The purpose of this volume is to provide a capsule view of the relationship of the behavioral and social sciences to public health as we enter the 21st century. Historically, the genealogical tree of Western medicine often is traced to Hippocrates, who held a holistic concept of health and disease: “Health depends upon a state of equilibrium among the various internal factors which govern the operation of the body and the mind; the equilibrium in turn is reached only when man lives in harmony with his external environment” (cited in Dubos, 1959, p. 114). Thus, although physicians before the Age of Enlightenment attempted to treat wounds, burns, and fractures with practical remedies, the emphasis in healing was on health preservation rather than on curative processes. There was also emphasis on the interactions between cognitive-affective processes and bodily processes and between the individual (i.e., the host) and the environment.

In the 17th century, emerging notions of scientific thought shifted the balance in favor of reductionist as opposed to holistic approaches to health and disease and curative medicine over the preservation of health.
One major impact on 17th-century thought was Newton's demonstrations that nature's laws could be understood according to exact, specifiable physical principles. If an apple falls to earth, its single cause is the gravitational pull of the earth, which can be studied precisely. A second major impact was Descartes' *Traité de l'homme*, which posited a dichotomy between mind and body, thought and matter (Eaton, 1927). This encouraged a reductionist viewpoint in which thoughts and emotions were held to have nothing to do with bodily processes; the secrets of health and disease could be understood solely in terms of physical processes.

The 19th century established that microorganisms cause certain diseases and that pathogenic effects could be avoided or reversed by antitoxins and vaccines (King, 1982, p. 796). By the end of the century Koch's postulates were firmly entrenched. Briefly, Koch's postulates state that the etiological microorganism must be present in every case of the disease; the microorganism is not found in any other disease; and the isolated microbe reproduces the disease when administered to a new host.

The last two decades of the 19th century saw an explosion of scientific discoveries by Koch, Pasteur, Jenner, and others, which led to the identification of a plethora of infectious diseases. These included cholera, diphtheria, leprosy, malaria, pneumococcus, staphylococcus, streptococcus, tetanus, and tuberculosis. With the development of immunizations and antibiotics, the tools now exist for preventing and treating most infectious diseases.

Although the development of an understanding of bacterial and viral agents in disease processes, along with the development of vaccines and antibiotics, represents a monumental achievement in the world of science, it is not the whole story. As the 20th century unfolded, it became apparent that few diseases besides tuberculosis and tetanus seemed to satisfy Koch's postulates completely. Even in the case of tuberculosis, transmission depends on the existence of a vulnerable host. Thus, the ability of the tubercle bacillus to infect the host depends on multiple variables including host nutrition, actions of leukocytes, and responses of body tissues to counteract the bacillus at the site of potential infection.

In a provocative analysis, McKinlay and McKinlay (1997) observed that the precipitous declines in infectious disease rates in the United States preceded the development of immunizations and antibiotics by several decades. They observed that for each of nine infectious diseases, including diphtheria and scarlet fever, the incidence rate dropped precipitously long before pharmacologic interventions were developed to counteract the responsible microorganism. Based on the published work of McKeown (1976) and others, McKinlay and McKinlay attributed the decline in infectious diseases to improved nutrition and decreased exposure to infection through improved hygiene. McKinlay and McKinlay concluded that only about 3.5% of the total decline in mortality since 1900 could be attributed to
medical interventions. Thus, they argued that changes in environmental conditions, not the control of disease-causing microorganisms, were responsible for the dramatic improvements in public health that occurred during the first half of the 20th century.

In any event, as infectious diseases declined as the leading causes of mortality in the United States, they were eclipsed by chronic diseases such as coronary heart disease (CHD), cancer, and stroke, which by 1990 accounted for more than 60% of the death rate (Centers for Disease Control and Prevention [CDC], 1996). As scientists attempted to find specific causal agents in the development of cancer and CHD throughout most of the 20th century, they became increasingly frustrated. Unable to identify single causes that could satisfy Koch's postulates, attention shifted from the search for single causative agents to the role of the environment and host in the pathogenesis of chronic diseases.

The landmark study for the rethinking of the pathogenesis of chronic diseases was the Framingham heart disease study initiated in the early 1950s. Using a prospective, longitudinal research design, the investigators collected behavioral, clinical, and demographic information on more than 6,000 men between ages 30 and 60 years (Dawber, Meadors, & Moore, 1991). Within 10 years, the investigators prospectively identified three leading risk factors for CHD as smoking, elevated cholesterol, and high blood pressure (Kannel, Dawber, Kagan, Revotskie, & Stokes, 1961). Whereas the single cause-and-effect model had proven successful in studying the genesis of infectious disease, an explanation for the causes of chronic diseases has had to turn to probabilistic models based on the presence of risk factors. The identification of risk factors makes the prediction of chronic diseases more likely, but individual risk factors cannot be seen as necessary and sufficient causes of disease. Scientists are still searching for primary causes of some diseases, but there is increasing recognition that to understand any disease, the interactions among agent, host, and environment are critical.

At the outset of the risk-factor revolution, it was widely thought that the causes of chronic diseases such as CHD could be explained in terms of a few biological (e.g., high cholesterol, high blood pressure) and lifestyle (e.g., smoking) risk factors. This was not the case. For example, the relationship between cholesterol and CHD soon led to a need to distinguish between low-density and high-density lipoprotein cholesterol. Likewise, the search for lifestyle risk factors led to an expanded list of risk factors including physical inactivity and a variety of consummatory activities. In addition, experimental behavioral research using appropriate animal models of human pathology, clinical studies of individuals predisposed to disease, and population-based studies of associations between behavioral–psychosocial variables and disease have extended the list of risk factors for...
TABLE 1.1
Average Annual Number of Deaths in the United States, 1988–1992

<table>
<thead>
<tr>
<th>Rank</th>
<th>Cause of Death</th>
<th>No. of Total Deaths</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Heart disease</td>
<td>723,636</td>
<td>34</td>
</tr>
<tr>
<td>2</td>
<td>All cancer</td>
<td>497,545</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Lung</td>
<td>(138,742)</td>
<td>(7)</td>
</tr>
<tr>
<td></td>
<td>Colorectal</td>
<td>(56,616)</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Prostate</td>
<td>(31,658)</td>
<td>(1)</td>
</tr>
<tr>
<td></td>
<td>Breast</td>
<td>(42,551)</td>
<td>(2)</td>
</tr>
<tr>
<td>3</td>
<td>Stroke</td>
<td>143,284</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Unintentional injuries</td>
<td>89,395</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Chronic obstructive pulmonary disorder</td>
<td>86,470</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Pneumonia and influenza</td>
<td>76,338</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Diabetes</td>
<td>45,937</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Suicide</td>
<td>29,872</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Liver disease</td>
<td>25,175</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>HIV/AIDS</td>
<td>23,632</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Homicide</td>
<td>(15,769)</td>
<td>(1)</td>
</tr>
<tr>
<td></td>
<td>Firearm homicide</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>All causes</td>
<td>2,131,977</td>
<td></td>
</tr>
</tbody>
</table>


disease to include multiple psychosocial and behavioral variables (National Heart, Lung, and Blood Institute [NHLBI], 1998).

Behavioral, psychosocial, and sociocultural factors associated with lifestyle are major contributors to morbidity and mortality in the United States and significantly contribute to the leading causes of death (U.S. Surgeon General, 1990). As seen in Table 1.1, the 11 major causes of death are heart disease, cancer, cerebrovascular disease (stroke), unintentional injuries, chronic obstructive pulmonary disease, pneumonia and influenza, diabetes, suicide, chronic liver disease and cirrhosis, HIV infection, and homicide (CDC, 1996).

Death rates from heart disease have declined during the past 30 years, but it remains the leading cause of death in the United States (American Heart Association, 1996). Of these deaths, two thirds are attributable to CHD. The responsible behavioral and lifestyle factors include cigarette smoking, diet high in saturated fat, physical inactivity, obesity, and excess consumption of alcohol. Individual characteristics such as anger and depression also have been implicated, as have social and environmental variables including socioeconomic status, ethnicity, lack of social support, and occupational stress (NHLBI, 1998).

Age-adjusted death rates for all cancer sites combined have changed little in the United States during the past two decades (CDC, 1996), but
incidence rates have increased about 1.3% per year (Kosary, Ries, & Miller, 1996). During the past 30 years, lung cancer has been the leading cause of cancer mortality in men; for the past decade, it has been the major cause of cancer deaths in women (American Cancer Society, 1994). The primary risk factor for lung cancer is cigarette smoking, which is associated with such factors as number of cigarettes smoked, duration of smoking, and use of unfiltered cigarettes (Ginsberg, Kris, & Armstrong, 1993).

The third leading cause of death in the United States is stroke, which has steadily declined throughout the 20th century (NHLBI, 1994). Risk factors associated with lifestyle include untreated hypertension, cigarette smoking, obesity, and excessive alcohol consumption.

The fourth leading cause of death in the United States is accidents, which peak between ages 15 and 24 years, then rise again after age 60 (CDC, 1996). Nearly half of all deaths in young people are motor vehicle-related, whereas falls are the leading cause of unintentional injury among older people. Young people, particularly young men, are prone to unintentional injuries often related to high-risk behavior (Baker, O'Neill, Ginsberg, & Li, 1992). This often is exacerbated by the use of alcohol.

Behavioral, psychosocial, sociocultural, and lifestyle factors are related to the other major causes of mortality as well. Among cases of chronic obstructive pulmonary disease, 90% are caused by smoking (NHLBI, 1998). Major risk factors for pneumonia are related to disruptions of natural pulmonary host defense mechanisms, which can include cigarette smoking and alcohol abuse (Donowitz & Mandell, 1995). Approximately 90% of all cases of diabetes mellitus consist of noninsulin-dependent diabetes in which obesity, often linked to poor diet and physical inactivity, is a major factor (Pareschi & Tomasi, 1989). Suicide has been related to alcohol abuse, depression, and stressful life events including loss of a spouse (Monk, 1987). Heavy use of alcohol is a major risk factor for chronic liver disease and cirrhosis (CDC, 1993). In the United States, infection from HIV is primarily spread through high-risk sexual practices and the sharing of contaminated drug paraphernalia (Auerbach, Wypijewska, & Brodie, 1994). These risks are exacerbated by alcohol or drug abuse. Finally, homicide is a leading cause of death within the United States and the leading cause of death in Black men between ages 15 and 24 (CDC, 1996). Major behavioral and psychosocial factors associated with homicide include poverty, firearm availability, alcohol and drug abuse, and cultural acceptance of violent behavior (CDC, 1990).

CONTROLLING MORBIDITY AND MORTALITY

The remarkable medical accomplishments of the late 19th century led to the identification of the primary etiological microorganisms respon-
sible for almost all known infectious diseases. Use of immunizations and antibiotics produced impressive results in reducing disease burdens. They also led to the reductionist belief that if only we “knew enough,” medical and biological concepts would be fully explicable in physicochemical terms. A more contemporary version of this argument would be that if only we had increased information about the fundamentals of cellular and molecular biology and fully understood the human genome, the illnesses that still plague us could be eradicated.

In contrast to this pure reductionist approach, a complementary view has emerged that it is not only etiologic agents that must be identified, but also the interactions among these agents, the host, and the environment; these must then be understood and controlled to prevent and cure most human afflictions. According to Engel (1981), for example, “the biochemical effect constitutes but one factor among many, the complex interaction of which may culminate in active disease or manifest illness” (p. 131). Thus, contemporary approaches to medicine and public health have begun to include the study of risk factors as well as interactions, often behavioral, that occur among agents, host, and the environment. Further, emphasis has shifted in public health from a focus on the individual to a focus on the population or community.

Individual Versus Population-Based Approaches to Disease Prevention

The control over most causes of morbidity and mortality has been dichotomized into a clinical or high-risk approach on the one hand and a population-based strategy on the other. Consistent with this distinction is the view that individual health care providers place a higher value on providing help to those who need it most, leading these providers to focus on individual patients at high risk for disability and death. Conversely, public health providers are essentially committed to primary prevention to provide the most benefit to the most people. Part of the justification for the population-based strategy can be seen in the example of CHD, in which most coronary events and deaths attributable to the disease occur in people with only a moderate elevation of risk (Rose, 1992).

Although there is some utility in distinguishing between high-risk and population-based strategies, there is also some agreement that individual- and population-based strategies are complementary because neither approach is effective for all behaviors or all target groups (Jeffery, 1989). Thus, it may be argued that an important task is to identify which risk behaviors are most amenable to individual-based versus population-based interventions and how to make these interventions synergistic with one another. With such thoughts in mind, Schneiderman and Orth-Gomér defined behavioral medicine as
the interdisciplinary field concerned with the development and integration of biomedical, behavioral, psychosocial, and sociocultural science knowledge and techniques relevant to the understanding of health and illness, and the application of this knowledge and these techniques to disease prevention, diagnosis, treatment, rehabilitation, and health promotion. (1996, p. 280)

The key features of the definition are twofold. First, it defines an interdisciplinary field encompassing biomedical, behavioral, psychosocial, and sociocultural science. Second, it encompasses approaches to health and illness that include both clinical, high-risk (e.g., diagnosis, treatment, rehabilitation) and population-based (e.g., disease prevention, health promotion) strategies.

In terms of prevention, the concepts of primary, secondary, and tertiary prevention are often distinguished (Last, 1988). Primary prevention refers to measures taken to reduce the incidence of disease. In the case of CHD, for example, individuals may be encouraged to quit smoking, decrease intake of dietary fat, and increase physical activity. Secondary prevention involves reducing the prevalence of disease by shortening its duration and limiting adverse physiological and psychological effects. Screening programs are examples of secondary prevention strategies. Breast cancer mortality is decreased by the early detection of breast cancer through the use of mammograms. Tertiary prevention involves reducing the complications associated with the disease process and minimizing disability and suffering. In patients with chronic AIDS, for example, medication adherence training may be considered as a form of tertiary prevention.

Sometimes the boundaries of prevention strategies are indistinct, and a given intervention may address a combination of primary, secondary, and tertiary interventions. Figure 1.1 shows how a group-based cognitive-behavioral therapy intervention may address primary and tertiary prevention needs in HIV/AIDS-infected men and women (Schneiderman, 1999). In this instance, the group-based intervention is intended to improve adherence to highly active antiretroviral medication therapy (tertiary prevention) both by providing skills training in adherence and by decreasing distress. Concomitantly, the intervention is intended to promote harm reduction (primary prevention) by educating participants about the increased risk to themselves and others caused by continuing to engage in risky sex or share drug paraphernalia. Because these participants with HIV infection are already seropositive, improved harm-reduction behaviors have a high likelihood of penetrating the community of those already infected and significantly decreasing the incidence of new infections.

In addition to the concepts of primary, secondary, and tertiary prevention, Strasser (1978) coined the term "primordial prevention" to refer to activities that can prevent the penetration of risk factors into the population. An example of this would be the prevention of cigarette sales into
countries where cigarette smoking has not yet begun. This issue is discussed further by Lynch in chapter 3.

**Intervention Levels**

The application of the behavioral and social sciences to improve health and combat disease occurs at many levels and requires the application of different skills both within and across levels. At the individual or interpersonal level, counseling of a suicidal patient, a violent sex offender, or a person recovering from cancer or who has just received a positive diagnosis of HIV infection are examples of such an intervention. Genetic counseling and screening for couples, family counseling to reduce substance abuse or intrafamilial violence, or group counseling to cope with issues such as myocardial infarction, HIV/AIDS, or violent behavior exemplify interventions at the interpersonal level. At the organizational level, individual or interpersonal interventions, as well as media communication, have been organized in schools, prisons, work sites, and community centers. Finally, societal type interventions involving the development of social norms through media and policy actions can occur at the community, state, or federal level.

To achieve public health objectives, it may be necessary to attack many intransigent problems at multiple levels. In this volume, for example, Chesney, Thurston, and Thomas in chapter 2 argue that to deal successfully with the problem of obesity, it is necessary to provide interventions at several levels. Chesney and her colleagues point out that although behavioral interventions administered at the individual level tend to produce
successful weight loss in the short-term, they fail to produce sustained long-term weight loss in many cases. They suggest that for individual-based interventions to succeed, such interventions should take place in a sociocultural environment that is supportive of healthful eating and conducive to exercise. According to Jeffery (1998), this could be accomplished by (a) improving the quality of the food supply, (b) enhancing accessibility of physical activity, (c) increasing advertising for healthy food options, (d) initiating mass-media campaigns supporting a healthy lifestyle, and (e) providing economic incentives for healthy eating by selective taxation (e.g., taxing sugar and some fats). In chapter 4, Puska and Uutela describe how such a multilevel approach reduced morbidity and mortality from CHD in North Karelia, Finland.

Although there is widespread agreement that multilevel approaches may be necessary to solve major public health problems, there is less agreement concerning the sequencing of the various interventions and how they reasonably can be assessed. Several clinical trials, for instance, have obtained mixed or inconclusive results, which at least in part have been attributed to secular trends or contextual factors (e.g., Multiple Risk Factor Intervention Trial [MRFIT], 1982). These factors may have been associated either with the trial itself or with other, possibly multilevel, intervention efforts.

Both the Oslo Heart Study in Norway (Hjermann, Velve-Byre, & Holme, 1981) and MRFIT (1982) in the United States identified high-risk individuals by screening and then intervened to reduce risk factors and CHD incidence. Whereas the Oslo Heart Study convincingly demonstrated significant differences between the intervention and control group in terms of risk-factor reduction and CHD incidence, the MRFIT did not. Both the Oslo Heart Study and the MRFIT, however, were successful in demonstrating evidence of risk-factor reduction associated with a significant decrease in CHD incidence when compared with previous population norms.

A problem with interpreting the MRFIT (1982) data is that many of the high-risk men in the control group apparently reduced risk behaviors on their own. Explanations for these findings have been attributed to several possible variables. First, having been labeled as high risk, some of the men may have responded by changing their behavior. Second, participating in a clinical trial in which they received physician and nurse attention may have provided some of these comparison group members with better medical monitoring than they otherwise might have received. Third, during the course of the MRFIT trial, substantial efforts were made concomitantly by the National High Blood Pressure Education Program (Roccella & Horan, 1988) and the pharmaceutical industry to increase the number of hypertensive individuals under adequate blood pressure control. Fourth, mass-media coverage of the ongoing MRFIT trial and its objectives was widespread, which may have convinced a significant number of comparison
group participants to modify target risk factors. In any event, by the sixth annual examination in MRFIT, 47% of the comparison group members were taking antihypertensive drugs (which was considerably higher than expected), compared with 58% in the intervention group. With relatively small differences observed between the intervention and control groups, statistical significance was not achieved between groups for either risk-factor modification or CHD incidence.

The results of the Oslo Heart Study (Hjermann et al., 1981) suggest that behavioral interventions can reduce risk factors and decrease the incidence of CHD. Conversely, the findings from MRFIT (1982) provide a caution that before initiating a large-scale clinical trial, the interventions used should have sufficient power to provide a high likelihood of success. Fortunately, in the two decades since these pioneering behavioral intervention trials, important knowledge has emerged concerning behavioral and psychosocial risk factors on the one hand and behavioral techniques for modifying risk factors on the other (NHLBI, 1998). At the same time, the results of the Oslo and MRFIT studies provide a useful caution about the design of clinical intervention trials. In this volume, Murray (chapter 15) outlines strategies that are likely to be useful in designing group randomized trials in health promotion and disease prevention research. Goodman’s discussion (chapter 14) provides a consideration of other design options that may be pursued when experimental designs may not be feasible.

**EXPERIMENTAL DESIGN IN HEALTH AND BEHAVIOR RESEARCH**

Flay (1986) described multiple steps in health promotion and disease prevention research ranging from basic research through efficacy and effectiveness trials to demonstration studies. One often-used, basic distinction is between efficacy trials and effectiveness trials. Briefly, efficacy trials are designed to test whether an intervention causes an observed effect under carefully controlled conditions. In this case, the investigator would have control over the content of the intervention, its delivery, and context. Conversely, treatment effectiveness trials are used to determine whether the treatment will remain effective when implemented under more natural or realistic conditions.

An example of an efficacy trial would be a cognitive–behavioral therapy intervention for individuals with HIV infection conducted in an academic setting with monetary incentives for participants, PhD-level therapists, and a retention specialist keeping track of participants throughout the study (Schneiderman, 1999). Once efficacy is established, an effectiveness trial might assess whether the intervention effects generalize when extended to multiple community health centers that do not use monetary incentives.
incentives, a retention specialist, and imported PhD-level psychotherapists. To the extent that patients are used to coming to community health centers to meet their medical needs and transportation and other benefits may be available through the centers, the use of community health centers offers important trade-offs that could facilitate an effectiveness trial. Once effectiveness is established, a demonstration project could be created without the need for a randomized control group. At this stage, the intervention itself would be under community center control, although rigorous evaluation of the type suggested by Goodman should be required (chapter 14).

**Design Issues**

A major goal of science is to be able to make strong inferences concerning causality. The strongest inferences can be made with those designs that best limit alternative interpretations of results. In experiments, alternative interpretations are limited through stratified sampling, random assignment to groups, and rigorous specification of the independent and dependent variables (Campbell & Stanley, 1966; Cook & Campbell, 1979). These are the objectives for which scientists strive in randomized clinical trials.

Sometimes, however, the randomized clinical trial may severely limit the nature of the scientific question under examination. For example, if one wishes to know whether a particular initiative can modify the health behavior of an entire population, the randomized clinical trial design may not be appropriate. In this case a quasi-experimental design may be more useful. In this volume, Puska and Uutela (chapter 4), describe a population-based intervention for reducing CHD risk factors, morbidity, and mortality in North Karelia, Finland, that has provided more than a quarter century of experience (Puska, 1996). The project used lay-leader training, television programs, stop-smoking contests, school and work-site interventions, and collaboration with housewives’ organizations, the food industry, and supermarkets. Initially, comparisons were made between the target area (North Karelia) and a comparison area (Kuopio), although after 10 years the interventions became part of a national policy and took on more of the characteristics of a demonstration project. The basic findings of the study were that serum cholesterol and smoking decreased more rapidly in North Karelia than in Kuopio during the first 10 years of the study; this was accompanied by a concomitant decrease in CHD mortality (Tuomilehto et al., 1989).

Quasi-experimental designs are attractive because they allow us to address important population-based questions. They must be approached with caution, however, because lacking rigorous experimental control, it is difficult to rule out alternative hypotheses as a way of understanding the factors that influence the dependent variables. Thus, for example, in com-
paring the impact of a needle-exchange program on injection-needle use practices among drug abusers, comparisons may be drawn between a community with a needle-exchange program and one without such a program. Even after using logic, reasoning, and knowledge of the experimental domain to rule out obvious confoundings, including community attitudes and police practices, confidence in the results would tend to become more robust as the number of intervention and control communities studied increases. When only one site or a small number of comparison sites is used, the possibility of a secular trend, an unexpected happening (e.g., a police crackdown), or obscure variables confounding the results may limit confidence in the results.

APPLICATION OF THEORY TO HEALTH AND BEHAVIOR PROBLEMS

Theories and models are helpful in health and behavior research to inform the design of intervention approaches and to guide the implementation of interventions. Many of the theories and models in common use have been described by Glanz, Lewis, and Rimer (1997).

Several prominent theories will be reviewed here. One of the first models specifically developed to explain health behavior was the health belief model (Becker, 1974; Rosenstock, 1966). This model was originally developed to explain adoption or nonadoption of preventive health behaviors, such as checkups and immunizations, but was later applied to sick-role behavior, adherence to medical regimens, and health promotion behaviors. The basis of the theory is that knowledge of perceived susceptibility, severity, benefits, and barriers jointly predict health behaviors. When the model has been used to predict the types of behavior for which it was originally intended (e.g., checkups and immunization), it has been successful (Cummings, Jette, Brock, & Haefner, 1979). In contrast, when more complex behaviors, such as smoking initiation, have been studied, beliefs about the severity of smoking-related disease and the benefits of smoking do not predict which adolescents will start smoking (Flay, 1985).

Social–cognitive theory as developed by Bandura (1986) assumes that healthy functioning is determined by the interactions among behavioral, physiological, and cognitive factors and the environment. The theory assumes that self-efficacy is the perception of being able to accomplish objectives necessary to obtain a desired outcome. Attainment of this goal leads to increased positive feelings toward oneself, which can serve as a motivation for change. The theory has been useful in predicting maintenance of physical activity (Sallis, Hovell, & Hofstetter, 1992), smoking relapse (Condiotte & Lichtenstein, 1981), and other health behaviors.
To the extent that stress may influence health behaviors and disease processes, cognitive–behavioral therapy has provided a theoretical model for teaching individuals to reduce their stress, evaluate their appraisals of potentially stressful situations more accurately, and improve coping skills. According to Beck (1976) systematic negative distortions about the future, the self, and others cause many of the components of depression and maladaptive coping responses. Specific applications of cognitive–behavioral therapy have been used in the management of asthma (Bartlett, 1983), rheumatoid arthritis (Parker et al., 1989), low-back pain (Turner, 1982), postmyocardial infarction (Friedman et al., 1986), HIV (Esterling et al., 1992), and malignant melanoma (Fawzy, Fawzy, Hyun, Guthrie, Fahey, & Morton, 1993). The study by Fawzy and colleagues is particularly noteworthy because it demonstrated that the intervention not only influenced affective state and coping positively, but also melanoma recurrence and the 6-year survival rate. It should be noted that many recent applications of cognitive–behavioral therapy to health problems have used a group format and have been concerned not only with the appraisal and management of stress responses but also with promoting self-efficacy, providing social support and health education, and offering adaptive coping, life skills, and harm-reduction training (Schneiderman, 1999). The use of a group format not only permits the therapist to reach more individuals, thus providing improvements in cost–benefits and diffusion of behavior change innovations into the community, but also provides interpersonal and intrapersonal approaches to treatment.

The theory of reasoned action (Ajzen & Fishbein, 1980) and its more recent variant, the theory of planned behavior (Ajzen, 1988) are concerned with the role of anticipated material and social consequences in people’s decisions and intentions to engage in health-related behaviors. Briefly, the theory states that intentions are the most immediate influence on behavior. Intentions are influenced by attitudes and subjective norms. Attitudes are determined by the most prominent beliefs about what would happen as a consequence of behavior. Subjective norms are affected primarily by pressures from significant others. Finally, intentions to perform a behavior become stronger once people perceive that they have control over that behavior. The theory of reasoned action has been used to predict smoking and exercise behaviors (Carter, 1990) but has not yet provided explicit strategies for changing behavior.

The transtheoretical model (Prochaska & DiClemente, 1984) was based on the observation that people appear to go through similar stages of change no matter what therapy is applied. The basic theses of the model are that (a) different intervention approaches are needed for people at different stages of behavior change and (b) different processes of change may be occurring at each stage. Briefly, Prochaska and DiClemente distinguished six stages in the process of behavior change. These are precontem-
plation, contemplation, preparation for action, action, maintenance, and relapse.

Prochaska and DiClemente (1984) used the term transtheoretical to indicate that people in different stages of change have to be approached with different intervention strategies, based on different theories, because they have different needs. Thus, precontemplators need to receive information concerning the disadvantages of maintaining current risk behavior and the advantages of changing behavior. Once having reached the contemplation stage, these individuals should be motivated to make specific plans to change behavior and set goals. During the preparation stage, people should be offered interventions that increase self-efficacy, skills, and social support. At the action stage, people need motivation and reinforcement to maintain their changed behavior. During the maintenance stage, relapse prevention strategies should be implemented to prevent backsliding. Finally, in the relapse stage, people must learn to treat this as a limited, minor setback rather than as a defeat; strategies need to be implemented to get the person to return to the contemplation, preparation for action, or action stages. The transtheoretical model has been studied extensively in smoking cessation (DiClemente, Prochaska, Fairhurst, Velicer, Velasquez, & Rossi, 1991) and also in promoting exercise (Marcus, Selby, Niaura, & Rossi, 1992), weight control (O'Connell & Velicer, 1988), alcohol treatment (DiClemente & Hughes, 1990), and mammography (Rakowski, Fulton, & Feldman, 1993).

Because public health problems may be best addressed at multiple levels (i.e., intrapersonal, interpersonal, organizational, and societal), social action theory was developed specifically to integrate social–cognitive models into a public health framework (Ewart, 1991). Briefly, the theory is designed to (a) analyze health behaviors (e.g., unprotected high-risk sex), (b) integrate individual self-change processes (e.g., problem anticipation, planning, role playing) that may be initiated to generate desired patterns, and (c) coordinate the self-change processes with contextual factors (e.g., school-based education, increased condom availability, public health messages) that support self-protective activity.

The models that we have described thus far offer theories of behavior change. Once a program has been demonstrated to be effective, the question is how to get it to be used widely so as to benefit the health of larger populations. Thus, McGuire (1981) has developed a communication–behavior change model describing how to sequence a media campaign and Rogers (1983) has presented a diffusion of innovations model to describe the channels that can be used to communicate health innovations. Finally, Green and Kreuter (1991) have created the PRECEDE–PROCEED model to provide a framework for putting health behavior programs together in a manner that can be delivered to a large number of people at a realistic cost.
McGuire's (1981) communication–behavior change model suggests that to design an effective public communication campaign, one should consider five input and 12 output factors. The five input factors that need to be considered are source, message, channel, receiver, and destination. In considering the source, attention must be paid to the credibility of the spokesperson and his or her ability to relate to the intended audience. Message factors include what and how the message is presented. The channel is the medium through which the message is transmitted and involves cost, number of people to be reached, and whether a “sound-bite” or a more complex message is to be sent. Receiver refers to the target audience and involves knowledge of their characteristics, likes, and dislikes. Finally, the destination is the intended outcome desired, such as actually placing infant car seats in the rear of vehicles rather than just knowing that it is a good idea.

The output factors in McGuire's (1981) model involve specifying a 12-step sequence of events: exposure to the situation, attending to it, becoming interested in it, comprehending, skill acquisition, attitude change, memory storage of content, information retrieval, deciding on basis of information retrieval, behaving in accord with the decision, reinforcement of desired acts, and finally the maintenance of the behavior. Examination of the communication–behavior change model provides important insights into the difficulties posed in using the media to develop a stable new habit. Thus, for example, even after attracting a receiver's attention, 10 more steps are still needed before the new habit is consolidated. Various aspects of McGuire's model have been tested in communication campaigns to reduce tobacco consumption, improve use of family planning services, and prevent heart disease (Rice & Atkin, 1989).

Rogers' (1983) diffusion of innovation model is similar to the stages of change concept insofar as it suggests that different groups of people require different strategic approaches if they are to adopt a particular health behavior. Thus, Rogers suggested that potential adopters include innovators, early adopters, early majority adopters, late majority adopters, and laggards. The model has been used widely in a variety of disease prevention programs, and Howze and Redman (1992) used the model to implement a strategy for diffusion of health promotion throughout Virginia.

The PRECEDE–PROCEED model (Green & Kreuter, 1991) is intended as a guide for designing and evaluating health promotion programs intended to change the health behaviors of large groups. The model first asks planners to determine if a program is needed (phases 1–5) and then decide how they would go about implementation (phase 6) and evaluation (phases 6–9).

Phase 1 (social diagnosis) involves determining if a problem exists that disrupts the quality of life of the target group. In phase 2 (epidemiological diagnosis), the question is couched in terms of health problems.
Phase 3 (behavioral and environmental diagnosis) asks what behavioral and environmental factors are related to the epidemiological diagnosis. In phase 4 (educational and organizational factors), questions are raised about the predisposing, reinforcing, and enabling factors that are likely to have the most direct effects on the target behaviors. Phase 5 (administrative diagnosis) asks what resources, time constraints, and abilities must be considered in carrying out the program.

Phase 6 (implementation) consists of a detailed plan including the behavior change intervention procedures, how the population will be engaged, what organizations will need to be involved, and what administrative structure will be required. Phase 7 (process evaluation) is the assessment of whether the intervention changed the predisposing, reinforcing, and enabling factors. Phase 8 (impact evaluation) asks whether the important behavioral and environmental variables were changed. Finally, phase 9 (outcome evaluation) addresses the issues of whether the target population improved in terms of quality of life and physical health as a consequence of the intervention. Aspects of the PRECEDE–PROCEED model have been applied in numerous community, occupational, school, and health care settings (Green & Kreuter, 1991).

ABOUT THIS VOLUME

Toward the end of the 20th century, the need for better integrating behavior and social sciences into public health was increasingly recognized. In fact, coursework in social and behavioral sciences was a mandated component of the core curriculum in all schools of public health in the United States that sought accreditation. The integration of sociology, political science, and health economics provided a relatively easy fit into public health training because of the traditional public health emphasis on populations. In contrast, the application of behavioral science expertise into public health research and practice may have lagged somewhat because of its emphasis on the individual. By the end of the 20th century, however, it was apparent that many important public health problems require behavioral change in populations. Thus, there has been increasing awareness that the solution of many public health problems probably will require the use of interdisciplinary strategies focused on multiple levels (i.e., intrapersonal, interpersonal, organizational, and societal).

The selection of chapters and the organization of this volume presented the editors with a challenge. Although the behavioral, social science, and public health communities appear to be eager for further integration among disciplines, they tend to know different things. Thus, some information presented to behavioral scientists may seem redundant to those already trained in public health and vice versa. We hope, however, that
the following messages will be conveyed to both constituencies: (a) knowledge and methods gained from the scientific study of individual behavior can be applied to public health problems, and (b) the resolution of many health problems requires attention to the organizational and societal level, as well as to the individual level.

Another problem posed in the development of this book was that the field has not yet absorbed a multilevel, interdisciplinary approach to public health issues. Therefore, instead of attempting to squeeze each chapter into a common template, we have provided the individual authors with an individual platform on which to address important behavioral and social sciences issues as they pertain to public health. At the same time, we have paired some chapters to explore the diversity of approaches used in various areas. Thus, in Part II, “Applying Behavioral and Social Science Approaches to Selected Public Health Problems,” chapter 2 (obesity), chapter 9 (breast screening), and chapter 10 (unintentional injury) stand alone. Conversely, chapters 3 and 4 both deal with cardiovascular disease prevention: Chapter 3 focuses on the socioeconomic and psychosocial epidemiology of cardiovascular disease and chapter 4 on the most celebrated first-generation effort to alter community-wide risk for cardiovascular disease. Similarly, chapters 5 and 6 both deal with the topic of violence: Chapter 5 argues for moving beyond a focus on the individual to an ecological approach, and chapter 6 looks broadly at the issue of violence against women. Whereas chapters 7 and 8 both deal with HIV/AIDS, chapter 7 explores what is known about the link between HIV infection and injection drug use, and chapter 8 provides examples of community efforts that have been launched to stem the epidemic through behavioral change in high-risk populations. Considered as a group, the first six chapters of this volume provide a basic introduction to public health concepts and issues for those whose primary background is in behavior, whereas the next four chapters elucidate important public health problems and emphasize a community perspective.

Part III, “Conceptual and Methodological Considerations in the Integration of Behavioral and Social Sciences With Public Health,” comprises seven chapters that address a variety of topics central to the integration of social science and behavioral approaches to public health issues. Among the topics discussed are the thorny methodological issues that must be addressed in evaluating behavioral and social science interventions. These include the need to develop and utilize alternative models of evaluating public health programs and the value of group randomized controlled trials in the evaluation of efficacy and effectiveness of health promotion and disease prevention programs. The chapters by Karasek (chapter 13) on the work environment and by Becker (chapter 17) on spirituality in public health are interesting thought pieces that are designed to expand our intellectual horizons.
In the design of the present volume, this chapter (by Schneiderman and Speers) is intended to provide a historical overview of the role of the behavioral and social sciences in public health and to develop the context for the chapters in the next section on “Applying Behavioral and Social Science Approaches to Selected Public Health Problems.” Chapter 2 by Chesney, Thurston, and Thomas, using obesity as an example, addresses the issue of moving beyond individual-level behavior change to the broader goal of developing interventions at social and environmental levels. In chapter 3, Lynch explores how socioeconomic factors influence psychosocial risk and public health. Using cardiovascular disease as an example, Lynch persuasively argues that social conditions are a powerful determinant of health and disease throughout the life span. Chapter 4 eloquently describes the conceptual elements of the North Karelia Project, which was designed to reduce cardiovascular morbidity and mortality. Puska and Uutela do a fine job of considering individual-level theories and demonstrating their relevance to a community-wide intervention.

Chapter 5 focuses on pervasive community violence and how community-level efforts can be used to stem this violence. Lorion suggests a number of ways in which theory and methods used in psychology might be applied to public health issues while still attending to the multilevel nature of the problem. Chapter 6 is a clearly written review of violence by men against women. Cook and Koss indicate what needs to be done in the future, with consideration of opportunities to apply behavioral strategies. In chapter 7 Des Jarlais and Friedman provide a useful orientation to the risk of HIV infection among intravenous drug users and describe issues related to increasing the effectiveness of needle exchange programs. Similarly, in chapter 8 Kalichman, Somlai, and Sikkema outline a history of HIV prevention efforts at the community level. Although chapters 7 and 8 do not focus on the individual level, within the context of the present volume the reader can see where opportunities for individual- and community-level interventions could be interactive.

In chapter 9, Rimer, Meissner, Breen, Legler, and Coyne deal with social and behavioral interventions in breast cancer screening, providing an exhaustive literature review of an important topic. In chapter 10, Gielen and Girasek use the classic epidemiological framework of host-agent-environment analysis to demonstrate how behavioral interventions can be applied to preventing unintentional injuries. On the one hand, the chapter clearly addresses the relevance of approaches derived from psychology; on the other hand, it does an outstanding job of conveying an important public health tradition (host-agent-environment analysis) to readers who may be new to the field.

The final section of the book, titled “Conceptual and Methodological Considerations in the Integration of Behavioral and Social Sciences With Public Health,” begins with chapter 11, which deals with community mo-
bilization for disease prevention and health promotion. An objective of Wandersman is to show that community mobilization and participation can be an important cornerstone of public health initiatives and that such initiatives can be objectively evaluated. In chapter 12 Holtgrave and Pinkerton describe the major issues in cost-documentation, cost-benefit, and cost-effectiveness analyses of behavioral interventions. The next chapter, chapter 13, offers an intellectually compelling change of pace in the form of a provocative essay about the need to expand the role of psychology and sociology in the study of work environments. Karasek makes a challenging call to action for public health scientists to expand their horizons.

Chapter 14 by Goodman provides an important perspective on how community-level interventions can be evaluated when classical experimental designs are not feasible. Conversely, chapter 15 by Murray provides an excellent discussion of the design of trials to assess efficacy and effectiveness. Whereas scientists from a behavioral background are trained in randomized designs in which the unit of randomization is the individual, chapter 15 introduces the reader to the randomization of groups, which is often appropriate in large-scale public health trials. Thus, chapters 14 and 15 together provide important building blocks for constructing a multilevel public health model for research and practice.

In chapter 16 Fetterman provides a detailed presentation of the principles and conceptual underpinnings of empowerment evaluation followed by a case example. Finally, chapter 17 explores relationships among spirituality, religion, and public health. Becker does a fine job of reviewing the evidence base of research in the area. Although this base is somewhat weak and uneven, the author has been able to pinpoint important issues that deserve further study.

It is clear from this introduction that this book is not intended to provide an exhaustive review of behavioral science, social science, or public health. Because the chapters are written from the perspectives of various disciplines, they are by no means uniform. Thus, some of the chapters work well at one level, and others work well at another. Our hope is that when readers are finished with this volume they will appreciate the direction that science has taken in moving toward interdisciplinary, multilevel approaches to public health research and practice.

A basic thread running through this volume is that the solution to important public health problems depends on these interdisciplinary, multilevel approaches. The public health community already has a rich tradition of epidemiological analysis of host-agent-environmental interactions. Behavioral scientists can contribute to these analyses by providing insight into behavioral change occurring at different levels of analyses. Similarly, social scientists provide important insights into organizational structure at the community level, including the utilization of community action, government, and health economic strategies. This volume repre-
sents an early attempt to call attention to the feasibility of these joint efforts among behavioral, social sciences, and public health perspectives.

SUMMARY AND CONCLUSION

This chapter has attempted to show why and how the behavioral and social sciences are making major contributions to understanding and solving the important public health problems confronting us as we enter the new millennium. During the first half of the 20th century, the occurrence of many infectious diseases declined in the United States, and chronic diseases replaced them as the leading causes of mortality. Most of these chronic diseases appear to be multiply determined and involve lifestyle risk factors that have major behavioral, psychosocial, and sociocultural contributions. Thus, to understand almost all major causes of mortality in the United States, it is necessary to study the behavioral, psychosocial, and sociocultural variables that contribute to these deaths.

The control over most causes of morbidity and mortality involves the use of behavioral—social sciences interventions. Application of these interventions occurs at many levels and requires the application of different skills both within and across levels. Thus, for many individual-based (i.e., intrapersonal, interpersonal) interventions to succeed, they may have to take place in a sociocultural environment that also involves concomitant population-based (i.e., organizational, societal) interventions. This is discussed explicitly in this volume in chapters 2 and 4 but appears implicitly throughout the volume in discussions of community interventions for cardiovascular health promotion, cancer screening, and decreasing urban violence.

This volume reflects the current state of public health practice by focusing primarily on behavioral and social factors that prevent disease through the use of community-based interventions. As discussed earlier, the epidemiological transition from infectious to chronic diseases in the U.S. population was accompanied by a delayed shift from primarily clinical interventions targeted to individuals to behavioral and social interventions targeted to populations. As we enter the 21st century, in which the contribution of environmental and social factors (e.g., poverty, illiteracy) on health is likely to increase, community-based behavioral and social interventions will become even more essential to preventing disease and improving quality of life.

Although the emphasis of this particular volume is on primary prevention, it should be pointed out that many people can benefit from secondary and tertiary prevention. As pointed out in chapter 8, there are 31 million persons infected with HIV worldwide and more than 1 million living in the United States. Thus, in addition to the need for population-
based strategies to combat HIV/AIDS, individual-based interventions would also be useful in facilitating harm reduction (primary prevention) strategies in HIV-infected communities and in serving those infected with chronic disease. Similarly, individual-based interventions with substance abusers, people infected with HIV, and violent offenders can complement population-based community strategies.

The design of intervention approaches is central to the role of behavioral—social sciences research into public health problems. Effort therefore needs to be expended in determining how to move from basic research to efficacy trials and when and how to move from efficacy to effectiveness trials. Decisions about whether to use a group-randomized controlled clinical trial or a quasi-experimental design have to be made with full knowledge of the advantages and drawbacks of each. Ideally, quasi-experimental designs should be carried out at multiple sites so that conclusions are not based on a single comparison. Comparisons across multiple sites minimize the likelihood that secular trends, unforeseen happenings, or overlooked variables may contaminate results.

In the application of behavioral and psychosocial interventions to public health problems, theories and models can help inform the design of the intervention and its implementation. Among the many theoretical formulations that have informed such research, this chapter has reviewed the health belief, social—cognitive, cognitive—behavioral, planned behavior, transtheoretical, and social action theory models. These models generally are directed toward understanding how and when behavior change can be facilitated.

Once a behavior change strategy is adopted, the issue becomes how to get the strategy to be used to benefit the health of a substantial portion of a population. Both the communication—behavior change model of McGuire (1981) and the diffusion of innovations model of Rogers (1983) provide useful insights concerning the transmission of behavior change messages into communities. The PRECEDE—PROCEED model of Green and Kreuter (1991) provides a useful guide for designing and evaluating health promotion programs.

As we look toward the future, the interdisciplinary, multilevel strategies described in this volume will become increasingly important. Whereas public health initiatives during the second half of the 20th century tended to focus on the identification of public health risk factors, strategies during the 21st century are likely to focus increasingly on problems that require behavioral change. Whereas the gradient relating socioeconomic status and health has grown steeper within the United States during the past quarter century, studies by Lynch (chapter 3) and others have shown that this gradient can change across the life span. Thus, although scientists may not be able to deal directly with the distribution of national wealth per se, they may well be able to facilitate behavioral changes that help those at
the lower end of the gradient improve their health. New improvements in technology including computer-based communication systems and increased potential for tailoring messages for the general population may be of some help. Increasingly the population of the United States will also become more diverse. Therefore, studies relating behavioral change to improved public health will have to become increasingly sensitive to cultural issues. As we explore the new millennium, improved knowledge of behavior change and sociocultural issues will be increasingly important as we design public health interventions. It is noteworthy that both the National Institutes of Health and the CDC have become increasingly attuned to these issues and are spearheading research into public health interventions that are culturally sensitive and use behavior change strategies.

A major challenge to the formulation of public health interventions is how to coordinate such interventions across multiple levels. It has become apparent that many interventions at the intrapersonal and interpersonal level need to be reinforced at the organizational and societal level if they are to succeed. Similarly, it is unlikely that many organizational and societal campaigns will be fully effective unless reinforced by behavior change strategies directed at the individual and interpersonal level. The challenge of integrating the behavioral and social sciences with public health in the 21st century rests on the use of transdisciplinary approaches to solve both clinical, high-risk and population-based public health problems.

REFERENCES


26 SCHNEIDERMAN AND SPEERS


