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Factors in Urban Stress

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This paper examines changing patterns of health, causes and effects of urban stress, and approaches to the management of stress.

Changing Patterns of Health

Dramatic advances in biomedical research and the great increases in national financial resources devoted to health care have enabled the richer countries of the European region to bring under control and virtually conquer the major killing infectious diseases such as tuberculosis, poliomyelitis and measles, which only thirty years ago still constituted an important hazard. Even earlier, the diseases of typhoid, cholera and malaria were brought under control, first in northern and then in southern Europe. Such diseases are still at a high level of incidence in countries on the borders of the European region and constant vigilance is therefore still required, especially in cities where immigrant populations are growing.

Almost the sole remaining infectious diseases of major proportions are bronchitis and similar chest-lung infections which persist especially in the poorer countries of the region.

Even in these poorer countries, there has been a major improvement in health standards—fewer mothers die in childbirth and more children survive to maturity. The expectation of life at birth has increased steadily in the region as a whole from 65.4 years in 1950–1955 to 72.7 in 1980–1985 (United Nations, 1981). Further modest increases of life expectancy are to be expected, but there are also signs that the figure could become stationary or even begin to decline if newly emerging health problems are not properly addressed.

The pattern of health and ill-health is constantly evolving and as one set of problems is brought under control, others emerge. In order to maintain the relatively high standards of health achieved in the European region, monitoring and

research continue at a high level. This work is bringing to attention a newly emerging pattern of health hazards so serious in its implications that there is widespread concern about a new health crisis which could overtake the European countries, especially the cities, by the year 2000 (O'Neill, 1983).

The dominant "new diseases" of the late 20th century in European cities are of course not new in any fundamental way, but they have risen to the top of the list of causes of death as the demographic pyramid has thickened out with an aging population and as the "classical" infective diseases have been brought under control. The leading causes of death in Europe today are diseases of the circulatory system (cardiovascular diseases) and cancer of all kinds (malignant neoplasms). Cardio-vascular diseases account for more than 50% of deaths in ten countries in the region and over 40% of deaths in thirteen others. About 20% of all deaths are due to cancer, of which one third are in the respiratory system. A further 10% of deaths are due to acute respiratory infections, bronchitis, pneumonia and influenza.

Although accidents cause only 5% of all deaths, they are the largest single cause of death in children and young adults. In most countries of the region, the proportion of deaths primarily due to other infections and parasitic diseases is less than 2% (United Nations, 1977).

While death rates and causes of death are an important indicator of where health problems lie, in countries with high standards of public health, other measures such as those of absenteeism (caused by ill-health), disability, discomfort and dissatisfaction must be added in order to obtain a more complete picture of a society's level of health.

Such a complete picture must necessarily include mental health as an important element. It is probably the leading cause of disability (if not mortality) in most developed countries. In the U.S.A., it has been claimed that over 80% of the population experiences some measure of psychiatric impairment at one time or another (Wolman, 1973). In England and Wales, nearly half the hospital beds were occupied by the mentally ill or mentally retarded (1962-63 estimates) and in the same period it was reported that 32 million working days were lost due to mental illnesses, with direct costs to National Insurance funds alone amounting to 21 million (Office of Health Economics 1962).

Stress: Causes and Effects

Precise definitions of "mental health" and "mental illness" continue to provoke debate among specialists, ranging from those who prefer to regard mental illness in the medical tradition as another variation of somatic illness, to those who regard mental health as essentially a social concept reflecting the values and norms of society (Griggs 1980).

By some definitions, some kinds of socially unacceptable behaviour, or social pathologies, are regarded as a symptom of mental illness, e.g., alcoholism, drug addiction, excessive use of medicines, rape, crimes of domestic violence (wife and child beating) and so forth. These are clearly associated with a set of environmental conditions, often including poor quality housing, high density living conditions, excessive noise, high levels of environmental pollution, and the general pattern of environmental and social conditions often found in the inner areas of large cities.

The concept of "stress" has been developed to describe the total sum of all such external and malign influences on health (Selye, 1974). Stress is thus seen as a function of environment (noise, overcrowding, toxic chemicals, air pollution, etc.) and social and behavioural factors (lifestyle), although what is cause and what is effect is not always clear (Evans, 1982). Are alcoholism and obesity causes or symptoms of stress?

The effects of stress are not necessarily limited to mental health and psycho-social pathologies, but are believed by some to be a factor in coronary heart disease, cerebrovascular disease and some forms of cancer (Howe 1980).

Of particular concern in some highly developed countries is the high cost of treatment of cardio-vascular diseases, of cancer and of mental illness. Even the richest countries are now finding the cost of hospital care and the elaborate treatment methods involved in the "new diseases" a growing burden on the national treasury. Thus it is not only the incidence of the "new diseases" that is cause for concern, but the costs that they impose. "Health Crisis 2000" is likely to be seen as much as a crisis of finance as it is of mortality and morbidity.

The emerging pattern is complex. The dominant causes of death and illness are underlain by many contributing factors.

Biomedical research has revealed not one cause of heart disease or cancer, but many causes. Unfortunately it is rarely possible to identify any one cause as "necessary". If necessary causes could be found, each one might be eliminated in turn, according to an order of priority and thus the diseases would be reduced. Alas, the causes identified do seem to be "sufficient", but what combination of causes, in what degree, is impossible to state. Whether one or a few fundamental and necessary causes of cancer and heart disease will ever be found is an open question. Certainly a massive allocation of research funds by developed country governments and private sources of funds have not been able to achieve it over three decades or more of concentrated effort.

The search for a single cause for cancer or heart disease is unlikely to be fruitful in the short run, but it is not entirely beyond the bounds of scientific possibility that fundamental biochemical research could produce a proper scientific explanation and hence a "cure". Such indeed is the rationale and justification for the expenditure of literally hundreds of millions of dollars on research annually.

On the other hand, it is quite certain that a single cause of the disabilities, discomforts and dissatisfaction will not be found. The root causes of the "health crisis 2000" that are manifested in social and behavioural symptoms are not at all susceptible to the kinds of proven cause-and-effect relationships that can be established in the natural sciences.

Civilization and its Discontents

Given that there are symptoms not only of disease, but also of discontent, and given that no single factor explanations are likely to suffice, what can be said by way of diagnosis of present and future ills in the European region?

First, that the causes of difficulty stem from the record of success. Industrialization, the growth of cities, and the modern lifestyle, based for the majority of the population on a level of "affluence" well beyond the anticipations and hopes of earlier generations. Second, despite four decades of economic growth and four decades of social egalitarian legislation and social philosophy, the "benefits" of economic success are still very unevenly distributed, and, in particular, leave out or neglect the

urban poor, including substantial numbers of immigrants from outside the European region, and the growing number of unemployed (both immigrant and nonimmigrant) especially among the young.

It has become a convention in international discussions of health to refer to the diseases prevalent in developing countries as constituting one problem area, and the diseases of "affluence" and "overdevelopment" as constituting another. Paradoxically, however, when we examine the health problems of the developed industrial societies more closely, we find that while some of them can clearly be attributed to "affluence"—(the wealthy business executive who rides everywhere in his car, lacks exercise, over-indulges in high cholesterol foods, is overweight, drinks and smokes too heavily, and is subject to heavy psychologically stressful business pressures, and who dies of a heart attack at the peak of his career), others are more associated with the conditions in which the poor or certainly the less affluent members of society live—(the industrial worker who is exposed to toxic substances in his work place, who lives in a more densely populated area of the central city, where pollution levels are high, living space is less, noise levels are higher, and who faces economic pressures of keeping up payments on loans—for house, car, appliances—in an environment where crimes of violence and drug abuse are common, and who dies from lung cancer).

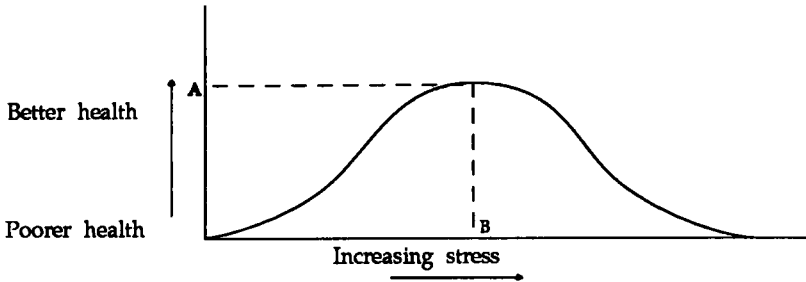
These stereotypes no doubt are an overdrawn caricature, but they serve to illustrate the problem of the interlocking and interwoven causes of mortality and morbidity that afflict the most successful developed and urbanized societies in Europe today. The social, economic and behavioural "causes" are linked with the environmental "causes". Different patterns of "cause" are exhibited in different localities and at different socio-economic levels, but all form part of the same mosaic.

There is no satisfactory way to describe the whole picture—it is indeed a fragmentary mosaic—one for which the term "stress" has come to be widely applied. The currency and popularity of the concept of "stress" derives from the work of Selye who was among the first to draw attention to the fact that all manner of illnesses manifest themselves in somewhat similar

symptoms of ill-health or "distress". The concept has now evolved into a general term applied to all sorts of "stimuli" or "insults" or "impacts" on the human body and mind, so much so that it is in danger of losing its meaning.

One thing is clear about "stress" in the sense used and propounded by Selye (Selye, 1974). Stress is part of life. It is not conceivable to think of life without stress, and an absence of stress can be harmful as much as over-abundance. The relationship should theoretically follow the slope of the arc in Figure 1 where the highest level of health is attained at an intermediate or optimal level of stress.

Figure 1. The relationship of stress to health.



Of course, this simple relationship is highly theoretical and cannot be measured or specified precisely. The reasons for this are that stress has so many different components—environmental, socio-economic, behavioural, etc., that there is and cannot be any satisfactory measure of "aggregate stress". Even if such a measure were available, it would have different values for each individual, and one would therefore have to measure both individual stress tolerance and average stress tolerance.

The management and policy questions thus are seen to be very complex. How do changing levels of stress in one area (e.g., higher levels of population) affect levels of stress in another (e.g., higher incomes, more employment, warmer and more comfortable living conditions, etc.)? Furthermore, how do "stresses" of various kinds augment and compound each other, or cancel each other out? What is "aggregate net stress" and how is it to be defined?

Before turning to the question of how "stress" is to be studied and policies adopted for the management of stress, it is

useful to list some of the "stressors" that have been identified. Partial lists are provided in Tables 1 and 2.

Approaches to the Management of Stress

A major objective of public health policy in European cities may therefore be described as the need to manage stress. Clearly some forms of stress are better eliminated entirely (or almost so) while others can be reduced to some acceptable or satisfactory level.

Simply to focus on the removal of stressors perceived as "bads" or "negatives" will not suffice however. From the point

Table 1

Environmental Stressors

Exposure to Chemicals

- Indoors:* Formaldehyde
- Radon daughters
- Carbon Monoxide
- Outdoors:* SO₂
- NO₂
- General:* Toxic chemicals in the workplace
- Food Additives and contaminants

Exposure to Physical Factors

- Noise
- Ionizing and nonionizing radiation
- Particulates and smoke
- Climatic and geophysical hazards
- Architecture and urban lay-out and design
- Housing conditions: temperature (insulation), ventilation
- Accessibility to urban green space

Exposure to Biological Factors

- Germes
- Virus
- Microbes
- Bacteria
- Diet

Technological Hazards

- Accidents – automobile accidents, accidents in the home, public transport

Falls

Table 2
Socio-Economic, Behavioural Stressors

Lack of exercise
Obesity
Overuse of medicines
Alcoholism
Other drug addictions
Sexually transmitted disease
Smoking
Mental illness
Suicide
Sense of security
Crime-robbery
Rape
Inter-personal domestic violence – wife & child beating
Unemployment
Divorce
Death of spouse or close relative
Lack of social support networks

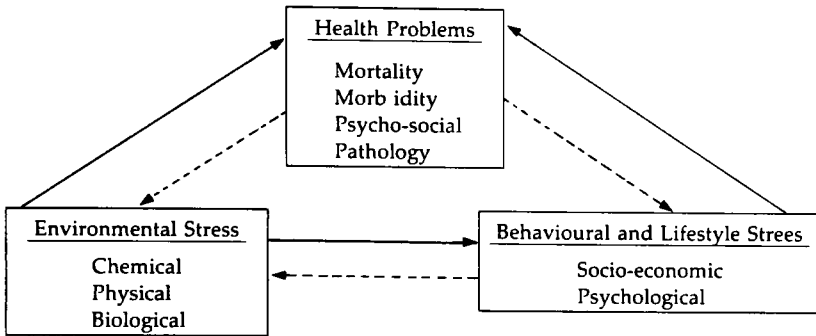
of view of public policy, it is also important to improve conditions. Thus a response to high residential density (overcrowding) can involve the provision of improved, more spacious housing. It may be convenient to distinguish between actions to reduce stress and actions to improve conditions or **meliors**.

Development of a public health strategy in European countries to meet the emerging health problems of the cities depends upon an appreciation of the interrelationships of three sets of variables. These are: (a) the incidence of mortality, morbidity and psycho-social pathologies as identifiers and measures of ill-health; (b) the behavioural and lifestyle patterns related to these patterns of ill-health; and (c) the environmental factors related to the patterns of ill-health and to the behavioural and lifestyle patterns.

A simple conceptual framework is suggested by Figure 2.

The framework suggests that health problems result from behavioural, lifestyle, socio-economic and environmental stress factors. The socio-economic and behavioural factors contribute directly to ill-health. The environmental factors contribute both directly to ill-health and indirectly through the socio-economic

Figure 2. Framework for human ecology of urban stress.



and behavioural factors. There are feedback effects in all cases, but for present purposes those are considered of secondary importance.

The precise contributions to ill-health of many of the socio-economic, behavioural and environmental variables is not known. Nor is there a good understanding of the possible synergistic effects of the variables upon each other. Faced with this complex and unyielding pattern of health problems and their causes, two broad and complementary approaches have been developed, the one focussing on treatment of ill-health, and the other on management of causes.

The treatment approach is essentially the classical medical approach of discovering illness by screening, testing and then applying medical prescriptions for treatment and perhaps cure. It is a characteristic of many of the "new diseases" that cure is more likely to be effected the earlier the illness is diagnosed. More emphasis is therefore being placed on the screening and monitoring of apparently healthy persons in order to achieve early detection of incipient disease. This holds true for cardiovascular diseases, cancer, and mental illness.

Success in early detection procedures is increasing in many instances. The mortality and morbidity statistics reflect to a degree the use of early detection. There is considerable discussion and concern in health policy circles about the high cost of expenditure on treatment and attempted cures for the "new diseases". Surgical and chemo-therapeutic treatments for example involve expensive "high technology" equipment and

sometimes long hospital stays. The high cost of treating the mentally ill and the high proportion of hospital beds occupied by the mentally ill have already been referred to.

Increasing realization of the "open-ended" costs of treating the main contemporary health problems in a highly urban society and in an aging population have led to serious questioning about health policy priorities, and more emphasis is now being given to the second approach, which might be called "the management of causes". This term is preferred to the more common "preventive approach" because it more accurately reflects what is possible. While heart disease, cancer and mental illness might, in certain individual cases, be "prevented", for society as a whole the most that can be hoped for is a reduction in the incidence of such diseases, and a postponement of their onset to a later age. This is simply because the causes cannot be eradicated.

Take, for example, the widespread presence of toxic, carcinogenic chemical substances in the environment. The extent to which many of these may be carcinogenic in human populations is not known (e.g., nitrates and nitrosamine compounds). Their alleged carcinogenicity rests on animal tests, usually based on high level exposures in short time periods. Extrapolation of such experimental results to human populations is highly uncertain. Human beings are biologically different from the test animals and may be less (or more) susceptible to the chemicals in question. Also human beings are exposed to low doses over long periods of time and the relationship of this to high short-term doses is not clear.

However, since such chemicals have been shown to be carcinogenic in animal testing, it cannot be assumed that they are not carcinogenic in man. Nor is it possible to set an absolutely safe exposure level. In many cases, permissible levels of chemical contamination are proposed (see W.H.O. environmental health criteria documents), on the grounds of available knowledge and expert judgment. To reduce the risk to zero, however, would involve the elimination of toxic chemicals from the human environment. In many instances, the benefits of such chemicals in manufacturing, in agricultural pest control, and in insect disease vector control, are such that it would be disadvantageous to stop

using them. Even if total prohibition were to be adopted, the risk would not be entirely removed because the chemicals are persistent, and are widely distributed through environmental media such that they cannot be recaptured.

In these circumstances, the approach adopted has been to carry out scientific research on exposure rates and dose levels in relation to effects, to construct dose-effect curves or dose/response curves, and to use these as a basis for setting standards or ambient standards). In this sense, then, the approach is one of "management of causes" rather than "prevention" strictly speaking.

The "management of causes" approach applies not only to toxic chemicals, but also to other environmental, socio-economic and behavioural sources of stress.

Human Ecological Approaches

The "management of causes" approach to health is essentially ecological in point of view. It seeks to explain the relationship of individual organisms, and communities of organisms (in this case, human beings, hence human ecology) to their environment. Within the broad framework labelled "human ecology", there are many levels at which studies can be organized and results assembled. These are schematically suggested in Table 3.

At the top left-hand corner of the table is a cell for studies of single environmental factors and their impact upon select (target) somatic functions or behaviours. In this category comes the impact of noise on hearing or blood pressure, or on sleep. Measures can be made in the field or in the laboratory of hearing impairment, blood pressure and loss of sleep, and these can in turn be linked to other health effects.

Such studies are usually very tightly circumscribed and rigorous scientific observations are made or attempted, holding, as far as possible, all other variables constant. While the evidently more precise results that can be obtained from such studies are useful as criteria in the setting of environmental (and other) standards, they are necessarily limited by the neglect (intentionally so) of other variables.

The scope of such studies can easily be broadened by movement in the two directions of the axes of the table. First, the

Table 3

Levels of Human Ecological Enquiry

	Single Environmental Factor	Multiple Environmental Factors	Integrated Holistic Environment	Environment as Perceived
Impact on selected somatic functioning or behavioral, e.g., hearing, blood pressure or sleep	Noise impact on sleep or myocardial infarction risk	Interactional effects of noise and other environmental factors	Integrated effects of environmental and socio-economic stressors	Modification of stress as subjectively perceived
Impact upon "whole man"	Impact of noise on hearing, non-auditory effects, sleep disturbance			
Impact upon communities	Impact of noise on individual in community functioning			

single environmental factors (noise, carbon monoxide, cadmium, etc., see Table 1) can be examined in relation to their effects on the "whole man", including all physiological, psychological and behavioural responses. Still further, the effects on whole communities can be studied. The complex interactive and self-aware nature of human society is such that community effects may be much more than the sum of effects on individuals. For example, noise may lead to aggregate social responses (blighted neighbourhoods, economic decline, crime) which will exacerbate or even create other environmental stressors.

The second direction of broadening is to examine multiple environmental factors, e.g., noise plus crowding, plus toxic exposure, plus air pollution on selected somatic functioning or pathophysiological effects. Similarly, the environmental factors can be broadened from physical, chemical and biotic factors to psychosocial, cultural, economic and so forth. Finally, these factors can be measured by some presumably objective measures (noise in decibels) and also as perceived by the individuals affected or their community groups.

Scientific studies of the health aspects of the human environment (human ecological studies) have not surprisingly tended to concentrate towards the upper left-hand corner of the table. The reasons for this are evident. The further one moves away from the single environmental factor and the single somatic function or organism, the more the research results are confused with extraneous variable factors that cannot be held constant and which therefore bias or invalidate the results.

There is, however, a major difficulty with such narrowly focussed and defined enquiry. It gives little guidance to health policy makers except in terms of very specific causes. As we have seen, the nature of the health crisis facing European cities is not one in which specific causes can be neatly attached to specific diseases. What specific diseases there are seem to have multiple causes, and there are many other manifestations of ill-health in the socio-psychological realm that it is hard to define as diseases. They are frequently thought of simply as manifestations of stress.

"Management of causes" therefore, if it concentrates on single causes, may miss the important sources of ill-health. Or, the controlled reduction of one cause may not have the beneficial impact foreseen, because other factors continue to operate. Furthermore, disease factors that were previously missed may assume greater significance as other factors were removed.

As long as environmental health studies remain heavily concentrated in the top left-hand corner of Table 3, then it will remain extremely difficult to provide good overall policy guidance to the managers of human settlements and those who would improve health in cities by reducing stress. The important policy questions concern not only the amount by which each individually identified stressor or risk factor should be reduced to meet certain health goals, but the combination of factors that need to be addressed.

Further Progress in Health Promotion

This brief survey of the concept of environmental stress and its causes suggests several important conclusions. First, the further development of scientific understanding is inhibited by the methodological difficulties of complex systems. Limited results

will be gained by single-factor studies which retain scientific validity but cannot reach the heart of the matter—which is the complex interactions involved. Second, it is desirable therefore to develop more holistic approaches to individual, family and community health. A possible approach is the development of a more rigorous methodology of comparative study in which large samples of individuals and communities are examined to identify congeries of causes and effects, or syndromes of causes as well as symptoms. Such a method might be expected to provide guidance for policy prescriptions, but not for the setting of precise standards and criteria.

Third, the research and management approaches suggested here are best conducted in the context of health promotion activities aimed at lifestyle risks as well as direct environmental risks to health. In order to obtain necessary feedback for policy evaluation and modification a careful programme of longitudinal comparisons is also required.

The directions in which to proceed in alleviating the anticipated "Health Crisis 2000" are relatively clear. Changes in "lifestyle" and "human behaviour" can do much to reduce environment stress and help avoid or mitigate the impending crisis in the health of urbanized society.

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