

KEYNOTE ADDRESS

DESIGNING HEALTH PROMOTIVE ENVIRONMENTS

Daniel Stokols, Program in Social Ecology, University of California, Irvine

ABSTRACT

We live during an era fraught with technological hazards, the depletion and degradation of natural resources, and the pervasive threat of global conflict. A signal challenge of our time is to establish and maintain healthy environments. The challenge of creating and maintaining healthy environments seems, initially, straightforward enough, yet it raises several complex theoretical, methodological, political and public policy questions. For example, how shall we conceptualize healthy environments and by what observable criteria can we determine the degree to which an environment is healthful? Is the healthfulness of an environment primarily a matter of its physical quality or shall we gauge the healthfulness of an environment by the joint influence of its material and symbolic features on the emotional and physical well-being of its occupants? Also, does the concept of environmental health refer to the present condition of the environment and its occupants, or to the potential that exists within a set thing for promoting and maintaining improved levels of health over an extended period? To address these questions, I will develop a social ecological conceptualization of environmental health which emphasizes (1) the interplay between the physical-material and social symbolic features of environments, as they influence (2) the emotional and physical well-being of individuals and groups. Moreover, health status will be considered (3) along a continuum ranging from individuals to larger aggregates and populations, and in relation to (4) micro-level, local settings (e.g., homes, offices, neighborhoods) as well as larger-scale and more distant environmental health will be examined, with particular emphasis on the stability or instability of healthful conditions within a setting and those factors that may undermine or ensure the healthfulness of an environment over extended periods. The discussion of these conceptual issues suggests a number of methodological strategies for assessing the healthfulness and overall qualit

OVERVIEW

I want to begin thanking the organizers of EDRA-22 for inviting me to present this keynote address. The central theme of this conference is certainly most timely, as we are living in an area fraught with technological hazards, degraded natural resources, and the pervasive threat of global conflict. The signal challenge of our time is to establish and maintain healthy environments. Yet, as we convene here to discuss opportunities for creating healthy environments, many regions of the world continue to be plagued by war, millions of Third World people are ravaged by disease and famine, and those in industrialized nations are becoming painfully aware of the health cost resulting from their exposure to environmental pollution and other by-products of "high technology".

Confronted by these global dilemmas, the tasks of creating and maintaining healthy environments seen rather daunting and, perhaps, even unachievable. Nonetheless, it is important that our efforts to take constructive action at local and regional levels not be deterred by the complexity and severity of global environmental problems. Certainly, much progress can be made at local levels toward establishing healthier environments. Moreover, the success of health promotion and environmental protection efforts within local communities can exert a positive, albeit gradual, influence on the quality and healthfulness of our global environment.

An essential prerequisite for developing effective environmental design and public policy programs to create healthful surroundings are sound theoretical analyses of key concepts such as "health", "health promotion", and "healthy environments". A review of the relevant research literature on topics such as health promotion, environmental stress, and environmental risk assessment, however, reveals important gaps in our understanding of these issues.

For example, health is often defined in individualistic and physicalistic terms with explicit emphasis on "soundness of body or mind and freedom from disease or ailment" (Webster, 1989). Analyses that define health simply as the absence of personal illness or injury, however, give little or no consideration to issues of *collective well-being* (e.g., social cohesion) and *optimal states of wellness* (e.g., strong feelings of personal commitment to one's social and physical milieu).

Similarly, the majority of health promotion programs implemented in corporate and community settings are individually rather than environmentally focused. That is, they are designed to modify individuals' health habits and lifestyles (e.g., exercise and dietary regimens), rather than to provide environmental resources and interventions that promote enhanced well-being among occupants of an area (e.g., installation of improved heating and ventilation systems within buildings to enhance indoor air quality). Recent studies suggest the potential value of environmental interventions as an adjunct to behaviorally oriented health promotion programs (cf., Archea, 1985; Archea & Connell, 1986; Greenberg, 1986; Hedge, 1989; Mendel & Smith, 1990).

A major goal of this paper is to develop an environmentally-based analysis of health promotion, focusing particularly on the conceptualization of health promotive environments. The analysis of health promotion from an environmental perspective is grounded in an ecological and contextually-oriented view of human health and well-being (Moos, 1979; Stokols, 1987). While an ecological perspective is beginning to emerge in health promotion research (with particular emphasis on linking individual-focused, small group/organizational, and community approaches to health promotion; cf., McLeroy, Bibeau, Steckler, & Glanz, 1988; Winett, King, & Altman, 1989), the delineation of specific environmental leverage points for health promotion at each level of analysis remains an important task. The present analysis, therefore, addresses the question: What environmental qualities of organizational and community settings are especially health promotive? In Michelson's (1990) terminology, the emhere developing a more phasis is on "environmentally explicit" version of the ecological approach to health promotion.

A second goal of the paper is to identify some important directions for future research on the creation and maintenance of healthy environments. Included among these research directions are opportunities for evaluating the efficacy of environmental design, urban planning, public policy and regulatory efforts to promote enhanced wellbeing at organizational, municipal, regional and international levels.

CONCEPTUALIZING HEALTH-PROMOTIVE ENVIRONMENTS

For the most part, health promotion research has focused on identifying and modifying personal behaviors that enhance physical health and reduce the risk of illness (cf., Cataldo & Coates, 1986; Green, 1984, O'Donnell & Ainsworth, 1984). Examples of health promotive behaviors are maintaining high fiber/low fat diets; engaging in regular aerobic exercise; refraining from smoking and avoiding excessive alcohol consumption. From an ecological perspective, however, health promotion is viewed not only in terms of the specific health behaviors enacted by individuals, but more broadly as a dynamic transaction between individuals, groups, and their sociophysical milieu.

A social ecological conceptualization of health promotion requires explicit analysis of the interplay between environmental resources available in an area and the particular health habits and lifestyles of the people who occupy the area (cf., Lindheim & Syme, 1983).

As a starting point for analyzing the transactions between environmental qualities, behavioral patterns, and health outcomes, it is first necessary to specify features of the environment that promote personal and collective well-being, as measured by several criteria viewed at different levels of analysis. Some suggested dimensions and criteria of health promotive environments are listed in Table 1. The environmental qualities and health criteria summarized in Table 1 offer a preliminary portrait of health promotive environments and reflect certain core assumptions underlying an ecological conceptualization of health promotion.

One important assumption underlying an ecological approach to health promotion is that healthfulness is a multifaceted phenomenon, encompassing physical health, emotional wellbeing, and social cohesion. Accordingly, these different facets of healthfulness are presented in the three rows of Table 1, ranging from individually-oriented assessments of physiological health to organizational and community-level analyses of social cohesion and health status. Explicit recognition of the multiple facets of healthfulness has important implications for environmentallyoriented analyses of health promotion. For instance, because environments can influence personal and collective well-being along several. different "paths", the health promotive capacity of an environment must be defined in terms of the

Environmental Resources and Behavioral Outcomes Facets of Healthfulness		Environmental Resources and Affordances	Behavioral, Psychological, and Physiological Outcomes
	Physical Health	accident-resistant design ergonomically sound design physically comfortable non-toxic & non-pathogenic	physiologic health absence of illness symptoms and injury perceived comfort genetic and reproductive health
Dimensions of Well-being	Mental and Emotional Well-being	environmental controllability and predictability environmental novelty and challenge non-distracting aesthetic qualities symbolic/spiritual elements	sense of personal competence, challenge, and fulfillment developmental growth minimal experience of emotional distress strong sense of personal identity and creativity feelings of attachment to one's physical and social milieu
	Social Cohesion at Organizational and Community Levels	availability of social support networks participatory design and management processes organizational flexibility and responsiveness economic stability low potential for intergroup conflict health promotive media and programming	high levels of social contact and cooperation high levels of commitment to and satisfaction with organization and/or community productivity and innovation at organizational & community levels high levels of perceived quality of life prevalence of health promotive, injury preventive, and environmentally protective behavior

TABLE 1. SOME DIMENSIONS AND CRITERIA OF HEALTH PROMOTIVE ENVIRONMENTS

multiple health outcomes resulting from peopleenvironment transactions over a specified time interval. Thus, for any environmental context of behavior, it becomes important to specify key environmental resources or constraints that are likely to influence personal and collective wellbeing among members of the setting.

The first column in Table 1 lists various environmental resources or "affordances" (Gibson, 1977) that can exert a positive influence on individual and group well-being, from micro-level features of the physical environment (e.g., ergonomicallysound and accident-resistant design; absence of toxic substances) to more molar or composite aspects of the sociophysical milieu (e.g., presence of pro-social environmental symbols, positive social climate, organizational programs and media to encourage health-promotive behaviors). The second column in Table 1 outlines several behavioral, psychological, and physiological indices that can be used to assess health outcomes of people-environment transactions at different levels of analysis (e.g., absence

of physiological disorders and illness symptoms; personal feelings of competence, creativity, and commitment; high levels of job satisfaction and perceived quality of worklife within organizational settings).

By firmly linking the analysis of health promotion to multiple dimensions of the environment and correspondingly diverse indices of health, some important issues for future research and community intervention are raised. First, whereas scientific research on behavior change strategies and environmental protection programs generally have remained separate, the proposed ecological view of health promotion suggests the efficacy of combining these perspectives in the design and management of environmental settings.

For example, environmental designers, facility managers, and urban planners can incorporate a variety of physical features within new or renovated settings to promote healthfulness, including the installation of physical fitness facilities onside or adjacent to the setting, to encourage

health-promotive exercise regimens among occupants of the area; the specification of ergonomically-sound and accident-resistant materials in the design and construction of the setting to reduce occupants' risk of injury; and the avoidance of toxic materials and potential sources of psychosocial stress (e.g., poor lighting and air conditioning systems in buildings; insufficient shielding from noise and other distractions) to minimize environmentally-induced illness and discomfort. Design and programming strategies to enhance the health-promotive capacity of settings should be broadly based, reflecting careful consideration of the diverse resources available within an area, rather than narrowly focused on singular features of the environment (e.g., ergonomics, toxicity, aesthetics, physical comfort, acoustical insulation).

Given the diversity of environmental conditions present in most settings, it is likely that the relationships between those conditions and multiple health indices will be guite varied and sometimes contradictory. For example, the potential health benefits of a well-designed physical environment may go unrealized if the interpersonal or intergroup relationships within a setting are chronically conflicted and stressful. On the other hand, a socially supportive family or organisation may enable setting members to cope more effectively with physical constraints (e.g. high spatial density. aesthetically drab surroundings. resource shortages), thereby avoiding the negative behavioral and health outcomes sometimes associated with those conditions. These examples highlight the importance of examining both physical and social dimensions of health promotive (or health impairing) environments and their joint influence on personal and collective well-being.

Similarly, several experimental studies suggest that when environments are personally controllable and predictable, individuals' physical and emotional well-being are enhanced (cf., Cohen, Evans, Stokols, & Krants, 1986; Glass & Singer, 1972; Sauter, Hurrell, & Cooper, 1989). However, to the extent that environments are too predictable and controllable, they can become so boring and unchallenging that they constrain opportunities for coping creatively with novel situations, thereby impeding developmental growth (cf., Aldwin & Stokols, 1988; Kaplan, 1983: Schaefer & Moos, in press). Thus, the same qualitative dimensions of an environment (e.g., its controllability and predictability) can be associated with contradictory health effects, depending on their magnitude (e.g., moderate vs. excessive levels of predictability) can be associated with contradictory health effects, depending on their magnitude (e.g., moderate vs. excessive levels of predictability) and duration (e.g., chronic vs. short-term exposure to unpredictable or predictable situations).

Just as environmental conditions can vary in their magnitude and duration, health outcome differ on these dimensions as well. For example, carcinogenic substances present in an environment may remain invisible and undetected, yet their cumulative impact on physical health can be disastrous. On the other hand, more salient shortterm encounters with environmental stressors such as uncontrollable noise or periodic crowding may be associated with acute but non-persisting episodes of emotional stress. Therefore, to adequately gauge the health promotive capacity of an environment, it is necessary not only to specify relevant environmental dimensions and health outcomes, but also to differentiate health outcome in terms of their severity, duration, and overall importance to members of the setting. Since many environments produce a mixture of positive and negative health outcomes (some of which are significant and some not), the healthpromotive quality of a setting ultimately depends on its capacity to support those health outcomes that are most desirable and important to its members, while eliminating or ameliorating those that are most clearly negative and detrimental to individual and social well-being.

Determining which health outcomes are of greatest importance to the occupants of a setting is not always a simple matter. Whether an individual or group places greater value on the comforts of a predictable environment or the challenges of coping with a novel one may vary in relation to their age, economic resources, and exploratory tendencies (cf., Stokols, Shumaker, & Martinez, 1982). Also, residents of historically significant areas often give greater priority to the symbolic and psychological benefits of environmental preservation than to the tangible economic gains that would result from neighborhood redevelopment projects (cf., Firey, 1945; 1945; Stokols & Jacobi, 1984). In this case, the symbolic and material benefits associated with the same environmental resources are divergent rather than compatible. Another example of voluntary tradeoffs between alternative environmental arrangements and health benefits is the frequent choice of urban residents to live in a highly desirable neighborhood despite the inconveniences and strains of a long-distance commute between home and work, rather than reside closer to work in a less desirable area (cf., Campbell, 1983; Stokols and Novaco, 1981).

The preceding discussion suggests some of the conceptual and research issues posed by the dimensions and criteria of health promotive environments shown in Table 1. While Table 1 may serve as a useful starting point for ecological analyses of health promotion, it is also limited in some important respects. First, the environmental resources and health outcomes shown in Table 1 reflect an optimality bias in the sense that all of the environmental conditions and criteria of wellbeing are highly positive and desirable. Yet, in actuality, environmental settings are characterised by a mixture of positive and negative environmental circumstances and health outcomes. Thus, an important challenge for environesmentally oriented health promotion researchers is to assess the overall health promotive capacity of an environmental setting based on a cumulative analysis and weighing of its specific features and composite qualities. While human-environment optimization remains an important theme in environment and behavior research (cf., Stokols, 1977, 1978), the realities of "satisfying" (Simon, 1978) and tradeoffs between alternative environmental resources and health benefits comes closer to reality in most environmental settings.

A second important limitation reflected in Table 1 is that it does not specify the particular environmental contexts of an individual's or group's experiences and health outcomes. As such, it does not address the *multiplicity and interrelatedness* of the environmental settings that influence individual and collective well-being. For example, the scale of environmental units relevant to individual and collective well-being ranges from specific stimuli and situations that occur within a

given setting to the more complex life domains that are, themselves, clusters of multiple situations and settings. Situations are sequences of individual or group activities that occur at a particular time and place (cf., Forgas, 1979; Pervin, 1978). Settings are geographical locations in which various personal or interpersonal situations occur on a regular basis (cf., Stokols & Shumaker, 1981; Barker, 1968). Life domains are different spheres of a person's life such as family, education, spiritual activities, recreation, employment, and commuting (cf., Campbell, 1981, Stokols & Novaco, 1981). An even broader unit of contextual analysis is the individual's overall life situation (cf., Magnusson, 1981), consisting of the major life domains in which a person is involved during a particular period of his or her life. The environmental dimensions that are most relevant to individual and collective well-being may vary considerably across these different levels of analysis. Thus, because the environmental resources and health outcomes shown in Table 1 are guite general rather than setting-specific, they do not identify (1) the environment-health relationships that are most relevant at alternate levels of analysis, or (2) the ways in which environmental conditions within multiple settings jointly influence overall health outcomes among individuals and groups.

The potential influence of multiple environmental settings on health outcomes raises an important question regarding the appropriate contextual scope of health promotion research. Just as environmental units can be arrayed along a continuum of scale of complexity, contextual analyses can be compared in terms of their relative scope. The *contextual* scope of research refers to the scale of the contextual units included in the analysis (Stokols, 1987). The spatial scope of an analysis increases to the extent that it represents places, processes, and events occurring within a broad rather than a narrow region of the individual's (or group's) geographical environment. Similarly, the temporal scope of an analysis increases to the extent that it represents places, processes, and events experienced by the individual or group within an extended rather than narrow time frame. Finally, the sociocultural scope of an analysis increases to the extent that it describes behaviorally relevant dimensions of an individual's or group's sociocultural environment. These dimensions of contextual scope suggest that analyses of the health promotive qualities of environments become increasingly complex to the extent that they encompass multiple environmental settings and are broadly drawn with respect to their contextual scope. Thus, *it is important for health promotion researchers to be explicit about the range of settings and time periods encompassed by their analyses and the possible ways in which environmental conditions within multiple settings jointly influence individual and collective health outcomes.*

The environmental resources and health outcomes shown in Table 1 are of narrow contextual scope in the sense that they apply to a single environmental context at a particular point in time. A more environmentally-explicit and temporally broader analysis of environment and health is depicted in Table 2. In Table 2, several health promotion strategies associated with a particular environmental context (i.e., a corporate behavior

setting) are shown. Here, the spatial scope of the analysis is relatively narrow in the sense that a single setting rather than multiple settings is involved, but the temporal scope of analysis is broader than the one shown in Table 1. Specifically, the environmentally-based and organizational strategies of health promotion noted in Table 2 are organized according to two time intervals: (1) the design and construction phase prior to occupancy, and (2) the postoccupancy intervention phase. Table 2 illustrates that the environmental foundations for health promotion (or health impairment) within a particular setting begin to take shape far in advance of occupants' direct involvement with the setting and continue to influence their well-being once they have occupied that environment.

An emphasis on the temporal dimensions of people-environment transactions suggests the importance of defining the health promotive capacity of a setting not only in terms of its imme-

TABLE 2. A SUMMARY OF HEALTH PROMOTION STRATEGIES IN RELATION TO THE PHYSICAL MILIE	U AND
ORGANIZATIONAL PROGRAM OF WORK ENVIRONMENTS	

Temporal Phases of Setting		Temporal Focus of Health Promotion Strategies	
Sociophysica Dimensions of Se	l tting	Pre-occupancy Affordances for Health Promotion	Post-occupancy Interventions to Promote Health
Behavior	Physical Milieu	installation of appropriate heating and ventilation systems installation of appropriate lighting systems installation of noise reduction devices space planning to reduce visual and auditory distractions ergonomic design of work areas installation of environmental monitoring devices	regular assessment of environmental quality data (air quality, noise levels, ventilation, lighting quality, and illumination) regular assessments of individual and aggregated health data retrofit to replace faulty heating, ventilation, lighting and related equipment development of restorative settings for employees
Setting Component	Organizational Program	organizational size, structure, management style as sources of stress financial status of the firm commitment of the firm to health promotion employee health benefits clear versus vague health planning goals	smoking cessation programs hypertension reduction alcohol intake reduction nutrition, weight management fitness, exercise job redesign ride sharing programs

diate impact on occupants' well-being, but also in terms of the potential that exists within the setting for promoting and maintaining improved levels of health over extended time intervals. Just as assessments of individuals health status must take into account current states of well-being as well as the prognosis for future illness or health (Kaplan, 1990), environmentally-based health promotion programs must distinguish between the immediate and potential capacity of a particular setting, organization, or community to promote health among its members.

While Table 2 is useful in broadening the temporal scope of our analysis of health promotion, it does not address the sociocultural factors within environmental settings that influence personal and collective well-being. The sociocultural scope of the analysis shown in both Tables 1 and 2 is narrow in that variables such as socioeconomic status, gender, ethnicity, and cultural norms are not considered. A broader sociocultural analysis of environment and health promotion would involve comparative studies of organizational and community settings that vary across these important social and cultural dimensions.

Several earlier studies indicate that supportive interpersonal relationships can enhance individuals' emotional and physical well-being and reduce the stressful consequences of negative life events (cf., Berkman & Syme, 1979; Cohen & Syme, 1985; Sarason & Sarason, 1985). Moreover, the social-structural qualities of settings may play an important etiologic role in promoting social cohesion, physical and emotional well-being among setting members. For example, extensive efforts have been made to conceptualize and measure the social climate of organizations (Moos, 1976, 1987), and a number of studies have suggested a positive relationship between dimensions of social climate and the mental and physical health of setting members (cf., Holahan & Moos, 1990; Moos, 1979).

An important task for future research is to identify the ways in which social-structural qualities of organizations and communities exert positive or negative effects on occupants' well-being. For example, some organizations may be structured in ways that permit the smooth resolution of interpersonal conflicts when they occur within the setting, whereas others lack the capacity to resolve such tensions when they arise. In the former settings, shared goals among members provide a structural basis for cooperation, even when occasional conflicts develop. Also, such settings are likely to incorporate both informal and formal mechanisms of dispute resolution. In "conflictprone" organizations, however, the positive interdependencies among members are weaker and effective mechanisms of dispute resolution are unavailable (cf., Stokols, in press). Such settings also may be characterised by more rigid ideological orientations that offer less tolerance points of view in the organization. To the extent that organizations promote chronic conflict among setting members, or provide few resources to resolve such conflicts when they arise, they are more likely to impair the emotional and physical well-being of their members.

ECOLOGICALLY ORIENTED APPROACHES TO HEALTH PROMOTION: SOME DIRECTIONS FOR RESEARCH AND PUBLIC POLICY

The present policy of health promotive environments contrasts with the behavioral modification thrust of earlier health research. By focusing on the health promotive capacity of environments, several physical and social features of settings have been identified that are linked to multiple facets of personal and collective well-being (Tables 1 and 2). Also, the joint influence of material and symbolic features of the environment on health was noted. And the importance of selecting criteria of healthfulness that are commensurate with the spatial, temporal, and sociocultural scope of the analysis was emphasized.

The conceptualization of health promotive environments offers a useful counterpoint to the individual-behavioral focus of earlier health promotion research. But a social ecological approach to health promotion encompasses more than the analysis of environmental factors in health and illness. The social ecological perspective requires a broader analysis of the transactions between individual and collective behavior and the various constraints and resources for health that exist within specific sociophysical environments. Thus, it is important at this point in the discussion to extend our analysis of healthy environments toward a more comprehensive, social ecological framework for future health promotion research and community intervention.

The preceding discussion of the health promotive qualities of environments is limited in several respects. First, our analysis has not specified the mechanisms by which social and physical features of the environment influence personal and collective well-being (e.g., by creating stress, imposing, danger, constraining resources). The various pathways of environmental influence on health warrant further elaboration. Second, while focusing on environmental factors, little attention has been given to the important role of individual and collective behavior in health and the dynamic interplay between people's activity patterns and specific features of their sociophysical environment. Third, our analysis to this point has focused on the health promotive qualities of behavior settings and organizational environments, but has given little attention to larger-scale environments such as municipalities and metropolitan regions. Yet, the social ecological perspective encompasses not only micro-environmental contexts of health promotion but also municipal, regional, and international strategies for creating and maintaining healthy environments. Fourth, our analysis of health promotive environments has given little attention to the policy implications of the social ecological perspective on health. The remaining sections of the paper are intended to address these research and policy issues.

Environgenic Processes in Health and Their Linkages with Biological. Psychological, and Behavior Factors

The term, "salutogenesis", has been used by Antonovsky (1979) to refer to etiologic processes that enhance emotional and physical well-being. The salutogenic orientation is distinctive in its focus on the etiology of health, as compared to more traditional pathogenic models that emphasize the development of illness. Antonovsky's research has focused primarily on psychogenic factors in health, especially individuals' "sense of coherence" which enables them to resist the potentially negative health consequences of stressful life events. Construed more broadly, however, the salutogenic perspective encompasses not only psychological resistance resources but also a wide array of biological, behavioral, and environmental processes that reduce vulnerability to illness and promote enhanced levels

Psychobiobehavioral Factors		Sociophysical Environmental Factors			
Biogenetic	Psychological	Behavioral	Geographic	Architectural and Technological	Sociocultural
genetic constitution and biological	personal dispositions:	dictary regimens	climatic and geologic risks (such as	accident-resistant architecture	socioeconomic status of individuals and groups
resources or challenges:	sense of coherence	alcohol consumption	earthquakes, floods, hurricanes, tornados,	non-toxic construction	social support vs. social isolation or
family history of	hardiness	smoking	extremes)	materials in buildings	social conflict; bereavement
illness	optimism	exercise patterns	groundwater	ergonomic design of work areas and other	social climate in families, organizations, and institutions
immunologic competence	self-esteem	sleep patterns	contamination	environmental settings	modeling and conformity processes
		safety practices (e.g.,	radon contamination of	environmental	the base of the schelle for and
reactivity	creativity	belts, bicycle helmets;	SOU	acsinctics	practices
exposure to infectious	health locus of control	safe sexual and pre- natal behaviors)	environmental sources of radioactivity	indoor and outdoor air pollution (e.g., "sick	organizational or political instability
pathogens (e.g., viruses, bacteria)	interpersonal skills	participation in health	ultraviolet radiation	building syndrome")	economic changes (job loss and related
congenital disability	extroversion	promotion programs	atmospheric ozone	effective design of health care facilities	stressful life events)
disabling injuries	coronary-prone	compliance with	depletion	ushiculas and	health communications and media
disabiling injuries	(type A) orientation	regimens	global warming	passenger safety	health promotion programs in
chronological age	cancer-prone (type C) orientation	use of community	health consequences of	noise pollution	organizations and communities (e.g., health education)
developmental stage	depression/anxiety	health services and resources	reduced biodiversity	electromagnetic	health promotive legislation and
gender	hostility/suspiciouspess	health-relevant	restorative potential of wilderness and other	radiation	building codes
		decisions and actions made on behalf of	natural environments	water quality and treatment systems	environmentally protective regulations
		others		solid waste treatment	availability of health insurance and
				and sanitation systems	continuinty nearer services

TABLE 3. PERSONAL AND ENVIRONMENTAL FACTORS IN HEALTH AND ILLNESS

of well-being.

Several categories of personal and environmental factors that play either an etiologic or moderating role in human health are shown in Table 3. The personal factors include a variety of biogenetic, psychological, and behavioral processes that promote or undermine well-being. The environmental factors include several facets of the sociophysical environment such as geographic, architectural/technological, and sociocultural processes that influence health. Thus, both natural and human-made features of the physical environment are included, as are multiple dimensions of the sociocultural milieu (e.g., socialstructural, cultural, economic, legal, and political processes).

Much research in the field of health psychology has focused on the direct links between specific dispositional factors and personal health. For example several studies indicate the close relationship between personal orientations such as hostility, optimism, sense of coherence, personal hardiness, coping efficacy, and individual well-Antonovsky, being (cf., 1979, Barefoot. Dahlstrom, & Williams, 1983; Friedman, 1990; Kobasa, Maddi, & Kahn, 1982; Scheier & Carver, 1985; Taylor & Brown, 1988; Watson & Pennebaker, 1989). Other researchers, working from a "biopsychosocial" model of health xfc(cf., Engel, 1976; Schwarts, 1982), have examined the interplay between psychological dispositions, interpersonal behavior, and physiological processes underlying health and illness. Examples of this research include recent studies of the psychophysiological underpinnings of the coronary-prone and cancer-prone behavior patterns (cf., Krantz, Lundberg, & Frankenhaueser, 1987; Temoshok, 1985) and the links between personal dispositions, social behavior, and susceptibility to infectious disease (cf., Cohen & Williamson, 1991).

What has been omitted from much earlier research on psychological and behavioral factors in health are structural features of the sociophysical environment that affect individual and collective well-being, either directly or interactively in conjunction with psychobiobehavioral factors. These *environgenic* processes in health and illness subsume geographic, architectural, and technological features of the physical environment, as well as *sociogenic* qualities of the social and cultural environment that influence the etiology of health and illness.

An important direction for future research on the environmental dimensions of health promotion is to identify the specific mechanisms by which geographic, architectural/technological, and sociocultural factors influence health and illness. For example, five health-related functions of the sociophysical environment are outlined in Table 4. First, both the physical and social environment can function as a medium for disease transmission, as exemplified by the occurrence of waterborne and airborne diseases, illnesses resulting from food contamination, and the spread of contagious disease through interpersonal contact. Second, the environment can operate as a stressor, evidenced by the emotional stress and physical debilitation resulting from chronic exposure to uncontrollable environmental demands such as noise, abrupt economic change, or interpersonal conflict (cf., Dooley & Catalano, 1984; Rook, 1984; Cohen et al., 1986). Third, the environment functions as a source of safety or danger as reflected in the health consequences of natural and technological disasters, air and water pollution, occupational hazards, interpersonal violence and crime (cf., Baum, Fleming & Davidson, 1983; Edelstein, 1988; Greenberg, 1987; Makower, 1981; Mendell & Smith, 1990). Fourth, the environment can be viewed as an enabler of health behavior, exemplified by the installation of safety devices in buildings and vehicles, geographic proximity to health care facilities, and exposure to interpersonal modeling or cultural practices that foster health promotive behavior. Fifth, the environment serves as a provider of health resources such as high-quality community sanitation systems, organizational and community health services, and legislation that protects the quality of physical environments and ensures citizens' access to health insurance and community-based health care. These health-relevant functions of the sociophysical environments are closely intertwined and can operate concurrently within specific environmental contexts (e.g., high rates of crime in a neighborhood may generate inperceptions creased of physical danger. physiological symptoms of chronic stress, and reduce utilization of community health services

	Environmental Dimensions	Dimensions of the Environment	
Environmenta Function	1	Physical Environment	Social Environment
	Environment as Medium of Disease	waterborne and airborne disease microbial contamination of food	spread of contagious disease through interpersonal contact
	Environment as Stressor	negative affective states resulting from exposure to physical stressors such as uncontrollable noise and technological risks negative health consequences of residential relocation	vulnerability to health problems resulting from chronic social conflict, isolation, organizational instability, and/or abrupt economic change
Health-Related Functions of the Sociophysical	Environment as Source of Safety or Danger	exposure to climatic and geologic risks accident-resistant environmental design mutagenic effects of toxic environments occupational hazards	risk of personal injury resulting from intergroup conflict, violence, and crime
Environment	Environment as Enabler of Health Behavior	geographic accessibility of health care facilities in the community installation of health behavioral supports in buildings and vehicles (e.g., smoke detectors, seat belts)	interpersonal modeling of health- promotive behavior and safety practices health-promotive cultural and religious practices
	Environment as Provider of Health Resources	healthful lighting and air quality in buildings community sanitation systems	legislation pertaining to public health and safety availability of organizational and community health services

TABLE 4. ENVIROGENIC PROCESSES IN HEALTH AND ILLNESS

among residents of the area; cf., Taylor, 1987).

Another important challenge for future social ecological research is to develop integrated models that address the joint influence of personal and environmental factors in health promotion and disease etiology. Some specific issues for future study suggested by the categories of variables shown in Table 3 are: (1) the disproportionate occurrence of negative health effects resulting from exposure to geographic, architectural, and technological hazards among low socioeconomic-status groups (cf., Lindheim & Syme, 1983; Seifert & Vaughan, 1991, Syme, & Berkman, 1976); (2) the relationship between individuals' age, gender, developmental stage, and their increased vulnerability to certain categories of environmental health threats (e.g., fatalities resulting from exposure to unsafe environmental conditions among children: illness outcomes of motor vehicle accidents, alcohol and drug abuse among adolescents and young adults; fatalities from the complications of falls among older adults); (3) the psychosocial underpinnings of high-risk behaviors (e.g., smoking, unsafe sexual practices, overexposure to ultraviolet radiation, failure to use vehicular seat belts) that predispose certain groups in the population to higher rates of environmentally-induced illness and injury (cf., Christopherson, 1989; Jeffery, 1989; Keesling & Friedman, 1987; Robertson, 1987; Weinstein, 1987); and (4) the ways in which psychological dispositions and sociophysical stressors interact to affect emotional and physical well-being (cf., Cohen & Edwards, 1989; Cottington & House, 1987; Evans, Johansson, & Carrere, 1990).

The social ecological view of health promotion has important implications not only for theory development and basic research, but also for public policy, community intervention, and program evaluation. We turn now to a consideration of these policy-related concerns.

Municipal, Regional and International Contexts for Health Promotion.

The environmental and personal factors in health

Focus of Health Prom	otive Interventions	Examples of Health Promotive Policies and Programs
	Biogenetic Factors	preventive public health programs for risk screening, genetic counseling, inoculation medical treatment regimens (e.g., medication, surgery)
Person-Focused	Psychological Factors	individual counseling and psychotherapeutic interventions
	Behavioral Factors	health behavior modification (lifestyle appraisal and modification pertaining to diet, exercise, smoking, safety practices)
	Geographic Factors	health and safety-oriented urban planning (e.g., site planning to reduce toxic or seismic hazards) land use policy and environmental law at municipal, regional and international levels (e.g., NEPA, CEQA) strategic siting of health care facilities in the community
Environment- Focused	Architectural/ Technological Factors	ergonomic and safety-oriented environmental design and facilities management design of safe and health-promotive products (e.g., passenger constraints in automobiles) community sanitation systems (water treatment, air filtration)
	Sociocultural Factors	organizational development and conflict resolution corporate health promotion programs community health education and media programming health-promotive legislation (e.g., regulation of health-damaging industries; health insurance and delivery of health services) and building codes

TABLE 5. POLICY OPTIONS FOR HEALTH PROMOTION AND ILLNESS PREVENTI	I PROMOTION AND ILLNESS PREVENTION
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and illness, summarized above, offer several leverage points for health promotive policies and community interventions at urban, regional, and international levels. Examples of these environmental design and public policy options for health promotion are summarized in Table 5, in relation to various categories of etiologic factors (i.e., psychobiobehavioral factors and sociophysical features of the environment). Whereas the major emphasis of earlier health promotion research was on person-focused interventions, the social ecological perspective emphasizes the integration of person-focused and environmentfocused strategies to enhance individual and collective well-being.

Health promotive policies and interventions can be arrayed along a continuum ranging from micro-environmental settings (eg., corporate or institutional facilities) to more molar environmental contexts (e.g., metropolitan and international regions): Each level of analysis poses opportunities for integrating person-focused and environment-focused interventions for health enhancement. For example, Table 2 which pertains to corporate behavior settings suggests the potential value of combining health promotive facility design and management strategies (e.g., specification of non-toxic furnishings, ergonomic and accident-resistant design) with organizational programs to enhance employees' health benefits and lifestyles. And at the community level, health promotive urban design and planning strategies (e.g., to ensure geographic accessibility of health care settings and appropriate siting of buildings away from toxic or seismic hazards) can be implemented in conjunction with effective sanitation systems and other health services (e.g., public education and risk-screening programs) to enhance the healthfulness of urban environments.

Because local and more distant environments are linked (both spatially and organizationally) within nested hierarchical systems (e.g., specific behavior settings exist as components of broader institutional, urban, and regional contexts) and are becoming increasingly interdependent due to global technological and social changes, opportunities for designing health promotive environments at local levels will be more and more

influenced by the regulatory and economic policies implemented within municipal, regional, and international contexts. Thus, an architect or facility planner working on the design of a corporate facility, neighborhood playground, apartment complex, hospital, or residential facility for the elderly will need to have knowledge of several disciplines including environmental law (e.g., the regulations intended to mitigate negative impacts proposed environmental developments), of lifespan human development (e.g., the specialized health and safety needs of different age groups), ergonomics and public health (e.g., the potential health consequences of poorly designed, toxic, or accident-prone environments). Thus, in response to the complex health challenges of the 1990s and beyond, there will be a growing need to develop broad-based, interdisciplinary graduate training programs for aspiring environmental designers, facility managers, urban planners, and public health professionals.

Among the topics that are likely to become more prominent in training programs for environmental planners and public health researchers are the legislative and economic strategies that have been initiated in recent years to protect environmental quality and public health. Commenting on the powerful impact of legislative interventions to enhance public health, McKinlay (1975) noted:

> "One stroke of effective health legislation is equal to many separate health intervention endeavors and cumulative efforts the of innumerable health workers over long periods of time... Greater changes will result from the continued politicization of illness than from the modification of specific individual behaviors. There are many opportunities for a reduction of at-riskness, and we ought to seize them (p. 13)".

One health promotive strategy that has been widely used at national, state, and local levels is the enactment of legislation designed to protect natural resources and the quality of public environments. Examples of environmentally protec-

tive legislation undertaken at national levels include the 1969 National Environmental Policy Act in the United States and the 1971 Town and Country Planning Act in Great Britain. NEPA, instituted by the U.S. Congress, requires all federal agencies to prepare detailed written statements about the possible negative impacts that could result from any of their actions relating to the environment, and proposed strategies for avoiding or mitigating those outcomes. The California Environmental Quality Act (CEQA) is one of several state analogues of NEPA that has been implemented in the U.S. over the past 20 years. Today about half of the states in the U.S. have emulated the NEPA process, and environmental impact assessment is now an established legal process in several nations (e.g., Australia, Canada, the European Community and Great Britain; cf., CEQA, 1986; Robinson, 1990).

Whereas environmental impact assessment regulations are intended to protect public health as well as environmental quality, the relevant legislative statements are typically left vague and open-ended with regard to alternative criteria for gauging emotional, physical, and social wellbeing, and the kinds of environmental impacts on public health that are viewed as most detrimental. For example, the CEQA legislation is intended to preclude those impacts of a proposed project that "will cause substantial adverse effects on human beings, either directly or indirectly (p. 26)". This wording leaves open to interpretation the question of which environmental effects on wellbeing are most serious (e.g., biogenetic, psychological, sociocultural) and the extent to which proposed mitigation strategies will effectively reduce those risks. Clearly, the health promotive value CEQA and related regulations depends on the extent to which community decision-makers and environmental professionals are knowledgeable about etiologic processes underlying short-term and cumulative health outcomes, and the degree to which proposed mitigation measures (e.g., person-focused and environment-focused interventions to avoid illness or injury) are scientifically valid and effective once they are implemented.

Unfortunately, the actual impacts of environmentally-protective legislation on public health have not been assessed through evaluation studies. It

is difficult to test the health consequences of environmental legislation at state and national levels because control communities in which similar legislation has not been enacted are not easily identified or readily available for comparative study. Thus, the design and enforcement of environmental regulations are based almost exclusively on prior scientific evidence concerning the links between particular environmental factors and health outcomes rather than on post-intervention evaluation research. Nonetheless, there are a number of ways in which the scientific validity and public health value of environmental legislation can be enhanced. These include the incorporation of environmental simulation procedures into the regulatory process to estimate the possible health effects of proposed changes in the physical environment before those changes are actually implemented (cf., Catalano & Arenstein, in press); and the development of prospective evaluation studies to assess the health impacts of environmental legislation enacted within a particular community, even in instances where comparable control communities can not be identified (cf., Campbell, 1969).

International efforts directed toward environmental protection and health promotion also have increased substantially in recent years. Growing public concern over global environmental problems has stimulated greater international collaboration in economic and legal matters (cf., World Commission on Environment and Development, 1987). Recent examples of inter-city and cross-national cooperation in health promotion include the World Health Organizations's Healthy Cities Project (cf., Ashton, Grey, & Barnard, 1986; Hancock and Duhl, 1985; WHO, 1984) and the Municipal Foreign Policy Movement (cf., Agran, 1989, Shuman, 1986). As part of the Healthy Cities Project, public health professionals from several different countries have worked together in developing and implementing intersectoral city health plans. In support of these collaborative efforts, WHO staff provide technical assistance and resource materials to the participating cities. One product of this collaboration is an European television series on the healthy city. An important defining attribute of healthy cities is that they continually create and improve physical and social environments conducive to the health of their residents (Hancock & Duhl, 1986). At least 14

criteria for assessing the healthfulness of a city have been proposed, including epidemiologic indices of illness and mortality, levels of public safety, quality of the physical and social environment, quality of public health services, the degree of intersectoral collaboration in developing health polices, and the state of the local economy including unemployment levels. These criteria provide a broad framework for establishing coordinated public health plans and objectives among the participating cities.

The Municipal Foreign Policy Movement has provided a similar forum for inter-city cooperation in the development of health promotive and environmentally protective legislation. Several of the municipalities that have participated in this program have implemented city-wide regulations aimed at protecting the earth's ozone layer (e.g., the Vienna Convention for the Protection of the Ozone Layer: The Montreal Protocol on Substances that Deplete the Ozone Layer; the City of Irvine Ordinance on Chlorofluorocarbons). To date, 58 countries including the European Community have ratified the Vienna Convention for the Protection of the Ozone Layer (cf., World Resources Institute, 1991). Earlier examples of international agreements that have been undertaken to protect global environmental resources and public health are the Nuclear Test Ban of 1963, the Ocean Dumping Act of 1972, the Endangered Species Act of 1973, and the World Charter of Nature of 1982 (Robinson, 1990).

A central concept that will guide future environmental and health promotive legislation is the notion of sustainable development. According to Robinson (1990), sustainable development is "the emerging cluster of policies by which we manage the use of the Earth's environment and natural resources to ensure the optimal level of sustainable benefits for present and succeeding generations (p. 16)". Growing concern about the sustainability of global resources highlights the crucial importance of public health forecasting, environmental simulation strategies, and the temporal dimensions of health promotion (see Table 2). Now more than ever, individually-focused and environmentally-focused efforts to enhance human health must anticipate the cumulative consequences of seemingly remote processes and distant events--for example: (1) the potential exacerbation of health problems among the elderly by elevated temperatures associated with global warming; (2) increased prevalence of cutaneous melanoma and other diseases resulting from global ozone depletion and heightened exposure to ultraviolet radiation; (3) the biogenetic consequences of exposure to toxic by products of modern technologies; (4) the implications of reduced ecosystem biodiversity for human health and medical treatment and research programs; and (5) the ever-present threat of global nuclear war and the health consequences of nuclear weapons testing.

Amidst these somber projections of public health problems and challenges for the 21st Century, the earlier-cited examples of municipal and international cooperation toward health promotion and environmental protection are impressive in their scope and offer a basis for optimism about the willingness of governments to work collaboratively to promote world health. The collaborative international efforts to protect the global environment and promote the well-being of the world's population give new meaning to the concept of "health behavior". Future health promotion programs must influence not only the behaviors of individuals that enhance or undermine their own well-being, but also the decisions they make and the actions they take on behalf of others-ranging from small groups to urban populations-their roles as environmental designers, in corporate executives, and community leaders.

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COMMENTS ON THE KEYNOTE ADDRESS OF DR. DANIEL STOKOLS

Comments of Serafín Mercado, School of Psychology, National University of Mexico

Dr. Stokols' keynote address was, as usual, very impressive. I think he has done a paramount analysis of the problem of healthy environment promotion, taking an interdisciplinary stand, and making a very solid proposal of a model of the relationships between behavior, social environment, physical environment and health, that deduces a set of practical implications about the organisation of research on the domain of interest, and establishes an important and, in many ways, creative set of research problems.

I think that by stressing the fact that health is not only a biological or a behavioral problem, but also a group, environmental, and a societal problem, he sets the stage for a less short-sighted approach to health promotion than has been the rule up to now.

I find it very interesting that legal issues are brought up as a subject of proper behavioral research, as legislation is sometimes considered as the societal way of behavior modification, without a sound evaluation of its impact, and not even making a serious analysis of the processes underlying law abeyance and influence. However, things may go very wrong if the situation and the processes that set some undesirable behavior are not fully understood and aimed at by the legal development.

As an example, in Mexico City, legislation was passed that established a program called "ONE DAY WITHOUT CAR". This program divided car license plates into five groups. Car plates in each one of the groups couldn't circulate on a specific day of the week. People had to abide. But, the needs that impelled people to use cars were not considered, the legislation failed its intent. This year has been the worst in Mexico City, in terms of air pollution. Even before the legislation was set up, car numbers increased twice as fast as city population. But when it came about, people that could afford it, began buying more cars than ever, to replace the one, that could not be used. Few could do that, but the ones that could, did and there was a significant addition to the problem. The legislation did not take into account that the cause of Mexico City's car boom is the terrible transportation system and the incredible risk of being a pedestrian. They didn't consider the central issue which is the immigration of people to the metropolis, due to factors related to differences in life quality in the big city and the countryside, which was what produced the car increase. Any given measures taken, could only have temporary effects, which very soon would have been superceded by population growth and the concomitant car number increase.

I find one concept in his paper somewhat incongruous, perhaps because we come from different theoretical traditions. I can conceive separate behavioral and psychological settings as truly different.

From my point of view, behavior is just the motor part of cognition, not subject to substantially different laws or principles, and the analysis of behavior is more fruitful when you unravel the level of processing underlying it, than when you try to posit "psychological processes" as something separate from behavior. Any process, be it personal dispositions, sense of coherence, locus of control, or whatsoever, has meaning if it explains behavior. Separating them is as if a chemist would postulate chemical reactions as something basically different from atomic structure and dynamics.

I think this paper will have a terrific impact on the development of both environmental design research and health psychology. However, I feel that much has to be done in terms of bringing the proposal to a workable level. It has to be unraveled down to a level of concepts that are clear-cut and functional enough, so as to allow the development of specific research proposals and models.

Comments of Stephan Klein

Dan, your paper has inspired some ideas. I would like to comment on them; then pose a question which, hopefully, will inspire further discussion.

Your paper covered many points. Your raised issues of global crisis; you provided a detailed conceptualization of health promotive environments; you outlined numerous directions for research and policy in this area; you pointed to the need for a social/ecological framework for addressing issues of environment and health. Clearly, you've addressed the conference theme, "Healthy Environments". And, certainly, the conference theme is a noble one to which we all can, and should, subscribe. Everyone wants healthy environments-no one would profess the opposite.

So a question arises: why don't we have generally healthy environments? Why is our world getting sicker instead of better?

It seems to me that the answer is not limited to the need for better conceptualizations of dimensions and criteria for health promotive environments, nor in the understanding of the personal and environmental factors in health and illness. The answer also lies in other directions that I would like to briefly explore.

When I think about the criteria for a more health promotive physical world, I see issues complicated by conflict, greed, unequal power, and domination. Thus, many environments that are healthy for some are unhealthy for others: for example, public spaces that are unsafe for women, gay people, the elderly, children, or people of color. Yusef Hawkins, an African-American youth tragically found out that some environments are unsafe when he entered an exclusively white neighborhood in Bensonhurst, New York, to buy a used car. He was killed by a band of local youths.

I also see that some environments are healthy for some people because unhealthy environments support them. For example, the United States' economy and high standard of living is sustained in part by international labor at low rates in factories such as the maquiladoras of United States' companies that have located over the Mexican border. Mexicans work in the maquiladoras for wages that bind them to poverty. They live in cardboard shacks surrounding factories whose poisonous wastes contaminate the rivers and earth, and, unfortunately, the drinking supply of maquiladora workers. Indeed, part of the appeal for locating in Mexico is that North American companies avoid costly environmental protection legislation at home.

I see that access to healthy environments becomes a function of power, status, or wealth. I remember an example from the conference you hosted at the University of California. Irvine in 1983 titled, "The Design of Work Environments: Implications for Health and Productivity". You will probably recall a speech made by Gerald Sinykin, company doctor for Flour Corporation. He proudly described an executive wellness center (a corporate health club and stress reduction center) as "a preventive maintenance program for a rather expensive piece of human machinery". Of course, lower, clerical level workers had no access to such a facility. Had they been allowed to use it, they could not take time off during work hours; their long commutes, as described by you and Raymond Novaco, precluded its use after work hours. Two large epidemiological studies at Columbia University and in Sweden have demonstrated that low level clerical workers suffer the most from stress related illness, particularly coronary heart disease. It is a myth that high rates of heart attacks are associated with high level jobs. These and other studies show that the rate of heart attacks correlated positively with jobs that had high demands and low control, the characteristics of clerical but not executive level office jobs.

Comments of Maria Montero, School of Psychology, National University of Mexico

As we already know, scientific work is fundamentally supported by observation. Furthermore, Pasteur used to say, regarding this fact that "In the field of observation, chance helps the prepared mind". I consider that there isn't a better analogy for describing Dr. Stokols' participation.

Dr. Stokols has shown his analytic-synthetic capacity since 1973, when he clarified the difference between crowding and density, enriching the research field in Environmental Psychology in 1978 with the concept of "optimization", and later, he talked about the scope and limitations of the contextualistic approach as a research strategy in Environmental Psychology (Stokols, 1987). Nowadays, he is contributing to the field with a conceptual organizational scheme from which crucial research related to health and environment can be generated.

In this respect a fundamental term in the conceptual development of Dr. Stokols could be taken to explore which aspects from a bio-psycho-social-cultural context facilitate healthy environment optimization in specific populations like children, senior citizens and handicapped persons. That would be especially important in developing countries because health problems increase as a function of the hard social, economic and political conditions that prevail in these countries.

In Mexico, few studies have been made that assess the factors identified by Dr. Stokols in an integral way. In this sense, the work done by Dr. Diaz-Guerrero is important because it shows that the factor that best forecast the quality of life in a sample of Mexican-American housewives was the one associated with psychological aspects, explaining a greater amount of the variance than those aspects related to the economic infrastructure. This illustrates the influence that aspects of social interaction as a basis for the conceptualization of quality of life in Mexican culture.

It is clear that, especially in Latin American countries, the contributions of psychology in general and environmental psychology in particular will be fundamental for deriving norms, policies and actions which will generate a culture regarding health. All of which, more than representing an opportunity for professional growth, means a challenge of social commitment.

In summary, the contribution that Dr. Stokols gave us is his useful organizational scheme that allows us to visualize the different factors related to health promotion. The compromise of those who are involved in Environmental Psychology is to continue with the effort of deriving theories, models and intervention programs to promote environmental health at different levels and to cover a wider population.