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Health Aspects of Housing and Town Planning*

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This paper presents an overview of those parameters that define health aspects of rural and urban housing. It begins with a brief historical account of the major preoccupations faced by those concerned with environmental health. It then examines how dwelling hygiene and safety can be ensured by accounting for biological, chemical, engineering and physical parameters that are relevant to human health and well-being in residential quarters. The author draws on his broad knowledge of studies funded and/or published by the World Health Organization to establish a range of principles that ought to be the goal for promoting health and well-being at the community or municipal level.

In the Middle Ages, the health problems caused by a lack of sanitation limited the size of towns, and overcrowding meant that urban populations were at great risk from epidemics of all types of infectious disease. Historians consider that as late as the sixteenth century mortality rates were higher in towns than in rural areas. The situation improved in the seventeenth and eighteenth centuries but deteriorated again in the nineteenth century, when the industrial revolution led to rapid urban growth and the appearance of new problems such as atmospheric pollution caused by industrial activities. The capital cities of Europe were ravaged by cholera epidemics in 1842 and 1843. Although at the time it was thought that cholera was transmitted by polluted air, these epidemics led to the establishment of the International Office for Public Health in Geneva, the forerunner of the World Health Organization (WHO). It also led to the famous discovery by Dr. Snow on the urban water cycle contribution to cholera transmission.

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Tuberculosis was the most feared disease in the nineteenth century; initially, it was recognized as being linked to poor urban housing and more particularly to overcrowding and inadequate heating, ventilation and exposure to sunlight. Work in Greenland over the past three decades gives a recent demonstration of the impact of good housing on tuberculosis control. Since the Danish Government took steps to move the local population from their traditional shanties to modern, healthy housing, tuberculosis (which was the most serious public health problem in Greenland) has virtually disappeared. Of course, other tuberculosis control measures (such as BCG vaccination) have been implemented at the same time as providing better housing. However, another trial in India showed that BCG vaccination alone was not enough to eradicate tuberculosis from shanty towns, without measures to improve nutrition and housing. Rickets was another nineteenth century disease directly linked to urban air pollution by smoke and to lack of sunshine in dwellings.

When we turn to the twentieth century, we see that health authorities and populations in industrialized countries are increasingly concerned at the spread of psychosocial diseases such as drug abuse and at the development of unhealthy lifestyles, the outward signs of which include smoking and a lack of physical exercise. New problems have arisen with regard to housing and work premises. These include the spread of infectious respiratory diseases through air conditioning systems and the pollution of indoor air by toxic chemicals from synthetic building materials, especially those used for insulation.

This paper is intended to present an overview of past and present health problems related to housing and work premises, on the one hand, and to the urban environment on the other.

Environmental Factors Affecting Respiratory Morbidity

Acute Respiratory Infections

These continue to be a major cause of morbidity in Europe and the principal cause of lost working days. Overpopulation and overcrowding, not only in buildings but above all on public

transport, play a predominant role in the transmission of respiratory infections.

The indoor and outdoor climates have repercussions mainly on germs-carrying individuals. The indoor parameters to be taken into consideration are ambient temperature, radiant temperature and relative humidity, with the latter being the most significant. Where the impact of radiant temperature is negligible, recommended values inside buildings are 40–65% humidity and a minimum ambient temperature of 12 – C. A negative radiant temperature must be taken into consideration, however: people should not sit or lie within one metre of a cold surface, such as a window, and the distance should be increased if the window is large. The outdoor climate cannot be changed by individuals, and one must adapt to it by wearing suitable clothing. Nonetheless, the elderly and those suffering from respiratory infections are recommended not to be immobile for too long a period out-of-doors in cold weather.

Overcrowding plays a more important role in the transmission of acute respiratory infections than do the combined factors of humidity and temperature. A recent study gave the results as shown in Tables 1 and 2.

These figures show (a) that overcrowding is of considerable significance with regard to acute respiratory diseases, but of very little significance for chronic respiratory diseases such as asthma; and, (b) that the household sanitary facilities available are not an important factor for respiratory diseases, since there are fewer such diseases in the least well equipped houses (this would not be the case, of course, with enteric diseases).

Tuberculosis

From an historical point of view, it was recognized in the nineteenth century that people living in poorly ventilated, ill lit and inadequately heated slum housing were particularly susceptible to tuberculosis, and an inadequate diet was rightly acknowledged to be a contributing factor. Following the implementation of systematic campaigns, tuberculosis has now been virtually eradicated from the rich countries of Europe. However,

as mentioned earlier, two recent projects have again demonstrated that some environmental factors affect the prevalence of tuberculosis.

Table 1

Percentage of Children Under 10 Years of Age Who Had Bronchitis, Pneumonia, or Asthma By the Number of people Per Room in Porto-Allegre, Brazil

Number of People per room in the family dwelling	% of total number of children under 10 years of age		
	Bronchitis	Pneumonia	Asthma
1	0	0	2
2	12	8	56
3	14	14	60
4	13	14	37
5 or more	15	23	56

Source: Bulletin of the Pan American Health Organization, 1985

Table 2

Percentage of Children Who Had Bronchitis, Pneumonia, or Asthma by Household Sanitary Facilities in Porto-Allegre, Brazil

Household sanitary facilities	% of total number of children		
	Bronchitis	Pneumonia	Asthma
Private flush toilet	22	24	119
Private latrine	25	31	71
Communal flush toilet	7	6	12
Communal latrine	1	0	5

Source: Bulletin of the Pan American Health Organization, 1985

In Greenland, Eskimos have traditionally lived in the type of shacks described by Paul-Emile Victor in his account of a winter spent with a Greenland family in 1935. Tuberculosis was the most important health problem until approximately 1960. The Danish Government then instituted a voluntary policy of resettling the population in modern, European-style housing. Although that policy can be criticized for not taking account of the local culture of the inhabitants, there is now virtually no tuberculosis in Greenland. Apart from improved housing, other medical measures have, also helped to achieve this.

A BCG vaccination programme sponsored by WHO in India did not lead to a marked reduction in tuberculosis prevalence, since no accompanying measures were taken to improve nutrition and housing for the population concerned.

Chronic Respiratory Diseases

The determining environmental factor here is pollution of indoor and outdoor air; pollution in turn is related to ventilation conditions. A distinction should be made between atmospheric pollutants, which act as irritants on the respiratory tract, and those that have a short-term or long-term toxic effect, such as carcinogens. Irritants increase the sensitivity of the respiratory tract and of the lung alveolis to infections, toxics and carcinogens.

So far as outdoor air pollution is concerned, irritation is caused by dust, possibly in combination with SO₂; nitrogen oxides are also irritants of the eye and may lead to conjunctivitis. Toxic effects are caused by various chemical compounds, including CO, SO₂ and NO_x; carcinogenic effects are linked to aromatic compounds originating from industrial emissions, heating installations and vehicles. In other terms, the lifestyle of populations can have unforeseen harmful effects on human health and well-being.

With regard to indoor air, current problems are related to the use of synthetic building materials for coatings, paints, varnishes and, above all, for insulation. Formaldehyde, used in Canada for insulating houses, is an irritant of the respiratory tract whereas asbestos has been recognized as a carcinogen, acting in synergy with tobacco to increase lung cancer and causing a specific pleural cancer called mesothelioma. This subject is fully covered by many WHO reports (See European Guidelines for Indoor and Outdoor Air Quality, WHO Publication, Geneva 1987). Tobacco smoke is also a major cause of indoor pollution and a predominant factor to be taken into consideration when working out ventilation standards; its contribution to lung cancer is now well known.

Radon is another indoor air carcinogen, which acts through a radioactive emission inside the lungs and bronchus. Bed-rocks and building materials (stones, bricks and concrete) are sources of radon.

In the urban environment, the problem of indoor air quality is not restricted to dwellings but is also found in workplaces and commercial premises. The most worrying problem, and that on which the least work has been done, is indoor air pollution in transport facilities. The air in the passenger compartment of a car, especially in winter, contains relatively high concentrations of all the atmospheric pollutants emitted by a motor, from carbon monoxide to carcinogenic benzene compounds. In public transport facilities, the main factor is the presence of large numbers of people in a confined space. This encourages the transmission of acute respiratory diseases, especially in winter. The problem is also found in commercial premises.

When drawing up urban development plans, the risk of accidents involving suffocation and related to certain types of installation should not be overlooked. In addition to the conventional domestic accident of suffocation from carbon monoxide in dwellings with primitive heating systems, there is the permanent risk of a disaster, such as mass suffocation following a malfunction in the ventilation system of an underground car park or road tunnel.

Prevention of Respiratory Diseases in Dwellings

To reduce the hazards caused by large numbers of people in confined spaces, overcrowding must be avoided and dwellings should be designed with sufficient useable floor space, the ideal being one room per person.

Both indoor climate and air quality should also be improved by measures affecting heating, air conditioning and ventilation. So far as the indoor climate is concerned, efforts should be made to maintain the ambient temperature within the range of 16–25 – C, with a humidity level of 40%–65%. Steps must also be taken to avoid radiant temperature effects, which may be listed under three headings: (a) the “greenhouse” effect, where large glazed surfaces are directly exposed to sunlight; in tropical or Mediterranean climates, this must be avoided by means of external passageways, balconies or shutters; (b) the “cold surface” effect, which creates a negative radiant temperature; the larger

the window, the further from it should beds and seats be placed; and, (c) the effect of condensation of humidity on cold surfaces, which must be avoided by limiting the temperature gradient and improving the insulation of external walls. (See WHO/EURO EH Document Series no. 16. Health Impact of Low Indoor Temperature, report on a WHO meeting).

To improve the quality of indoor air, the use of coatings, insulating panels, paints, varnishes or furnishings that release toxic emissions should be avoided, as should uncontrolled indoor combustion such as open fireplaces without canopies, heating systems with chimneys that are ineffective or not airtight and, in particular, tobacco smoke.

Technical specifications for ventilation are drawn up to meet the requirement of removing unpleasant odours and tobacco smoke. When these specifications are complied with, concentrations of other pollutants in indoor air can be maintained at an acceptable level. Wherever possible, natural ventilation should be preferred over artificial ventilation or forced air conditioning, primarily in order to avoid microbiological contamination of indoor air and the transmission of infectious respiratory diseases.

For technical reasons, air conditioning and artificial ventilation are unfortunately necessary in large buildings used as hotels, offices or department stores. Steps must be taken to prevent the transmission of diseases such as legionnaire's disease, a form of pneumonia that affects middle-aged men in particular. It is virtually impossible to eliminate the *Legionella* bacterium by disinfection, but its circulation in ventilation and air conditioning systems can be avoided by proper maintenance and temperature adjustment. (See WHO/EURO EH Document Series no. 14. Environmental Aspects of the Control of Legionellosis, Report on a WHO meeting).

Prevention of Respiratory Diseases in the Urban Environment

The size and location of buildings affect the formation of eddies and local air flows under windy conditions. Violent flows

of air may have a negative impact on health, leading, for example, to respiratory diseases among children who play near buildings, especially those built on piles; the latter should therefore be avoided. In climates where high winds are common, it is worth using scale models to analyse the wind flows set up by the physical configuration of buildings and roads.

The control of urban air pollution is a crucial and specialized subject. Action must be taken to deal with point sources of pollution or disseminated emissions, to modify dispersion patterns and to mitigate unfavourable meteorological conditions. There are many technical measures that can be taken to reduce emissions from point sources such as major industrial plants. Dispersion can be improved through the use of tall chimneys, although wind tunnel tests must be made on scale models to ensure that such measures are really effective. Lastly, zoning can confine pollution-producing plants to industrial areas that are far from, and downwind of, residential districts. Especially in mountainous regions, however, wind tunnel tests must be made on scale models to ensure that zoning is effective. Even so, it may not be practicable, for instance when a heavy industrial plant must be linked to a fixed infrastructure such as a navigable waterway.

Zoning cannot be used with disseminated sources of pollution such as small workshops, domestic heating and vehicles, and it is extremely difficult to control such emissions at source. One effective solution for domestic heating is to develop district heating networks based on a central heat plant, where emissions can be more easily regulated and controlled. So far as vehicles are concerned, action can be taken to improve fuel quality, to ensure that motors are correctly tuned and emission standards complied with, and to modify the choice of vehicles available, in the worst cases by banning diesel motors or encouraging electric vehicles, for instance.

Although we cannot control general weather conditions, human action influences the micro-climate in cities. Periods of acute pollution occur when weather conditions are unfavourable: one example of this is the temperature inversion that occurs above a city in winter with calm weather (a winter high

pressure system) and heat rising from the city. In extreme cases, steps must be taken to reduce industrial activity, to limit the movement of traffic or to alter heating parameters, for instance by substituting a more expensive but cleaner fuel for that normally used.

As noted above, confined spaces are often more polluted than the outdoor air. The ventilation of public transport vehicles and their infrastructures (tunnels and underground stations) is far from satisfactory at peak periods. The situation is even worse with regard to road traffic and its underground infrastructures, tunnels and parking areas. Despite numerous encouraging experiments, a comprehensive system of efficient, safe and clean urban transport has still not been implemented at city scale, although encouraging systems do exist at pilot scale.

Environmental Factors Affecting Other Infectious Diseases

Enteric Diseases

Although enteric diseases are fortunately no longer encountered in Europe, it is worth recalling that most of them are related to poor household drinking-water and sanitation facilities. Sanitation is taken here to include the disposal of excreta, other liquid waste and solid waste including all household refuse. In this connection, it should be noted that most of the available statistics on housing hygiene refer to household sanitary facilities.

In the developing countries, however, the problem of enteric diseases continues to be of prime importance, and children are the first to suffer. A recent study of infant mortality in the shanty towns Pôrto Alegre (Brazil), published in the Bulletin of the Pan American Health Organization (1985), gave the following overall results: (a) overall infant mortality rate in Pôrto Alegre, 1980—33.9%; (b) infant mortality rate in non-shanty town infants—24.4%; (c) infant mortality rate in shanty town infants—75.5%. The infant mortality rate was thus three times higher in shanty towns; in Pôrto Alegre, fortunately, only 15.22% of the population live in such areas.

The following causes of infant mortality were found.

Table 3

Causes of Infant Mortality in Pôrta Alegre, Brazil

	Shanty town population	Nonshanty town population
	%	%
Abnormal pregnancy or birth	24.2	47.6
Pneumonia or influenza	28.6	14.8
Infectious intestinal diseases	13.7	7.2
Septicaemia	8.5	3.3
Congenital anomalies	4.7	16.9
Other causes	16.3	100.0
	100.0	100.0

Source: Bulletin of the Pan American Health Organization, 1985.

In absolute terms, infant mortality due to infectious intestinal diseases was 1.8% in "normal" neighbourhoods and 10.3% (i.e., six times greater) in shanty towns.

It should also be noted that the proportion of infant deaths due to infectious intestinal diseases in shanty towns (13.7%) was relatively low; this is due to the fact that most of the shanty town districts in this city have piped supplies of drinking-water. In the slum district of Moinho Arroyo, which does not have such facilities, infectious intestinal diseases accounted for 52.9% of infant deaths.

Table 4 shows UNICEF statistics on causes of mortality in preschool children (1-5 years) in urban fringe zones and rural areas in Turkey.

Table 4

Causes of Mortality in Preschool Children in Urban Fringe Zones

	%
Enteric diseases	56
Respiratory diseases	29
Domestic and other accidents	11
Other causes	4

From the point of view of health indicators, the prevalence of typhoid and paratyphoid diseases is regarded as closely related

to the quality of drinking-water; cholera is a symptom of a very low level of sanitation; diarrhea is the main cause of infant mortality from enteric diseases; salmonella outbreaks testify to a low level of food hygiene; and intestinal parasitic diseases are a reflection of both improper excreta disposal and poor food hygiene.

*Prevention of Enteric Diseases at Home
and in the Urban Environment*

The elementary rules of domestic hygiene are applicable here.

Piped supplies of drinking-water prevent not only the transmission of waterborne diseases (typhoid, cholera, etc.) but also the spread of skin diseases. Good personal hygiene clearly depends on the washing facilities (shower or bath) available. Even in Europe, periodic cases of hair lice in schoolchildren do happen. Sanitary facilities should be provided. These include the disposal of sewage by main drains or septic tanks and the collection and disposal of household refuse. Sanitary facilities are commonly found in the countries of Europe, but become ineffective when not used correctly or inadequately maintained (e.g., dirty or blocked flush toilets, septic tanks not emptied regularly, refuse chutes used for loose refuse).

Domestic food hygiene must be maintained. Perishable food should be protected from insects, rodents, spoiling or contamination by the use of suitable refrigerators or larders. Dishes must be thoroughly washed.

Domestic insects, acarians and rodents must be controlled, especially in hot climates. Food can be contaminated by rats and mice, flies and cockroaches and by many other insects such as weevils. The first steps in the control of insects and rodents must be to dispose of leftover food and to block up lodging sites in walls, etc., with pesticides being used only as a last resort.

In housing complexes and municipalities, the control of enteric diseases rests on the same basic principles: safe water supplies, the collection and treatment of liquid and solid waste, the control of insects and rodents, and epidemiological surveil-

lance. Basic hygiene in low-cost housing complexes is currently deteriorating throughout Europe, and the same may be said of many municipalities, where the cleaning of streets and open spaces leaves much to be desired. (See the Report of the WHO/Council of Europe Conference on the Health in Towns, held in Vienna, Austria 24–26 May 1988).

Parasitic Diseases

At least three types of parasitic disease linked to poor housing hygiene may be distinguished: Chagas' disease, intestinal parasitic diseases and parasitic zoonoses. In addition, poor housing hygiene may encourage the spread of parasitic diseases by insects or through food.

Chagas' disease is a trypanosomiasis transmitted by an arachnid called the "Kissing bug" found throughout tropical America. The vector lodges in the cracks and walls and partitions. The simple measures of replacing mud huts with concrete or stone houses or of replastering internal partitions will eliminate the vectors' lodging places and thus remove the risk of transmission of the disease.

Intestinal parasitic diseases, especially in rural areas, are the result of poor sanitation, such as where the cesspool of a latrine contaminates the plants in a vegetable garden.

Parasitic zoonoses, including leishmaniasis (transmitted by dogs) and psittacosis (transmitted by birds), are the result of human beings and domestic animals living in the same premises. Unless domestic animals are closely monitored by a veterinarian, such proximity should be avoided. Bacterial or viral infections are also transmitted by ticks found on pets.

Poor domestic food hygiene also promotes the occurrence of parasitic zoonoses transmitted in meat (trichinosis, tapeworm infections, etc.). Conversely, good domestic hygiene helps to control parasitic diseases transmitted by insects. For example, in tropical areas, windows must be protected by mosquito nets, walls sprayed with insecticides twice a year, and pools of stagnant water and certain types of plants in gardens must be avoided. These precautions are also worth taking in some Mediterranean countries.

Good municipal hygiene also includes the control of insects that are vectors of disease and of other animals harmful to

health. In Europe, in addition to controlling insects and rodents, stray cats and dogs should be impounded so as to prevent rabies. In tropical areas, steps must be taken to prevent the formation of stagnant pools of waste water in which *Anopheles*, the vector of filariasis, can breed. It is clear that the domestic control of insects, rodents and other harmful animals will be ineffective unless accompanied by measures at municipal level.

There is currently a tendency in Europe to underestimate the role played by insects and domestic animals in the transmission of infections. In addition to the damage done by flies, mosquitos, cockroaches, fleas, bugs and lice, it is worth noting that lice transmit typhus, canine ticks transmit a rickettsial disease and, historically, rat fleas transmitted the plague. To this list may be added the allergies caused by acarians, called house mites, in bed linen. However, other allergens are found in house dust or coming from indoor mould and fungi. Good domestic hygiene, together with good personal hygiene, can undoubtedly make a major contribution to the eradication of domestic insects and pests; both of these depend on an adequate supply of water.

Architects should avoid creating lodging sites for insects or rodents. For instance, exposed runs of water pipes and, in particular, of electric cables offer shelter for cockroaches; hollow floors are breeding sites for mice; and rats can feed on the piles of rubbish that accumulate at the bottom of refuse chutes if the premises are not accessible, well lit and easy to clean.

Dermatoses

Many skin diseases are the result of poor personal or domestic hygiene, which in turn are due to a lack of water, sanitary facilities or health education. The urban environment also favours the transmission of venereal diseases (which are also dermatoses) through prostitution; the latter is itself a product of psychosocial stress in the urban environment (see below). Today the AIDS transmission is facilitated by poor physical and social urban environment. Narcotic addicts who are the main risk group concentrate in decayed city centres.

Environmental Factors Affecting Chronic Diseases

Cancers and the Urban Environment

Some epidemiological studies or analysis of clusters of diseases seem to show that exposure to low doses of a combination of toxic chemicals leads to a higher incidence of various types of cancer. The well known case of the Love Canal site near Niagara Falls, U.S., is an example of such a cluster of diseases. Among the epidemiological studies, mention should be made of the study carried out by the Scottish Home and Health Department and documented by the International Agency for Research on Cancer in its scientific publication No. 72, *Atlas of cancer in Scotland 1975-1980*. This study shows markedly higher rates of certain cancers in industrialized urban areas such as Greater Glasgow, where the effect of smoking is combined with the cancerogenic effect of low concentrations of a large number of toxic chemicals. Toxicological studies are a tool to identify cancerogenicity of individual chemicals, and epidemiological studies may identify some synergies in cancerogenicity, but in the urban or indoor environment we are not faced with noticeable concentrations of a limited number of pollutants but with a cocktail of minute concentrations of a large number of pollutants, of which a certain percentage are cancerogenics.

The various types of ionizing radiation and some nonionizing radiation also have a carcinogenic effect. However, it has not been proved that human exposure to either ionizing or nonionizing radiation is higher in towns than elsewhere, but exposure to radon is definitely a problem of the indoor environment.

Cardiovascular Diseases and Urban Stress

City life and the attendant negative factors, especially noise and overcrowding on public transport facilities, have a psychological and physiological impact known as stress. It has not been proved that stress is the cause of cardiovascular conditions. On the other hand, it has been epidemiologically demonstrated that it makes such conditions worse. Reducing stress implies, among other things, action on the causative environmental factors such as noise or traffic problems. Reduced stress would also have a positive effect on the number of accidents and mental disorders.

Mental Health and Psychosocial Stress

The environmental factors involved in psychosocial stress include overpopulation, noise, air pollution, unpleasant odours, humidity, overcrowded public transport, dirty roads and a lack of parks, cultural amenities and sports facilities.

Within people's homes, overcrowding, noise and decayed buildings in a poor maintenance state are all stress factors. Outside the home, the quality of architectural design and town pattern affect urban stress; living in high-rise buildings, delayed low-cost housing and underprivileged suburban areas, etc., have been held responsible for causing psychosocial stress.

Psychosocial stress in urban areas is a contributing factor to mental disorders. For instance, nervous breakdown is far more frequent in congested major urban centres, and the other indicators of mental health are all worse in large cities (suicides, divorce rates, drug addiction, etc.)

Accidents and Disasters

Accidents are one of the most frequent causes of death and injury in cities. These include all kinds of domestic accident, the main victims of which are preschool children and the elderly, while traffic accidents account for most of the accidents that occur outside the home.

In homes, the likelihood of a fall may be reduced by properly designed staircases, balconies and windows, but the two most dangerous rooms are the kitchen and the bathroom, in that order. Burns, electrical shocks, suffocation and poisoning are due to poor heating, lighting and cooking equipment, inadequately maintained electrical or plumbing systems, lack of closed cupboards for storing toxic cleaning products, use of toxic paints, plasters or varnishes, the purchase of dangerous or toxic domestic furniture or fittings, etc. There is an extensive body of literature on this subject which has been summarized by Ranson in this issue.

Outside the home, in addition to traffic or transport accidents (an extensively researched area and one where town planning can clearly have a positive effect), other potential disasters must be taken into consideration. These might include fires, flooding, earthquakes or a major industrial accident. There are a

number of possible causes of the latter, ranging from an explosion in a chemical plant to a traffic accident involving a truck transporting toxic chemicals. All these disasters can be prevented by the town planner or the municipal authorities. Technical measures are available to prevent such events or to alleviate their harmful repercussions. Anti-seismic construction criteria and technology do exist.

Other Chronic Diseases

Among the many chronic conditions related to poor housing hygiene or an unsatisfactory urban environment, one problem now solved is that of rickets, a condition caused by inadequate exposure to sunlight, air pollution or a lack of windows exposed to sunshine. Present-day problems include increased exposure to all types of chemical pollutants and the repercussions of such exposure on many chronic diseases, such as restrictive or obstructive respiratory diseases, cancers, cardiovascular disorders, neurocerebral disorders.

Social Disorders

As mentioned earlier, psychosocial stress has an impact on mental diseases, i.e., on disorders that require the services of a psychiatrist or psychoanalyst. In addition, however, it also affects social disorders that are apparent in such phenomena as: criminal and delinquent behaviour, especially among young people; assaults, rapes and insecurity psychoses; intolerance, xenophobia and racism; and a general feeling of unease or ill health.

Even though appropriate architecture or town planning can help to control these social "diseases", their prevention depends primarily on action far beyond the scope of the architect or town planner, which requires a joint approach of the socioeconomic-psychological aspects as well as of the physicochemical-biological ones.

The WHO Regional Office for Europe has launched a "Health Cities" project, which is aimed at reducing both urban psychosocial stress and the ensuing mental, physical and social diseases through action to promote health, improve the environment and attain sociological balance.

Special Requirements of High-Risk Groups

The profile of a high-risk group obviously depends on the hazard under consideration; for accidents, the groups include young children, the elderly and the disabled; for respiratory diseases, they are infants, the elderly and those suffering from chronic respiratory diseases (e.g., asthmatics); for psychosocial stress, single people, immigrants or people in resettlement schemes are the most vulnerable groups.

The problem of adapting housing and urban facilities to the needs of these special groups must be tackled. Technical documents are available that lay down the rules for designing housing for the elderly or disabled and for planning urban transport systems accessible by them. For instance, lifts must allow access for wheelchairs and prams. It is generally accepted that the elderly and disabled must be given ground-floor accommodation in normal housing rather than housed separately from the general population.

The problem of rural migrants or immigrants is largely a sociological one. The solution implies teaching them how to live in a large city and in modern accommodation. This should include health education and community development actions.

One group that has been badly overlooked by modern town planning is children of all ages, whether in large families, young families or one-parent families. Their specific problems are receiving even less attention than those of the elderly and disabled, and as things stand at the moment major cities cannot be said to be designed for children. This is why the Healthy Cities project has developed the so-called "Kid place survey" to access their needs.

From Disease Prevention to Health Promotion

The above considerations have referred to diseases and accidents in relation to what dwellings and town planning can do to prevent them. Another more positive approach is to consider what adequate housing can do to enhance the health of the general population, not only considering the absence of disease or infirmity but the necessary action on the fundamental determinants of health. This is what is called health promotion, and the Healthy Cities project is nothing else than a health promotion project developed at municipal level.

Prevention measures are actions performed by the public health services to prevent risk groups getting a disease or having an accident; health promotion measures are intersectoral actions carried out by professionals or services apparently not related to public health and directed towards the general population to enhance its health status.

It is clear that architects, town planners, construction engineers, city engineers and social scientists or workers are key actors in health promotion activities. It is also clear that, even if it is out of the scope of chemical epidemiological studies, a high quality of the urban physical environment, the balance of the urban ecosystem, comfortable and health dwellings, social harmony, economic prosperity, intensive cultural life and attractive architecture are all contributors to health promotion.

Synthesis of the Main Aspects of Housing Hygiene

The following principles are relevant to dwelling hygiene and safety.

(1) The shelter function of the dwelling, its structural stability, its ability to protect its inhabitants against meteorological and other external intrusions. The layout of the dwelling, including space and density considerations.

(2) The sanitary equipment of the dwelling, drinking-water supply, connection to sewers, garbage disposal, availability of toilets and bathroom.

(3) The indoor climate of the dwelling: (a) physical parameters: ambient and radiant temperature, humidity and dampness, vibration (noise) and radiation (lighting and radon), dust and micro-fibres; (b) chemical parameters: indoor pollution from human physiology, from heating, cooking and working, toxic chemicals from paints, varnish, insulation materials, carpets and furniture, bad smells; (c) biological parameters: pathogens in aerosols, house mites, allergens from moulds and fungi, transmission of acute respiratory diseases by improper air-conditioning system and through overcrowding; and, (e) engineering aspects of a healthy indoor climate: ventilation requirements, natural versus mechanical ventilation, domestic heating system, natural sunlight through windows, anti-noise windows, etc.

(4) The safety of the dwelling and domestic accidents: (a) fall-downs—safety of stairs, balconies, windows; (b) burns—safety of heating and cooking systems, fire protection; (c) electric shocks—safety of electric appliances; (d) dangerous places—kitchen, bathroom, stairs; and (e) safe handling of domestic products, including toxic chemicals.

(5) Public health problems linked to housing hygiene and safety: (a) domestic accidents: risk groups – preschool children and the elderly; prevention methods: safe architecture, safe furniture, safe electrical heating and cooking equipment; health education: safe handling of toxic chemicals in the home, good maintenance of electrical cooking and heating equipment; (b) acute respiratory diseases: main factors – poor ventilation, poor heating, excessive humidity, overcrowding in the home; however, in big cities, public transportation plays a major role in transmission of acute respiratory diseases; (c) enteric diseases: due to poor water supply and sanitation or in Europe more often due to unhealthy food handling and storage in the home; (d) kitchen: the most hazardous place in the home; (e) other infectious or parasitic diseases are transmitted in the home by domestic pets, rodents, insects and acaria, especially in warm climates; (f) chronic respiratory diseases or long-term cancerogenic risks will result from poor indoor air quality (dust, chemicals, radon, fibres); and, (g) mental disorders linked to overcrowding, lack of privacy, excessive noise, impact of seeing rodents and insects in the home, impact of decaying structures, bad smells and dirtiness.

(6) The hygiene of the indoor environment (dwellings, offices, shops, sports halls, etc.) is of the utmost importance in cold climates where people spend little time outdoors. Current health research concentrates on: (a) ventilation and air-conditioning requirements; (b) risk assessment of physical factors such as radon and fibres (asbestos); and, (c) risk assessment of chemical factors such as formaldehyde, tobacco smoke, carbon monoxide and nitrogen dioxide.

The subject of housing hygiene and healthy buildings has recently been given priority in Europe, as shown by the success of the "Healthy Building" Congress organized in Stockholm, Sweden, 4–8 September 1988 by the Centre international du Bâtiment and sponsored by WHO.

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