

Behavioral Interventions for STDs: Theoretical Models and Intervention Methods

Janet S. St. Lawrence, Ph.D., and J. Dennis Fortenberry, Ph.D, M.D., M.S.

Adverse health consequences from sexual behavior, such as infections with STDs, are conservatively estimated to be at least threefold higher in the United States than in any other developed country (1). This disparity in disease prevalence and the serious personal, social, and financial consequences of sexually transmitted infections are generating a growing body of literature that describes the development, implementation, and evaluation of behavioral interventions addressing STD/HIV prevention. These interventions are designed to inform, change attitudes and perceptions, modify social norms, promote sexual health and reduce risky behaviors, transform social contexts, and alter policies that are facilitators or barriers to healthy behaviors. However, a careful review of the literature reveals that exhortations to intervene and recommendations for interventions far outnumber credible interventions that have been subjected to a thorough statistical evaluation demonstrating their effectiveness.

Up to the present, interventions for STD/HIV prevention have been implemented primarily at the individual, small-group, and community-levels, with varying degrees of population coverage associated with these efforts (2). A source of confusion for many consumers of this research is that not all of these intervention efforts are correctly labeled as “behavioral” interventions. Intervention strategies that are described in the literature can range from atheoretical to theoretical; from straightforward information provision to complex multi-method, multi-component programs; from minimally to rigorously evaluated; and from individual to multilevel programs. Some may be grounded in beliefs about how things should work in the real world; others are empirically grounded in evidence about how things actually happen. The objective of this chapter, then, is to describe and evaluate theoretical approaches to behavior change; to review the basic structure of behavioral interventions; and to summarize interventions conducted at various individual, group, and community levels.

What Is a Behavioral Theory and How Can It Be Used?

A theory is a systematic way of describing events and behaviors. It incorporates a set of concepts, definitions, and hypotheses that explain or predict behaviors by examining the relationships between variables. Theories are, by

nature, abstract. Most of the theories that are applied to health promotion were originally developed to explain other topics and were later adapted to explain health behaviors. Many of the theories to be described in the sections that follow have not been rigorously evaluated; therefore they constitute theoretical frameworks for understanding and predicting behavior that await empirical verification.

Given the unproven nature of most theoretical models, why then do behavioral scientists use them in developing and evaluating an intervention? Theoretical models provide a logical framework for designing, measuring, and evaluating behavioral interventions. They enable the program developer or evaluator to consider what they are planning within a larger context, applying relevant theoretical models to develop tailored programs and measurement of the effectiveness of those programs. Thus, behavioral theories provide us with a roadmap for studying a health problem, explaining the relationships between behaviors (including the social and physical contexts surrounding them), and specifying the measurement that will provide useful outcome evaluations from an intervention.

In other words, our theories provide a way of organizing the reasons why people do or do not engage in specific behaviors, helping to identify what we need to know before we develop a health promotion program, and suggesting what we need to monitor and measure in order to know whether our intervention manages to change the intended outcomes. Simply put, a large body of literature underscores the reality that interventions based on a theoretical model are far more likely to succeed than programs delivered without the benefit of a theoretical model.

Two different types of theories will be described in this chapter. Some theories are explanatory, describing the reasons why a problem arises. These theories are used to identify variables that contribute to a problem that can potentially be changed to alleviate the problem. Other theories focus on behavior change. These latter theories are most often used to guide the development of interventions and their evaluation. Their focus is on extracting the interventions methods and messages thereby providing a framework for program evaluation.

What Is a Behavioral Intervention?

Two approaches characterize the structure of behavioral interventions. The first approach is to define *a priori* the components to be incorporated into a behavioral intervention. The second method is extrapolated from research syntheses and meta-analyses of effective behavioral interventions. This latter strategy extracts the cross-cutting characteristics of effective interventions. When these two methods are contrasted, the convergence between them demonstrates remarkably consistent agreement between their conclusions.

A priori definitions of behavioral interventions are characterized by 1) a specified theoretical model; 2) intervention using evidence-based methods of behavior change; 3) rigorous outcome evaluation; 4) sound research designs; and 5) measurement of multiple domains such as cognitions (e.g., knowledge, attitudes, perceptions, self-efficacy beliefs, readiness for change), behavioral skills (e.g., correct condom application skill, social competencies to refuse unwanted sex), or biological variables representing a direct outcome of the behavior in question (e.g., STD diagnosis or a pregnancy test).

Post hoc research syntheses and meta-analyses examine cross-cutting characteristics of effective behavioral interventions and provide remarkably congruent support for the above definition. Cross-cutting characteristics of effective behavioral interventions are that they 1) have a clear focus on reducing sexual risk; 2) are based on sound theoretical models; 3) deliver interventions of sufficient magnitude and duration; 4) utilize a variety of evidence-based intervention methods; 5) personalize the information to the participants; 6) provide specific and accurate information; 7) provide participants with skill training and with opportunities to practice these newly acquired skills; 8) reinforce clear messages that strengthen values and norms that favor safety; 9) are tailored to the community and cultural norms of the participants; 10) make an effort to include the target group in program planning; 11) have clear goals and objectives; and 12) systematically document their results relative to the goals using sound research designs and rigorous evaluation (3–6).

Integrating Behavioral Interventions and Public Health

Research summaries consistently document the effectiveness of behavioral interventions in changing risky behaviors of specific groups, including drug users (7), adolescents (8), heterosexual adults (9), and men who have sex with other men (10). With such strong support for the efficacy of behavioral interventions, integration of the fields of behavioral science and public health presents a high priority.

However, continuing challenges have limited the integration of behavioral sciences and public health. Behavioral sciences have had a greater influence on research and demonstration activities than on the continuing services of public health departments (11). Behavioral interventions are often rooted in theoretical models that are familiar to the behavioral scientists, but are not as well known by public health practitioners. If these models are applied in a faulty manner, the desired outcomes may not be attained, as was the case in several intervention reports (12–15). Such failures may widen the gap between behavioral science and public health practice (16). For example, when Flowers et al. (15) and Elford et al. (14) attempted to replicate an intervention that had consistently demonstrated risky behavior reductions of 30% in communities of men who have sex with men, they incorporated only one of the nine core elements from the model. As a result, unlike the programs that incorporated all—or even most—of those core components, their interventions yielded no behavior changes. Therefore, careful analysis of the situation is necessary to estimate how piecemeal adaptation of theory-based interventions could have undesired consequences (11).

Given the importance behavioral scientists attribute to their theoretical models, let us next examine what these models are, as well as their comparative strengths and shortcomings. Although there is no theoretical model specifically developed to explain sexual behavior, a number of existing theoretical models have been adapted and extended to STD/HIV research.

Theoretical Models Applied to STD/HIV Interventions

Seven conceptual “families” of theoretical models appear in the STD and HIV intervention literatures. These conceptual domains include 1) psycho-educational approaches that stress information provision; 2) cognitive theories that emphasize

internal decision-making processes; 3) behavioral models based on the principles derived from learning theories; 4) theories of motivation and emotional arousal; 5) social marketing and social influence theories; 6) a stage theory, the transtheoretical model; and 7) blended theories that integrate more than one of these domains into a single model, such as the Information-Motivation-Behavior model.

Psycho-Educational Theories Stressing Information Provision

Education and information provision continue to be prominent public health responses to STD/HIV. Information provision programs generally have three goals: 1) providing accurate information to recipients; 2) influencing attitudes and behaviors so that the recipients will translate knowledge into behavior change; and 3) reducing the number of infections (17). Psycho-educational interventions often accomplish the first of these three goals, but they are usually insufficient to attain the last two goals.

A number of studies illustrate the limitations of information-based interventions. For example, Brandt et al. (18) found that the quality and accuracy of printed educational materials varies widely. When they evaluated 21 printed educational materials about human papillomavirus (HPV), most were found to be “not suitable” or “barely adequate”; information was inconsistent from one pamphlet to another; and the content was sometimes highly inaccurate. In addition, the language in most of materials required a reading comprehension level that exceeded the literacy of a large proportion of the U.S. population.

In many public health and medical settings, information provision is often the only available intervention. The limitations of this approach are illustrated by a study of women who were tested and found to be positive for HPV infection. All of the women were counseled about their HPV infection. However, follow-up interviews showed that fewer than half recalled ever hearing of HPV or having been told that they had HPV infection (19).

Information provision may accomplish some important public health objectives. For example, the national educational campaign initiated in 1988 by former Surgeon General C. Everett Koop in response to HIV and AIDS was a key effort to quickly educate the U.S. population about an emerging epidemic. At a time when misconceptions about AIDS were prevalent, an educational brochure was mailed by the U.S. Public Health Service to every household in the United States. This monumental task, accompanied by substantial advocacy by the Surgeon General, contributed to a substantial reorientation of public awareness of HIV/AIDS (20).

Cognitive Theories Applied to STD/HIV Prevention

Cognitive theoretical models emphasize the relationship between cognitive processes (attitudes, values, perceptions, intentions, and beliefs) and behavior, and these models view cognition as the proximal determinant of sexual behaviors. Each cognitive theory shares in common the assumption that cognitions are causal, predisposing factors that explain sexual behaviors. These theoretical approaches are widely applied, with varying success, as explanatory models in the STD/HIV behavioral intervention literature.

The Health Belief Model

The Health Belief Model (HBM) hypothesizes that cognitive mediators such as 1) perceived vulnerability to a health threat; 2) perceived severity of the threat; 3) beliefs in the effectiveness of taking precautionary action; 4) perceived costs of implementing that action; and 5) the presence of environmental cues that interact to produce behavior change. Additionally, the model indicates that the perceived efficacy of behavior change is subsequently balanced against perceived social, physical, and psychological barriers to implementing the behavior. Finally, the model states that specific, identifiable cues are necessary to trigger the decision-making process (21,22).

A large body of literature has examined the utility of HBM in explaining STD/HIV risk behavior (23). Some studies have found that perceptions of susceptibility, severity, and benefits are significant predictors of sexual behavior, while others have found little or no relationship (17). In many instances, predictors specified by HBM accounted for only a modest amount, that is, 15% to 20% of the behavioral variance (24). An important limitation of HBM from a public health perspective is that it does not explain how perceptions of risk originate, nor does the model describe how health beliefs develop or persist over time (25,26). In addition, the theoretical perspective that beliefs necessarily precede behavior is not substantiated by contemporary research, which suggests that many health beliefs are a consequence rather than a precursor of behavior.

Theory of Reasoned Action

The Theory of Reasoned Action (TRA) postulates that an individual's attitudes, beliefs, perceptions about peers' attitudes, and the extent to which the individual values the peer group's approval all interact to form an intention to behave in a specific fashion (27,28). This specific intention is the proximal determinant of a specified behavior. Although similar to other cognitive theories in viewing behavior as an outcome of beliefs, addition of social norms as contributing factors and emphasis on behavioral intentions differentiate the TRA from the other cognitive theories. TRA has been widely used in survey research to explain the observed correlations between attitudes and precautionary behavior or intentions to engage in safer behavior in the future (29).

An important limitation of TRA is the assumption that sexual risk and protective behaviors result from a conscious decision-making process. However, substantial recent research suggests that many behaviors in sexual situations are motivated at least in part by affect and emotion rather than by the deliberative evaluations. Other research raises questions about the strength of the intentions-behavior relationship, which may differ across behaviors and populations (30). The limitations described in the previous section for the HBM also apply to the TRA, including the modest behavioral variance explained by the theory, the unclear origins of the cognitive progenitors of intentions, and the implicit directionality in the model that could just as easily be reversed with equal plausibility. Finally, while the model explains relationships between variables and suggests where to intervene, it offers no specific guidance regarding how to implement intervention strategies that might produce changes in these observed relationships. The model can also be criticized for leading to truncated measurement when it is applied in several intervention studies for STD/HIV prevention (31). Despite these limitations, the TRA is a popular framework in the intervention literature.

Theory of Planned Behavior

Icek Azjen later modified the TRA (32). This modified theory became known as the Theory of Planned Behavior (TPB). The TPB differs from the TRA in that it added one additional construct to the original model—perceived behavioral control. Perceived behavioral control is a person's belief that it is possible to control a given behavior. Azjen added this construct to account for situations in which people's behavior or behavioral intentions are influenced by things that they believe are beyond their ability to control. The model argues that people will be more successful in performing a behavior if they believe that they have a high degree of control over whether or not they engage in the behavior. Like the TRA, this theory emphasizes the relationships between behavior and cognitions such as beliefs, attitudes, and intentions. Like the TRA, it assumes that behavioral intention is the most important determinant of behavior and that behavioral intentions, in turn, result from a person's attitudes toward performing a behavior and by beliefs about whether the individuals who are important to the person would approve or disapprove of the behavior. Both of these models largely ignore factors such as culture or the surrounding environmental context, assuming that they do not add further explanatory benefit to the models' explanations of the likelihood that a person will behave in a particular manner. Like the TRA, the TPB describes a causal chain of beliefs, attitudes, perceptions of controllability, and intentions that are believed to drive behavior.

Decision-Making Theory

Decision-making models, similar to HBM and TRA, are based on the assumption that people make rational choices about sexual risk and protection, expecting their choices to produce positive outcomes (33–35). As applied to STD/HIV prevention, these models offer an explanatory framework for how decisions should be made, then examine differences between decisions that increase risk and those that maximize safety. Several aspects of the model call into question whether it should be used to explain sexual behavior. The model does not reconcile the decisional balance from the immediate gratification offered by risky behaviors such as sexual intercourse or drug use and the delayed and uncertain long term negative consequences of a decision not to engage in these actions. As suggested previously, emotions may be more important than rational choice in decisions about sexual behavior. Finally, many decades of evidence show that immediate gratification usually overwhelms alternatives requiring delay of gratification (36).

Theories Based on the Principles of Learning

Learning theories are widely applied to behavioral interventions for STD/HIV prevention. Behavioral interventions based on learning theory often focus on identification of cues to risky behavior and on teaching new skills intended to reduce infection risk. Theoretical models based upon learning theories are often misunderstood to a greater extent than other theoretical models.

Operant Learning Theory

Unlike the cognitive theories, operant learning theory relies on measurable behaviors and identification of stimulus cues and reinforcers to explain the acquisition, performance, and maintenance of behaviors (37). Operant learning-based approaches concentrate on three components: 1) specifying the

behavior; 2) identifying current consequences of the behavior (reinforcers) that operate (hence the term “operant”) to strengthen or maintain the behavior; and 3) identifying discriminative stimuli in the environment that serve as cues and “trigger” the behavior. Behavior change strategies that derive from operant learning theory include managing the consequences of behavior (reinforcement, punishment, and extinction), shaping, counter conditioning, and stimulus control. The key construct in operant approaches is the concept of reinforcements that follow a behavior and affect whether or not the behavior is repeated in the future. Positive reinforcements (often described as “rewards”) increase a person’s likelihood of repeating the behavior in the future. Negative reinforcement also increases future performance of a behavior because it eliminates some continual negative condition (e.g., giving in to pressures to have sex without a condom). Reinforcements can be internal or external. Internal rewards are things that people do to reward themselves, while external rewards are provided by others. Behavior change strategies using reinforcement always are designed to increase the incidence of behaviors.

By contrast, there are also strategies that are designed to reduce or suppress behaviors. These are referred to as punishing consequences or extinction. Punishment is the application of a negative consequence perceived as being decidedly unpleasant by the recipient. Punishment is often misapplied; although it can successfully suppress a behavior for some period of time, it does not eliminate it and the behavior typically recurs. Elimination is achieved through a carefully designed process called extinction that identifies and then systematically removes the reinforcers that give rise to or maintain the behavior.

Shaping is the process of changing discrete steps along a sequence of behaviors by interrupting the sequence and replacing behaviors in the chain that led to risky behavior in the past with alternatives that do not lead to the same end point. For example, there are many behaviors in a linked chain of occurrences between leaving one’s place of work and arriving home. When the commute involves passing a location where unsafe sex has taken place repeatedly, the chain of events can be altered by designing a different route between the office and home that is not associated with any cues to embark on the chain of behaviors (events) that have led to the unsafe sexual occurrences in the past.

Counter conditioning involves substituting an incompatible alternative to the problematic behavior. For example, someone who is easily led by others to engage in risky behavior may benefit from assertiveness training. In that case, the counter conditioning would replace passive response patterns with assertive responses. If negative mood states are associated with risky behavior, learning when and how to use positive self-statements may effectively counter this chain of behaviors.

Stimulus control refers to avoiding or countering stimuli that elicited the problem behaviors in the past, restructuring one’s personal environment, avoiding cues that previously “triggered” high-risk behavior, and using gradual fading techniques, if necessary, to make the transition from maladaptive to adaptive behavior (38). The example given above about changing a route between work and home to avoid locations associated with unsafe sex also addresses stimulus control, since changing the route also avoids the “stimulus” of seeing (and responding to) the location where such acts took place, for example, a “massage parlor” along the way where sexual behaviors are included in the establishment’s services.

Clinicians use operant approaches extensively in interventions for other health concerns such as smoking cessation, weight control, and medication adherence (39–41). Operant approaches are designed to change the chain of past behavior that culminated in risk; to provide participants with new behavioral skills that they can employ in the future; to modify the stimulus cues in the environment that were associated with risky behaviors; to replace past behavior patterns; and to change the reinforcers that make it more likely that a past risky behavior will be repeated in the future. Usually, operant learning theory is embedded into the behavior change methods included in intervention programs based on the social learning theories described below.

Social Learning and Self-Efficacy Theory

Social learning theory (SL) and its later derivative, social cognitive theory (SCT), are popular models in the intervention literature. Social learning theory adds to operant approaches by explaining that new behaviors also are acquired by observational learning: watching others, noting consequences, then imitating the observed skills that led to positive consequences (42). More recently, Bandura expanded social learning theory to incorporate the concept of self-efficacy—confidence in one's ability to successfully implement changes (43). This modified theory is called SCT. In reality, these terms are often used interchangeably although they refer to two distinct conceptual stages in the development of Bandura's theory. In its newer form, SCT specifies three main components that affect the likelihood that a person will change a health-related behavior: a) self-efficacy, b) goals, and c) outcome expectancies. In other words, if a person is confident about his or her ability to make a successful change (self-efficacy), he or she can change behaviors even if faced with barriers. If one does not believe that one has such control, one may not be motivated to act or may not persist when faced with resistance. However, the importance of changing self-efficacy as a critical step for promoting STD/HIV risk reduction has not been conclusively demonstrated.

SL and SCT are the most frequently used and most robust theoretical models for successful behavioral interventions. In practice, behavioral interventions that employ learning theories also attend to information provision and to cognitive processing. Thus, the learning theories, in reality, are additive to the earlier models rather than stand-alone explanations.

The *Becoming a Responsible Teen* (BART) intervention is one example from a large number of behavioral interventions based on the learning theories (17). Initially, the intervention provided its participants with information and education about STDs and HIV. In the next step, the intervention addressed motivation by attending to values, beliefs, handling peer pressure, and mobilizing positive attitudes toward change. Most of the intervention was devoted to modeling and practice of the skills that would be needed to act effectively on decisions to reduce risk taking. The skill training addressed technical competencies such as correct condom application and correct needle cleaning. Training in social competencies such as refusing sex or drug initiations, partner negotiation, sharing information with peers and family members, and condom purchases were also practiced. Finally, the intervention also attended to cognitive skills such as risk appraisal, problem solving, self-management of mood states, coping skills, and self-reinforcement for engaging in desired behavior.

Evaluation of the intervention showed that young people who had not reached their sexual debut were less likely to initiate sexual activity in the

following year than were young persons who did not participate in BART. Only 11% of the abstinent BART participants became sexually active in the following year; in comparison, nearly 33% of the abstinent young persons who did not receive the BART program became sexually active. The intervention was also effective in changing the risk behavior of young persons who were already sexually active. Sexually active boys reduced the number of their sex partners, discontinued unprotected anal intercourse entirely, and sustained condom use over time. Sexually active BART girls reduced their number of sex partners, as well as the frequency of unprotected vaginal, oral, and anal intercourse. Thus, there were clear and measurable positive changes, and these changes endured for the following year.

Theories of Motivation and Emotional Arousal

Theories grounded in motivation and arousal were generally developed to explain health-risk and health-protective behaviors, at least partially to amplify the motivational aspects with the cognitive theories introduced earlier. Among the theories within this category are 1) the Fear-Drive model (44); 2) the Dual Process Model (45); and 3) Protection Motivation Theory (46,47).

The Fear-Drive and the Dual Process Models

The Fear-Drive Model states that fear generates a subjective discomfort that motivates some action to reduce the unpleasant emotional state. The Dual Process Model extended the Fear-Drive Model one step further so as to regard fear as an effective motivator when it is paired with a health threat. In addition, the Dual Process Model recognizes that fear-generated behaviors may be irrational and may fail to effectively alleviate the threat. Instead of alleviating the threat, fear leads to maladaptive strategies that reduce the unpleasant emotional state while leaving the risk-producing behavior intact. Denial is one such example of an emotional coping strategy that can be behaviorally maladaptive because it minimizes the likelihood that an individual will take any effective action to reduce risk. The Dual Process Model adds learned helplessness as its explanation for failure to react to a perceived threat. Learned helplessness refers to the generation of feelings of helplessness by intense fear, leading to reduced likelihood of constructive courses of action.

Fear-Drive and Dual-Process Models are rarely used as a basis for behavioral interventions to prevent STD/HIV. Contemporary studies suggest that differential power (based on gender or economic reasons) is a more important source of inhibition of self-protective behaviors.

Protection Motivation Theory

Protection Motivation Theory (PMT) (47) is a hybrid theory that combines cognition and emotional arousal into a single framework. This theory posits that concern in response to a health threat initiates a generalized coping appraisal that, in turn, generates coping responses that may be either adaptive or maladaptive. The particular coping responses that people ultimately choose depend on their perceptions and beliefs regarding available options and on their ability to enact those options. In this way, PMT encompasses many of the concepts that appear in the cognitive theoretical models.

PMT starts with recognition of a potential threat to which an individual can respond in either an adaptive or a maladaptive fashion. The response is mediated by a balance between “threat appraisal” and “coping appraisal.” Threat

appraisal is the balance between anticipated rewards associated with the behavior and the perceived severity of and personal vulnerability to the threat. The rewards can be extrinsic (related to social, peer, or parental influences) or intrinsic (associated with the person's personality traits and physical feelings of pleasure). The coping appraisal process is mediated by balancing the behavioral efficacy of an action (perceived likelihood that the action will reduce the threat) and perceived belief that the person can complete the adaptive response) with the response cost (barriers or inconvenience) of the possible protective behaviors. PMT expands theories of motivation and emotional arousal by also incorporating attention to the dynamic cognitive process in making a decision about behavior change.

PMT is not one of the theories at the forefront of intervention research, but it is applied as an explanatory theory in studies examining the factors associated with risky and protective behavior (24). As is true for the cognitive models, this model's constructs may be statistically significant in studies assessing the model's "fit" as an explanatory framework, but all of the measured variables taken together account for only modest amounts of the total variance. In the Li et al. study (24) cited above, for example, all of the constructs of PMT accounted for only 17% of the total variance in risky sexual behaviors, similar to the small amount of variance explained by the cognitive theories.

The Limits of Emotional Arousal as Stimulus for Behavior Change

The emotional arousal models share an emphasis on health messages designed to arouse fear as the starting point needed to motivate action. Obviously, the degree of arousal is critical since too much fear may generate despair instead of motivating action. Therefore, practitioners who rely on such models believe that interventions must 1) induce a level of anxiety that motivates sustained precautionary behavior; 2) assist people to maintain their psychological equilibrium in the face of this anxiety; and 3) contain the anxiety below a debilitating threshold level (48).

In practice, fear-inducing messages can be memorable (49), but their effectiveness in motivating precautionary behavior is questionable. Moreover, an unanticipated increase in denial associated with anxiety induction can have inadvertent undesirable consequences when it results in increases, rather than decreases, in health-harming behaviors. Thus, emotional arousal theories present an implicit conundrum when they are applied to STD/HIV prevention. On one hand, individuals at risk need to initiate safer behavior if they are to preserve their health. Yet, if they are recipients of fear arousal and do not use denial as their coping strategy, they may be vulnerable to high levels of anxiety. The alternative is to react with denial, thereby undermining the likelihood they will initiate any effective behavior changes (50). In the context of STDs and HIV, denial is never functional because even infrequent risky activity can confer exceedingly high risk (48,51).

Sadly, despite extensive evidence that scare tactics are inadvisable, such programs continue to be implemented. As recently as 2005, a small-print media campaign relying on fear tactics was underway in San Francisco in response to syphilis outbreaks in men having sex with men (MSM) who used crystal methamphetamine. The "Meth = Death" campaign materials, in addition to their verbal emotional appeal, also featured a male whose head is in the process of morphing into a skull, graphically illustrating the campaign's fear

arousal approach. The San Francisco Department of Public Health, which sponsored the “Meth = Death” campaign, monitored requests for the “Meth = Death” print materials as well as requests for a factual informational brochure that took a harm-reduction approach to methamphetamine use titled, “A Few Things to Know About Speed.” Physicians requested both types of materials, but more often requested the “Meth = Death” materials. In stark contrast, outreach workers and organizations in the gay community requested only the harm-reduction brochure, never asking for the fear induction materials associated with the “Meth = Death” campaign (52). This disconnect between this campaign and its target community may reflect a lack of understanding of the target community on the part of the health department or unfamiliarity with more effective intervention methods, but it also suggests that community input early in the campaign’s development may have been able to prevent such a misguided effort.

Social Influence Theories

Intervention programs based on the social influence theories typically attempt to reach a critical mass of people at the community or population level with information, motivation, and skills to alter the social norms that either regulate or support behavior (53). Social marketing theories and diffusion of innovation theory generally provide the conceptual underpinnings of such programs.

Social Marketing

Social marketing approaches are based on commercial marketing philosophies adapted for health promotion. Such strategies reflect implicit belief that the knowledge, beliefs, attitudes, and needs of the target groups—the “consumers” of information—are the most important determinants of effective prevention. Embedded in the social context of the targeted “consumer,” social marketing attempts to offer recipients personal benefits they will value, in language that is familiar, and at a “price” (not necessarily monetary) that they are willing to pay in order to achieve a meaningful goal (54). Silvestre et al. (55, p. 223) defined social marketing as “the design, implementation, and control of programs seeking to increase the acceptability of a social idea or practice in a target group.” Public health programs have relied on social marketing concepts for decades and are now adapting these concepts to STD/HIV prevention.

STOP AIDS (56) was the first major AIDS prevention intervention that used social marketing. STOP AIDS began in San Francisco and capitalized on community mobilization by using members of the local gay community to provide risk-reduction information to other gay men. The developers modeled the program on home-marketing methods that were then used to sell housewares and personal care products. Epidemiological evidence suggests that STOP AIDS initiated dramatic behavior changes in homosexual men in San Francisco and later in other urban centers, but there are no program evaluation data that can extricate the STOP AIDS contribution from other factors that may have been taking place at the same time unrelated to the campaign. Later, Miller et al. (57) replicated and evaluated the STOP AIDS program in southern California and found significant post-discussion changes on all measures. However, there was no longitudinal measurement to assess the extent to which the program changed actual behavior or, if so, whether the results were enduring.

Diffusion of Innovation Theory

A theoretical model that has proven useful in explaining how new behavioral trends become established in communities is Diffusion of Innovation theory (DOI) (16). This approach has more recently come to be known as the “popular opinion leader” (POL) approach when it is applied to changing sexual behaviors that pose STD/HIV risk within communities. Opinion leaders are the people within social groups who are respected or popular; individuals whom others naturally observe and imitate. DOI suggests that new innovations are most effective when a critical mass of opinion leaders, usually 15% of the total population, adopt and endorse the innovation.

POL uses ethnographic methods to systematically identify the popular and socially influential individuals within the target population. These individuals are then recruited and trained in how to communicate risk-reduction messages to their peers during everyday conversations. The core elements of the POL model that must be incorporated into an intervention include (58):

1. Intervention directed to an identifiable target population in well-defined community venues where the population size can be estimated and where social interactions take place;
2. Ethnographic techniques to identify segments within the target population and the popular persons within each segment who are well-liked and trusted by others;
3. Enlisting 15% of the POLs into the intervention;
4. Teaching the POLs skills for initiating risk-reduction conversations with friends and acquaintances during everyday conversations and to use themselves as an example;
5. Training POLs to use the characteristics of effective behavior change messages that address risk-related attitudes, norms, intentions, and self-efficacy. In their conversations, the POLs endorse the benefits of safer behavior and use themselves as examples of for practical steps that can be used to implement changes;
6. Intervention that takes place weekly in sessions that use instruction, facilitator modeling, and extensive role play practice to help the POLs refine their skills and gain confidence about delivering the messages to others. Intervention groups are small enough to allow for extensive practice for all of the POLs;
7. POLs who set specific goals for the number of risk-reduction conversations they will initiate with friends and acquaintances between the weekly sessions;
8. Review of the POLs experiences delivering the messages followed by discussion and reinforcement in subsequent sessions. Successful conversations provide modeling to other participants; difficult conversations are addressed with problem-solving strategies to apply in a future interaction; and
9. Logos, symbols, or other stimulus cues that are made available as conversation starters between the POLs and others in their social or sexual networks.

Applied to sexual behavior, this model was first evaluated in an experimentally tested community-level intervention in clubs frequented by gay men in three small cities (59,60). Bartenders in the clubs identified socially influential

men from each of the customer subgroups who patronized the bar. These men were then recruited to participate in four weekly group training sessions. Three months after the intervention and at two 6-month intervals thereafter, the surveys were repeated to detect whether the intervention produced changes in the risk behavior of gay men in each city. These population-wide surveys revealed consistent and substantial reductions in the proportion of gay men who engaged in risky behavior following the intervention in each city, ranging from 19% to 30% reductions in risk behavior from baseline levels in the proportion of men who engaged in unprotected anal intercourse. Because these changes followed the stepwise introduction of the intervention in each city, it was clear that the POL intervention was responsible for these reductions. Three years later, the surveys were again repeated and clearly documented that these changes were enduring; even lower levels of risk behavior were present in all three cities three years after the intervention (61).

Transtheoretical Model (Stages of Change)

The Transtheoretical Model (TTM) has two distinct characteristics (62). First, it defines five distinctive stages through which people cycle in making behavior changes. As a result, it is often called the “Stages of Change” theory. Second, it explicitly identifies intervention methods linked with each stage. According to the model, if a given treatment is mismatched to the person’s stage of readiness for change, it is likely to be ineffective. Thus, the hallmark of interventions based on TTM is assessing the person’s readiness, or stage of change, and then tailoring the intervention accordingly (63). Briefly, the five stages are:

1. *Precontemplation*, the stage at which there is no intention to change behavior in the foreseeable future. Friends and family may be aware of the problem and may even apply pressure to change. Resistance to recognizing a problem is the defining characteristic of precontemplation. People in the precontemplation stage can be responsive to consciousness-raising techniques such as observations, confrontations, and interpretations.
2. *Contemplation* is the stage at which people become aware that a problem exists but are not committed to taking action. They may weigh the pros and cons of continuing or changing the behavior, counterbalancing their past positive experiences with the behavior against the time, energy, and loss they believe they will experience if they change the problematic behavior. Individuals who say they are considering changing a behavior within the next six months would be classified in the contemplation stage. In this stage, dramatic relief techniques that raise positive emotions about the benefits of change and clarify negative emotions that could be lowered by change can be effective. If the problem behavior is central to their self-identify, this reevaluation may require altering their definitions of themselves. During this process, the person may also reevaluate how his or her behavior is affecting others. Such a reevaluation might involve, for example, a man redefining himself as being a responsible person who is going to protect others by engaging in safer sex.
3. *Preparation* is the time when people begin making small steps toward action. People in this stage make some tentative reductions in their behavior and indicate that they clearly plan to change, but have not yet committed themselves

to take actions even though they “intend” to do so within the very near future. Change methods that are well matched to this stage include initiating counter conditioning and stimulus control to begin altering their behavior or to avoid situations in which risky behavior has commonly occurred in the past. In this stage, they move into a greater commitment to avoid the risks that characterized their past behavior.

4. *Action* is the stage in which people initiate overt changes in their behavior and environment. This is the point at which efforts to change become visible to others. People are classified in this stage if they have successfully modified the problem behavior for a period of time ranging from one day to six months. Successful action entails having and using the requisite skills to make changes, accompanied by effective use of counter conditioning and stimulus control in order to modify the stimuli that frequently trigger a relapse. During this stage, social support and helping relationships can buoy behavior change efforts. An example of a stimulus control step might be a decision to always carry condoms as a reminder to practice safer sex and to ensure they are “on hand” if needed.
5. *Maintenance* is the stage when people consolidate the gains from the action stage and concentrate on preventing relapses into unsafe behavior. This stage represents a continuation, not an absence, of change. The hallmarks of this stage are stabilization of the behavior change and avoiding relapses. This stage is present from six months after successful change and it lasts indefinitely. For some behaviors, maintenance may need to last a lifetime. Successful maintenance builds on all the change strategies that helped the person get to this point. In addition, very specific preparation and planning to anticipate situations that will arise when relapse is more likely and to identify or develop specific alternate ways of dealing with those situations become important interventions in preserving maintenance.

Information, Motivation, Behavior (IMB) Model

The IMB model (64) is a parsimonious and practical model that has become widely applied. In brief, the model states that AIDS risk-reduction interventions need to provide people with information about AIDS transmission and prevention, incorporate strategies that increase motivation to reduce AIDS risk, and train people in behavioral skills that will be needed to enact the specific behaviors required for successful risk reduction. The model has been applied to both primary prevention campaigns (for those who are uninfected to prevent disease acquisition) and to secondary prevention interventions (for those who are already infected to prevent both transmission and acquisition or reacquisition).

The IMB model was proposed following a thorough review of the AIDS risk-reduction literature that identified intervention characteristics favoring risk-reduction behavioral changes (64). The reviewers consistently found that interventions with evidence of effectiveness were all characterized as providing AIDS risk-reduction information, motivation, and behavioral skills. Information regarding the means of transmission and information about specific methods of preventing infection are regarded as necessary prerequisites of risk-reducing behavior. Motivation to change risky behavior affects whether one acts on the overt knowledge regarding transmission and prevention. Finally, having the necessary behavioral skills to perform the specific preventive

behaviors is a critical determinant of whether even a knowledgeable, highly motivated person will be able to change his or her behavior. This model, in many respects, integrates educational, cognitive, and behavioral theories into a coherent whole.

The IMB theory explicitly describes the process of intervention development beginning with elicitation research to identify the population's existing level of knowledge, factors that determine their motivation for change, and their existing prevention behavioral skills. Then, on this basis of this population-specific information, the next steps are to create appropriate and evidence-based interventions that address the elicitation findings to produce changes in knowledge, motivation, and behavioral skills leading to preventive behavior. Finally, this model stresses the need to implement methodologically sound evaluation research to determine whether the intervention has produced short-term changes in these multiple indicators (knowledge, motivation, and behavioral skills) and then to assess to what extent those changes resulted in long-term risk-reduction behavior changes.

Summary

During the review for this chapter, several themes emerged from the intervention literature. First, although the need for theoretically driven interventions has been stressed for many years (65,66), most interventions have been based on an informal blend of logic and practical experience. Even 25 years into the AIDS epidemic, published interventions based on formal theoretical conceptualizations of any kind are exceedingly few. Second, although investigators have stressed the importance of tailoring interventions to specifically meet the needs of target groups for decades (67), descriptions of formal elicitation research to identify group-appropriate intervention tactics are rare. When elicitation research is present, the intervention's effectiveness appears to increase. Regrettably, the number of such interventions that were preceded by an elicitation phase is exceedingly small (68–70). Third, although many authors allude to the need for interventions that focus on the informational, motivational, and behavioral skills needed for change (65,64,67,70,71), such a broad focus is uncommon in the intervention literature. When interventions do stress all three components, their effect is enhanced (57,72–75). Finally, many authors stress the need for systematic evaluation research to monitor the effectiveness of interventions (64,65,70,71,75), but even of these interventions that have been evaluated, there are often limitations with respect to their experimental design and control groups, reliance only on self-report measures, high subject self-selection bias, unacceptably high attrition, multiple confounded interventions, and failure to assess the intervention's effect on mediating factors that presumably affect intervention uptake. These methodological limitations make the attribution of changes to an intervention or to specific components within interventions virtually impossible in many cases. It also appeared that the more broad-based the intervention (vs. narrowly focused interventions) the more serious the methodological problems became.

The most defensible uses of the existing theories at present are in the organization that they provide for measurement and for identifying determinants that need to be addressed by an intervention. Relatively few of these theoretical models provide any concrete guidance regarding the strategies that will produce the desired changes. Questions are also raised as to whether the

specific theory is critical or whether the benefit is in having any overarching model that guides development of the measurement plan and intervention strategies. When St. Lawrence and her colleagues (76) specifically tested interventions based on three different theoretical models against one another and compared them with a control comparison condition, all three theoretically grounded interventions produced comparable changes in behavior, perhaps because although the rationales differed, the intervention procedures associated with each of these models were very similar. These interventions, conducted with low-income inner city women, also found that change was greater for women when they were entering new relationships than for women who remained in an ongoing relationship, suggesting that the existing intervention models may not be entirely adequate for women whose primary risk derives from a partner’s behavior and not from their own behaviors.

Levels for Intervention Delivery

Just as there are different theoretical models that can inform the development of an intervention, behavioral interventions also differ markedly in their population coverage and in the intensity (in terms of cost, staff, or training) that is required for their delivery. Interventions may be implemented at a variety of “levels”: societal, population, community, schools, small groups, dyads, or individuals. Figure 1 illustrates differences between some of the intervention approaches discussed in this chapter and their comparative intensity and coverage. Several chapters in this volume review the potential levels for intervention delivery in depth and they will be addressed only briefly in this chapter.

Structural, Legal, and Policy-Level Interventions

Societal interventions are those that affect an entire population, typically through either a policy or legal mandate. Governments frequently enact laws and impose regulations to promote the public’s health by discouraging unhealthy behaviors and promoting healthy behaviors. In addition to direct appeals through public education and law, government also can influence individual choices by taxation and spending priorities, as well as by penalizing

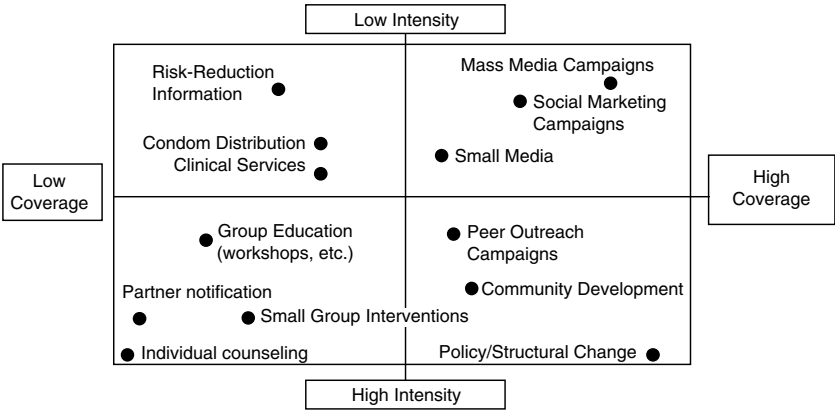


Figure 1 Prevention interventions: population coverage and delivery intensity.

harmful activities by imposing civil and criminal penalties. Despite the magnitude, costs, and scope of governmental efforts to promote health, few such initiatives have been subjected to rigorous evaluation. Nor is the process of creating such policy-level changes efficient or clearly delineated. The foremost examples are in the decline in deaths owing to heart disease over the past 40 years, significant reductions in the rate of cigarette smoking, and dramatic decreases in the rate of motor vehicle crash deaths per million miles driven (77). Each of these changes resulted from government mandates, legal imperatives, and selective application of taxation.

The process by which behavioral scientists can help translate scientific findings into public health policy formation is not well understood. Typically, so many variables affect behavior that it is extraordinarily difficult to demonstrate a causal relationship between the policy and the health effect (78,79).

In some instances, changes in laws have unintended, but beneficial, health effects. Chesson and colleagues (80) examined the relationship between changes in alcohol consumption and STD incidence rates in the 50 United States and the District of Columbia. From 1983 to 1998, they found that reductions in alcohol consumption (usually as a consequence of increases in alcohol taxes) were significantly associated with decreases in gonorrhea and syphilis rates. Each 1% decrease in per capita alcohol consumption was paralleled by decreases of 0.4% to 0.7% in reported gonorrhea incidence and 1.8% to 3.6% in reported syphilis incidence. The findings suggest that increases in alcohol tax could potentially reduce alcohol consumption, thereby reducing the burden of STDs.

Media Interventions

Population-level interventions are often characterized by using media interventions as the preferred delivery medium. The best of these media interventions are informed by social marketing principles, with the goal of delivering the right message to the largest number of people. The limitations of that approach have already been discussed in the earlier section on psycho-educational theory (see “Psycho-educational Theories Stressing Information Provision”).

Effective health communication campaigns are characterized by use of a variety of mass communication channels, making sure that the audience is exposed to the message, and providing a clear and specific action for the people to take. Effective campaigns are usually based in formative research such as focus groups to develop the messages and inform the campaign’s strategy. Many of the better-designed interventions include other social marketing strategies such as market segmentation, channel analysis, and message pre-testing (81). They also link media strategies with community programs, thus reinforcing the media message and providing local support for the desired behavior changes (82).

One media campaign based on social marketing principles evaluated the effect of a brief community-level condom social marketing campaign in a high syphilis prevalence region of the United States (83). The campaign’s development was preceded by qualitative research phase and community engagement activities to identify what the messages should be and then to pretest media materials. Radio and small-print media, retail distribution of condoms, and community outreach workers all promoted a novel condom brand during a 12-week

social marketing campaign. Post-intervention evaluation showed that almost 80% of residents interviewed in the targeted community reported exposure to the intervention, but almost no one in the comparison area did so. In the community where the campaign was implemented, condom use with main and casual partners increased, while no changes were reported in the comparison community. Of considerable importance, residents in the intervention community reported a 20% decrease in the number of sex partners, changes that did not occur in the comparison community. The results suggest that community-based and theoretically driven social marketing campaigns can, in even a brief intervention, produce measurable outcomes in areas of high STD prevalence in the United States.

Community-Level Interventions

Community-level interventions may be “community level” or “community-based,” and these terms are not interchangeable. Community-level approaches target an entire community or a population segment within the community. Community-level interventions are at the heart of many public health approaches (84). Interventions that are conducted in partnership with communities, rather than being applied from outside the communities, are more likely to enlist the community in addressing health issues and to yield behavior changes. This latter approach is considered to be community-based. Public health approaches more often rely on involving selected individuals from communities in program planning (85), an approach that falls short of the true partnerships needed to fully engage communities with an active voice in problem definition, data collection, intervention delivery, and the subsequent application of the results to address the community’s concerns. In addition, community-level participation and buy-in are likely to produce more sustainable interventions by leaving an infrastructure in place after the research ends. Earlier in this chapter, several community-level interventions were described in sections 2.5 and 2.6.

School-Based Interventions

School-based prevention programs have been viewed as a desirable way to prevent young people from adopting risky behaviors, even as early as elementary school (3,86). Many studies of young people of different ages and from different locales indicate that most youth initiate sexual activity while they are of school age, whether or not they are in school (87) and numerous reviews and studies confirm that effective interventions that are delivered prior to sexual debut can prevent later STDs (3,69,88,). Finally, schools are an accepted venue for many interventions, given that their purpose is to equip young people with education for life. They have a defined location; they are sustained within the community; their hours and operations are well known; they already have established mechanisms for introducing new programs and accessing students; and their target population’s size is known. In addition, schools are linked into the larger community through families and other community organizations, potentially enhancing local ownership of intervention programs.

Social and Sexual Network Interventions

Social network analysis identified the ties between people and how the structure of these ties affects the spread of disease within and between social groups. While research on sexual networks can be complex, this approach is providing

unique insights into the spread of STDs that traditional epidemiological and behavioral approaches may not capture. To date, most of the research has focused on understanding the structure of and relationships between networks, illustrating how different network types affect the distribution of STDs, and generating information on which network-based interventions could be developed (89). Relatively few intervention studies to date have been reported that target networks, but this is a promising approach for the future. Amirhanian et al. (90) provided a practical blueprint explaining how to 1) access high-risk networks in a community; 2) identify and enumerate the membership of these networks; 3) identify the key persons within each network; and 4) establish the levels of risky behavior within the networks. To date, most network interventions have targeted the networks of drug injectors who share needles (91,92). Cottler et al. (93) showed that interventions delivered by peers within social networks of out-of-treatment drug abusers reduced their injection-related risk behavior. Trotter et al. (92) demonstrated that when HIV risk-reduction counseling for intravenous drug users (IDUs) is provided to all members of social networks, risk-reduction outcomes are greater. Training peer leaders within drug using networks to be HIV behavior change agents has also produced injection risk reduction within injectors' risk networks (91,94). Broadhead et al. (95) estimated that the cost of reaching drug users through a social network approach is only one-thirtieth the cost of reaching drug users through traditional community outreach programs. One example of a network intervention applied to changing sexual behavior was reported by Kincaid (96). Kincaid compared the effectiveness of different strategies to promote the adoption of contraceptives by married women in Bangladesh. He found that peer-delivered social network-based intervention produced significantly greater adoption of contraceptives than did discussions led by fieldworkers from family planning settings. Taken together, these findings offer promising support for the potential usefulness of network-delivered interventions.

Small-Group Interventions

Small-group interventions involve the delivery of an intervention to cohorts of 6 to 18 participants and have been the most common intervention format in the United States. Large numbers of studies attest to the effectiveness of sound behavioral interventions when provided to small groups (68,72,97–99). The largest of these small-group intervention studies was the National Multisite HIV Prevention Trial, sponsored by the National Institute of Mental Health. In this randomized controlled HIV prevention behavioral intervention trial, 3706 high-risk adults from 37 clinics across the United States were randomly assigned to attend either a seven-session intervention of 14 hours or a single-session educational program (100). During a 12-month follow-up period, the participants from the more intensive skills training intervention reported significantly fewer unprotected sex acts and higher levels of condom use.

Kalichman et al. (68) used the small-group format to deliver an intervention for persons living with HIV/AIDS. The results of this randomized controlled trial showed that a behavioral intervention grounded in social cognitive theory reduced unprotected sexual behavior of both men and women living with HIV infection, with the greatest reductions in HIV transmission risk behavior taking place with non-HIV seropositive sex partners. The intervention was developed and the content identified in consultation with a community advisory

group using elicitation research. Their effective five-session group intervention focused on enhancing motivation through self-reflection and developing coping efficacy skills for HIV disclosure decision-making, active listening, assertiveness skills, and problem solving for disclosure and transmission risk-reduction behaviors. The intervention components were tailored for gender and sexual orientation. Integrated skills practice sessions used coached role-plays developed from elicitation and films. The intervention was proven to be effective within a community service delivery setting and could be adapted for use by HIV-related service organizations, delivered within support groups or in health department settings.

Interventions for Dyads

STD transmission takes place during a dyadic interaction; therefore dyad interventions would seem to be a logical level for intervention delivery. Evidence that women who participate in interventions are less likely to initiate condom use within an ongoing relationship than when they enter into a new relationship (76) also suggests that dyads, rather than individuals or unconnected individual people within small groups, would be a fruitful intervention focus. Although we were unable to locate any dyadic interventions in the existing literature, this is another potential approach that warrants further attention.

Individual Counseling Interventions

Individual-level interventions are provided one-by-one to persons at risk or who have contracted an STD. Individual-level interventions are common in the literature, along with small-group interventions. One notable example is a large intervention study (101) that was conducted with 5700 heterosexual patients from five inner-city STD clinics. Patients were randomly assigned to one of three individual-level interventions coupled with HIV testing: 1) standard clinic practice; 2) STD/HIV prevention counseling with two 20-minute sessions intended to increase risk perception and negotiating a behavior change step; and 3) enhanced counseling consisting of four theory-based interactive sessions. The first 20-minute session took place during the initial clinic visit and was identical in all three interventions. The next three sessions in the third experimental condition were approximately one hour in length. All interventions focused on promoting consistent condom use with all sex partners as their outcome goal. After three months, self-reported frequencies of consistent condom use were significantly higher for the second and third arms than for those who received standard practice messages. After six months, more participants in the standard practice group developed new STDs (10.4%) than in the enhanced (7.2%) or intensive counseling (7.4%) conditions. This trend was similar both for men and women in all five participating sites.

In another individual-level intervention study, Belcher et al. (102) employed motivational enhancement interviewing techniques combined with skills training for high-risk women who used drugs and traded sex for drugs. In the study, women were randomized to receive either a one-on-one single session of two hours with motivational enhancement and skills training or to an AIDS education-only comparison condition of the same duration. Results demonstrated the potential promise of even brief, well designed, individual-level behavior

interventions when they focus on building motivation and skills. Women in the experimental condition increased their self-reported frequency of condom use by 44%, while women in the education-only condition increased to a much lesser degree, changes that were sustained through a three-month follow-up assessment.

Multilevel Interventions

Achieving our health promotion goals will require more than a single intervention that teaches people skills and providing them with information. It will require efforts to change organizational behavior, social norms, as well as the physical and social environments within communities. Ideally, it also requires policy changes that support health. Thus, the optimal health promotion effort would address health issues across a spectrum by using a range of different strategies and operating at multiple, rather than single, levels. Given the substantial heterogeneity of determinants of STD/HIV-relevant health outcomes, it is not realistic to expect that a single intervention addressing only one determinant delivered only once will ever be sufficient to eliminate STDs or even to produce substantial sustained reductions. A multilevel approach intervening at multiple levels of influence, including the individual, interpersonal, institutional, familial, community, and policy levels over a sustained duration is rare, but is more realistic if long-term changes are to be produced and sustained. Fortunately, there is a small number of intervention reports that attest to the benefits of taking a multilevel approach for intervention delivery (77,103–107). This multilevel approach recognizes that sustained positive health outcomes will be the result of interplay between individual, familial, school, and larger social contexts that influence health risks. However, interventions targeting STD/HIV health behavior change have a tradition of focusing first on individual- or group-level factors such as increasing knowledge, motivating positive attitudes, or transmitting skills relevant to implementing behavior changes, and such interventions have only rarely taken a multilevel approach.

The obvious advantage of a multilevel intervention is that by linking interventions at multiple levels, consistent intervention messages, support, and maintenance can culminate in a positive synergy over time. Relatively few multilevel interventions are to be found in the literature, but those that are cited in the previous paragraph all suggest that health behavior changes are supported and reinforced well after such multilevel interventions have concluded. Some of the most extensive multilevel efforts have been in tobacco prevention, but in any area of health behavior, coordinated, multilevel interventions may offer the greatest promise to accomplish public health goals.

The Seattle Social Development Project (SSDP) (104–106), for example, provides an excellent example of how a well-designed multilevel program that was provided to elementary school children, their teachers, and their parents can yield measurable benefits even two decades later. This multilevel intervention involved 1) training teachers in proactive classroom management, interactive teaching, and cooperative learning; 2) training parents in child management and skills to support their child's educational development; and 3) providing the children with cognitive and social skills training. Although the SSDP did not address specific health risks, its effects on behavior and

health were far-reaching. A decade later, participants in the SSDP showed evidence of delaying the onset of sexual activity, decreasing unprotected sexual intercourse after sexual debut, and had fewer STDS and unplanned pregnancies (106). Even 20 years later, the intervention still demonstrated beneficial effects, still lowering the sexual risk behaviors of SSDP participants, underscoring the value of early intervention as well multilevel approaches (105).

Another example of a multilevel program that intervened with schools, parents, and young people was the Safer Choices project (108). This project included a school-based curriculum, staff development, peer resources within the schools, parent and parent-surrogate educational programs, and active school-community linkages. Evaluation of the program demonstrated its effectiveness in reducing recent unprotected intercourse.

What Behaviors Should Be Changed?

Considerable discussion has addressed the selection of appropriate outcome goals for behavioral interventions. For the most part, these debates cluster into two types: 1) deeply held and heartfelt opinions as to whether behavioral interventions should strive to obtain complete cessation of risk behavior versus a harm-reduction approach that promotes risk reduction; and 2) academic debates over measurement, research designs, and theoretical frameworks.

Abstinence Versus “Safer Sex” Interventions?

Contentious debate characterizes a deep division between those who argue that abstinence until marriage should be the only acceptable goal of interventions and those who argue that a range of options need to be available, especially given the STD and sexual behavior statistics for the United States. Where the debate begins, however, is with regard to the best strategies for prevention.

Comprehensive sexuality intervention programs typically provide information, encourage abstinence, promote condom use for those who are sexually active, encourage fewer sex partners, and transmit sexual communication skills. The evidence is clear that comprehensive sexuality interventions do not accelerate sexual debut (109) and do reduce unwanted pregnancy rates (110). These multi-spectrum programs decrease the likelihood of unprotected sexual intercourse at the time of sexual debut (3,4,111) and reduce the sexual risk behavior that contribute to STDs and HIV (69,106,112,113). Such programs not only decrease high-risk sexual behaviors, but they also increase the number of adolescents who abstain from sex (69,113). Sexually active youth who participate in these programs increase condom acquisition and use (114–117) and are more likely to use condoms when they have sex for the first time (118,119). Taken together, there is a considerable body of evidence that comprehensive sexual risk-reduction interventions that address *both* abstinence and condom use produce reductions in risky sexual behavior and delays in the onset of intercourse (4,69,113,120,121). It is also reassuring that the majority of parents support comprehensive programs for their children (122).

There are few published scientific studies evaluating the efficacy of abstinence-only and abstinence-until-marriage programs (123,124) and these studies tend to be quite limited since most lack random assignment to programs and enroll a very homogeneous sample, making behavior change difficult to measure and the results impossible to generalize with reliability. Overall, the

evidence is not encouraging. Several published studies evaluating abstinence-only programs have failed to document any reduction in sexual behavior (125–127). Virginity pledges, abstinence-only programs, and abstinence-until-marriage programs have been shown to have the unintended consequence of increasing the likelihood that adolescents have unprotected intercourse at the time of their first intercourse (128–130) and virginity pledgers who contract an STD are less likely to realize they are infected (130). No long-term randomized controlled studies have shown these programs to be effective, especially for sexually experienced adolescents (126,128,131, 132), although several evaluations of abstinence-only programs are currently underway. Thus, such programs may not be the most defensible strategy for reducing STDs in youth and young adults. Abstinence-until-marriage programs have also been criticized for their insensitivity to gay, lesbian, and transgendered youth and young adults who are precluded by law from marrying in most jurisdictions; therefore, they cannot achieve abstinence until marriage.

Cessation Versus Harm Reduction: The Needle Exchange Controversy

Injection drug use is associated with one third of the AIDS cases and one half of all hepatitis C cases in the United States (133). As a result, interventions have been conducted to change drug use behaviors as well as sexual behaviors. Numerous studies have shown unequivocally that needle exchange programs (NEPs) and pharmacy sales of sterile syringes are effective in reducing transmission of both diseases. The evidence supporting positive outcomes from NEPs is overwhelming. There are more than a million injection drug users in the United States (134) who are estimated to inject approximately 1000 times a year (135). Only a fraction of drug users who seek substance-abuse treatment are able to be served by existing treatment programs (136). Studies have clearly documented that injection-related risk behavior is associated with restricted syringe access (95,137,138). Other studies clearly document that needle exchange programs are associated with reductions in needle reuse, syringe sharing, and other indirect sharing of paraphernalia (139–142), and that regular use of needle exchange programs is associated with less drug-related HIV risk behavior and lower rates of seroconversion (143), reduced incident hepatitis C infection (144), and that the incidence of HIV in IDUs who use NEPs is less than one third of the HIV incidence in IDUs who do not use NEPs (145). Further, IDUs who use needle exchange programs exhibit reductions in the mean average number of injections per syringe as well as reductions in the number of injections per day (141), and participation in NEPs is associated with improved access to health care and drug treatment (146). Such programs are clearly cost effective (147–150) and neither result in increased use of illicit drugs nor encourage first-time drug use (140). The available evidence also confirms that if sterile syringes are available, injection drug users will obtain them (151,152), and access to sterile injection equipment through pharmacies has been associated with reduced rates of both needle sharing and HIV transmission (153).

The Measurement Debate

Self-reported behaviors have often been the primary outcome measure from behavioral prevention studies. One reservation about self-report is whether study participants provide truthful or accurate information in response to sensitive

questions about sexual or drug use behaviors. Some argue that one can have confidence only in self-reported data when there are biological outcome measures that corroborate self-reported behavior change (2). Although most intervention researchers would agree that disease incidence offers strong confirmatory support, this can be difficult when there is a low incidence in such diseases as HIV in the population under study. STDs have been recommended as surrogate markers for HIV, despite the lack of a true empirical relationship between specific STDs and HIV. However, the relationship between the incidence and prevalence of a given STD and HIV incidence is equally as complex as the relationship between self-reported behaviors and HIV incidence (154).

Because of self-reported data, two psychometric aspects of such data have been of concern: their reliability and their validity. Reliability confirms that the instrument is free of random error, and validity demonstrates whether the instrument measures what we think it is measuring. People may bias self-reported information either because the person does not accurately remember his or her behavior during the period under question or because the person does not accurately report behavior that is recalled. A large volume of literature has addressed these questions and found that, in general, people provide truthful information if they are 1) assured that their information will be anonymous; 2) provided with motivating instruction that stresses the importance of their information; 3) not required to report the information face-to-face; and 4) able to confirm that their answers are truthful (154).

Given truthful responding, the accuracy of the information that is provided will be dependent on the length of the recall period, the question format, and individual differences (i.e., recall may be less accurate for those who engage in the behavior with high frequency). Most of the research suggests that moderate recall intervals are preferable to those that are short or lengthy (155,156). Recall can also be affected by the respondents' education or age, the data collection methods being used, and demand characteristics of the situation. However, the research suggests that only a small percentage of persons provide inaccurate responses when the conditions listed in the preceding paragraph are present (154).

A panel constituted by the National Institute of Mental Health (NIMH) examined the issue of self-report and biological data as outcome variables and prepared a National Institutes of Health Policy Statement based on its conclusions (154). This report noted that there are many reasons why biologic data may not be congruent with self-reported information. The report concluded that the failure to find a linear relationship between self-report and incident STDs cannot be taken as an indication of dishonesty or inaccuracy. In fact, that panel concluded that when appropriate assessment conditions are established, well-designed questions result in reliable and valid self-reported information about sensitive behaviors.

Are Behavioral Interventions Cost Effective?

The relatively modest resources for public health efforts need to be carefully allocated if they are to have the greatest benefit for public health. Often, this necessitates weighing alternative intervention and measurement strategies and prioritizing those that are expected to yield the greatest benefit at the lowest

cost. Cost-effectiveness analyses (CEAs) are needed to help public health officials and community leaders establish priorities and assess the utility of different interventions. CEA is an umbrella term covering a variety of analyses that compare alternative interventions, often using measures such as the potential years of life gained, infections averted, or quality-adjusted life years to assess the tradeoffs between interventions. CEA therefore yields a ratio that expresses the value of an intervention relative to its cost. The cost effectiveness of behavioral interventions has been the subject of several recent empirical investigations, primarily after the public and private costs of managing HIV and AIDS became evident to policy-makers and raised questions about the cost-effectiveness of other approaches (97). The CEAs that have appeared in the literature indicate that a preventive public health approach to the AIDS epidemic based on social and behavioral science would be cost-effective, saving thousands of dollars for each HIV infection averted. In an analysis of one of the POL intervention studies conducted by Kelly et al. (157) on urban women in the United States, for example, Holtgrave and Kelly (158) concluded that the cost-utility ratio of the POL intervention was at a level generally regarded to be very cost effective. Taken together, the available literature indicated that behavioral interventions are both cost saving and cost effective (159–162).

Moving Interventions from Research to Service Delivery

Dissemination of new diagnostic tests and treatments in health care average 15 to 17 years (163). Consider the record of uptake into clinical practice of newer, more specific and sensitive laboratory tests for chlamydia and gonorrhea. More than a decade after they were shown to offer improved sensitivity and specificity, less than 3% of practicing clinicians reported that they were using the newer and more sensitive tests (164).

If dissemination of new diagnostic tests and clinical treatments seems unreasonably long, dissemination of behavioral interventions is even more uncertain in the absence of the intensive marketing that characterizes the pharmaceutical and diagnostics industries. The best developed dissemination efforts for behavioral interventions were organized by the Centers for Disease Control and Prevention (CDC). Although limited in both their scope and their duration, these were model efforts attempting to get sound interventions into the hands of community organizations and agencies that provide programs on a local level. In the first instance, the Division of Adolescent and School Health (DASH) at the CDC sponsored programs for youth with evidence of effectiveness and no evidence of untoward consequences. Potential candidates for DASH's dissemination effort were identified by program staff from the literature. Independent panels, one of scientists and another of program end users, then reviewed and rated the interventions, using rigorous criteria. A small number of programs was subsequently selected for their "Programs that Work" designation. Program materials were prepared by education contractors, and then trainers from state Departments of Education were funded to attend a centralized "train the trainer" program. The trainers' attendance at the initial training was supported by CDC in exchange for their commitment to train others within their states to deliver the programs after they returned

home. In this way, DASH made a concerted effort to move sound research programs into broad use in a timely manner. The “Programs that Work” effort was a commendatory and model effort, but the effort was abruptly discontinued in response to intensive conservative political pressures. The second model effort was initiated by the Division of HIV Prevention (DHAP), also within CDC, when DHAP initiated a program called “Interventions in a Box” to disseminate effective interventions for adults. The selected interventions were packaged in a “box” that contained training videos, an intervention manual, and intervention handouts. As of 2005, 13 programs had been packaged, and almost 3000 people had participated in the sponsored training programs using these materials. Finally, the NIMH is currently supporting a large international trial of the popular opinion leader intervention in five countries. This well-funded and carefully controlled experimental trial is likely to yield exciting information, but it leaves the issue of how to accomplish widespread dissemination of effective programs largely unresolved.

Ethical Considerations About Behavioral Interventions

Unanticipated and detrimental behavioral outcomes have accidentally resulted from some biomedical interventions. For example, one problematic consequence of successful antiretroviral treatment and the subsequent advertising campaigns that reframed AIDS as a “chronic manageable disease” is that some people resumed risky behavior as their HIV viral load decreased, believing either that they were no longer infectious or that HIV’s severity had been lessened. Ven and colleagues (165) reported that 40% of gay men whose viral load became undetectable as a result of treatment with antiretroviral drugs resumed engaging in unprotected anal intercourse. Such resumptions of risky behavior following improved health, restoration of higher energy levels, and beliefs that they could no longer transmit HIV to sex partners have been widely reported and are unquestionably problematic. In behavioral interventions, questions about the possibility of adverse outcomes are usually based on 1) uncertainty whether the usual participant incentive payments may be coercive or create opportunities for continued risk behavior and 2) whether the intervention itself produces untoward effects by increasing risky behaviors, as it appears was the case for pharmacological treatments such as Viagra and antiretroviral medications.

Effect of Incentive Payments on Risk Behaviors

Research studies going back a quarter of a century consistently confirm that ethical concerns about incentives for participants are unwarranted (166). Clearly, the size of incentive payments has a positive effect on participants’ retention in longitudinal research; however, there is no evidence that incentive payments increase risky behavior. For example, when cash or voucher incentives of varying amounts were paid to active drug abusers, neither the mode nor the magnitude of payment had any significant effect on rates of drug use or on participants’ perceptions of coercion (167). Consistent with other studies on contingency management (168), higher incentive payments produce higher retention in research studies, a serious concern in maintaining the validity and generalizability of the research results (167,169), but incentive payments have not been shown to introduce any deleterious consequences.

Are There Adverse Behavioral Outcomes from Behavioral Interventions?

Concerns are often voiced as to whether behavioral interventions give rise to undesirable outcomes. For example, critics express their concern that safer sex interventions or condom distribution may promote an increase of sexual behaviors or earlier sexual debut. Despite an extensive literature review covering a quarter of a century of intervention science, we were unable to locate any evidence of such untoward outcomes.

Summary and Future Directions

You cannot defend the truth with lies.

A.S. Byatt, Whistling Women

The main purpose of this chapter is to offer perspectives about the essentials of public health interventions that are necessary to prevent STD in those who are uninfected, and about the limits of adverse sequelae of infections that do occur. Our goal was to provide for nonspecialists an interdisciplinary blueprint about the architecture of behavioral interventions. We believe there are four general principles that may be distilled from the details that were presented.

First, we encourage readers to carefully consider the goals of public health behavioral intervention efforts to reduce STI morbidity. An effective public health intervention may achieve at best modest health improvements, often with an investment of substantial effort and resources. Such interventions may yield only minor behavior change but still may be associated with substantial public health benefit. Consider, for example, the likely benefit of a net reduction of the caloric equivalent of one bag of potato chips each month on rates of adult obesity. The efforts to achieve such a goal would likely require coordinated efforts of manufacturers to produce a less-fattening chip, and from communities, retailers, advertisers, and public health teams to encourage reduced consumption. Many individuals would not adhere to such a change, and some might paradoxically increase potato chip consumption. It is unlikely that efforts to completely eliminate chips would be successful. Yet, important public health gains still could result. However, interventions to change sexual risk behavior appear to be held to higher standards. This may be because many public health approaches to STI (sexually transmitted infection) control traditionally involve reinforcement of strong social controls on sexuality. This artificial standard for STI interventions leads to substantial policy mischief when, for example, sexual abstinence as an individual behavior is confused with sexual abstinence as a public health intervention. For individuals, abstinence is 100% effective for STI prevention because an individual person cannot simultaneously be abstinent and nonabstinent. At a population level, however, some individuals will fail to be abstinent. Failure to consider abstinence from a public health perspective leads to policies grounded in false assumptions about efficacy. This belief has led to an increasingly widespread practice of withholding information about effective approaches to prevention (170,171). Such systematic withholding of information raises a number of moral and ethical concerns.

Second, readers should consider the place of behavioral interventions within the larger contexts of a society. Our society, like all societies, is a dynamic

entity. Larger societal developments such as economic expansion or contraction, shifts in the demography of poverty, or changes in attitudes about family formation will all have effects on the design, implementation, and success of a given intervention. Readers should also remember that the population of people “at risk” for STIs is neither homogenous nor static. This means that various components of a population become sexually active as they age from adolescence into adulthood. Not only are the prevention needs of younger people different from those of older folks, but prevention needs change as cohorts age. Thus, with age, a cohort’s sexual health needs (including the need for disease prevention) also change. One of the challenges yet to be met by intervention science is creation of interventions that match the diversity and developmental dynamism of a diverse population.

Third, readers are encouraged to consider interventions within the context of future biomedical innovations. Phrases such as “until we have a vaccine or a cure, we must rely on behavioral interventions to reduce rates of sexually transmitted infections” reverberate through public and professional discourse about STIs. These phrases are quaintly optimistic in their faith in technological solutions to public health problems. Yet, these phrases emphasize a pessimistic, even fatalistic, sense that behavioral interventions are little better than nothing at all. In considering the various types of technological solutions to the various epidemics of STI—drugs, vaccines, microbicides, improved condoms—the various ways people must incorporate these advances into their sexual lives remains the gist of public health science and practice about prevention. For example, consider the implications for STI prevention of a vaccine to prevent genital HPV infections. Preliminary data suggest that such a vaccine will be highly effective for prevention of the most common HPV types associated with cervical and other genital cancers. However, other common STIs are not prevented by this vaccine. A new generation of interventions will be required to help people differentiate vaccine-prevented STIs from those to which susceptibility remains. This is but one example of several imminent challenges to STI prevention practice.

Fourth, readers are encouraged to consider the fundamentals of science presented in this chapter. It should be obvious that effective behavior change is not a simple product of education and exhortation. Many in public health seem to feel that a sufficient intervention is defined by some posters and pamphlets, a rhetorical question such as “you don’t want to get an STI, do you?” and an admonition to change. Data reviewed in this chapter should make the limitations of this approach quite clear. These data also suggest some alternative means by which public health personnel and institutions can help people understand and target specific behaviors, identify appropriate target behaviors, and acquire skills to achieve those targets. This, of course, is the essence of public health prevention practice.

References

1. Ebrahim SH, McKenna MT, Marks JS. Sexual behaviour: related adverse health burden in the United States. *Sexually Transmitted Infections*. 2005;81:38–40.
2. Manhart LE, Holmes KK. Randomized controlled trials of individual-level, population-level, and multilevel interventions for preventing sexually transmitted infections. What has worked. *Journal of Infectious Diseases*. 2005; 191:S7–S24.

3. Kirby D. School based interventions to prevent unprotected sex and HIV among adolescents. In: Peterson JL, DiClemente RJ, eds. *Handbook of HIV Prevention*. New York, NY: Kluwer/Plenum Publishers; 2000:103–107.
4. Kirby D. *Emerging Answers: Research Findings on Programs to Reduce Teen Pregnancy*. National Campaign to Prevent Teen pregnancy, 2001.
5. Nation M, Crusto C, Wandersman A, et al. What works in prevention: principles of effective prevention programs. *American Psychologist*. 2003;56:449–456.
6. St. Lawrence JS. *What Works in Prevention: Principles of Effective Programs*. Symposium presented at the International Union for the Study of Sexually Transmitted Infections (IUSSTI). Punta del Este, Uruguay; December 2003.
7. Semaan S, Des Jarlais D, Sogoglow E, et al. A meta-analysis of the effect of HIV prevention interventions on the sex behaviors of drug users in the United States. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology*. 2002;30:S73–S93.
8. Robin L, Dittus P, Whitaker D, et al. Behavioral interventions to reduce incidence of HIV, STD, and pregnancy among adolescents: a decade in review. *Journal of Adolescent Health*. 2004;34:3–26.
9. Neumann MS, Johnson WD, Semaan S, et al. Review and meta-analysis of HIV prevention intervention research for heterosexual adult populations in the United States. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology*. 2002;34:S106–S117.
10. Johnson WD, Hedges LV, Ramirez G, et al. HIV prevention research for men who have sex with men: a systematic review and meta-analysis. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology*. 2002;4:S118–S129.
11. Leviton LC. Integrating psychology and public health: challenges and opportunities. *American Psychologist*. 1996;51:42–51.
12. COMMIT Research Group. Community intervention trial for smoking cessation (COMMIT): I. Cohort results from a four year community intervention. *American Journal of Public Health*. 1995;85:183–192.
13. COMMIT Research Group. Community intervention trial for smoking cessation (COMMIT): II. Changes in adult cigarette smoking prevalence. *American Journal of Public Health*. 1995;85:193–200.
14. Elford J, Bolding G, Sherr L. Peer education has no significant impact on HIV risk behaviours among gay men in London. *AIDS*. 2002;15:535–538.
15. Flowers P, Hart GJ, Williamson IM, Frankis JS, Der GJ. Does peer-led sexual health promotion have a community level effect amongst gay men in Scotland? *International Journal of STD & AIDS*. 2002;13:102–108.
16. Rogers EM. *Diffusion of Innovation*. New York, NY: Free Press; 1983.
17. St. Lawrence JS, Brasfield T, Jefferson K, Alleyne E. Theoretical models applied to AIDS prevention. In: Goreczny A, ed. *Handbook of Health and Rehabilitative Psychology*. New York, NY: Plenum Publishing Company; 1995:555–582.
18. Brandt HM, McCree DH, Lindsey LL, Sharpe PA. *A formal evaluation of existing printed HPV educational materials*. Presented at the annual meeting of the American Public Health Association. Washington, DC; 2003.
19. Sharpe PA, Brandt HM, McCree DH. (2005). Knowledge and beliefs about abnormal Pap test results and HPV among women with high-risk HPV: results from in-depth interviews. *Women and Health*. 2005;42:107–133.
20. AIDS brochure launched despite doubts. *Nature*. 1988;333:87.
21. Becker HM. The Health Belief Model and personal health behavior. *Health Education Monographs*. 1974;2:236–473.
22. Janz N, Becker HM. The Health Belief Model: a decade later. *Health Education Quarterly*. 1984;11:1–47.
23. Brown LK, DiClemente RJ, Reynolds LA. HIV prevention for adolescents: utility of the Health Belief Model. *AIDS Education and Prevention*. 1991;3:50–59.

24. Li X, Fang X, Lin D, et al. HIV/STD risk behaviors and perceptions among rural-to-urban migrants in China. *AIDS Education and Prevention*. 2004;16:536–558.
25. Cleary PD, Rogers TF, Singer E, et al. Health education about AIDS among seropositive blood donors. *Health Education Quarterly*. 1986;13:317–319.
26. Prochaska TR, Albrecht G, Levy A, Sugrue N, Kim, JH. Determinants of self-perceived risk for AIDS. *Journal of Health and Social Behavior*. 1990;31:384–395.
27. Fishbein M, Azjen I. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley; 1975.
28. Fishbein M, Middlestadt SE. Using the Theory of Reasoned Action as a framework for understanding and changing AIDS related behaviors. In: Mays VM, Albee GW, Schneider SF, eds. *Primary Prevention of AIDS: Psychological Approaches*. Newbury Park: Sage Publications; 1989:93–110.
29. Jemmott LS, Jemmott JB. Applying the theory of reasoned action to AIDS risk behavior: condom use among black women. *Nursing Research*. 1991;30:228–234.
30. Sheeran P, Orbell S. Do intentions predict condom use? Meta-analysis and examination of six moderator variables. *British Journal of Social Psychology*. 1998;37:231–250.
31. Schnell DJ, Galavotti C, Fishbein M, Chan DK, The AIDS Community Demonstration Projects. Measuring the adoption of consistent use of condoms using the stages of change model. *Public Health Reports*. 1996;111:59–68.
32. Azjen I. Perceive behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*. 2002;32:665–683.
33. Fischhoff B. Making decisions about AIDS. In: Mays VM, Albee GW, Schneider SF, eds. *Primary Prevention of AIDS: Psychological Approaches*. Newbury Park: Sage Publications; 1989:168–206.
34. Lebow RN, Stein J. Beyond deterrence. *Journal of Social Issues*. 1987;43:5–72.
35. Eddy DM. Probabilistic reasoning in clinic medicine: problems and opportunities. In: Kahneman D, Slovic P, Tversky A, eds. *Judgment under Uncertainty: Heuristics and Biases*. New York: Cambridge University Press; 1980:46–53.
36. Mischel W, Ebbeson EB. Attention to delay of gratification. *Journal of Personality and Social Psychology*. 1970;16:329–337.
37. Ferster CB, Skinner BF. *Schedules of Reinforcement*. New York: Appleton-Century-Crofts, Inc.; 1957.
38. Kelly JA, St. Lawrence JS. *The AIDS Health Crisis: Psychological and Social Interventions*. New York: Plenum; 1988.
39. Brownell KD. Obesity: Understanding and treating a serious, prevalent, and refractory disorder. *Journal of Consulting and Clinical Psychology*. 1982;50:820–840.
40. Chesney M. Behavior modification and health enhancement. In: JD Matarrazo, SM Weiss, JA Herd, NE Miller, SM Weiss, eds. *Biobehavioral Health: A Handbook of Health Enhancement and Disease Prevention*. New York: Wiley; 1984:658–663.
41. Prechacek TF. Modification of smoking behavior. In: Krasnegor N, ed. *The Biobehavioral Aspects of Smoking*. National Institute on Drug Abuse Research Monograph 26. Rockville, MD: US Department of Health, Education, and Welfare; 1979. Available at: <http://www.nida.nih.gov/pdf/monographs/26.pdf>.
42. Bandura AA. *Social Learning Theory*. Englewood Cliffs, NJ: Prentice-Hall; 1977.
43. Bandura AA. Perceived self efficacy in the exercise of control over AIDS infection. In: Mays VM, Albee GW, Schneider SF, eds. *Primary Prevention of AIDS: Psychological Approaches*. Newbury Park: Sage Publications; 1989:128–141.
44. Leventhal H, Safer MA, Panagis DM. The impact of communication on self-regulation of health beliefs, decisions, and behavior. *Health Education Quarterly*. 1983;10:3–31.

45. Leventhal H, Zimmerman R, Gutmann M. Compliance: A self-regulation perspective. In: Gentry WD, ed. *Handbook of Behavioral Medicine*. New York: Guilford; 1984:369–436.
46. Maddox J, Rogers R. Protection motivation and self-efficacy: a revised theory of fear appeals and attitude change. *Journal of Experimental Social Psychology*. 1983;19:469–479.
47. Rogers R. Cognitive and physiological processes and attitude change: a revised theory of protection motivation. In: Cacioppo JT, Petty RE, eds. *Social Psychophysiology: A Sourcebook*. Guilford Press, New York, NY; 1983: 53–176.
48. Bauman IJ, Siegel K. Misperception among gay men of the risk for AIDS associated with their sexual behavior. *Journal of Applied Social Psychology*. 1987;17:329–350.
49. Rhodes F, Wolitski RJ. Perceived effectiveness of fear appeals in AIDS education: relationship to ethnicity, gender, age, and group membership. *AIDS Education & Prevention*. 1990;2:1–11.
50. Lazarua AA. *The Practice of Multimodal Therapy*. New York: McGraw-Hill; 1981.
51. St. Lawrence JS, Hood HV, Brasfield TL, Kelly JA. Differences in gay men's AIDS risk knowledge and behavior patterns in high and low AIDS prevalence cities. *Public Health Reports*. 1989;391–395.
52. Mitchell SJ, Klausner JD. *Methamphetamine & STDs Including HIV Infection: A Local Public Health Department Responds*. Seminar presented to the National Center on HIV, STD, & TB Prevention, Centers for Disease Control & Prevention. Atlanta, GA; February 9, 2005.
53. Miller HG, Turner CF, Moses IE, eds. *AIDS: The Second Decade*. Washington, DC: National Academy Press; 1990.
54. MacDonald G, Schneider A. *The Importance of Social Marketing Techniques in Creating Effective Medical Campaigns*. Paper presented to the VII International Conference on AIDS, Florence, Italy; 1991.
55. Silvestre A, Lyster DW, Rinaldo CR, Kingsley IA, Forrester R, Huggins J. Marketing strategies for recruiting gay men into AIDS research and education projects. *Journal of Community Health*. 1986;11:222–231.
56. Puckett SB, Bye LL. *The Stop-AIDS Project: An Interpersonal AIDS Prevention Plan*. Report to the San Francisco AIDS Foundation, San Francisco; 1987.
57. Miller T, Booraem C, Flowers J, Iverson A. Changes in knowledge, attitudes, and behavior as a result of a community-based AIDS prevention program. *AIDS Education & Prevention*. 1990;2:12–25.
58. Kelly JA. Popular opinion leaders and HIV prevention peer education: Resolving discrepant findings, and implications for the development of effective community programmes. *AIDS Care*. 2004;16:139–150.
59. Kelly JA, St. Lawrence JS, Diaz YE, et al. HIV risk behavior reduction following intervention with key opinion leaders of a population: an experimental community-level analysis. *American Journal of Public Health*. 1991;81:168–171.
60. Kelly JA, St. Lawrence JS, Stevenson LY, et al. Producing population wide reductions in HIV risk behavior among small-city gay men: Results of an experimental field trial in three cities. *American Journal of Public Health*. 1992; 82:1483–1489.
61. St. Lawrence JS, Brasfield TL, Diaz YE, Jefferson KW, Reynolds M, Leonard M. Longitudinal follow-up from a community AIDS/HIV risk reduction intervention training popular peers as change agents: population risk behavior three years later. *American Journal of Public Health*. 1994;84:2027–2028.
62. Prochaska JO, DiClemente CC, Norcross JC. In search of how people change: application to addictive behaviors. *American Psychology*. 1992;47:1102–1114.

63. Prochaska JO, Redding CA, Harlow LL, Rossi JS, Velicer WF. The transtheoretical model of change and HIV prevention: a review. *Health Education Quarterly*. 1994;21:471–485.
64. Fisher JD, Fisher WA. Changing AIDS risk behavior. *Psychological Bulletin*. 1992;111:455–474.
65. Coates T. Strategies for modifying sexual behavior for primary and secondary prevention of HIV disease. *Journal of Consulting and Clinical Psychology*. 1990;58:37–49.
66. Leviton LC. Theoretical foundations of AIDS prevention programs. In: Valdiserri RO, ed. *Preventing AIDS: The Design of Effective Programs*. New Brunswick, NJ: Rutgers University; 1989:42–90.
67. McKusick L, Conant M, Coates TJ. The AIDS epidemic: a model for developing intervention strategies for reducing high risk behavior in gay men. *Sexually Transmitted Diseases*. 1985;12:229–234.
68. Kalichman SC, Rompa D, Cage M. Group intervention to reduce HIV transmission risk behavior among persons living with HIV/AIDS. *Behavior Modification*. 2005;29:256–285.
69. St. Lawrence JS, Brasfield TL, Jefferson KW, Alleyne E, O'Bannon RE, Shirley A. Cognitive-behavioral intervention to reduce African-American adolescents' risk for HIV infection. *Journal of Consulting and Clinical Psychology*. 1995;63:221–237.
70. Winett RA, Altman DG, King DG. Conceptual and strategic foundations for effective media campaigns for preventing the spread of HIV infection. *Evaluation and Program Planning*. 1990;13:91–104.
71. Flora JA, Thoresen CE. Reducing the risk of AIDS in adolescents. *American Psychologist*. 1988;43:965–970.
72. Kelly JA, St. Lawrence JS, Hood HV, Brasfield TL. Behavioral intervention to reduce AIDS risk activities. *Journal of Consulting and Clinical Psychology*. 1989;57:60–67.
73. Kelly JA, St. Lawrence JS, Betts R, Brasfield TL, Hood HV. A skills training group intervention model to assist persons in reducing risk behaviors for HIV infection. *AIDS Prevention & Education*. 1990;2:24–35.
74. Rotheram-Borus MJ, Koopman C, Haignere C, Davies M. Reducing HIV sexual risk behaviors among runaway adolescents. *Journal of the American Medical Association*. 1991;266:123–127.
75. Valdiserri RO, Lyter DW, Leviton LC, Callahan CM, Kingsley LA, Rinaldo CR. AIDS prevention in homosexual and bisexual men: results of a randomized trial evaluating two risk reduction interventions. *AIDS*. 1989;3:21–26.
76. St. Lawrence JS, Wilson T, Eldridge G, Brasfield T, O'Bannon R. Evaluation of community-based intervention to reduce low income African-American women's risk of sexually transmitted diseases: a randomized controlled trial of three theoretical models. *American Journal of Community Psychology*. 2001;29:937–964.
77. Institute of Medicine. *Promoting Health Intervention Strategies from Social and Behavioral Research*. Washington, DC: National Academy Press; 2000.
78. Flay BR, Cook TD. Evaluation of mass media prevention campaigns. In: Rice RE, Atkins CK, eds. *Public Communication Campaigns*. Newbury Park, CA: Sage Publications; 1990.
79. Gostin LA. Legal and public policy interventions to advance the population's health. In: Institute of Medicine. *Promoting Health: Intervention Strategies from Social and Behavioral Research*. Washington, DC: National Academy Press; 2000:340–416.
80. Chesson HW, Harrison P, Stall R. Changes in alcohol consumption and in sexually transmitted disease incidence rates in the United States: 1983–1998. *Journal of Studies on Alcohol*. 2003;64:623–630.

81. Lefebvre C, Flora J. Social marketing and public health intervention. *Health Education Quarterly*. 1988;15:299–315.
82. Wallace L, DeJong W. Mass media and public health. In: US Department of Health and Human Services. *The Effects of Mass Media on the Use and Abuse of Alcohol*. Bethesda, MD: National Institutes of Health; 1995:253–268.
83. St. Lawrence JS. Social marketing to increase condom acceptance and use in a high syphilis morbidity community. *Manuscript under editorial review*. 2007.
84. Coyle RT. *Theory: A Guide for Health Promotion Practice*. Washington, DC: US Department of Health and Human Services, National Institutes of Health; 2005.
85. Sorenson G, Emmons K, Hunt M, Johnson D. Implications of the results of community intervention trials. *Annual Review of Public Health*. 1998;19:379–416.
86. Finger B, Lapertina M, Pribla M, James-Traore T. *Intervention Strategies that Work for Youth: Summary of the FOCUS on Young Adults End of Program Report*. Arlington, VA: Family Health Interventional, YouthNet Program; 2002.
87. World Health Organization (WHO). *School Health Education to Prevent AIDS and Sexually Transmitted Diseases*. Geneva: WHO; 1992. WHO AIDS Series.
88. Grunseit A, Kippax S, Aggleton P, Baldo M, Slutkin G. Sexuality education and young people's sexual behavior: a review of studies. *Journal of Adolescent Research*. 1997;12:421–453.
89. Doherty IA, Padian NS, Cameron M, Aral SO. Determinants and consequences of sexual networks as they affect the spread of sexually transmitted infections. *Journal of Infectious Diseases*. 2005;191:S42–S54.
90. Amirhanian YA, Kelly JA, McAuliffe TI. Identifying, recruiting, and assessing social networks at high risk for HIV/AIDS: methodology, practice, and a case study in St. Petersburg, Russia. *AIDS Care*. 2005;17:58–75.
91. Latkin C, Mandell W, Vlahov D, Oziemkowska M, Celentano D. People and places: behavioral settings and personal network characteristics as correlates of needle sharing. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology*. 1996;13:273–280.
92. Trotter RT II, Bowen AM, Potter JM Jr. Network models for HIV outreach and prevention programs for drug users. *NIDA Research Monograph*. 1995;151:144–180.
93. Cottler LB, Compton WM, Ben Abdallah A, et al. Peer-delivered interventions reduce HIV risk behaviors among out-of-treatment drug abusers. *Public Health Reports*. 1998;113(suppl 1):31–41.
94. Latkin C, Glass GE, Duncan T. Using geographic information systems to assess spatial patterns of drug use, selection bias and attrition among a sample of injection drug users. *Drug and Alcohol Dependence*. 1998;50:167–175.
95. Broadhead RS, van Julst Y, Heckathorn DD. The impact of a needle exchange's closure. *Public Health Reports*. 1999;114:439–447.
96. Kincaid DL. Social networks, ideation, and contraceptive behavior in Bangladesh: a longitudinal analysis. *Social Science and Medicine*. 2000;50:215–231.
97. Belcher L, St. Lawrence JS. Women and HIV. In: Sherr L, St. Lawrence JS, eds. *Women, Health, and the Mind*. London: John Wiley & Sons; 2000:205–326.
98. Exner T, Seal D, Ehrhardt A. A review of HIV interventions for at-risk women. *AIDS & Behavior*. 1997;1:93–124.
99. Ickovics J, Yoshikawa J. Preventive interventions to reduce heterosexual HIV risk for women: current perspectives, future directions. *AIDS*. 1998;12(Suppl. A):197–208.
100. National Institute of Mental Health. The NIMH Multisite HIV Prevention Trial: reducing sexual HIV risk behavior. *Science*. 1998;280:1889–1894.
101. Kamb M, Fishbein M, Douglas J, et al. HIV/STD prevention counseling reduces high risk behaviors and sexually transmitted diseases: results from a multicenter randomized controlled trial (Project RESPECT). *Journal of the American Medical Association*. 1998;280:1161–1167.

102. Belcher L, Kalichman S, Topping M, et al. A randomized trial of a brief HIV risk reduction counseling intervention for women. *Journal of Consulting and Clinical Psychology*. 1998;66:856–861.
103. Emmons KM. Behavioral and social science contributions to the health of adults in the United States. In: Institute of Medicine. *Promoting Health: Intervention Strategies from Social and Behavioral Research*. Washington, DC: National Academy Press; 2000:254–321.
104. Hawkins JD, Catalano RF, Kosterman R, Abbot R, Hill KG. Preventing adolescent health risk behaviors by strengthening protection during childhood. *Archives of Pediatric Adolescent Medicine*. 1999;153:438–447.
105. Lonczak HA, Abbott ES, Hawkins JD, Kosherman R, Catalano RF. Effects of the Seattle Social Development Project on sexual behavior, pregnancy, birth, and sexually transmitted disease outcomes by age 21 years. *Archives of Pediatric Adolescent Medicine*. 2002;156:438–447.
106. O'Donnell J, Hawkins JD, Catalano RF, Abbott RD, Day LE. Preventing school failure, drug use, and delinquency among low income children: long term intervention in elementary schools. *American Journal of Orthopsychiatry*. 1995;65:87–100.
107. Perry CL. Preadolescent and adolescent influences on health. In: Institute of Medicine, *Promoting Health: Intervention Strategies from Social and Behavioral Research*. Washington, DC: National Academy Press; 2000:217–253.
108. Coyle K, Basen-Enquist K, Kirby D. Short term impact of Safer Choices: a multi-component school based HIV, other STD, and pregnancy prevention program. *Journal of School Health*. 1999;69:181–188.
109. Blake SM. Condom availability programs in Massachusetts high schools: relationships with condom use and sexual behavior. *American Journal of Public Health*. 2003;3:955–962.
110. Centers for Disease Control and Prevention. *HIV/STD/TB Prevention News Update*. May 11, 2004. Available at: <http://listmanager.aspensys.com/read/messages?id=32247>
111. Main DS, Iverson DC, McGolin J, et al. Preventing HIV infection among adolescents: evaluation of a school-based education program. *Preventive Medicine*. 1994;23:409–417.
112. Centers for Disease Control and Prevention. *Compendium of HIV Prevention Interventions with Evidence of Effectiveness from CDC's HIV/AIDS Prevention Research Synthesis Project* November 1999 (Revised on August 31, 2001). Available at <http://www.cdc.gov/hiv/pubs/hivcompendium/hivcompendium.htm>
113. St. Lawrence JS, Crosby RA, Brasfield TL, O'Bannon RE. Reducing HIV/STD risk behavior of substance-dependent adolescents: a randomized controlled trial. *Journal of Consulting and Clinical Psychology*. 2002;40:1010–1021.
114. Harper GW, Robinson WL. Pathways to risk among inner city African American adolescent females: the influence of gang membership. *American Journal of Community Psychology*. 1999;27:383–404.
115. Jemmott JB, Jemmott LS. HIV behavioral interventions for adolescents in community settings. In: Peterson JL, DiClemente RJ, eds. *Handbook of HIV Prevention*. New York, NY: Kluwer Academics/Plenum Publishers; 2000:103–127.
116. Lightfoot M, Rotherm-Borus MJ. Interventions for high risk youth. In: Peterson JL, DiClemente RJ, eds. *Handbook of HIV Prevention*. New York, NY: Kluwer Academics/Plenum Publishers; 2000:129–145.
117. Peterson JS, DiClemente RJ, eds. *Handbook of HIV Prevention*. New York, NY: Kluwer Academics/Plenum Publishers; 2000.
118. Rosenfeld A, Myer L, Merson M. *The HIV/AIDS pandemic: The Case for Prevention*. Menlo Park, CA: Henry J. Kaiser Family Foundation; 2001.
119. Low-Beer D, Stoneburner S. *In Search of the Magic Bullet: Evaluating and Replicating Prevention Programs*. Menlo Park, CA: Henry J. Kaiser Family Foundation; 2001.

120. Collins C, Alagiri P, Summers T, Morin SF. *Abstinence Only vs. Comprehensive Sex Education: What Are the Arguments? What Is the Evidence?* San Francisco: University of California at San Francisco; March 1992. AIDS Research Institute, Policy Monograph Series.
121. Pedlow CT, Carey MP. *Developmentally Appropriate Features of HIV Risk Reduction Interventions for Adolescents*. Paper presented to the National HIV Prevention Conference. Atlanta, GA; August 13, 2001.
122. Henry J. Kaiser Family Foundation. *Sex Education in America: A View from Inside the Nation's Classrooms*. 2000. Available at: <http://www.kff.org/youthhivstds/3048-index.cfm>. Accessed February 18, 2005.
123. Thomas MH. Abstinence based programs for prevention of adolescent pregnancies: a review. *Journal of Adolescent Health*. 2000;26:5–17.
124. Denny G, Young M, Rausch S, Spear C. An evaluation of an abstinence education curriculum series: sex can wait. *American Journal of Behavior*. 2002;26:366–377.
125. Christopher FS, Roosa MW. An evaluation of an adolescent pregnancy prevention program: is “just say no” enough? *Family Relations*. 1990;39:68–72.
126. Kirby D, Korbi M, Barth RP, Cagampang HH. The impact of the Postponing Sexual Involvement curriculum among youth in California. *Family Planning Perspectives*. 1997;29:100–108.
127. Roosa MW, Christopher FS. Evaluation of an abstinence only adolescent pregnancy prevention program: a replication. *Family Relations*. 1990;39:363–367.
128. Bearman P, Bruckner H. Promising the future: virginity pledges and first intercourse. *American Journal of Sociology*. 2001;106:859–912.
129. Bearman PS, Bruckner H. *The relationship between virginity pledges in adolescence and STD acquisition in young adulthood*. Paper presented at the 2004 National STD Conference. Philadelphia, PA; March 9, 2004. Available at <http://www.cdc.gov/stdconference/2004/PlenMiniPlen/Bearman.pps>.
130. Bruckner H, Bearman P. After the promise: the STD consequences of adolescent virginity pledges. *Journal of Adolescent Health*. 2005;36:271–278.
131. Jemmott JB, Jemmott LS, Fong GT. Abstinence and safer sex HIV risk reduction interventions for African American adolescents: a randomized controlled trial. *Journal of the American Medical Association*. 1998;279:1529–1536.
132. Zimmerman R. *Why Haven't Abstinence Programs Worked*. Presented at the annual meeting of the American Public Health Association. Philadelphia, PA; December 12, 2005.
133. Centers for Disease Control and Prevention. *HIV/AIDS Surveillance Report*, 2003 (Vol. 15). Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention; 2004. Also available at: <http://www.cdc.gov/hiv/stats/hasrlink.htm>.
134. Aceijas C, Stimson GV, Hickman M, Rhodes T. Global overview of injecting drug use and HIV infection among injecting drug use. *AIDS*. 2004;18:2295–2303.
135. Lurie P, Jones TS, Foley, J. A sterile syringe for every drug user injection: how many injections take place annually and how might pharmacists contribute to syringe distribution. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology*. 1998;18(suppl):S45–S51.
136. Centers for Disease Control and Prevention. Policy Issues and Challenges in Substance Abuse Treatment. *Prevention among Injection Drug Users Fact Sheet Series*. February 2002. Available at <http://www.cdc.gov/idu/facts/Policy.htm>.
137. Gostin LO, Lazzarini Z., Jones TS, Flaherty K. Prevention of HIV/AIDS and other blood-borne diseases among injection drug users: a national survey on the regulation of syringes and needles. *Journal of the American Medical Association*. 1997;277:53–62.
138. Rich JD, Dickinson B, Liu K. Strict syringe laws in Rhode Island are associated with high rates of reusing syringes and HIV risks among injection drug users.

- Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology*. 1998;18(suppl):S140.
139. Hagan J, Thiede H. Changes in injection risk behavior associated with participation in the Seattle needle exchange program. *Journal of Urban Health*. 2000;77:369–382.
 140. Vlahov D, Junge B. The role of needle exchange programs in HIV prevention. *Public Health Report*. 1998;113:75–80.
 141. Vlahov D, Junge B, Brookmeyer R, et al. Reductions in high risk drug use behaviors among participants in the Baltimore needle exchange program. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology*. 1997;16:400–406.
 142. Blumenthal RN, Kral AH, Gee L, Erringer EA, Edlin B. The effect of syringe exchange use on high risk injection drug users: a cohort study. *AIDS*. 2000;14:605–611.
 143. Des Jarlais DC, Marmor M, Paone D, et al. HIV incidence among injecting drug users in New York City syringe exchange programs. *Lancet*. 1996;348:987–991.
 144. Taylor A, Goldberg D, Hutchinson S, et al. Prevalence of hepatitis C virus infection among injecting drug users in Glasgow 1990–1996: are current harm reduction strategies working? *Journal of Injections*. 2000;40:176–183.
 145. Des Jarlais DC. Research, politics and needle exchange. *American Journal of Public Health*. 2000;90:1392–1394.
 146. Strathdee SA, Celentano DD, Shah N, et al. Needle exchange attendance and health care utilization promote entry into detoxification. *Journal of Urban Health*. 1999;76:448–460.
 147. Gold M, Safni A, Melligan P, Millson P. Needle exchange programs: an economic evaluation of a local experience. *Canadian Medical Association Journal*. 1998;157:255–262.
 148. Holtgrave D, Pinkerton SD. Updates of cost of illness and quality of life estimates for use in economic evaluations of HIV prevention programs. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology*. 1997;16:54–62.
 149. Holtgrave D, Pinkerton SD, Jones TS, Lurie P, Vlahov D. Cost and cost effectiveness of increasing access to sterile syringes and needles as an HIV prevention intervention in the United States. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology*. 1998;18(suppl):S133–S138.
 150. Jacobs P, Calder P, Taylor M, Houston, S, Saunders LD, Alvert T. Cost effectiveness of Streetwork's needle exchange program of Edmonton. *Canadian Journal of Public Health*. 1999;90:168–171.
 151. Junge B, Vlahov D, Riley E, Huettner S, Brown M, Beilenson P. Pharmacy access to sterile syringes for injecting drug users: attitudes of participants in a syringe exchange program. *Journal of the American Pharmaceutical Association*. 1999;39:17–22.
 152. Heimer R, Khoshnood K, Biggs D, Guydish J, Junge B. Syringe use and reuse: effects of needle exchange programs in three cities. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology*. 1998;18(suppl):S37–S44.
 153. Cotton-Oldenburg NU, Car P, DeBoer JM, Colison EK, Novotny G. Impact of pharmacy-based syringe access on injection practices among injecting drug users in Minnesota, 1998 to 1999. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology*. 2001;27:183–192.
 154. Pequegnat W, Fishbein M, Celentano D, et al. NIMH/APPC Workgroup on behavioral and biological outcomes in HIV/STD prevention studies: a position statement. *Sexually Transmitted Diseases*. 2000;27:127–132.
 155. Kauth MR, St. Lawrence JS, Kelly JA. Reliability of retrospective assessments of sexual risk behavior: a comparison of biweekly, three-month, and twelve-month self-reports. *AIDS Education & Prevention*. 1991;3:207–215.

156. McFarlane M, St. Lawrence JS. Adolescents' recall of sexual behavior: Consistency of self-report and the effect of variations in recall duration. *Journal of Adolescent Health*. 1999;25:199–206.
157. Kelly JA, Somlai AM, Benetsch EG, et al. Distance communication transfer of HIV prevention interventions to service providers. *Science*. 2004;305:1953–1955.
158. Holtgrave D, Kelly JA. Preventing HIV/AIDS among high risk urban women: the cost effectiveness of a behavioral group intervention. *American Journal of Public Health*. 1997;86:1442–1445.
159. Kumaranayake L, Vickerman P, Walker D, et al. The cost effectiveness of HIV preventive measures among injecting drug users in Svetlogorsk, Belarus. *Addiction*. 2004;12:1565–1576.
160. Pinkerton SD, Holtgrave DR, Jemmott JB. Economic evaluation of HIV risk reduction intervention in African-American male adolescents. *Journal of Acquired Immune Deficiency Syndromes & Human Retrovirology*. 2000;25:1634–172.
161. Pinkerton SD, Johnston-Masotti AP, Holtgrave DR, Farnham PG. Using cost effectiveness league tables to compare interventions to prevent sexual transmission of HIV. *AIDS*. 2001;15:917–928.
162. Pinkerton SD, Holtgrave DR, DiFranceisco MA, Stevenson LY, Kelly JA. Cost effectiveness of a community level HIV risk reduction intervention. *American Journal of Public Health*. 1998;88:1239–1242.
163. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academy Press; 2001.
164. St. Lawrence JS, Montano DA, Kasprzyk D, Phillips WR, Armstrong K, Leichliter J. National survey of US physicians' STD screening, testing, case reporting, clinical and partner notification practices. *American Journal of Public Health*. 2002;92:1784–1788.
165. Ven PV, Mao LA, Fogarty AA, et al. Undetectable viral load is associated with sexual risk taking in HIV serodiscordant gay couples in Sydney. *AIDS*. 2005;19:179–184.
166. St. Lawrence JS. Efficacy of a money deposit contingency on clinical outpatients' attendance and participation in assertive training. *Journal of Behavior Therapy and Experimental Psychiatry*. 1981;12:237–240.
167. Festinger DS, Marlowe DB, Croft JR, et al. Do research payments precipitate drug use or coerce participation? *Drug and Alcohol Dependence*. 2005;11:11–18.
168. Higgins D, Galavotti C, O'Reilly K, et al. Evidence for the effects of HIV antibody counseling and testing on HIV risk behavior. *Journal of the American Medical Association*. 1991;266:2419–2429.
169. Kasprzyk D, Montano DE, St. Lawrence JS, Phillips WR. The effect of variations in mode of delivery and monetary incentive on physicians' responses to a mailed survey assessing STD practice patterns. *Evaluation and the Health Professions*. 2001;24:3–17.
170. DeLamarter J. *Values Trump Data: The Bush Administration's Approach to Sexual Science*. Paper presented at the annual meeting of the American Public Health Association. Philadelphia, PA; December 12, 2005.
171. Kerry J. *Keynote address*. Presented to the annual meeting of the American Public Health Association. Philadelphia, PA; December 10, 2005.

Behavioral Interventions for Prevention and Control of
Sexually Transmitted Diseases

Aral, S.O.; Douglas, J.M. (Eds.)

2007, XXX, 578 p., Softcover

ISBN: 978-0-387-85768-8