-risikowahrnehmung-in-der-oeffentlichkeit.pdf)
Literature

In this section we will provide a collection of recent housing and health publications from a variety of backgrounds. Literature published in German or French, respectively, is indicated with the German flag 🇩🇪 or the French flag 🇫🇷.

If you have suggestions for interesting journals that we should screen for the literature collection, please let us know!

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Allergies and Respiratory Diseases

Indoor dust and air concentrations of endotoxin in urban and rural environments.
Barnig C, Reboux G, Roussel S, Casset A, Sohy C, Dalphin JC, de Blay F.

Indoor air contaminants and their impact on respiratory pathologies.
Carazo Fernández L, Fernández Alvarez R, González-Barcala FJ, Rodríguez Portal JA.

Renovation activities during pregnancy induce a Th2 shift in fetal but not in maternal immune system.

Being overweight increases susceptibility to indoor pollutants among urban children with asthma.
Lu KD, Breyssse PN, Diette GB, Curtin-Brosnan J, Aloe C, Williams DL, Peng RD, McCormack MC, Matsui EC.

A prospective study of the impact of air pollution on respiratory symptoms and infections in infants.

Household air pollution: a call for studies into biomarkers of exposure and predictors of respiratory disease.

The air quality health index and asthma morbidity: a population-based study.
To T, Shen S, Atenafu EG, Guan J, McLimont S, Stocks B, Licskai C.
Indoor Air

Cyanide poisoning by fire smoke inhalation: a European expert consensus.

Evaluation of Portable Household and In-Car Air Cleaners for Air Cleaning Potential and Ozone-Initiated Pollutants.

Carbon monoxide exposures and kitchen concentrations from cookstove-related woodsmoke in San Marcos, Peru.

After the PBDE phase-out: a broad suite of flame retardants in repeat house dust samples from California.

The Impact of Air-conditioning Usage on Sick Building Syndrome during Summer in China.

In-home air filtration for improving cardiovascular health: lessons from a CBPR study in public housing.

Changes in sputum cytology, airway inflammation and oxidative stress due to chronic inhalation of biomass smoke during cooking in premenopausal rural Indian women.


In-home air pollution is linked to respiratory morbidity in former smokers with chronic obstructive pulmonary disease.

Long-Term Trend of Indoor Volatile Organic Compounds – a 15-Year Follow-Up Considering Real Living Conditions.

Associations between brominated flame retardants in house dust and hormone levels in men.

Effect of central ventilation and air conditioner system on the concentration and health risk from airborne polycyclic aromatic hydrocarbons.
Spatial relationships between lead sources and children's blood lead levels in the urban center of Indianapolis (USA).

Longitudinal relationship between personal CO and personal PM2.5 among women cooking with wooded cookstoves in Guatemala.
McCacken JP, Schwartz J, Diaz A, Bruce N, Smith KR.

The University of Michigan Dioxin Exposure Study: estimating residential soil and house dust exposures to young children.
Paustenbach DJ, Kerger BD.

Canadian House Dust Study: population-based concentrations, loads and loading rates of arsenic, cadmium, chromium, copper, nickel, lead, and zinc inside urban homes.
Rasmussen PE, Levesque C, Chénier M, Gardner HD, Jones-Otazo H, Petrovic S.

Increase in vesicular hand eczema after house dust mite inhalation provocation: a double-blind, placebo-controlled, cross-over study.
Schutteelaar ML, Coenraads PJ, Huizinga J, De Monchy JG, Vermeulen KM.
Contact Dermatitis. 2013 Feb;68(2):76-85.

Assessment of penetration through vacuum cleaners and recommendation of wet cyclone technology.
Seo Y, Han T.

The contribution of housing renovation to children's blood lead levels: a cohort study.

Concentrations of polybrominated diphenyl ethers (PBDEs) in residential dust samples from Western Australia.
Stasinska A, Reid A, Hinwood A, Stevenson G, Callan A, Odland JØ, Heyworth J.

Experimental Investigation of Indoor Air Pollutants in Residential Buildings.
Tan CCL, Finney KN, Chen Q, Russell NV, Sharifi VN, Swithinbank J.
Indoor and Built Environment June 2013 22:471-489.

Contamination of indoor dust and air by polychlorinated biphenyls and brominated flame retardants and relevance of non-dietary exposure in Vietnamese informal e-waste recycling sites.

Cancer risk from incidental ingestion exposures to PAHs associated with coal-tar-sealed pavement.
Williams ES, Mahler BJ, Van Metre PC.

Human exposure to fluorotelomer alcohols, perfluorooctane sulfonate and perfluorooctanoate via house dust in Bavaria, Germany.
Mould and Dampness

**Indoor environmental exposures for children with asthma enrolled in the HEAL study, post-Katrina New Orleans.**

**Changes in atmospheric CO2 influence the allergenicity of Aspergillus fumigatus.**

**Family and home characteristics correlate with mold in homes.**

**Domestic mite antigens in floor and airborne dust at workplaces in comparison to living areas: a new immunoassay to assess personal airborne allergen exposure.**

**On Associations between Housing Characteristics, Dampness and Asthma and Allergies among Children in Northeast Texas.**

**Higher Environmental Relative Moldiness Index (ERMI) values measured in homes of asthmatic children in Boston, Kansas City, and San Diego.**

**Exposure to Airborne Mould in School Environments and Nasal Patency in Children.**

Light and Radiation

**How Do Different Locations, Floors and Aspects Influence Indoor Radon Concentrations? An Empirical Study Using Neural Networks for a University Campus in Northwestern Turkey.**

**Idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF): a systematic review of identifying criteria.**

**Design of an ecological momentary assessment study of exposure to radiofrequency electromagnetic fields and non-specific physical symptoms.**

**Preliminary results regarding the first map of residential radon in some regions in Romania.**
Idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF) and electrosensibility (ES) - are they connected?

Creating smoke-free homes for children.

Symptom attribution and risk perception in individuals with idiopathic environmental intolerance to electromagnetic fields and in the general population.
van Dongen D, Smid T, Timmermans DR.
Perspect Public Health. 2013 Aug 2. [Epub ahead of print]

Are media warnings about the adverse health effects of modern life self-fulfilling? An experimental study on idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF).
Witthöft M, Rubin GJ.

Preliminary risk assessment of radon in groundwater: a case study from Eskisehir, Turkey.
Yuce G, Gasparon M.

Smoking / Environmental Tobacco Smoke

Assessing knowledge and attitudes of owners or managers of hospitality venues regarding a policy banning indoor smoking.

The role of nicotine replacement therapy for temporary abstinence in the home to protect children from environmental tobacco smoke exposure: a qualitative study with disadvantaged smokers.
Atkinson O, Coleman T, McNeill A, Lewis S, Jones LL.

Telephone-assisted placement of air nicotine monitors to validate self-reported smoke-free home policies.

Second-hand tobacco smoke and cardiovascular disease risk: an epidemiological review.
Dunbar A, Gotsis W, Frishman W.
Cardiol Rev. 2013 Mar-Apr;21(2):94-100. Review.

Third-hand smoke exposure and health hazards in children.

Acute impact of active and passive electronic cigarette smoking on serum cotinine and lung function.
Flouris AD, Chorti MS, Poulianiti KP, Jamurtas AZ, Kostikas K, Tzatzarakis MN, Wallace Hayes A, Tsatsaki AM, Koutedakis Y.

A cross-sectional study of secondhand smoke exposure and respiratory symptoms in non-current smokers in the U.S. trucking industry: SHS exposure and respiratory symptoms.
Laden F, Chiu YH, Garshick E, Hammond SK, Hart JE.
Mother’s environmental tobacco smoke exposure during pregnancy and externalizing behavior problems in children.

Passive smoking, invasive meningococcal disease and preventive measures: a commentary.

Home Safety

Preventing unintentional injuries in Indigenous children and youth in Canada.


Acute mercury poisoning among children in two provinces of Turkey.

Contemporary hazards in the home: keeping children safe from thermal injuries.


Child injury: using national emergency department monitoring systems to identify temporal and demographic risk factors.


Root Causes, Clinical Effects, and Outcomes of Unintentional Exposures to Buprenorphine by Young Children.

Fatal childhood injuries in Finland, 1971-2010.

Healthy Homes/Healthy Kids: A randomized trial of a pediatric primary care-based obesity prevention intervention for at-risk 5-10 year olds.
Housing and Ageing Society

German health-related environmental monitoring: assessing time trends of the general population's exposure to heavy metals.

Relocation Remembered: Perspectives on Senior Transitions in the Living Environment.
Perry TE, Andersen TC, Kaplan DB.
Gerontologist. 2013 Jul 9. [Epub ahead of print]

Designing a “Think-Along Dwelling” for People With Dementia: A Co-Creation Project Between Health Care and the Building Services Sector.
vан Hoof J, Blom MM, Post HNA, Bastein WL.

Housing Conditions

Elderly Mobility and the Occupancy Status of Single-Family Homes.
Aurand A, Reynolds A.

Air pollution and congenital heart defects.
Agay-Shay K, Friger M, Linn S, Peled A, Amitai Y, Peretz C.

Impact of LEED-certified affordable housing on asthma in the South Bronx.
Garland E, Steenburgh ET, Sanchez SH, Geevarughese A, Bluestone L, Rothenberg L, Rialdi A, Foley M.

High diversity of Staphylococcus aureus and Staphylococcus pseudintermedius lineages and toxigenic traits in healthy pet-owning household members. Underestimating normal household contact?
Gómez-Sanz E, Torres C, Lozano C, Zarazaga M.

Ambient air pollution exposures and risk of rheumatoid arthritis: results from the Swedish EIRA case-control study.

Phillimore J.

Can realtor education reduce lead exposures for vulnerable populations?
Phoenix JA, Green RD, Thompson AM.

Modeling exposures to organophosphates and pyrethroids for children living in an urban low-income environment.
**Geochemistry and health risk assessment of arsenic exposure to street dust in the zinc smelting district, Northeast China.**

**Determining the relative importance of soil sample locations to predict risk of child lead exposure.**
Zahran S, Mielke HW, McElmurry SP, Filippelli GM, Laidlaw MA, Taylor MP.
Environ Int. 2013 Aug 22;60C:7-14.

**Housing and Mental Health**

**Private space second-hand smoke exposure and the mental health of non-smokers: a cross-sectional analysis of Canadian adults.**
Asbridge M, Ralph K, Stewart S.
Addict Behav. 2013 Mar;38(3):1679-86.

**Thermal Comfort / Energy**

**An Air Distribution Index for Assessing the Thermal Comfort and Air Quality in Uniform and Nonuniform Thermal Environments.**
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Events Announcement

4. Innenraumtagung des Arbeitskreises Innenraumluf t am Lebensministerium
Date: November 26, 2013
Venue: Vienna, Austria
Further Information: 4. Jahrestagung des Arbeitskreises Innenraumluf t am Lebensmittelministerium

VDI Wissensforum - Bauprodukte und gesunde Innenraumluf t
Date: November 27-28, 2013
Venue: Dusseldorf, Germany
Further Information: VDI Wissensforum: Emissionen Bauprodukte

VDI - Wissensforum - Schadstoffe in Innenräumen Ursachen - Messstrategie - Bewertung
Date: March 25-26, 2014
Venue: Munich, Germany
Further Information: VDI Wissensforum: Schadstoffe in Innenräumen

Indoor Air 2014 - ISIAQ International Society of Indoor Air Quality and Climate
Date: July 7-14, 2014
Venue: Hong Kong, People’s Republik of China
Further Information: Indoor Air 2014 — ISIAQ
26\textsuperscript{th} Conference of the International Society for Environmental Epidemiology ISEE  
Date: August 24-28, 2014  
Venue: Seattle / Washington, USA  
Further Information: \textit{ISEE - International Society for Environmental Epidemiology}

24\textsuperscript{th} ISES Annual Meeting  
Date: October 12-16, 2014  
Venue: Cincinnati / Ohio, USA  
Further Information: \textit{International Society of Exposure Science (ISES)}

Message Board

\begin{itemize}
\item In this section we will inform you about activities and projects related to housing and health that are being carried out by WHO or the WHO CC. This may relate to ongoing activities and projects, as well as invitations to participate in data collections or case study projects.
\end{itemize}

\textbf{WHO work on indoor and built environments}

\textbf{Review of social determinants and the health divide in the WHO European Region. Final report published.}

This review of inequities in health across the 53 Member States of the Region was commissioned to support the development of the new European policy framework for health and well-being, Health 2020. It builds on the global evidence and recommends policies to reduce health inequities and the health divide across all countries, including those with low incomes. One of the many areas covered by the report are inequalities related to housing and settlement conditions.

To access the final report, please go to  

\textbf{Health 2020. A European policy framework and strategy for the 21st century}

In 2012, the WHO Regional Committee for Europe approved Health 2020 as the new health policy for the WHO Regional office for Europe. The commitment to Health 2020 was repeated at the 63\textsuperscript{rd} Regional Committee in 2013. The policy has two strategic objectives, constructed around equity, gender and human rights and improved governance for health. Again, housing and settlement conditions are frequently mentioned as necessary measures for improving health and environments through actions in various settings and by multiple actors.

The full Health 2020 policy framework and the associated strategy can be accessed at: \texttt{http://www.euro.who.int/__data/assets/pdf_file/0011/199532/Health2020-Long.pdf}

\textbf{Report on the European Environment and Health Process (2010-2013)}

This background document is a full report documenting the implementation of the European Environment and Health Process since 2010. It provides an overview of the recent work done on housing and urban issues as well as all other dimensions covered by the WHO European Centre for Environment and Health.

The report is available at  
Health and Environment in the WHO European region: Creating resilient communities and supportive environments