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Published on: 01 Jan 1992 - American Psychologist (American Psychological Association)

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Journal

The American psychologist, 47(1)

ISSN

0003-066X

Author

Stokols, D

Publication Date

1992

DOI

10.1037//0003-066x.47.1.6

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Establishing and Maintaining Healthy Environments

Toward a Social Ecology of Health Promotion

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Earlier research on health promotion has emphasized behavior change strategies rather than environmentally focused interventions. The advantages of integrating lifestyle modification, injury control, and environmental enhancement strategies of health promotion are substantial. The author offers a social ecological analysis of health promotive environments, emphasizing the transactions between individual or collective behavior and the health resources and constraints that exist in specific environmental settings. Directions for future research on the creation and maintenance of health promotive environments also are examined.

We live in an era 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 many regions of the world continue to be plagued by war, millions of people in the Third World are ravaged by disease and famine, and people in industrialized nations are becoming painfully aware of the health costs resulting from their exposure to environmental pollution and other by-products of high technology.

These global dilemmas make the tasks of creating and maintaining healthy environments seem rather daunting and perhaps unachievable. Nonetheless, it is important that 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. The "small wins" approach to social problems (Weick, 1984) suggests that as incremental health promotion and environmental protection efforts are adopted in local communities, they can exert a positive, albeit gradual, influence on the quality and healthfulness of the global environment.

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

For example, *health* is often defined in individualistic and physical terms with explicit emphasis on "soundness

of body or mind and freedom from disease or ailment" (Webster's *Encyclopedic Unabridged Dictionary*, 1989, p. 653). 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 sense of community; S. B. Sarason, 1974) and optimal states of wellness (e.g., strong feelings of personal commitment to one's social and physical milieu). The terms *disease prevention* and *health protection* have been used to describe various medical and public health strategies aimed at preventing the onset of physical and mental illness (e.g., inoculation against infectious diseases, enhanced community sanitation services, reduction of workplace hazards, and governmental regulation of food and drug safety). The concept of *health promotion*, however, differs from the disease prevention orientation in that it places greater emphasis on the role of individuals, groups, and organizations as active agents in shaping health practices and policies to optimize both individual wellness and collective well-being (e.g., U.S. Department of Health, Education, and Welfare [HEW], 1979; U.S. Department of Health and Human Services [DHHS], 1991; Williams, 1982; Winett, King, & Altman, 1989; World Health Organization [WHO], 1984).

The majority of health promotion programs implemented in corporate and community settings have been focused on individuals rather than environments. That is, they have been designed to modify individuals' health habits and life-styles (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 venti-

E. Scott Geller served as action editor for this article.

Preparation of this article was supported by grants from the University of California/Health Net Wellness Lectures Program and the Irvine Health Foundation. Portions of the article were presented as a keynote address on "Designing Health Promotive Environments" at the Annual Conference of the Environmental Design Research Association in Oaxtepec, Mexico, March 1991, and as part of the University of California/Health Net Lecture Series during October 1991.

The author thanks Gary Evans, E. Scott Geller, Stephan Klein, Peter Lallas, Serafin Mercado, Maria Montero, Ted Scharf, Margaret Schneider, Kim Witte, and three anonymous reviewers for their valuable comments on earlier versions of the manuscript.

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lation systems to enhance indoor air quality, design of safe stairways to reduce falls and injuries, and provision of physical fitness facilities at the workplace). Much recent research suggests the potential value of environmental interventions as an adjunct to behaviorally oriented health promotion programs (e.g., Archea, 1985; Archea & Connell, 1986; Green & Kreuter, 1990; Greenberg, 1986; Hedge, 1989; Karasek & Theorell, 1990; Lawrence, 1990; Mendell & Smith, 1990; Robertson, 1986; Syme, 1990; Williams, 1982; Winett et al., 1989).

A major goal of this article is to develop an ecological analysis of health promotion, focusing particularly on the conceptualization of *health-promotive environments*. The analysis of health promotion from an ecological perspective is grounded in a contextually oriented view of human health and well-being (Moos, 1979; Stokols, 1987). Although an ecological perspective is beginning to emerge in health-promotion research, with particular emphasis on linking individually focused, small-group, organizational, and community approaches to health promotion (e.g., McLeroy, Bibeau, Steckler, & Glanz, 1988; Weiss, 1991; Winett et al., 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 emphasis here is on developing a more environmentally explicit version of the ecological approach to health promotion.

A second goal of this article 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 well-being at organizational, municipal, regional, and international levels.

Social Ecology of Health Promotion: Core Assumptions

The term *ecology* pertains broadly to the interrelations between organisms and their environments (Hawley, 1950). From its early roots in biology, the ecological paradigm has evolved in several disciplines (e.g., sociology, psychology, economics, and public health) to provide a general framework for understanding the nature of people's transactions with their physical and sociocultural surroundings (e.g., Barker, 1968; Cassel, 1964; Catalano, 1979; Park & Burgess, 1925; Rogers-Warren & Warren, 1977). The field of social ecology gives greater attention to the social, institutional, and cultural contexts of people-environment relations than did earlier versions of human ecology, which were more closely oriented to biological processes and the geographic environment (e.g., Alihan, 1964; Binder, Stokols, & Catalano, 1975; Michelson, 1970). The social ecological perspective encompasses certain core assumptions about the dynamics of human health and the development of effective strategies

to promote personal and collective well-being. These assumptions are outlined below.

First, the healthfulness of a situation and the well-being of its participants are assumed to be influenced by multiple facets of both the physical environment (e.g., geography, architecture, and technology) and the social environment (e.g., culture, economics, and politics). Moreover, the health status of individuals and groups is influenced not only by environmental factors but also by a variety of personal attributes, including genetic heritage, psychological dispositions, and behavioral patterns. Thus, efforts to promote human well-being should be based on an understanding of the dynamic interplay among diverse environmental and personal factors, rather than on analyses that focus exclusively on environmental, biological, or behavioral factors.

Second, analyses of health and health promotion should address the multidimensional and complex nature of human environments. Environments can be described in terms of their physical and social components, but they also can be characterized in terms of their objective (actual) or subjective (perceived) qualities, and their scale or immediacy to individuals and groups (proximal vs. distal). Furthermore, environments can be described as an array of independent attributes (e.g., lighting, temperature, noise, space arrangement, and group size) or in terms of the composite relationships among several features, as exemplified by such constructs as behavior settings, person-environment fit, and social climate (Stokols, 1987). The highly variegated nature of human environments has direct implications for the design and evaluation of health-promotion programs, as will be discussed in subsequent sections of this article.

Third, just as environments can be described in terms of their relative scale and complexity, the participants in those environments can be studied at varying levels ranging from individuals, small groups, and organizations to larger aggregates and populations. Rather than focusing solely on individuals or aggregates, the social-ecological perspective incorporates multiple levels of analysis and diverse methodologies (e.g., medical examinations, questionnaires, behavioral observations, environmental recordings, and epidemiologic analyses) for assessing the healthfulness of settings and the well-being of individuals and groups. Moreover, the social ecological perspective assumes that the effectiveness of health-promotion programs can be enhanced significantly through the coordination of individuals and groups acting at different levels, such as family members who make efforts to improve their health practices, corporate managers who shape organizational health policies, and public health officials who supervise community health services (e.g., Green & Kreuter, 1990; Pelletier, 1984; Winett et al., 1989).

Fourth, the social-ecological perspective incorporates a variety of concepts derived from systems theory (e.g., interdependence, homeostasis, negative feedback, and deviation amplification; see Cannon, 1932; Emery & Trist, 1972; Katz & Kahn, 1966; Maruyama, 1963) to

understand the dynamic interrelations between people and their environments. Thus, people-environment transactions are characterized by cycles of mutual influence, whereby the physical and social features of settings directly influence their occupants' health and, concurrently, the participants in settings modify the healthfulness of their surroundings through their individual and collective actions. The various levels of human environments are viewed as complex systems in which local settings and organizations are nested in more complex and remote regions. Accordingly, efforts to promote human well-being must take into account the interdependencies that exist among immediate and more distant environments. For instance, the occupational health and safety of community work settings are directly influenced by state and national ordinances aimed at protecting environmental quality and public health.

Because of the complexity of human environments and an explicit emphasis on multilevel and multimethod analyses of behavior, the social-ecological perspective is inherently interdisciplinary in its approach to health research and the development of health-promotion programs. The ecological perspective draws on the fields of medicine and public health as well as the behavioral and social sciences in the study and promotion of human well-being. Specifically, social-ecological approaches link the communitywide, preventive strategies and epidemiologic orientation of public health with the individual-level therapeutic and curative strategies of medicine. At the same time, the ecological perspective incorporates the behavioral and social sciences' emphases on (a) the active role played by individuals and groups in modifying their own health behavior and well-being, (b) the development and testing of theoretical models describing people-environment transactions, and (c) the importance of conducting evaluative studies to assess the cost-effectiveness and social effects of health-promotion programs (e.g., Cassel, 1964; Engel, 1976; R. I. Evans, 1988; Henderson & Scutchfield, 1989; Schwartz, 1982; Williams, 1982; Winett et al., 1989).

In the following sections of this article I elaborate on the social-ecological approach to health promotion. First, the multiple dimensions of environments and the ways in which they are related to individual and collective well-being are discussed. Next, the interactions among several categories of environmental and personal determinants of health are considered. Finally, a wide range of community intervention and public policy strategies for promoting individual and collective well-being are considered, including environmental and behavioral programming and legislative initiatives at local, regional, national, and international levels. The present discussion gives greater attention to environmental dimensions of health promotion, primarily because these issues have received less emphasis in psychological research on health than have biobehavioral and dispositional factors. Despite the differential emphasis on environmental issues in this article, the social-ecological perspective assumes that the effectiveness of health-promotion efforts can be enhanced

through multilevel intervention packages (Geller, 1987; Weiss, 1991; Williams, 1982; Winett et al., 1989) that combine both behavioral and environmental modification strategies. An important issue in this regard is the specification of social, political, and economic criteria for selecting alternative behavioral and environmental strategies of health promotion. This issue is discussed in a later section of the article.

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 (e.g., Belloc & Breslow, 1972; Cataldo & Coates, 1986; Green, 1984; O'Donnell & Ainsworth, 1984). Examples of health-promotive behaviors are maintaining a high-fiber-low-fat diet, engaging in regular aerobic exercise, using vehicle safety belts, 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 of individuals, but more broadly as a dynamic transaction between individuals and groups and their sociophysical milieu. The social-ecological approach to health promotion requires explicit analysis of the interplay between the environmental resources available in an area and the particular health habits and life-styles of the people who occupy the area (Lindheim & Syme, 1983).

As a starting point for analyzing 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 some of the assumptions associated with the ecological perspective on health promotion.

A basic assumption underlying the ecological perspective is that healthfulness is a multifaceted phenomenon encompassing physical health, emotional well-being, 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 ecologically oriented 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 multiple health outcomes resulting from people-environment transactions over a specified time interval. Thus, for any environmental context of behavior, it is important to

Table 1
Some Dimensions and Criteria of Health-Promotive Environments

Facets of healthfulness	Environmental resources	Behavioral, psychological, and physiological outcomes
Physical health	Injury-resistant design; ergonomically sound design; physical comfort, nontoxic & nonpathogenic environment	Physiologic health; absence of illness symptoms and injury; perceived comfort; genetic and reproductive health
Mental & emotional well-being	Environmental controllability & predictability; environmental novelty & challenge; low distraction; aesthetic qualities; symbolic & spiritual elements	Sense of personal competence, challenge, & fulfillment; developmental growth; minimal experience of emotional distress; strong sense of personal identity & creativity; feelings of attachment to one's physical & social milieu
Social cohesion at organizational & community levels	Availability of social support networks; participatory design & management processes; organizational flexibility & responsiveness; economic stability; low potential for intergroup conflict; health-promotive media & programming	High levels of social contact and cooperation; commitment to & satisfaction with organization & community; productivity and innovation at organizational & community levels; high levels of perceived quality of life; prevalence of health-promotive, injury-preventive, & environmentally protective behavior

specify key environmental resources or constraints that are likely to influence personal and collective well-being among members of the setting.

Table 1 lists various environmental resources that can exert a positive influence on individual and group well-being, from microlevel features of the physical environment to more composite aspects of the sociophysical milieu. Table 1 also includes several behavioral, psychological, and physiological indices that can be used to assess health outcomes of people-environment transactions at different levels of analysis.

Linking the analysis of health promotion to multiple dimensions of the environment and correspondingly diverse indices of health raises some important issues for future research and community intervention. 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 (see also Geller, Winett, & Everett, 1982, for a behavioral approach to the design of environmental protection programs).

For example, automobile manufacturers can help individuals reduce their risk of serious injury from car crashes by installing air bags and safety belts in their vehicles. Similarly, environmental designers, facility managers, and urban planners can incorporate a variety of physical features in new or renovated settings to promote healthfulness, such as physical fitness facilities in or adjacent to the setting to encourage health-promotive exercise regimens among occupants of the area; ergonomically sound and injury-resistant materials in the design and construction of the setting to reduce occupants' risk of injury; and avoidance of toxic materials and potential sources of psychosocial stress (e.g., poor lighting and air

conditioning systems in buildings and 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 in an area, rather than narrowly focused on singular features of the environment.

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 quite 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 in the setting are chronically conflicted and stressful. On the other hand, a socially supportive family or organization may enable setting members to cope more effectively with physical constraints (e.g., high spatial density, aesthetically drab surroundings, and 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 studies suggest that individuals' physical and emotional well-being are enhanced when environments are personally controllable and predictable (e.g., Cohen, Evans, Stokols, & Krantz, 1986; Gardell & Johansson, 1981; Glass & Singer, 1972; Karasek & Theorell, 1990; Sauter, Hurrell, & Cooper, 1989). However, environments that are too predictable and controllable can become so boring and unchallenging that they constrain opportunities for coping creatively with novel situations, thereby impeding developmental growth (Aldwin

& Stokols, 1988; S. 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 and duration.

Just as environmental conditions can vary in their magnitude and duration, health outcomes differ on these dimensions as well. For example, carcinogenic substances present in an environment may remain invisible and undetected, yet their cumulative effect on physical health can be disastrous. On the other hand, more salient short-term encounters with environmental stressors such as uncontrollable noise or periodic crowding may be associated with acute but nonpersisting episodes of emotional stress. Therefore, to gauge adequately 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 outcomes in terms of their severity, duration, and overall importance to members of the setting. Because many environments produce a mixture of positive and negative health outcomes (some of which are significant and some not), the health-promotive quality of a setting ultimately depends on its capacity to support those health outcomes most desirable and important to its members while eliminating or ameliorating those 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 individuals or groups place 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 (Stokols, Shumaker, & Martinez, 1983). 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 (e.g., Firey, 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 trade-offs 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 live closer to work in a less desirable area (e.g., J. M. Campbell, 1983; Stokols & Novaco, 1981).

The environmental resources and health outcomes shown in Table 1 are all highly positive. This emphasis on the positive is consistent with the goals of applied environmental and health research—to optimize or enhance environmental quality and human well-being (Stokols, 1978). The preceding examples of trade-offs among environmental amenities and costs serve as reminders that most situations are characterized by a mixture of positive and negative environmental circumstances and health outcomes. Thus, an important challenge for future re-

search is to assess the overall health-promotive capacity of environments on the basis of a cumulative analysis and weighting of their positive and negative features as they affect occupants' well-being.

Relevance of Environmental Scale and Contextual Scope for Health-Promotion Research

The ecological perspective emphasizes not only the many intrasetting factors that can influence occupants' health, but also the ways in which multiple situations and settings (e.g., homes, workplaces, schools, and institutions) jointly affect the well-being of community members. The scale of environmental units relevant to individual and collective well-being ranges from specific stimuli and situations that occur in 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 occurring at a particular time and place (Forgas, 1979; Pervin, 1978). *Settings* are geographical locations in which various personal or interpersonal situations occur on a regular basis (Barker, 1968; Stokols & Shumaker, 1981). *Life domains* are different spheres of a person's life, such as family, education, spiritual activities, recreation, employment, and commuting (A. Campbell, 1981; Stokols & Novaco, 1981). An even broader unit of contextual analysis is the individual's *overall life situation* (Magnusson, 1981), which consists of the major life domains in which a person is involved during a particular period of his or her life. The environmental dimensions most relevant to individual and collective well-being may vary considerably across these different levels of analysis.

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 or 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 in 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 in 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 as 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 in multiple

settings jointly influence individual and collective health outcomes.

Consider, for example, the challenge of preventing alcohol-related injuries. One strategy for reducing such injuries is to provide employee assistance programs at the workplace that facilitate workers' efforts to decrease their consumption of alcoholic beverages. Alternatively, a multisetting approach to this public health problem would combine employee assistance and treatment programs at the workplace with responsible beverage service programs for restaurant personnel, communitywide media campaigns to increase public awareness of alcohol-related injuries and prevention opportunities, legislative initiatives to raise the minimum age of purchase, and enforcement programs to reduce the illegal sale of alcohol to minors (Geller, 1990; Russ & Geller, 1987). The latter approach is based on a contextually broader analysis of injury prevention than the one focusing exclusively on the workplace, as it incorporates several different intervention programs implemented in multiple community settings in an extended geographical area.

Health-promotion analyses and interventions also can be characterized in terms of their temporal scope. For example, workplace health-promotion strategies typically emphasize the provision of employee assistance and life-style modification programs oriented toward individual workers. They often ignore the design and equipment decisions made during the construction of the workplace. However, the physical design and furnishings of the workplace can have substantial long-term effects on employees' health. For instance, the use of formaldehyde-laden construction materials, the installation of ineffective air conditioning and ventilation systems, poorly designed stairwells, nonadjustable seating and work surfaces, and space plans that expose workers to excessive crowding and noise can have deleterious effects on employees' physical and mental well-being (e.g., Archea, 1985; Greenberg, 1986; Hedge, 1989; Makower, 1981; Mendell & Smith, 1990; Stellman & Henifin, 1983). Clearly, the environmental foundations for health promotion or health impairment begin to take shape far in advance of employees' direct involvement with the workplace and continue to influence their well-being once they have occupied that environment. By explicitly considering the design and construction phase as well as the postoccupancy phase of the setting, the temporal scope of workplace health promotion is expanded to include a broader and more robust array of intervention strategies than those focusing exclusively on employee assistance and health education.

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 immediate effects on occupants' well-being, but also in terms of the potential existing in the setting for promoting and maintaining improved levels of health over extended time intervals. Just as assessments of individual health status must take into account current states of well-being as well as the prognosis for future illness or health (R. M. 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.

The dimension of sociocultural scope is directly relevant to research on environment-health relationships and the design of health-promotion programs. The sociocultural scope of health-promotion research and interventions is broadened to the extent that they encompass social and cultural factors in community settings (e.g., socioeconomic status, gender, ethnicity, cultural norms about health and illness, supportive social relationships, and organizational climate) that influence personal and collective well-being. Contextually oriented health research 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 (Berkman & Syme, 1979; Cohen & Syme, 1985; I. G. Sarason & B. R. Sarason, 1985). Moreover, the social-structural qualities of settings may play an important etiologic role in promoting social cohesion and 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 (e.g., 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, 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. Such settings are likely to incorporate both informal and formal mechanisms of dispute resolution. In conflict-prone organizations, however, the positive interdependencies among members are weaker and effective mechanisms of dispute resolution are unavailable (Stokols, 1991). Such settings may be characterized by more rigid ideological orientations that offer less tolerance for diverse points of view in the organization. To the extent that organizations promote chronic conflict among 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.

Developing Interdisciplinary Models of the Relationships Among Environmental and Behavioral Factors in Health

In view of the predominant focus of earlier health-promotion programs on modifying personal health habits

and life-styles, several theorists have called for a redirection of the field on the basis of ecological models of research and community intervention (e.g., Geller, 1987; McLeroy et al., 1988; Winnett et al., 1989). Green (1984) noted a psychological bias in the health-promotion field, in that illness-preventive interventions typically are directed at individuals in a counseling or small-group mode of delivery, with little or no theoretical input from the fields of sociology, anthropology, economics, and political science. Similarly, Syme (1990) emphasized the cost-in-effectiveness of individually oriented health-promotion programs (e.g., the Multiple Risk Factor Intervention Trials [MRFIT] intervention to reduce cardiovascular disease among high-risk individuals) and advocated a stronger community and environmental focus in public health research.

The present analysis of health promotive environments expands the behavior-modification thrust of earlier health research. By focusing on the health-promotive capacity of environments, I have identified several physical and social features of settings that are linked to multiple facets of personal and collective well-being (Table 1). I have also noted the joint influence of material and symbolic features of the environment on health, and the importance of selecting criteria of healthfulness commensurate with the spatial, temporal, and sociocultural scope of the analysis.

The conceptualization of health-promotive environments offers a valuable adjunct to the individual-behavioral focus of earlier health promotion research. However, 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 behaviors and the various constraints and resources for health that exist in specific sociophysical environments. Thus, it is important at this point in the discussion to extend the analysis of healthy environments to a more comprehensive and interactive analysis of the relationships among behavioral and environmental factors in health and health promotion.

Envirogenic Processes in Health and Their Link With Biological, Psychological, and Behavioral Factors

Antonovsky (1979) used the term *salutogenesis* 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 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 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 2. 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 artificial features of the physical environment are included, in addition to multiple dimensions of the sociocultural milieu (e.g., social-structural, cultural, economic, legal, and political processes).

Many researchers in the field of health psychology have focused on the direct links between specific dispositional factors and personal health. For example, several studies indicated the close relationship between individual well-being and personal orientations such as hostility, optimism, sense of coherence, personal hardiness, and coping efficacy (Antonovsky, 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 (e.g., Engel, 1976; Schwartz, 1982), have examined the interplay between psychological dispositions, interpersonal behavior, and physiological processes underlying health and illness. Examples of this research include studies of the psychophysiological underpinnings of the coronary-prone and cancer-prone behavior patterns (Krantz, Lundberg, & Frankenhaeuser, 1987; Temoshok, 1985) and the links between personal dispositions, social behavior, and susceptibility to infectious disease (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 biopsychobehavioral factors. These *envirogenic* processes in health and illness subsume geographic, architectural, and technological features of the physical environment and 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 identification of the specific mechanisms by which geographic, architectural-technological, and sociocultural factors influence health and illness. Five health-related functions of the sociophysical environment are outlined in Table 3. First, both the physical and social environment can function as *mediums 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 (e.g., Cohen

Table 2
Personal and Environmental Factors in Health and Illness

Biopsychobehavioral factors			Sociophysical environmental factors		
Biogenetic	Psychological	Behavioral	Geographic	Architectural and technological	Sociocultural
Family history of illness	Sense of coherence	Dietary regimens	Climatic and geologic risks (e.g., earthquakes, floods, hurricanes, tornados, draught, temperature extremes)	Injury-resistant architecture	Socioeconomic status of individuals and groups
Exposure to infectious pathogens (e.g., viruses, bacteria)	Psychological hardiness	Alcohol consumption	Ground-water contamination	Nontoxic construction materials in buildings	Social support vs. social isolation or social conflict; bereavement
Immunologic competence	Self-esteem	Smoking			
Inoculation and medication history	Creativity	Exercise patterns	Radon contamination of soil	Ergonomic design of work areas and other environmental settings	Social climate in families, organizations, and institutions
Congenital disability	Optimism	Sleep patterns			
Disabling injuries	Pessimistic explanatory style	Safety practices (e.g., use of vehicular safety belts, bicycle helmets; safe sexual and prenatal behaviors)	Ultraviolet radiation	Environmental aesthetics	Modeling and conformity processes
Cardiovascular reactivity	Health locus of control	Participation in health promotion programs	Atmospheric ozone depletion	Indoor and outdoor air pollution (e.g., "sick building syndrome")	Cultural and religious beliefs and practices
Chronological age	Interpersonal skills		Global warming	Effective design of health care facilities	Organizational or political instability
Developmental stage	Extroversion	Compliance with prescribed medical regimens	Health consequences of reduced biodiversity	Vehicular and passenger safety	Economic changes (job loss and related stressful life events)
Gender	Coronary-prone (Type A) orientation				
	Cancer-prone (Type C) orientation	Use of community health services and resources	Restorative potential of wilderness and other natural environments	Noise pollution	Health communications and media
	Depression/anxiety				
	Hostility/suspiciousness	Health-relevant decisions and actions made on behalf of others		Electromagnetic radiation	Health promotion programs in organizations and communities (e.g., health education)
				Water quality and treatment systems	Health-promotive legislation
				Solid waste treatment and sanitation systems	Environmentally protective regulations
					Availability of health insurance and community health services

et al., 1986; Dooley & Catalano, 1984; G. W. Evans, 1982; Rook, 1984). On the other hand, exposure to certain environmental conditions such as natural, aesthetic, and symbolic amenities can alleviate stress and promote physical and emotional well-being (e.g., Hartig, Mang, & Evans, 1991; R. Kaplan & S. Kaplan, 1989; Stokols, 1990). 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 (e.g., Baum, Fleming, & Davidson, 1983; Edelstein, 1988; Fielding & Phenow, 1988; Greenberg, 1987; Markower, 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

Table 3
Envirogenic Processes in Health and Illness

Environmental function	Dimensions of the environment	
	Physical	Social
Medium of disease	Waterborne & airborne disease; microbial contamination of food	Spread of contagious disease through interpersonal contact
Stressor	Negative affective states from exposure to such physical stressors as uncontrollable noise & technological risks; negative health consequences of residential relocation	Vulnerability to health problems resulting from chronic social conflict, isolation, organizational instability, & abrupt economic change
Source of safety or danger	Exposure to climatic and geologic risks; injury-resistant environmental design; mutagenic effects of toxic environments; occupational hazards	Risk of personal injury resulting from intergroup conflict, violence, & crime
Enabler of health behavior	Geographic accessibility of health care facilities in the community; installation of health-behavioral supports in buildings & vehicles	Interpersonal modeling of health-promotive behavior & safety practices; health-promotive cultural & religious practices
Provider of health resources	Healthful lighting & air quality in buildings; community sanitation systems	Legislation pertaining to public health & safety; availability of organizational & community health services

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 protecting the quality of physical environments and ensuring citizens' access to health insurance and community-based health care. These health-relevant functions of the sociophysical environment are closely intertwined and can operate concurrently in specific environmental contexts. For example, high rates of crime in a neighborhood may generate increased perceptions of physical danger, physiological symptoms of chronic stress, and reduced use of community health services among residents (see Taylor, 1987).

Another important challenge for future research is to develop integrative 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 2 are (a) the prevalence of negative health effects among low-socioeconomic-status groups resulting from their disproportionate exposure to geographic, architectural, and technological hazards (e.g., Lindheim & Syme, 1983; Seifert & Vaughan, 1991; Syme & Berkman, 1976; DHHS, 1991; Vaughan, 1991)¹; (b) the relationship between individuals' age, gender, and developmental stage and their increased vulnerability to certain categories of environmental health threats, such as lead poisoning (Florini, Krumbhaar, & Silbergeld, 1990; Needleman, Schell, Bellinger, Leviton, & Allred, 1990) and fatalities resulting from exposure to other unsafe environmental conditions among children, injuries from motor vehicle

crashes and illness outcomes from alcohol and drug abuse among adolescents and young adults, and fatalities from the complications of falls among older adults (DHHS, 1991); (c) the psychosocial underpinnings of high-risk behaviors (e.g., smoking, unsafe sexual practices, overexposure to ultraviolet radiation, and failure to use vehicular safety belts) that predispose certain groups in the population to higher rates of environmentally induced illness and injury (Christophersen, 1989; Jeffery, 1989; Keesling & Friedman, 1987; Robertson, 1987; Weinstein, 1987); (d) the ways in which environmental factors (e.g., geographic, architectural, and sociocultural conditions) contribute to the development, modification, and maintenance of health-promotive behavior (Sallis & Hovell, 1990; Weiss, 1991; Winett et al., 1989); and (e) the processes by which psychological dispositions and sociophysical stressors jointly influence emotional and physical well-being (Cottingham & House, 1987; G. W. 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.

Community Interventions to Promote Public Health: A Multilevel Approach

The environmental and personal factors in health and illness offer several leverage points for health-promotive

¹ An important issue in this regard is the extent to which socio-demographic variables are correlated with psychological dispositions and behavior patterns that increase susceptibility to disease (Matthews, 1989).

policies and community interventions at municipal, regional, national, and international levels. Examples of these environmental design and public policy options for health promotion are summarized in Table 4, in relation to various categories of etiologic factors (i.e., biopsychobehavioral factors and sociophysical features of the environment). Whereas the predominant emphasis of health-promotion research has been on individual-level interventions, the social-ecological perspective emphasizes the integration of person-focused and environment-focused strategies to enhance individual and collective well-being.

Health-promotive policies and interventions can be arrayed along a continuum ranging from microenvironmental settings (e.g., corporate or institutional facilities) to larger 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. The advantages of combining health-promotive environmental design and management policies at the workplace (e.g., nontoxic furnishings and ergonomic and injury-resistant design) with behaviorally oriented programs to modify employees' health practices were noted earlier. At the community level, health-promotive urban design and planning strategies (e.g., to ensure geographic accessibility of health care settings and to locate 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 distant environments are linked both spatially and organizationally in nested hierarchical systems (e.g., specific behavior settings exist as compo-

nents of broader institutional, urban, and regional contexts) and are becoming increasingly interdependent because of 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 in municipal, regional, and international contexts. An architect or facility planner designing a corporate facility, neighborhood playground, apartment complex, hospital, or residential facility for the elderly will need knowledge of several disciplines, including environmental law (e.g., the regulations intended to mitigate negative impacts of proposed environmental developments), life span human development, (e.g., the specialized health and safety needs of different age groups), and ergonomics and public health (e.g., the potential health consequences of poorly designed, toxic, or injury-prone environments). 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 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 the cumulative efforts 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)

Table 4
Policy Options for Health Promotion and Illness Prevention

Health-promotive interventions	Examples of health-promotive policies and programs
Person-focused strategies	
Biogenetic	Preventive public health programs for risk screening, genetic counseling, & inoculation; medical treatment regimens
Psychological	Individual counseling & psychotherapeutic interventions
Behavioral	Health behavior modification; lifestyle appraisal & modification pertaining to diet, exercise, smoking, & safety practices
Environment-focused strategies	
Geographic	Health & safety-oriented urban planning; land use policy and environmental law at municipal, regional, & international levels; strategic siting of health care facilities in the community
Architectural & technological	Ergonomic & safety-oriented environmental design & facilities management; design of safe & health-promotive products; community sanitation systems
Sociocultural	Organizational development & conflict resolution; corporate health-promotion programs; community health education & media programming; health-promotive legislation & building codes

The following sections of the article examine legislative initiatives and other community interventions that either have been implemented or could be adopted at local, state, national, and international levels to enhance environmental quality and public health.

Municipal, State, and National Contexts of Health Promotion

In an effort to reduce the devastating personal and public health consequences of smoking (e.g., Eriksen, LeMaistre, & Newell, 1988; Fielding & Phenow, 1988; HEW, 1979), several local governments have banned smoking in public places. In California alone, 172 municipalities and counties had passed ordinances restricting smoking in workplaces and commercial settings, and nearly 400 such ordinances had been enacted nationwide by September 1989 (Pertschuk & Shopland, 1989; see also Bureau of National Affairs, 1986). Other health-promotive interventions undertaken in local communities include media campaigns to encourage heart-healthy behaviors (e.g., Farquhar et al., 1985; Maccoby & Alexander, 1980), elementary school education programs to promote bicycle helmet use among children (DiGuseppi, Rivara, Koepsell, & Polissar, 1989), and corporate-based programs to increase vehicle safety belt use (Geller, 1984).

At state levels, several legislative actions have reduced injury and fatality rates associated with automobile crashes. These include laws mandating the use of child safety seats in automobiles (e.g., Fawcett, Seekins, & Jason, 1987; Insurance Institute for Highway Safety, 1987), requiring servers of alcoholic beverages to have intervention training to reduce customers' risk of alcohol-impaired driving (Geller, 1990; Russ & Geller, 1987), and raising the legal minimum drinking age (Williams, Zador, Harris, & Karpf, 1983) or the drivers' licensing age (Williams, Karpf, & Zador, 1983). At the national level, lowering the maximum speed limit from 70 to 55 miles per hour in 1973 was associated with a substantial decrease in automobile accident injuries and fatalities throughout the United States (National Safety Council, 1987).

A notable strength of several of the local, state, and national interventions cited above is that their actual influence on public health and safety has been documented through carefully designed quasi-experimental studies. Rigorous evaluations of health-promotive legislation and community interventions are essential for estimating the scientific validity and practical utility of existing and proposed programs (e.g., Campbell, 1969; Evans, 1988; Geller, 1990).

Another health-promotive strategy that has been widely used at national, state, and local levels is legislation designed to protect natural resources and the quality of public environments. Examples at national levels include the 1969 National Environmental Policy Act (NEPA), the 1970 Clean Air Act, the 1972 Clean Water Act, and the 1976 Toxic Substances Control Act in the United States, and the 1971 Town and Country Planning Act in the United Kingdom. The NEPA requires all federal agencies to prepare detailed written statements about the

potential negative results of any of their actions relating to the environment, and proposed strategies for avoiding or mitigating those outcomes. If an agency determines through an initial environmental assessment that no significant effects will occur from the proposed development, then it may issue a *finding of no significant impact* (FONSI) in lieu of an *environmental impact statement* (EIS).

The California Environmental Quality Act (CEQA, 1986) is one of several state analogues of NEPA that has been implemented over the past 20 years. CEQA requires that municipal and state agencies not approve a proposed environmental project unless the potentially adverse effects of the development are identified in an environmental impact report (EIR) and all feasible alternatives or mitigation measures to reduce those effects have been incorporated into the project plans. About one half of the states have emulated the NEPA process, and environmental impact assessment is now an established legal process in several nations and international organizations (e.g., Australia, Canada, the European Community, and the United Kingdom; CEQA, 1986; Robinson, 1990).

Whereas environmental impact assessment regulations are intended to protect public health and environmental quality, the relevant legislative statements are sometimes left vague and open-ended with regard to alternative criteria for gauging emotional, physical, and social well-being, and the kinds of environmental effects on public health that are viewed as most detrimental. For example, the CEQA (1986) legislation is intended to mitigate those aspects of a proposed project that "will cause substantial adverse effects on human beings, either directly or indirectly (p. 26)." This wording, however, leaves open to interpretation the question of which environmental effects on well-being (e.g., biogenetic, psychological, or sociocultural) are most serious and the extent to which proposed mitigation strategies will reduce those risks effectively.²

Ambiguities in the interpretation of environmental regulations also are evident in the deliberations of federal courts. For example, in a case involving the Three Mile Island nuclear reactors, the United States Supreme Court ruled that NEPA does not require consideration of whether the risks of technological accidents might cause harm to the psychological health and community well-being of residents in the surrounding community (*Metropolitan Edison Company v. People Against Nuclear Energy*, 1983), even though longitudinal studies have linked

² The CEQA guidelines specify 26 categories of health, safety, sociocultural, and aesthetic problems that may result from physical modifications of the environment, including contaminated public water supplies, increased ambient noise levels, exposure of people and structures to geologic hazards, reduced ambient air quality, and the division or disruption of the arrangement of an established community (see CEQA, 1986, Appendix G, p. 284, for a complete listing of these significant effects on the environment and its occupants). However, no criteria are provided in CEQA for rank ordering the potential effects of environmental projects in terms of their relative severity or importance to the community.

the incidence of psychological and physiological stress symptoms to residents' concerns about the health risks associated with the Three Mile Island accident (Baum, Weiss, & Davidson, 1988; Davidson & Baum, 1986). The ruling in this case suggests that the health-promotive value of NEPA, 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 as they are manifested at physiological and psychosocial levels, and on the degree to which proposed mitigation measures are scientifically valid and effective once they are implemented.

Unfortunately, the actual effects of environmentally protective legislation on public health have not been assessed through evaluation studies.³ 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 postintervention 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 effects of environmental legislation enacted in a particular community, even if comparable control communities cannot be identified (D. T. Campbell, 1969).

International Efforts to Protect Environmental Quality and to Promote Public Health

International efforts 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 (Ayala, 1987; Silver & DeFries, 1990; Wilson & Peter, 1988; World Commission on Environment and Development, 1987). Examples of intercity and cross-national cooperation in health promotion include the World Health Organization's Healthy Cities Project (e.g., Ashton, Grey, & Barnard, 1986; Hancock & Duhl, 1985; WHO, 1984) and the Municipal Foreign Policy Movement (Agran, 1989; Shuman, 1986). As part of the Healthy Cities Project, public health professionals from several countries worked together in developing and implementing intersectoral city health plans. WHO staff provided technical assistance and resource materials to the participating cities. One product of this collaboration is a European television series on healthy cities.

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, 1985). 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 policies, 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 intercity cooperation in the development of health-promotive and environmentally protective legislation. Several of the municipalities that have participated in this program have implemented citywide 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, and the City of Irvine Ordinance on Chlorofluorocarbons). To date, 58 countries including the members of the European Community have ratified the Vienna Convention for the Protection of the Ozone Layer (World Resources Institute, 1991). Earlier examples of international agreements 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, including (a) the potential exacerbation of health problems among the elderly by elevated temperatures associated with global warming, (b) increased prevalence of cutaneous melanoma and other diseases resulting from global ozone depletion and heightened exposure to ultraviolet radiation, (c) the biogenetic consequences of ex-

³ In contrast, the effectiveness of locally implemented interventions to promote environmentally protective behavior (e.g., recycling, energy conservation, and ride sharing) among individuals in households, business organizations, and other small groups has been examined extensively through field-experimental studies (e.g., Cone & Hayes, 1980; Geller, Winett, & Everett, 1982).

posure to toxic by-products of modern technologies, (d) the implications of reduced ecosystem biodiversity for human health and medical treatment and research programs, and (e) 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 examples of municipal and international cooperation toward health promotion and environmental protection cited in this article are impressive in their scope and are a basis for optimism about the willingness of governments to work collaboratively to promote world health. As is the case with national and state environmental regulations, the actual effectiveness of international efforts such as the Healthy Cities and Municipal Foreign Policy programs has not been assessed through systematic evaluation research. Whether these programs can reduce or reverse the potentially negative effects of global ozone depletion, elevated temperatures, and decreased biodiversity remains unknown. What is known, however, is that the health threats posed by these global trends are enormous and that concerted efforts must be made to reduce these threats through environmentally protective measures, even in the absence of confirmatory evaluation studies.

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—in their roles as environmental planners, corporate executives, and community leaders.

Criteria for Selecting From Among Alternative Health-Promotion Strategies

The preceding discussion has identified several behavioral and environmental strategies for community health promotion. The great diversity of approaches to health promotion raises an important question: By what criteria shall we choose from among alternative intervention strategies to promote individual and collective well-being? Epidemiologic criteria of illness and injury prevalence rate, incidence rate, and severity offer a useful starting point for identifying the health problems in a given population that warrant the most immediate and comprehensive attention (Winett, Moore, & Anderson, 1991). For instance, epidemiologic studies have verified the pervasive health effects of passive smoking (Eriksen et al., 1988; Fielding & Phenow, 1988), childhood lead poisoning (Florini et al., 1990), and poor air quality in office buildings (Mendell & Smith, 1990). Such studies also reveal differential patterns of illness and injury susceptibility among age-based and ethnic subgroups of the population and provide a basis for tailoring health-promotion programs to the specific needs of those groups (e.g., greater incidence of injury-related deaths among children and

higher mortality rates among Latinos from homicide, injury, and liver disease than from heart disease and cancer; Perez-Stable, 1991; DHHS, 1991).

The social validity or significance of intervention goals, procedures, and anticipated outcomes is another important issue that must be considered in the selection of target problems, populations, and health-promotion strategies (Geller, 1991; Winett et al., 1991; Wolf, 1978). The concept of social validity encompasses not only the epidemiologic importance of various health problems in the community but also several other considerations, including the economic costs and anticipated effectiveness of the proposed intervention, the number of people who are likely to benefit from the program, the possible occurrence of undesirable side effects from the intervention,⁴ and public opinion about the severity of health threats and the efficacy of preventive behaviors. The social validity of a health-promotion program increases to the extent that it is (a) firmly grounded in scientific and epidemiologic research, (b) economically feasible, (c) likely to reach a large segment of the target population, (d) unlikely to cause adverse side effects, and (e) consistent with community priorities and commitments.

The social-ecological perspective emphasizes the advantages of multilevel interventions that combine complementary or synergistic behavioral and environmental components. For example, behavior modification programs for smoking cessation may be more effective if they coincide with no-smoking policies at the workplace and municipal ordinances prohibiting smoking in public environments. Similarly, corporate or school-based programs that encourage individuals to improve their diet and exercise regularly may be facilitated by community-wide media campaigns to promote heart-healthy lifestyles, regulatory interventions to enhance food quality and safety, and the provision of physical fitness and recreational facilities in work environments and residential areas. The ecological perspective suggests that multifaceted interventions that incorporate complementary environmental and behavioral components and span multiple settings and levels of analysis are more likely to be effective in promoting personal and public health than are those narrower in scope.

Whereas the environmental and behavioral bases of health promotion are often mutually reinforcing, they sometimes operate in contradictory fashion. For instance, workplace programs to modify employees' health habits may be underused if they are scheduled at inconvenient times and locations, lack the support of upper management, or require very high levels of personal commitment and effort. In such instances, "passive" environmental

⁴ See Barsky (1988) and Becker (1991) for analyses of the undesirable side effects that sometimes result from health-promotion programs (e.g., increased risk of injury associated with jogging and other exercise regimens, medical complications resulting from mass-screening programs for coronary artery and colorectal disease, and the "epidemic of apprehension" [Thomas, 1983] created by fear-arousing health-promotion appeals).

interventions for health promotion, which require little or no effort by the target individuals (e.g., designing buildings without elevators to encourage physical activity, or providing high-quality food facilities and nutritious meals for employees) may be more cost-effective than "active" interventions that require voluntary and sustained adherence to health-promotive regimens (Williams, 1982). Similarly, the use of environmental resources for health promotion (e.g., vehicle safety belts, bicycle helmets, physical fitness facilities, testing kits to assess radon contamination in homes, and Velcro equipment fasteners to reduce injuries during earthquakes) may be undermined by certain psychological orientations, such as fatalistic cultural beliefs about illness and injury, pessimistic explanatory styles, and perceived invulnerability to health threats (e.g., Becker, 1990; Geller, 1984; Peterson, Seligman, & Vaillant, 1988; Rippetoe & Rogers, 1987; Sallis & Hovell, 1990; Weinstein, Sandman, & Roberts, 1991). Thus, before substantial resources are committed to the implementation of health-promotion programs, a variety of spatial, temporal, organizational, and motivational constraints on their effectiveness must be identified and resolved.

Summary

The challenge of creating and maintaining healthy environments raises several complex theoretical, methodological, and public policy questions. For example, how shall we conceptualize healthy environments and by what observable criteria can we determine the extent to which an environment is health promotive? Is the healthfulness of an environment defined primarily by its physical quality or in terms of the joint influence of its material and symbolic features on the emotional and physical well-being of its occupants? Does the concept of environmental health refer to the present condition of the environment and its occupants, or to the potential for promoting and maintaining improved levels of well-being over an extended period?

To address these questions, I have proposed a social-ecological conceptualization of health-promotive environments that emphasizes the interactions among physical-material and social-symbolic features of environments as they affect the emotional, physical, and social well-being of individuals and groups. Moreover, I have analyzed health status along a continuum ranging from individuals to larger aggregates and populations, and in relation to microlevel, local settings and larger scale, more distant environments. I have examined the temporal dimensions of environmental health, with particular emphasis on the stability or instability of healthful conditions in a setting or region and those factors that may determine the healthfulness of an environment over extended periods. Finally, I have examined several directions for both basic research and the evaluation of policy initiatives to protect environmental quality and promote public health at organizational, municipal, regional, and international levels.

REFERENCES

- Agran, L. (1989, March). *Mayor as global leader*. Paper presented at Macalester College Mayors' Forum, St. Paul, Minnesota.
- Aldwin, C., & Stokols, D. (1988). The effects of environmental change on individuals and groups: Some neglected issues in stress research. *Journal of Environmental Psychology, 8*, 57-75.
- Alihan, M. A. (1964). *Social ecology: A critical analysis*. New York: Cooper Square.
- Antonovsky, A. (1979). *Health, stress, and coping*. San Francisco: Jossey-Bass.
- Archea, J. C. (1985). Environmental factors associated with stair accidents by the elderly. *Clinics in Geriatric Medicine, 1*, 555-569.
- Archea, J., & Connell, B. R. (1986). Architecture as an instrument of public health: Mandating practice prior to the conduct of systematic inquiry. In J. Wineman, R. Barnes, & C. Zimring (Eds.), *Proceedings of the Seventeenth Annual Conference of the Environmental Design Research Association* (pp. 305-309). Washington, DC: Environmental Design Research Association.
- Ashton, J., Grey, P., & Barnard, K. (1986). Healthy cities: WHO's New Public Health Initiative. *Health Promotion, 1*, 319-324.
- Ayala, H. L. (1987). New view of environmental health: Toward an environmental research policy for international strategies. *Environmental Management, 11*, 141-147.
- Barefoot, J. C., Dahlstrom, W. G., & Williams, R. B. (1983). Hostility, CHD incidence, and total mortality: A 25-year follow-up study of 255 physicians. *Psychosomatic Medicine, 45*, 59-63.
- Barker, R. G. (1968). *Ecological psychology: Concepts and methods for studying the environment of human behavior*. Stanford, CA: Stanford University Press.
- Barsky, A. J. (1988). The paradox of health. *New England Journal of Medicine, 318*, 414-418.
- Baum, A., Fleming, R., & Davidson, L. M. (1983). Natural disaster and technological catastrophe. *Environment and Behavior, 15*, 333-354.
- Baum, A., Weiss, L. M., & Davidson, L. M. (1988, August). Chronic stress in victimized communities. Paper presented at the 96th Annual Convention of the American Psychological Association, Atlanta, GA.
- Becker, M. H. (1990). Theoretical models of adherence and strategies for improving adherence. In S. A. Shumaker, E. B. Schron, J. K. Ockene, C. T. Parker, J. L. Probstfield, & J. M. Wille (Eds.), *The handbook of health behavior change* (pp. 5-43). New York: Springer.
- Becker, M. H. (1991). In hot pursuit of health promotion: Some admonitions. In S. M. Weiss, J. E. Fielding, & A. Baum (Eds.), *Perspectives in behavioral medicine: Health at work* (pp. 178-188). Hillsdale, NJ: Erlbaum.
- Belloc, N., & Breslow, L. (1972). Relationship of physical health status and health practices. *Preventive Medicine, 1*, 409-421.
- Berkman, L. F., & Syme, S. L. (1979). Social networks, host resistance, and mortality: A nine-year follow-up study of Alameda County residents. *American Journal of Epidemiology, 109*, 186-204.
- Binder, A., Stokols, D., & Catalano, R. (1975). Social ecology: An emerging multidiscipline. *The Journal of Environmental Education, 7*, 32-43.
- Bureau of National Affairs (1986). *Where there's smoke: Problems and policies concerning smoking in the workplace*. Washington, DC: Author.
- Campbell, A. (1981). *The sense of well-being in America*. New York: McGraw-Hill.
- Campbell, D. T. (1969). Reforms as experiments. *American Psychologist, 24*, 209-219.
- Campbell, J. M. (1983). Ambient stressors. *Environment and Behavior, 15*, 355-380.
- Cannon, W. B. (1932). *The wisdom of the body*. New York: Norton.
- Cassel, J. (1964). Social science theory as a source of hypotheses in epidemiological research. *American Journal of Public Health, 54*, 1482-1487.
- Catalano, R. (1979). *Health, behavior, and the community: An ecological perspective*. Elmsford, NY: Pergamon Press.
- Catalano, R., & Arenstein, W. (in press). Regulatory implications of environmental simulation. In R. W. Marans & D. Stokols (Eds.), *Environmental simulation: Research and policy issues*. New York: Plenum Press.

- Cataldo, M. F., & Coates, T. J., (Eds.). (1986). *Health and industry: A behavioral medicine perspective*. New York: Wiley.
- CEQA—*The California Environmental Quality Act* (1986). Sacramento, CA: State of California, Governor's Office of Planning & Research.
- Christophersen, E. R. (1989). Injury control. *American Psychologist*, *44*, 237–241.
- Cohen, S., Evans, G. W., Stokols, D., & Krantz, D. S. (1986). *Behavior, health and environmental stress*. New York: Plenum Press.
- Cohen, S., & Syme, S. L. (Eds.). (1985). *Social support and health*. San Diego, CA: Academic Press.
- Cohen, S., & Williamson, G. M. (1991). Stress and infectious disease in humans. *Psychological Bulletin*, *109*, 5–24.
- Cone, J. D., & Hayes, S. C. (1980). *Environmental problems/Behavioral solutions*. Monterey, CA: Brooks/Cole.
- Cottingham, E., & House, J. S. (1987). Occupational stress and health: A multivariate relationship. In A. Baum & J. E. Singer (Eds.), *Handbook of psychology and health: Vol. V* (pp. 41–62). Hillsdale, NJ: Erlbaum.
- Davidson, L. M., & Baum, A. (1986). Chronic stress and post-traumatic stress disorders. *Journal of Consulting and Clinical Psychology*, *54*, 303–308.
- DiGiuseppi, C. G., Rivara, F. P., Koepsell, T. D., & Polissar, L. (1989). Bicycle helmet use by children: Evaluation of a community-wide helmet campaign. *Journal of the American Medical Association*, *262*, 2256–2261.
- Dooley, D., & Catalano, R. (1984). The epidemiology of economic stress. *American Journal of Community Psychology*, *12*, 387–409.
- Edelstein, M. R. (1988). *Contaminated communities: The social and psychological impacts of residential toxic exposure*. Boulder, CO: Westview Press.
- Emery, F. E., & Trist, E. L. (1972). *Towards a social ecology: Contextual appreciations of the future in the present*. London: Plenum Press.
- Engel, G. L. (1976). The need for a new medical model. *Science*, *196*, 129–136.
- Eriksen, M. P., LeMaistre, C. A., & Newell, G. R. (1988). Health hazards of passive smoking. In L. Breslow, J. E. Fielding, & L. B. Lave (Eds.), *Annual Review of Public Health*, *9*, 47–70. Palo Alto, CA: Annual Reviews, Inc.
- Evans, G. W. (Ed.). (1982). *Environmental stress*. New York: Cambridge University Press.
- Evans, G. W., Johansson, G., & Carrere, S. (1990). *Occupational settings and health: The interplay of the psychosocial and physical environment*. Program in Social Ecology, University of California, Irvine.
- Evans, R. I. (1988). Health promotion—Science or ideology? *Health Psychology*, *7*, 203–219.
- Farquhar, J. W., Fortman, S. P., Maccoby, N., Haskell, W. L., Williams, P. T., Flora, J. A., Taylor, C. B., Brown, B. W., Solomon, D. S., & Hulley, S. B. (1985). The Stanford Five City Project: Design and methods. *American Journal of Epidemiology*, *63*, 171–182.
- Fawcett, S. B., Seekins, T., & Jason, L. A. (1987). Policy research and child passenger safety legislation: A case study and experimental evaluation. *Journal of Social Issues*, *43*, 133–148.
- Fielding, J. E., & Phenow, K. J. (1988). Health effects of involuntary smoking. *The New England Journal of Medicine*, *319*, 1452–1460.
- Firey, W. (1945). Sentiment and symbolism as ecological variables. *American Sociological Review*, *10*, 410–418.
- Florini, K. L., Krumbhaar, G. D., & Silbergeld, E. K. (1990, March). *Legacy of lead: America's continuing epidemic of childhood lead poisoning: A report and proposal for legislative action*. Washington, DC: Environmental Defense Fund.
- Forgas, J. P. (1979). *Social episodes: The study of interaction routines*. San Diego, CA: Academic Press.
- Friedman, H. S. (Ed.). (1990). *Personality and disease*. New York: Wiley.
- Gardell, B., & Johansson, G. (Eds.). (1981). *Working life: A social science contribution to work reform*. New York: Wiley.
- Geller, E. S. (1984). *Motivating safety belt use with incentives: A critical review of the past and a look to the future* (SAE Technical Paper Series No. 840326). Warrendale, PA: Society of Automotive Engineers.
- Geller, E. S. (1987). Environmental psychology and applied behavior analysis: From strange bedfellows to a productive marriage. In D. Stokols & I. Altman (Eds.), *Handbook of environmental psychology, Vol. 1* (pp. 361–388). New York: Wiley.
- Geller, E. S. (1990). Preventing injuries and deaths from vehicle crashes: Encouraging belts and discouraging booze. In J. Edwards, R. S. Tindale, L. Heath, & E. J. Posavac (Eds.), *Social influence processes and prevention* (pp. 249–277). New York: Plenum Press.
- Geller, E. S. (1991). Where's the validity in social validity? *Journal of Applied Behavior Analysis*, *24*, 189–204.
- Geller, E. S., Winett, R. A., & Everett, P. B. (1982). *Preserving the environment: New strategies for behavior change*. New York: Pergamon Press.
- Glass, D. C., & Singer, J. E. (1972). *Urban stress*. San Diego, CA: Academic Press.
- Green, L. W. (1984). Modifying and developing health behavior. *Annual Review of Public Health*, *5*, 215–236.
- Green, L. W., & Kreuter, M. W. (1990). Health promotion as a public health strategy for the 1990s. *Annual Review of Public Health*, *11*, 319–334.
- Greenberg, M. R. (1986). Indoor air quality: Protecting public health through design, planning, and research. *Journal of Architectural and Planning Research*, *3*, 253–261.
- Greenberg, M. R. (1987). *Public health and the environment: The United States experience*. New York: Guilford Press.
- Hancock, T., & Duhl, L. (1985). *Healthy cities: Promoting health in the urban context. A background working paper for the Healthy Cities symposium, Lisbon, 1986*. Copenhagen, Denmark: World Health Organization.
- Hartig, T., Mang, M., & Evans, G. W. (1991). Restorative effects of natural environment experiences. *Environment and Behavior*, *23*, 3–26.
- Hawley, A. H. (1950). *Human ecology: A theory of community structure*. New York: Ronald Press.
- Hedge, A. (1989). Environmental conditions and health in offices. *International Review of Ergonomics*, *2*, 87–110.
- Henderson, D. A., & Scutchfield, F. D. (1989). Point-counterpoint: The public health versus medical model of prevention. *American Journal of Preventive Medicine*, *5*, 113–119.
- Holahan, C. J., & Moos, R. H. (1990). Life stressors, resistance factors, and improved psychological functioning. An extension of the stress-resistance paradigm. *Journal of Personality and Social Psychology*, *58*, 909–917.
- Insurance Institute for Highway Safety (1987). *Status report, December, 1987*. Washington, DC: Author.
- Jeffery, R. W. (1989). Risk behaviors and health: Contrasting individual and population perspectives. *American Psychologist*, *44*, 1194–1202.
- Kaplan, R., & Kaplan, S. (1989). *The experience of nature: A psychological perspective*. New York: Cambridge University Press.
- Kaplan, R. M. (1990). Behavior as the central outcome in health care. *American Psychologist*, *45*, 1211–1220.
- Kaplan, S. (1983). A model of person-environment compatibility. *Environment and Behavior*, *15*, 331–332.
- Karasek, R., & Theorell, T., Eds. (1990). *Healthy work: Stress, productivity, and the reconstruction of working life*. New York: Basic Books.
- Katz, D., & Kahn, R. L. (1966). *The social psychology of organizations*. New York: Wiley.
- Keesling, B., & Friedman, H. S. (1987). Psychosocial factors in sunbathing and sunscreen use. *Health Psychology*, *6*, 477–493.
- Kobasa, S. C., Maddi, S. R., & Kahn, S. (1982). Hardiness and health: A prospective study. *Journal of Personality and Social Psychology*, *42*, 168–177.
- Krantz, D. S., Lundberg, U., & Frankenhaeuser, M. (1987). Stress and Type-A behavior: Environmental and biological factors. In A. Baum & J. E. Singer (Eds.), *Handbook of psychology and health* (Vol. 5, pp. 203–228). Hillsdale, NJ: Erlbaum.
- Lawrence, R. J. (Ed.). (1990). Housing, health, and well-being [Special issue]. *Journal of Sociology and Social Welfare*, *17* (1).
- Lindheim, R., & Syme, S. L. (1983). Environments, people, and health. *Annual Review of Public Health*, *4*, 335–354.
- Maccoby, N., & Alexander, J. (1980). Use of media in lifestyle programs. In P. O. Davidson & S. M. Davidson (Eds.), *Behavioral medicine: Changing health lifestyles* (pp. 351–370). New York: Brunner/Mazel.
- Magnusson, D. (1981). A psychology of situations. In D. Magnusson (Ed.), *Toward a psychology of situations: An interactional perspective* (pp. 9–32). Hillsdale, NJ: Erlbaum.

- Makower, J. (1981). *Office hazards: How your job can make you sick*. Washington, DC: Tilden Press.
- Maruyama, M. (1963). The second cybernetics: Deviation-amplifying mutual causal processes. *American Scientist*, 51, 164-179.
- Matthews, K. A. (1989). Are sociodemographic variables markers for psychological determinants of health? *Health Psychology*, 8, 641-648.
- McKinlay, J. B. (1975). A case for refocusing upstream: The political economy of illness. In A. J. Enelow & J. B. Henderson (Eds.), *Applying behavioral science to cardiovascular risk* (pp. 7-17). Washington, DC: American Heart Association.
- McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education Quarterly*, 15, 351-378.
- Mendell, M. J., & Smith, A. H. (1990). Consistent pattern of elevated symptoms in air-conditioned office buildings: A reanalysis of epidemiologic studies. *American Journal of Public Health*, 80, 1193-1199.
- Metropolitan Edison Company v. People Against Nuclear Energy (1983). *U.S. Supreme Court Reports*, 460 US 766, 75 L Ed. 2d 534, 103 S Ct 1556 (Nos. 81-2399). Washington, DC: U.S. Government Printing Office.
- Michelson, W. (1990, July). Making ecology environmentally explicit. Paper presented at the 22nd International Congress of Applied Psychology, Kyoto, Japan.
- Michelson, W. H. (1970). *Man and his urban environment: A sociological approach*. Reading, MA: Addison-Wesley.
- Moos, R. H. (1976). *The human context*. New York: Wiley.
- Moos, R. H. (1979). Social ecological perspectives on health. In G. C. Stone, F. Cohen, & N. E. Adler (Eds.), *Health psychology: A handbook* (pp. 523-547). San Francisco: Jossey-Bass.
- Moos, R. H. (1987). *The social climate scales: A user's guide*. Palo Alto, CA: Consulting Psychologists Press.
- National Safety Council (1987). *Accident facts*. Chicago: Author.
- Needleman, H. L., Schell, A., Bellinger, D., Leviton, A., & Allred, E. N. (1990). The long-term effects of exposure to low doses of lead in childhood. *New England Journal of Medicine*, 322, 83-88.
- O'Donnell, M. P., & Ainsworth, T. (Eds.) (1984). *Health promotion in the workplace*. New York: Wiley.
- Park, R., & Burgess, E. (Eds.) (1925). *The city*. Chicago: University of Chicago Press.
- Pelletier, K. R. (1984). *Healthy people in unhealthy places: Stress and fitness at work*. New York: Dell.
- Perez-Stable, E. (1991, May). *Health promotion among Latinos: What are the priorities?* Chancellor's Distinguished Lecture, University of California, Irvine. (Available from Department of Medicine, University of California, San Francisco, CA)
- Pervin, L. A. (1978). Definitions, measurements, and classifications of stimuli, situations, and environments. *Human Ecology*, 6, 71-105.
- Pertschuk, M., & Shopland, D. (1989, September). *Major local smoking ordinances in the United States* (National Institutes of Health Publication No. 90-479). Washington, DC: U.S. Government Printing Office.
- Peterson, C., Seligman, M. E. P., & Vaillant, G. E. (1988). Pessimistic explanatory style is a risk factor for physical illness: A thirty-five-year longitudinal study. *Journal of Personality and Social Psychology*, 55, 23-27.
- Rippetoe, P. A., & Rogers, R. W. (1987). Effects of components of protection-motivation theory on adaptive and maladaptive coping with a health threat. *Journal of Personality and Social Psychology*, 52, 596-604.
- Robertson, L. S. (1986). Behavioral and environmental interventions for reducing motor vehicle trauma. In L. Breslow, J. E. Fielding, & L. B. Lave (Eds.), *Annual Review of Public Health* (Vol. 7, pp. 13-34). Palo Alto, CA: Annual Reviews Inc.
- Robertson, L. S. (1987). Injury prevention: Limits to self-protective behavior. In N. D. Weinstein (Ed.), *Taking care: Understanding and encouraging self-protective behavior* (pp. 280-297). New York: Cambridge University Press.
- Robinson, N. (1990). Sustainable development: An introduction to the concept. In J. O. Saunders (Ed.), *The legal challenge of sustainable development* (pp. 15-34). Calgary, Alberta, Canada: Canadian Institute of Resources Law.
- Rogers-Warren, A., & Warren, S. F. (Eds.) (1977). *Ecological perspectives in behavior analysis*. Baltimore, MD: University Park Press.
- Rook, K. S. (1984). The negative side of social interaction: Impact on psychological well-being. *Journal of Personality and Social Psychology*, 46, 1097-1108.
- Russ, N. W., & Geller, E. S. (1987). Training bar personnel to prevent drunken driving: A field evaluation. *American Journal of Public Health*, 77, 952-954.
- Sallis, J. F., & Hovell, M. F. (1990). Determinants of exercise behavior. In J. O. Holloszy & K. B. Pandolf (Eds.), *Exercise and sport sciences reviews* (Vol. 18, pp. 307-330). Baltimore, MD: Williams & Wilkins.
- Sarason, I. G., & Sarason, B. R. (Eds.) (1985). *Social support: Theory, research, and applications*. Dordrecht, The Netherlands: Martinus Nijhoff.
- Sarason, S. B. (1974). *The psychological sense of community*. San Francisco: Jossey-Bass.
- Sauter, S. L., Hurrell, J. J., & Cooper, C. L. (Eds.) (1989). *Job control and worker health*. Chichester, England: Wiley.
- Schaefer, J. A., & Moos, R. H. (in press). Life crises and personal growth. In B. N. Carpenter (Ed.), *Personal coping: Theory, research, and applications*. New York: Praeger.
- Scheier, M. F., & Carver, C. S. (1985). Optimism, coping, and health: Assessment and implications of generalized outcome expectancies. *Health Psychology*, 4, 219-247.
- Schwartz, G. E. (1982). Testing the biopsychosocial model: The ultimate challenge facing behavioral medicine. *Journal of Consulting and Clinical Psychology*, 50, 1041-1053.
- Seifert, M., & Vaughan, E. (1991, March). *When agricultural workers of Mexican origin protect themselves from pesticide exposure: The role of knowledge and perceived control*. Paper presented at the Annual Conference of the Environmental Design Research Association, Oaxtepec, Mexico.
- Shuman, M. H. (1986). Dateline main street: Local foreign policies. *Foreign Policy*, 65, 154-174.
- Silver, C., & DeFries, R. (1990). *One earth, one future: Our changing global environment*. Washington, DC: National Academy of Sciences.
- Stellman, J., & Henifin, M. S. (1983). *Office work can be dangerous to your health: A handbook of office health and safety hazards and what you can do about them*. New York: Fawcett Crest.
- Stokols, D. (1978). Environmental psychology. In M. R. Rosenzweig & L. W. Porter (Eds.), *Annual Review of Psychology* (Vol. 29, pp. 253-295). Palo Alto, CA: Annual Reviews.
- Stokols, D. (1987). Conceptual strategies of environmental psychology. In D. Stokols & I. Altman (Eds.), *Handbook of environmental psychology* (pp. 41-70). New York: Wiley.
- Stokols, D. (1990). Instrumental and spiritual views of people-environment relations. *American Psychologist*, 45, 641-646.
- Stokols, D. (1991). Conflict-prone and conflict-resistant organizations. In H. Friedman (Ed.), *Hostility, coping, and health* (pp. 65-76). Washington, DC: American Psychological Association.
- Stokols, D., & Jacobi, M. (1984). Traditional, present-oriented, and futuristic modes of group-environment relations. In K. Gergen & M. Gergen, (Eds.), *Historical social psychology* (pp. 303-324). Hillsdale, NJ: Erlbaum.
- Stokols, D., & Novaco, R. W. (1981). Transportation and well-being: An ecological perspective. In J. Wohlwill, P. Everett, & I. Altman (Eds.), *Human behavior and environment: Advances in theory and research: Vol. 5. Transportation environments* (pp. 85-130). New York: Plenum Press.
- Stokols, D., & Shumaker, S. (1981). People in places: A transactional view of settings. In J. Harvey (Ed.), *Cognition, social behavior and the environment* (pp. 441-448). Hillsdale, NJ: Erlbaum.
- Stokols, D., Shumaker, S., & Martinez, J. (1983). Residential mobility and personal well-being. *Journal of Environmental Psychology*, 3, 5-19.
- Syme, S. L. (1990, April). *Health promotion: Old approaches, new choices, future imperatives*. Paper presented at Conference on The New Public Health: 1990, Los Angeles, CA.
- Syme, S. L., & Berkman, L. F. (1976). Social class, susceptibility and sickness. *American Journal of Epidemiology*, 104, 1-8.
- Taylor, R. B. (1987). Toward an environmental psychology of disorder:

- Delinquency, crime, and fear of crime. In D. Stokols & I. Altman (Eds.), *Handbook of environmental psychology*. New York: Wiley, 951-986.
- Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being. A social psychological perspective on mental health. *Psychological Bulletin*, *103*, 193-210.
- Temoshok, L. (1985). Biopsychosocial studies on cutaneous malignant melanoma: Psychosocial factors associated with prognostic indicators, progression, psychophysiology, and tumor-host response. *Social Science and Medicine*, *20*, 833-840.
- Thomas, L. (1983). An epidemic of apprehension. *Discover*, *4*, 78-80.
- United States Department of Health, Education, and Welfare (1979). *Healthy people: The Surgeon General's report on health promotion and disease prevention* (DHEW Publication No. PHS 79-55071). Washington, DC: U.S. Government Printing Office.
- United States Department of Health and Human Services (1991). *Healthy People 2000: National Health Promotion and Disease Prevention Objectives* (DHHS Publication No. PHS 91-50212). Washington, DC: U.S. Government Printing Office.
- Vaughan, E. (1991). *Individual differences and implications for environmental policy*. Manuscript submitted for publication.
- Watson, D., & Pennebaker, J. W. (1989). Health complaints, stress, and distress: Exploring the central role of negative affectivity. *Psychological Review*, *96*, 234-254.
- Webster's encyclopedic unabridged dictionary of the English language*. (1989). New York: Portland House.
- Weick, K. E. (1984). Small wins: Redefining the scale of social problems. *American Psychologist*, *39*, 40-49.
- Weinstein, N. D., Ed. (1987). *Taking care: Understanding and encouraging self-protective behavior*. New York: Cambridge University Press.
- Weinstein, N. D., Sandman, P. M., & Roberts, N. E. (1991). Perceived susceptibility and self-protective behavior: A field experiment to encourage home radon testing. *Health Psychology*, *10*, 25-33.
- Weiss, S. M. (1991). Health at work. In S. M. Weiss, J. E. Fielding, & A. Baum (Eds.), *Perspectives in behavioral medicine: Health at work* (pp. 1-10). Hillsdale, NJ: Erlbaum.
- Williams, A. F. (1982). Passive and active measures for controlling disease and injury: The role of health psychologists. *Health Psychology*, *1*, 399-409.
- Williams, A. F., Karpf, R. S., & Zador, P. F. (1983). Variations in minimum licensing age and fatal motor vehicle crashes. *American Journal of Public Health*, *73*, 1401-1403.
- Williams, A. F., Zador, P. L., Harris, S. S., & Karpf, R. S. (1983). The effect of raising the legal minimum drinking age on fatal crash involvement. *Journal of Legal Studies*, *12*, 169-179.
- Wilson, E. O., & Peter, F. M. (Eds.). (1988). *Biodiversity*. Washington, DC: National Academy Press.
- Winett, R. A., King, A. C., & Altman, D. G. (1989). *Health psychology and public health: An integrative approach*. New York: Pergamon Press.
- Winett, R. A., Moore, J. F., & Anderson, E. S. (1991). Extending the concept of social validity: Behavior analysis for disease prevention and health promotion. *Journal of Applied Behavior Analysis*, *24*, 215-230.
- Wolf, M. M. (1978). Social validity: The case for subjective measurement, or how behavior analysis is finding its heart. *Journal of Applied Behavior Analysis*, *11*, 203-214.
- World Commission on Environment and Development (1987). *Our common future*. New York: Oxford University Press.
- World Health Organization (1984). Health promotion: A discussion document on the concept and principles. *Health Promotion*, *1*, 73-76.
- World Resources Institute (1991). *World resources, 1990-91*. New York: Oxford University Press.