

## EDITORIAL INTRODUCTION

**Housing, Health and Well-Being: Moving Forward**

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This special issue addresses the vast and complex subject of housing, health, and well-being. During the last decade, housing and health has returned to the research agenda. In 2001, for example, the World Health Organization (WHO) Regional Office for Europe established a Task Force to help raise both political and scientific awareness about housing and health in all countries, especially the New Independent States of central Europe and the former Soviet Union. Simultaneously, housing and health has been included on the agenda of researchers in a number of disciplines and professions, including environmental psychology, epidemiology, gerontology, human geography, housing studies, public health, and social welfare. In recent years, innovative research strategies and methods tackling complex subjects and contexts have been presented at conferences and seminars around the world. For example, the European Network for Housing Research has established a working group on housing and health, now called the residential context of health, which has held regular symposia since 1998.<sup>1</sup>

A WHO International Symposium on Housing and Health was held in Forli, Italy, from 21<sup>st</sup> to 23<sup>rd</sup> November 2002. A second WHO International Symposium was held in Vilnius, Lithuania, from 29<sup>th</sup> September to 1<sup>st</sup> October 2004. A housing and health symposium organized by the WHO European

Office for Europe was held in Bonn from 6<sup>th</sup> to 8<sup>th</sup> June 2001. At that event, WHO staff presented the results of a household survey of residents living in high-rise prefabricated residential buildings that were constructed in Schwedt (Germany), Vilnius (Lithuania), and Bratislava (Slovakia). This study became the basis for the development of a WHO Large Analysis and Review of European Housing and Health Status (WHO LARES) database.<sup>2</sup> The final results of this large-scale study were not published at the time of writing this edition, whereas preliminary findings were reported /1/.

One aim of this special issue is to present a set of reviews and empirical case studies of housing, health, and well-being. Collectively, they are meant to improve our current understanding. The contributions present examples of empirical research and professional practice in European and North American countries, as well as in Brazil, South Africa, and Thailand. The authors of the papers in this special issue live in Australia, Brazil, Canada, France, Germany, South Africa, Switzerland, Thailand, the United Kingdom (U.K.), and the United States of America (U.S.A.). In addition to their professional concerns about housing, health, and well-being, the contributors have other common interests: they share professional interests in applying their professional knowledge to improve the health and well-being of target groups (notably, children and elderly or homeless persons).

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<sup>1</sup> <http://www.enhr.ibf.uu.se>

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<sup>2</sup> <http://www.euro.who.int/housing>

The complex research in which these authors are involved concerns the human-made residential environment in relation to issues about quality of life (for example, the affordability and availability of adequate housing; or land use and urban planning for an active lifestyle). The authors not only deal with theoretical and methodological questions debated in university institutions but also, in addition, commonly collaborate with several end users of research, including policy decision-makers and practitioners.

Finally, several authors are university professors or researchers. One should not forget that universities are the locus not only of knowledge production but also of knowledge transmission; they are institutions where one learns to produce knowledge and to apply it.

Key questions about housing, health, and well-being—whether at the geographic scale of specific rooms, residential buildings or neighborhoods, or at the human scale of the individual, household, or larger social group—must be understood by innovative concepts and methods. This need stems from the observation that the capacity of human societies to deal with key questions (such as health promotion, homelessness, affordable housing construction, compound poverty, and urban planning) are insufficient, even though many professionals are convinced that they have the ‘right answers’. The failure of so-called ‘model’ housing estates and urban-planning projects constructed in the 1960s and 1970s in many countries around the world illustrates that new ideas, working methods, objectives, and criteria are needed /2/.

Our incapacity to deal with the above-mentioned problems is related to their complexity, to the segmentation of scientific and professional knowledge, to the sharp division of responsibilities in contemporary society, and to the increasingly diverse nature of the societal contexts in which people live. In addition, the lack of effective collaboration among researchers, professionals,

and policy decision-makers has led to the ‘applicability gap’ in sectors that deal directly or indirectly with housing and health /2/. An urgent need exists for innovative approaches in many situations, such as the blatant failure of the wealthiest countries to provide all citizens with secure employment, affordable housing, and appropriate health care that meet at least minimal requirements. This special issue includes contributions that explore several ways and means of addressing these shortcomings by using a range of concepts and methods in both research and professional practice.

Concern about relations between the housing conditions of people and their ill-health has been recorded over several centuries by architects, medical practitioners, novelists, and social reformers. Today, following the results of many studies in a range of disciplines, the residential environment is known to be an important determinant of quality of life and well-being /3–5/. A large number of research findings in several disciplines confirm that the multiple components of housing units and outdoor areas must be considered in terms of both their potential and their effective contribution to physical health and to social and mental well-being.

Today no widely shared consensus has been reached about the nature of the relationship between health status and housing conditions /6/. Some reasons for this lack of consensus include the environmental, geographic, and temporal complexity of the subject, as well as the diversity of ethnic, occupational, and other social groups living and working in residential neighborhoods. Furthermore, the current disciplinary interpretations of health (including a variety of theoretical and methodological approaches used to study it) do not facilitate the task. The contributions in this special issue argue that conceptual clarification and theoretical development is necessary. In addition, several researchers argue that the analytical tools

and measurement techniques that enable them to deal with the complexity of health in residential environments is lacking /7–8/.

### HEALTH AND HOUSING: DEFINITIONS AND INTERPRETATIONS

The word *health* is derived from the old English word *hal*, meaning whole, healed, and sound. Health is a difficult concept to define and, therefore, not surprisingly has been interpreted in diverse ways. Each individual can be a consumer of and a subject toward which health services are directed. Simultaneously, each person is an active producer of her/his health by following habits of diet, exercise, and hygiene, and other lifestyle traits that may or may not be conducive to health promotion.

#### Health

The WHO definition states that health is *not merely the absence of disease and infirmity but a state of optimal physical, mental, and social well-being* /9/. This definition is idealistic but has the merit of not focusing on illness and disease, which have often been considered as either a temporary or permanent impairment to health or a malfunction of a single or several constituents of the human body. Given that the WHO definition of health includes social well-being, then the most common interpretations of health ought to be enlarged. The WHO also states that the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political, economic, or social condition.

Health is defined by the author of this special issue as a condition or state of human beings resulting from the interrelations between humans and their biological, chemical, economic, physical, and social environment. All components of the

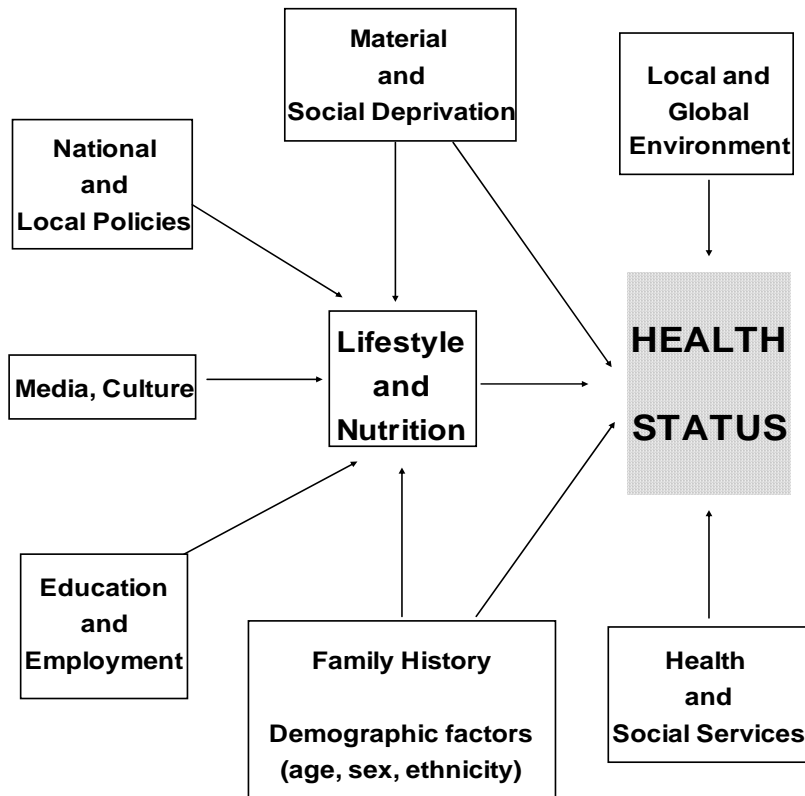
residential environment should be compatible with the basic needs of the residents and their full functional activity, including reproduction over a long period. Health is the result of both (a) the direct pathological effects of chemicals, several biological agents, and radiation; and (b) the influence of physical, psychological, and social dimensions of daily life, including housing, transport, and other characteristics of metropolitan areas. These constituents of the daily lives of individuals are represented in terms of their health status in Fig. 1. For example, improved access to medical services is a common characteristic of urban neighborhoods but is rare in rural areas.

In the field of health promotion, health is not considered an abstract condition but rather the ability of an individual to achieve her/his potential and to respond positively to the challenges of daily life. From this perspective, health is an asset or a resource for everyday life, rather than a standard or goal that ought to be achieved. This redefinition is pertinent for the field of housing and health because the environmental and social conditions in specific residential environments have an impact on human relations, induce stress, and can have a positive or negative impact on the health status of groups and individuals. Given the multiple factors that influence health shown in Fig. 1, the necessity of using interdisciplinary approaches to studying the health of a population in precise residential neighborhoods should be evident.

#### Residential Environment

Housing is meant to address basic human needs for shelter and security by providing protection against climatic conditions (excessive heat and cold) and unwanted intrusions from insects, rodents, and environmental nuisances, including noise, that may be harmful for health and well-being /4, 10/.

Houses are a potential source of physical hazards—for example, injuries from fire, scalds,



**Fig. 1:** The multiple influences of health status

sharp edges, falls, and structural collapse of the building, as discussed by Richard Moore and David Ormandy in this issue. Houses can also provoke climate hazards (notably too cold or too hot ambient indoor temperatures). The home can also harbor biological hazards (from molds and pest species, as noted by Patricia Hynes and her co-authors in this issue), as well as chemical hazards (indoor smoke from cooking fires or tobacco, as Leslie Rushton discusses in another contribution in this issue). In addition, houses can

be the locus of infectious disease hazards (stemming from inadequate food storage and exposure to vector organisms like mosquitoes). Two basic human activities, defecation and cooking, produce potentially health-endangering waste products, as Sharon Friel and her co-authors note. When human excreta are not completely removed from the household environment and isolated from drinking water supplies, a high risk of diarrheal and other waterborne diseases ensues. The indoor retention of smoke from cooking fires

fueled with wood, coal, and other low-quality fuels leads to respiratory diseases and other health risks. The combination of all these housing-related factors (especially drinking water, sanitation, and indoor air) account for the largest contribution to the global burden of disease /11/.

Housing is a physical construction containing household activities and possessions. According to Turner /12/, housing can be considered a product (from an individual housing unit to the housing stock in a neighborhood or city). The author also suggested that housing could be considered a process by referring to the provision and maintenance of all kinds of residential buildings, either by public authorities or by private initiatives. Turner's interpretation of housing enables researchers and practitioners to consider the multiple interrelations between housing conditions and human processes in precise localities. Figure 2 can be used as a conceptual reference model for interdisciplinary contributions about housing. The model suggests that cultural, economic, social, economic, political, and individual human factors should be considered simultaneously at the geographic scale of the housing unit, the residential building (with one or more housing units), and its site and conditions in the local neighborhood.

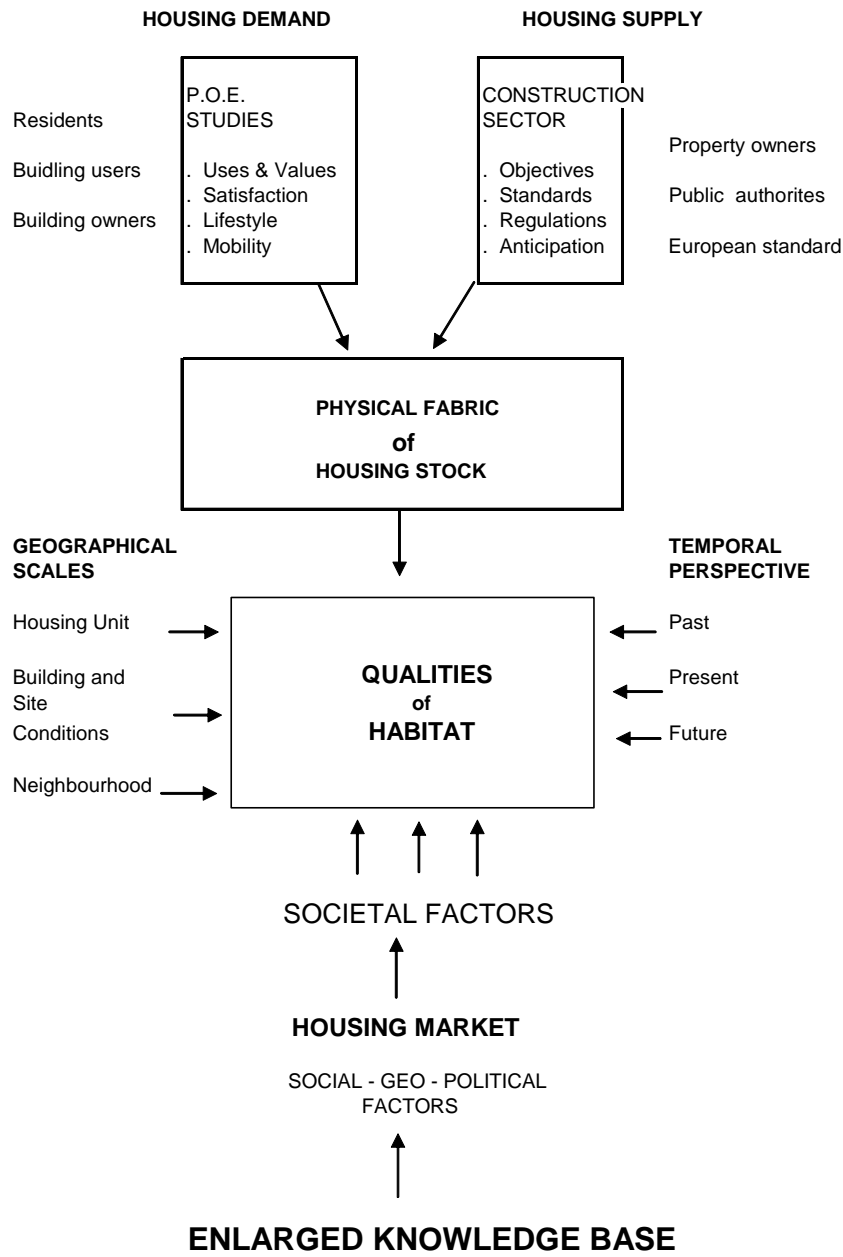
The housing environment can also be considered in terms of its capacity to nurture and sustain social and psychological processes as Halpern /13/ has shown. For example, the capacity of the resident in the home environment to alleviate stress that has accumulated at school or in the workplace and whether this capacity is mediated by views of nature or being in natural surroundings like urban parks. The multiple dimensions of the residential environment that circumscribe a resident's capacity to use the domestic setting to promote well-being is a subject that has been studied by a limited number of scholars during the last decade. In addition, little doubt remains that the physical condition of

housing units should be examined with respect to forms of housing tenure /14/. Likewise household composition and income /3, 15/, the availability and cost of building materials, infrastructure, and services, the levels of education, and the employment status of its residents /16/. These dimensions of the housing environment and the health of residents should not be isolated from their diet, lifestyle, type of employment, and the availability of health care, as Marmot and Wilkinson have shown /17/. Hartig and Lawrence /18/ have used the term "the residential context of health" to refer to all dimensions that define the interrelated nature of housing and health /18/.

### **Supportive Environment**

The concept of supportive environment has been used in the field of health promotion and prevention to emphasize that policy definition and implementation should focus on all determinants of health, not just those within the health sector /19/. Therefore, this concept includes the role of physical environmental factors that influence health, not only the lifestyle of individuals and groups in specific localities. In addition, supportive environment is not limited to the physical characteristics of the environment because it accounts for cultural, social, economic, and political dimensions. When these dimensions are explicitly addressed, then dealing with equality and equity in societies and their impact on health and well-being in precise localities is necessary.

The preceding paragraphs argue that if housing and the built environment are considered too narrowly, then the interrelations among housing, health, and well-being may not seem important. The authors in this special issue realize that recognition is growing of a need for innovative approaches. It is argued that current shortcomings are not simply the result of a lack of resources, or viable solutions, or political commitment. These



**Fig. 2:** Conceptual reference model of housing supply and demand at the geographical scale of housing units, residential buildings, and neighborhoods

shortcomings are, above all, the result of the narrow vision of academics, professionals, and policy makers who address only the treatment of symptoms rather than the fundamental issues at stake. Lawrence /20/ also suggests that interdisciplinary approaches can highlight the difference between a discipline-based interpretation of housing, health, and well-being and one that rejects a symptom-treatment explanation based on a biomedical model by combining the interpretation of biological, cultural, economic, political, psychological, and social factors in a new way /20/.

Most health and housing problems are not structured within traditional disciplinary and professional boundaries /20/. For example, today we know that the relation between housing and health involves more than the direct effects of specific physical and chemical factors in residential environments on the inhabitants. Collectively, the contributions to this special issue show that the relations between the residential environment and health are multidimensional and complex. Determining not only whether housing impacts health but also how the health of an individual can influence housing is possible /21/.

Despite the contribution of a wide range of studies by environmental health officers, doctors, psychologists, physiologists, and housing researchers, several recent surveys of the literature on the health-housing relation indicate that few comprehensive, empirical studies identify and measure those characteristics of housing that hinder or promote health and well-being /4–6, 22/. These reviews show that contributions often lack a broad conceptual framework (including the societal context of housing); they have a restricted methodological approach (owing to a lack of multivariate techniques), and they rarely address practical guidelines or policy issues. Most contributions identify relations between illness and housing conditions without providing convincing evidence of the mechanisms linking them /13, 23/.

Empirical studies of the relations between housing and health have commonly adopted this kind of approach by examining how one quantifiable characteristic of housing conditions in a precise situation (such as the presence of dampness in the building structure) effects the health and well-being of inhabitants /24–25/. Alternatively, proxy measures of the morbidity of resident populations (such as the number of visits to a doctor) are related to one aspect of the residential environment (for example, the floor level above the ground in high-rise housing) /26–27/. Irrespective of the simplifications inherent in these contributions, the findings of many studies have rarely been replicated in the same or different residential environments as Gabe and Williams /28/ have noted. Moreover, many studies have commonly examined the relation between isolated variables at only one point in time. Sufficient evidence from empirical studies, however, indicates that (a) the aspirations and preferences of residents for housing change during the course of the life-cycle, (b) the health and well-being of residents also change, and (c) the condition of the housing stock varies during the period of occupation /29/. Some of these limitations of contributions on housing and health are explicitly addressed by authors in this issue.

#### THE CONTRIBUTIONS

This special issue includes eleven articles addressing many topics. No claim is made, however, that collectively these contributions can deal with all dimensions of this vast subject. Nonetheless, the contributions do consider how the constituents of specific settings—at the scale of specific rooms, the housing unit, or the residential neighborhood—can influence the health and well-being of specific populations (notably children and elderly or homeless persons) in terms of exposure to the constituents of ambient living conditions.

We hope that the conceptual models and methodological approaches used by the authors in this issue could be reapplied in other situations to help improve current understanding about this vast and complex subject.

In the first contribution, James Dunn, Jennifer Walker, Jennifer Graham, and Christina Weiss review and criticize research on the links between socioeconomic status (SES) and health. The authors note that the studies reviewed reported a steep socioeconomic gradient in health for a wide range of conditions in industrial societies. They also state that, unfortunately, relatively little of this research explicitly examines the mechanisms underlying gender differences in the magnitude and nature of the relation between SES and health. The authors stress that the need for innovative research stems from the observation that patterns of health and illness can differ between men and women, as well as the strength of the relation between SES and health. In addition to biological differences, important social differences are found in the daily life of women and men, including different social roles and experiences related to work, family, and the home. For example, the authors note that women have longer life expectancy but report more illness and disability. In addition, SES gradients in almost all conditions are typically less steep for women than for men. We must emphasize here that the presence of gender differences in the relation between SES and health is an important first step in understanding health inequalities and intervening to reduce them in contemporary societies.

In their contribution, Dunn and co-authors analyze empirical data about male-female differences in the relation between the material and meaningful attributes of housing and self-rated health status, adjusting for household SES. In the late 19<sup>th</sup> and 20<sup>th</sup> centuries, the links between SES, housing conditions, and health were commonplace. At that time, the primary burden of illness was

attributable to airborne infectious diseases. The decline of infectious disease in industrialized countries since then has meant that the assumed connection between housing and health in these countries has changed. Nonetheless, if still existing, this connection is probably complicated and involves an amalgam of social, economic, psychological, design, and biophysical factors, as the contributions in this special issue show.

In her article, Nita Chaudhuri provides an extensive global review of housing conditions and the health of children, who constitute about half of the world population. The author notes that young children spend more than 90% of their time in the household environment. Therefore, the home is the most likely place of their exposure to hazardous substances. Environmental contaminants found in the household include biological agents (such as the vector-borne diseases discussed by Sharon Friel, Anthony McMichael, Tord Kjellstrom, and Tippawan Prapamontol in their article), and chemical agents (including lead, discussed by Angela Mathee, Yasmin von Schirnding, Mary Montgomery, and Halina Röllin in their contribution). The exposure of children to environmental tobacco smoke (ETS) is considered by Leslie Rushton in a subsequent article in this issue. Other factors including radon and electric or magnetic fields, for example, can greatly influence child health.

Given that children spend so much of their time in the indoor environment, allocating resources for problem solving on housing issues related to their health is paramount. To understand this intricate relationship, however, Nita Chaudhuri argues that a systematic conceptual framework must be used to help discern the processes, patterns, products, and mediating factors that interact in the housing-health relationship. In this article, the author states that the conceptual frameworks that have been proposed to date illustrate the importance of considering socio-economic, physical/environmental, behavior-cultural, and physiological factors

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in understanding this relationship. To develop a holistic understanding, Chaudhuri notes that several disciplines should work together. Once common organizing principles have been reached a plethora of strategies are available to address such housing and health issues as policy intervention, education, infrastructure improvement, and community-capacity building. Such strategies can then be targeted at the community, regional, national, and international levels. The author concludes that long-term monitoring and evaluating different kinds of intervention ought to be implemented to ensure their effectiveness.

In their article, Frank Oswald and Hans-Werner Wahl have compiled recent data on the relation of housing and health in old age, with special emphasis on geropsychological and gerontology studies. The authors define and present theoretical models of subjective and objective dimensions of housing and health as the foundation for a better understanding of the relation between housing and health-related outcomes for elderly persons. Among the objective functional housing aspects are health-relevant micro-environmental indicators, including housing hazards and amenities, retrofitting and assistance devices, as well as meso- and macro-environmental indicators such as housing type, neighborhood conditions, or urban-rural differences. Housing relocation is a subject studied in environmental gerontology, and research shows that environmental change has been linked to health outcome. The subjective housing aspects considered by the authors include residential satisfaction, housing-related control beliefs, and the meaning of home. Direct health-related outcomes—for example, physical and mental disease and functional limitation—as well as indirect health-related outcomes like housing satisfaction and well-being are important dimensions analyzed by the authors.

The extensive literature review by Oswald and Wahl found that research on housing and health in later life has concentrated on processes of the

functionality of housing and its concomitant relation to direct and indirect health outcomes. The authors note that most of this research is framed in terms of the classic risk factor/prevention model and focuses on direct health outcomes. In general, the convergent lines of empirical evidence strongly support the existing links between functional features of the residential environment and a diversity of (mainly direct) health outcomes. This finding is important because the geriatric medical model usually attributes loss in competence to disease processes, whereas environmental influence is neglected. Good reasons exist to support the argument that 'evidence-based' medicine today is in a strong position to refer explicitly to the critical role of the residential environment with respect to age-related loss in competence. Hence, the authors argue that, in future research, much stronger concern about considering and modifying the housing environment for therapeutic and preventive benefits is required. For example, the European Union (EU)-funded research project ENABLE-AGE, in which the authors collaborate, explicitly addresses the supportive qualities of place attachment, the meaning of home, and the perceived usability of the home as important for healthy aging.<sup>3</sup>

Injuries and deaths from home accidents constitute a major public health problem at global and national levels, especially for children and elderly persons /4, 10/. In this issue, Richard Moore and David Ormandy describe how data on the characteristics of housing units were matched with data about housing-related mortality and injuries in the U.K. As no single database provided sufficient accurate data on housing and the occupiers, the research agenda involved identifying data sets to create and validate a Housing and Population Database. This database was matched with various data sets on injuries and fatalities in

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<sup>3</sup> <http://www.enableage.arb.lu.se/>

the residential environment. This research not only studies the frequency of a particular accident but also the severity of the impact on health. This approach provides a broader interpretation of the public health importance of each type of accident. The authors also investigated whether one age group was more vulnerable than others were to a particular type of accident, as well as the relation between different types of accidents and the age and type of the housing unit. A literature review was completed to look at the relation between the design and condition of housing features and domestic accidents, and between human behavior and domestic accidents. The review showed that in most areas, little in-depth research has been carried out on the different degrees of contribution made by human behavior and housing conditions. Even though more focused research would be useful, however, preventative actions would help to reduce the scale of this public health problem.

According to Moore and Ormandy, for the first time national housing and population data have been matched with accident mortality and injury data to investigate the possible relation between them. The statistical analysis was made possible by the amount, nature, and detail of data available in the U.K. and by the small number of housing units in each post-code area as well. The data and information could be improved, however, which would increase the accuracy and detail of future analyses. Although this research was completed on a national basis, similar investigations could be made at regional and perhaps local levels using existing data or data collected through housing and health surveys.

In recent decades, awareness has been growing of the increase in asthma and respiratory infections among people living in industrialized countries /30/. For example, statistics show that from 1980 to 1994, the self-reported prevalence of asthma in the U.S.A. increased by 75%, a trend found to be significant and evident in every region of the

country. The increase was most marked in children from 0 to 14 years of age. The evidence is growing that, as with lead poisoning, inner-city and urban populations are at most risk. Not wholly surprising, therefore, is that attention has turned to the role of indoor environment risk factors, especially in homes and schools. Such factors include moisture and mold growth, pest infestation, dust mites, the building envelope, heating systems, inadequate ventilation, nitrogen dioxide, and ETS. The Healthy Public Housing Initiative (HPHI) is a Boston-based community-centered research and intervention project designed to engage Boston Housing Authority residents in a collaborative process to improve respiratory health, quality of life, building conditions, and building maintenance in public housing. The contribution in this issue by Patricia Hynes, Doug Brugge, Neal-Dra Osgood, John Snell, Jose Vallarino, and John Spengler summarizes the foundation for the larger HPHI asthma-related environmental intervention study. The research design for the pilot projects is based on principles of collaborative or participatory research with residents in the local community. This article warrants close attention because too little concern has been given to assessing the effectiveness of interventions by monitoring changing living conditions in specific localities and health outcomes. If such evaluations are not available, then both policy-making and decision-making are handicapped. More research of the kind reported in this article is required, including collecting time-series data, to evaluate various kinds of interventions that improve the residential environment in urban areas and to identify the effects on health and well-being. Environmental impact assessment, health impact assessment, and cost-benefit analysis can be used in an integrated way to study interventions intended to promote health. At the beginning of the 21st century, a new research and policy agenda is urgently needed that addresses these key issues.

In the next contribution, Lesley Rushton notes that ETS, a major component of indoor air pollution, contains thousands of chemicals, including many known carcinogens. Hence, ETS is an important contributor to ill-health. Several established health effects of ETS exposure include lung cancer, childhood illnesses like chronic middle ear disease and sudden infant death syndrome (SIDS), upper and lower respirator infections, and cardiovascular disease. In many countries, smoking and ETS have been targeted as public health priorities for ill-health prevention, particularly for such susceptible groups as children. Even though legislation is becoming increasingly effective in reducing ETS in public places, a significant proportion of ETS exposure occurs in side housing units. Although such exposure is generally acknowledged as a potential health hazard, cultural, social, and practical barriers hinder the introduction of risk-reduction measures in the domestic environment.

Leslie Rushton has compiled an extensive review of ETS levels in the housing environment and factors that influence exposure. Most of the literature reviewed dates from the mid 1980s and includes clinical, epidemiological, mechanistic, chemical analysis, and exposure assessment studies. Environmental tobacco smoke is defined and methods of determining individual exposure to ETS are outlined. Estimates of the prevalence of exposure inside housing units are given. The health effects of ETS are then reviewed together with an evaluation of the contribution of ETS experienced in the home. The effects of ETS on the health of children, cardiovascular effects, adult cancer, and respiratory effects in adults are addressed in separate sections of the review. Practical mitigation measures and the potential implication of these for housing construction are then discussed, together with cultural and social barriers in the general context of the promotion of reduction strategies.

Sharon Friel, Anthony McMichael, Tord Kjellstrom, and Tippawan Prapamontol note in their article that during the last 50 years, Thailand's health profile has been undergoing an epidemiologic transition. This rapid transition is associated with various fundamental societal changes that have shifted health risks from a predominant burden of communicable disease to a higher risk from noncommunicable diseases and accidents. Nonetheless, among the communicable diseases reported in the 1990s, pneumonia was still the leading cause of death in children under 5 years of age, with 16.7 deaths per 100,000 in 1994. Acute diarrhea remained an important cause of mortality, with 1.6 deaths per 100,000 children under 5 years of age. In recent years, malaria has declined as an important cause of mortality, with 856 deaths reported in 1995, whereas dengue hemorrhagic fever remains a real threat. Mortality related to tuberculosis has dropped, whereas mortality from HIV/AIDS is steadily increasing and is likely to emerge as a major cause of mortality in future. The evidence reviewed in this article shows that since 1970, noncommunicable diseases, particularly cardiovascular-related conditions and cancer, have steadily increased in proportion and are now a major contributor to mortality among the resident population over the age of 25 years.

At this stage of the health transition in Thailand, the four main causes of death are chronic infectious diseases (particularly HIV/AIDS), lower respiratory infections (COPD, asthma), diseases of the circulatory system (cerebrovascular events, myocardial infarction, hypertension), and cancer (liver, lung, digestive system). Another cause of death that has increased in importance is traffic accidents.

The authors pose the key question: "Why have the various disease rates in the Thai population changed?" The authors state that to provide a valid answer to this question, one must examine under

lying transitions in social and contextual factors. Their article examines published data that present changes to housing conditions as one set of environmental health and how this particular change maps on the health-transition process. The combination of economic development, urbanization, modernization, and increased health literacy has resulted in a range of health-protecting changes in housing design and materials. Preeminent among these are improvements in household sanitation and in equipment, fuel, and ventilation pertaining to indoor cooking and heating. In Thailand, gains have been made in mosquito-proofing houses and in reducing open pools of water to combat the risks of malaria, dengue fever, and other mosquito-borne infections. Meanwhile, the growth in shantytown and slum housing around the urban fringe, often in precarious environmental settings, has introduced a negative dimension to the evolving profile of housing-related health risks, whereas the urban sprawl of modern housing areas creates health risks from traffic accidents and lack of walking in residential neighborhoods.

The rural economy of Brazil has been radically transformed during the last half of the 20<sup>th</sup> century. Today, more than 75% of the population lives in urban areas. In 1940, the urbanization rate was 26.35% and reached 68.86% in 1980. Between 1940 and 1980, the national population increased threefold, whereas for the urban population, the multiplication factor was seven. In the year 2000, the urban population in Brazil surpassed 80% of its overall population. Such a rapid urbanization process has led to inadequate housing conditions.

In Brazil, the considerable growth in the number of substandard housing units between the years 1980 and 1991 is confirmed by the Brazilian Institute of Geography and Statistics. In 1980, only 1.89% of all Brazilian housing units were substandard, whereas the share rose to 3.28% or more than 1.14 million substandard housing units in 1991. Substandard housing conditions in Brazil

have had a negative impact on health, including infectious diseases (closely associated with the lack of basic sanitation in and around housing units), and respiratory diseases associated with damp indoor environments, (including inadequate ventilation, heatstroke, and atmospheric pollution in the housing environment). Housing construction defects leading to drafts, cold floors, water infiltration, and lack of ventilation have been identified as the main causes of bronchitis, colds, influenza, and pneumonia.

Regarding the quality of the services of urban infrastructure, 28% of the total of homes in Brazil are considered inadequate, in other words, they lack at least one of the essential basic services. The most deficient service in Brazilian homes is sanitary drainage, followed by the absence of a public water supply. An important conclusion resulting from research over the last decades by academics and reformers in the urban and housing fields is that the mechanisms of the market are insufficient to combat the shortage of affordable housing. The data show that subsidies are indispensable in leveling out the problem for most people in need.

In many countries, including Brazil, South Africa, and Thailand, a key policy issue is how to support the informal economic sector to promote the construction of low-cost housing and to increase household income by creating employment while concomitantly ensuring a healthy, safe, and pleasant residential environment. The informal sector can serve as a catalyst for reducing poverty, provided if at the outset we recognize that contributions by this sector do not necessarily respect legal, social, and technical prescriptions. Hence, the contribution of the informal sector can pose a real hazard to the health of a population that cannot afford the monetary cost of formal health care. The policy dilemma is how to reconcile informal sector contributions so that the adverse health impact is reduced or eliminated. This approach implies that

the policy agenda is not only about the degree of state intervention and control but also about how collaborative partnerships and participatory decision-making processes involving the public, and the private and the informal sectors could create innovative proposals to deal with these complex questions in precise localities.

In their contribution, Angela Mathee, Yasmin von Schirnding, Mary Montgomery, and Halina Röllin review published papers, unpublished reports, data, and information that provide irrefutable evidence associating lead at different exposure levels with a wide spectrum of health and social effects. The effects on children include mild intellectual impairment, hyperactivity, shortened concentration spans, poor school performance, violent/aggressive behavior, hearing loss, as well as adverse impacts on virtually all organ systems, including the heart, brain, liver, kidneys, and circulatory system, and in severe cases, coma and death. In recent years, a consensus has been reached concerning the absence of a threshold for key health effects associated with lead exposure and the permanent and irreversible nature of many of the health and social consequences of exposure to lead. Despite these advances in knowledge, lead is still widely used in a number of products and processes including petrol for motor vehicles, lead plumbing, house paints, as well as in cottage industries related to the informal economy. Today, no national blood lead surveillance program exists in South Africa. The authors conclude that awareness is low of the health risks that are associated with lead exposure and that a national campaign to improve public awareness is long overdue and should be implemented as a matter of high priority.

John Pritchard and John Puzey from Shelter Cymru in Wales consider the links between homelessness and mental and physical ill-health in their contribution. Their article discusses the relations between homelessness and health identified in the

U.K. and in other countries. The first section of their article identifies a broad range of international research on the impact of homelessness on both physical and mental health. This review confirms a strong link between homelessness and illness, especially among single persons. Yet, such a link is not straight forward /31/. Some critics have argued that homelessness is not a main determinant of ill-health but rather a risk factor that is the outcome of various events and conditions during the life-cycle. Hence, as the authors note, homelessness should not be interpreted as a homogeneous concept but as one comprising a wide range of housing, social, economic, and psychological dimensions that can change over relatively short periods.

Collectively, empirical studies in several countries have highlighted the growth in homelessness since the late 1990s, especially among adolescents and young adults /32/. In their contribution, Pritchard and Puzey consider the significant increase of homelessness and assesses whether, in reality, sufficient practical measures are being taken to combat homelessness as a means of tackling ill-health in Wales. The authors state that although Wales is making progress toward a more integrated approach to health and well-being, and that the need to tackle broader health determinants is recognized, a need also exists to invest in more effectively tackling homelessness and exclusion. The authors stress that integrating the broader housing, homelessness, and health agendas could contribute to health gains in Wales and conclude by suggesting that tackling homelessness and poor housing as part of the overall health agenda in Wales would be the most effective means of promoting general health equality.

Geographic patterns of poor health and mortality risk are to be found in most countries, as several contributions in this issue have noted. This observation is the starting point for the final contribution by Irene van Kamp, Jeanne van Loon,

Mariel Droomers, and Augustinus de Hollander. The authors note that the important health effects at the neighborhood level derived from empirical studies include mortality, general health, illness and disabilities, mental health, and health care use. Since the 1980s, awareness has been growing of the influence of social class on health. Studies show that people with lower SES have a shorter life expectancy than do others living in the same city or region. The authors emphasize, however, that SES-related health inequalities cannot be fully explained by individual characteristics. Awareness is growing that the local environmental qualities should be considered as well. The characteristics of residential neighborhoods that might be related to people's health or of access to opportunities to live healthily are frequently poorer in more socially disadvantaged areas. Therefore, such factors have the potential to explain health differences between deprived and prosperous neighborhoods. Investigating health differences at the neighborhood level implies conceptual as well as methodological issues pertaining to selection, accumulation, multiple level measurement, objective features versus perceptions, and time dynamic aspects.

The main objectives of this review are to describe systematically the methodological issues, to bring together conceptual approaches from different disciplinary fields, to analyze their applicability to empirical health research at the level of residential areas and, finally, to make some preliminary suggestions for ways to help overcome these issues in future research to advance the field. The review of methodological issues is primarily based on recent overviews of environment and health at the scale of neighborhoods. The conceptual models described here are exemplary for approaches in different disciplinary fields.

After a detailed discussion of the preceding subjects, several prevailing conceptual models developed in both fields of public health and environmental health are reviewed. The applica-

bility of the different frameworks to specific research questions is compared, as well as their potential to deal with the issues of selection, accumulation, measurement problems, and dynamics, at both the individual level and the neighborhood level. The authors review these issues and evaluate several exemplary theoretical approaches from the fields of public health and environmental health. The articles provide plausible ways of advancing research on housing and health.

#### **SYNTHESIS: MOVING AHEAD—HOW?**

Both housing and health are multidimensional. Hence, both subjects are not structured within traditional disciplinary and professional boundaries /20/. An ecological perspective recognizes that behavioral, biological, cultural, economic, social, physical, and political factors must be considered if a comprehensive understanding of housing and health is to complement disciplinary and professional interpretations /29/. The articles in this special issue present a range of disciplinary and interdisciplinary interpretations of health and housing, using the contributions of authors from many regions of the world in a complementary way. Their contributions have improved our understanding of this vast and complex subject, to improve existing housing conditions and to accommodate the requirements of specific groups. The case studies have been presented in this issue to show possible avenues for research on housing and health and innovative professional practice in the immediate future.

Today, a need exists for more interdisciplinary research, with explicit linkages among such disciplines as architecture, anthropology, geography, gerontology, housing studies, occupational therapy, medicine, psychology, psychiatry, and sociology /20/. The relations between housing and health are not unidirectional, as shown by the contributions in

this issue. Although housing can predict health-related outcomes, health also influences housing decisions, options, and human activities in the domestic environment.

In terms of the methodological challenges, the insufficient measurement of housing quality variables, the use of subjective self-report measures for both dependent and independent variables, or the lack of adequate comparison groups and control of confounding factors are all crucial issues that have to be addressed, as noted by several authors in this issue. Several authors also noted the importance of a temporal perspective, which they have well illustrated too.

In addition to methodological challenges, other issues that warrant closer attention include the lack of a comprehensive theory about the mechanisms by which residential environments influence both health risks and health outcomes. The contributions by Nita Chaudhuri and by Irene van Kamp and colleagues address these issues. The latter stress that a need for further development of statistical methods linking aspects of the residential environment (that are often highly interrelated but available only at an aggregate level) to individual health measures. Collectively the contributions in this issue show that health differences are the outcome of a complex interaction between physical, spatial, economic, and social domains with life-style and psychological factors.

Today, a gap can still be found between the accumulated empirical evidence on physical, economic, and functional dimensions of housing conditions and health status, and the under-researched relations among the cultural, semiotic, and symbolic dimensions of housing and health /3, 6, 13, 19/. This situation is unfortunate because the broad field of person-environment studies has provided many theoretical insights about the residential environment /22/. The final requirement is for further integrating and synthesizing concepts to improve our current understanding of empirical

housing and health relations across the whole life-span. The analytic schemes provided by several contributions in this special issue can serve as a conceptual foundation for future research. The impacts of housing conditions cannot and should not be underestimated and merit more scientific research, more political commitment, and more innovative interventions in the immediate future.

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