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Introduction: Scientific Methods for Prevention Intervention Research

Lula A. Beatty and Arturo Cázares

The purpose of this research monograph, titled *Scientific Methods for Prevention Intervention Research,* is to advance theoretical, methodological, and analytical rigor in the design and conduct of prevention intervention research, particularly with minority populations. It results from a National Institute on Drug Abuse (NIDA) Technical Review held September 29 and 30, 1992, and sponsored by the Prevention Research Branch of NIDA's Division of Epidemiology and Prevention Research. This research monograph will provide both researchers and clinicians in the field of drug abuse prevention with the latest information regarding scientific methodology in prevention research. The specific objectives of the monograph are to: (1) provide current and potential researchers with state-of-the-art information regarding theory, design, and analysis in drug abuse prevention intervention research; (2) provide considerations for and models of drug abuse prevention intervention research on culturally diverse populations that are both sensitive and responsive to cultural and minority concerns and scientific rigor; (3) identify areas in need of research and theoretical development; and (4) improve the quality of applications submitted to NIDA seeking drug abuse prevention intervention research support.

The intended audience is a rather broad one. It includes current researchers in drug abuse prevention, potential researchers and applicants to NIDA (in particular, researchers asking about prevention intervention research conducted by NIDA staff at conferences and meetings and through telephone inquiries), faculty members teaching units on drug abuse evaluation and prevention, graduate students, and clinical staff and program administrators interested in demonstrating the success of their interventions,

This research monograph will strive to fill gaps based on the following evidence: (1) program staff in the Prevention Research Branch frequently receive requests from the field for information, particularly for written texts, and technical assistance in conceptualizing and designing prevention intervention research; (2) NIDA, other Federal and State agencies, and researchers recognize the need for increased scientifically rigorous research capable of documenting the effectiveness and impact of prevention intervention efforts; (3) a higher-than-usual number of prevention intervention research applications submitted to NIDA are not highly rated by the scientific review committee for reasons common across applications (one of the chapters discusses common reasons for rejection of applications, and others discuss specific areas that lead to problems in the conduct of research); (4) prevention research still is a relatively new discipline with a great need for resources for investigators, especially investigators new to this field; (5) there is a need to increase the number of new and minority researchers in the field; (6) there is a need to increase research in topic areas that are of importance and interest to NIDA (as determined by the work of NIDA staff and grantees); and (7) there is limited information available on conducting sound, theoretically based, methodologically rigorous prevention intervention research with culturally diverse populations. It is our expectation that this research monograph will provide assistance to the prevention field by addressing methodological needs in one comprehensive volume more than a typical journal article will allow. It should be noted that the chapter authors represent much input from the leadership in the field. Through the years, their work has advanced the field of prevention intervention research.

The readers of this research monograph can benefit most from its use in the following ways: (1) Current researchers may use the volume to further refine their research, integrate new methodological and analytic approaches into their studies, and consider new avenues for exploration; (2) researchers and applicants new to NIDA may use the volume as a guide for the design of a rigorous research proposal and well-designed study and as a reference point to other researchers and sources for collaboration or consultation; (3) faculty members may use it as a resource book and instructional material for courses in drug abuse prevention design and evaluation; (4) graduate students may use it as an introductory overview and guide to issues and considerations

in drug abuse prevention intervention research; and (5) clinical staff and program administrators may use the monograph to assist them in identifying issues of concern in assessing the effectiveness of their prevention intervention strategies and, perhaps, in collaborating with researchers. All readers are expected to benefit from the information provided on the four major ethnic/minority populations. In addition, libraries are expected to obtain the monograph for use by their patrons, particularly research institutions, and departments at universities and agencies that maintain interest-specific collections.

This research monograph is not duplicative of another public or private communication effort. Its uniqueness lies in the fact that it provides valuable information on how ethnicity and cultural considerations can be represented in the state-of-the-art of rigorous prevention methodologies. Further, the publication will serve as a guide to potential (and current) grantees in pointing out important considerations and implications for prevention intervention research. It reflects original work by recognized researchers in the prevention intervention field. Lastly, this timely publication of technical reviews on the topic of scientific methods for prevention intervention research will provide policymakers with research methodologies important for drug prevention and control.

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Prevention Intervention Research: Focus and Perspective

Arturo Cázares

INTRODUCTION

The purpose of this chapter and subsequent chapters in this volume is to improve the quality of applications in drug abuse prevention intervention research. This chapter has four sections. Each of the four sections discusses a number of issues that are important for prevention intervention research. Initial discussion centers around background issues, such as descriptions of prevention and comprehensive prevention, risk and protective factors for substance abuse, need to address substance abuse at an earlier age, community relevance, and effective prevention intervention models. Next, an overview of this volume provides current and potential researchers with state-of-the-art information regarding theory, design, and analysis in drug abuse prevention intervention research. The overview also provides considerations for and models of drug abuse prevention intervention research on culturally diverse populations that are both sensitive and responsive to cultural and minority concerns and scientific rigor. The third section of this chapter identifies areas in need of future research and theoretical development. Last, a general discussion on grant development provides the investigator with a basis for research planning.

PREVENTION INTERVENTION RESEARCH: BACKGROUND ISSUES

Prevention often is not thought of as a discipline, but as a random compilation of ideas applied without assessment plans or measurements of validity. Some believe that prevention, as practiced in communities across the United States, is very much like the natural experiment—a methodology devoid of planned intervention or

assessment components—in the hope that an intervention-shot-in-the-dark will change, reduce, or eliminate drug use behaviors. As a result, the field of drug abuse prevention has not clearly delineated (1) the theoretical basis for programs; (2) specific, measurable, and predicted program outcomes; or (3) the probable impact of programs on drug use incidence and prevalence when measured within a program's service area or the community at large (Leukefeld and Bukoski 1991). Progress in drug abuse prevention research has been hampered in part by the need to develop a clear definition of "prevention" that has the consensus of practitioners, researchers, and policymakers (Bukoski 1990).

The Prevention Research Branch of the Division of Epidemiology and Prevention Research at the National Institute on Drug Abuse (NIDA) supports the development of scientific knowledge concerning prevention theory and the efficacy of biobehavioral drug abuse prevention programs. The theoretical basis for prevention as a discipline is dynamic and should be established from two areas. First, it is established from epidemiologic research that defines the nature, scope, and sequencing of drug use onset and progression to abuse and addiction in the general population and in culturally diverse populations that are at high risk for drug use. Second, it is established from etiologic research that depicts behavioral, environmental, and biomedical factors that may increase or decrease risks to drug use onset and progression to abuse and later dependency (Jones and Battjes 1985; Leukefeld and Bukoski 1991; National Institute on Drug Abuse 1991).

The etiologic research suggests that a single "silver bullet" as a preventive solution does not exist. Rather, research does indicate that drug use and abuse have multiple causes, pathways, and correlates (Jones and Battjes 1985; Leukefeld and Bukoski 1991). Designing prevention interventions requires a theoretical basis as provided *from* etiologic risk factor research for drug use onset and progression to abuse and addiction. The risk factor approach (Stamler 1978; Simons et al. 1988) was adapted from biomedical research and focuses on the identification of those biopsychosocial (Kumpfer 1987), behavioral, and environmental factors that appear to be associated with the emergence of a health problem.

Estimating drug prevalence rates and trends among all segments of the population provides important and valuable information for determining the breadth of the Nation's drug problem, the extent of treatment needs, and the success of prevention policies and programs (General Accounting Office 1993). Epidemiologic research has not adequately articulated an understanding of the patterns, prevalence, and consequences of illicit and licit drug use and abuse within minority-youth populations (De La Rosa et al. 1993). Specifically, De La Rosa and colleagues (1993) indicate that the current epidemiologic research has not been able to provide comprehensive information about the prevalence of drug use among minority youth ages 12 to 24 who belong to recent immigrant groups or who are foreign-born or first-, second-, or third-generation minorities. For example, anecdotal information derived from prevention, education, and treatment programs serving minority youth suggests that, unlike nonminority youth, minority youth do not follow the same patterns of drug use and subsequent progression to abuse (Office for Substance Abuse Prevention, unpublished manuscript). Instead, many minority youth start their drug-using behavior with inhalants and alcohol and quickly progress to using cocaine and heroin accompanied with heavy alcohol use (Austin and Gilbert 1989; Crider and Rouse 1988; Sharp et al. 1992).

Comprehensive Prevention Intervention Research

Since drug abuse often is described as progressive and chronic with multiple origins and pathways, it is imperative to target varied preventive strategies at different stages of the emerging problem (Kellam et al. 1980; Leukefeld and Bukoski 1991). Effective strategies for comprehensive drug abuse prevention intervention research involve multiple program components that address risk factors across at least four groups: individual (Newcomb et al. 1986), family (Brook 1993; National Institute on Drug Abuse 1991; Watts and Wright 1990), peer group (National Institute on Drug Abuse 1991; Brown et al. 1989; Oetting and Beauvais 1987), and community, which includes school, workplace, and local neighborhood (Auslander 1988; Linsky and Straus 1986; Rush et al. 1986). By nature, the four risk factor groups are not stagnant but dynamic within and across risk factor groups (Leukefeld and Bukoski 1991).

The prevention metaresearch approach proposed by Bukoski (1991) integrates etiologic, intervention, and epidemiologic research by linking theoretical studies on the causes of and mediating factors relevant to drug use and abuse (process research) and controlled efficacy studies of theory-based prevention interventions (outcome research). Comprehensive prevention research should address the following areas:

1. Development of a scientifically sound knowledge base concerning the efficacy and effectiveness of drug abuse prevention policies and programs;

2. Development of testing of innovative research methodologies, measurement instruments, and analytical procedures to assess the process, outcome, and impact of preventive interventions;

3. Integration of testing of theories of drug use and abuse with the experimental assessment of promising prevention interventions;

4. Development and testing of the application of computer-based systems to the prevention of drug abuse; and

5. Assessment of techniques to better disseminate or share innovative, research-based preventive strategies among prevention practitioners, researchers, and State and local health care program planners and providers.

Risk Factors

There are known risk factor categories associated with **drug** use initiation and progression to abuse (Hawkins et al. 1992). Drug abuse intervention research applies the scientific understanding of the causes of drug use onset and progression to the design, development, and testing of theory-based prevention interventions focused upon risk factor groups that include individual, family, peer group, and community (school, workplace, and neighborhood).

The effectiveness of prevention interventions must be assessed on the basis of a thorough understanding of risk factor categories in the context of comprehensive programs involving schools, families, health departments, and other community agents (Adcock et al. 1991).

Research has shown that drug use and abuse behaviors are influenced by multiple risk factors in the individual and the environment (Hawkins et al. 1986). It is not enough to deal with individual risk factor categories when there is a likelihood that the risk factors interact within and across categories in an ever-changing environment. Although some risk factors for drug abuse may have a constant effect on risk, others appear to increase or decrease in predictive importance over the course of child and adolescent development (Brook et al. 1990). The research literature demonstrates that exposure to more risk factors over the course of development can increase risk exponentially, suggesting that those exposed to multiple risk factors should be included in prevention interventions (Newcomb et al. 1987). The same research findings suggest that interventions (e.g., reducing multiple risk factors at appropriate developmental periods) hold promise for drug abuse prevention (Rutter 1985). Effective prevention interventions that build upon etiologic research (risk and protective factors) and epidemiologic research (drug use scope, nature, and sequencing) may play a significant role in the prevention of drug use initiation and progression to abuse and addiction.

Protective Factors

In addition to risk factors, investigators have identified factors that appear to protect children in vulnerable environments (Werner 1989). For example, the Social Development Theory proposed by Hawkins and colleagues (1992) is a theory-based approach that describes how protective processes may operate to reduce problem behavior. Specifically, the model proposes three protective factors that bridle the development of antisocial behaviors. The first protective factor is bonding. It is described as attachment; commitment to family, school, and positive peers; and belief in shared values of these social units. Bonding is viewed as an important inhibitor of behavior outside a group's norms. The second set of factors is external constraints. These factors are described as being clear and consistent standards, or norms, against drug use. The third set of factors is that set of social competence skills that enables the individual to transcend drug use situations through problem-solving techniques, become assertive and confident in social situations, and resist the influences to violate established norms of behavior.

The Social Development Theory hypothesizes that children learn patterns of behavior that are either prosocial or antisocial. During the early years of development, children learn these patterns of behavior from social influences within the family and at school. Toward the end of elementary school, peers also have a role. It is hypothesized that socialization follows the same processes of social learning whether it produces prosocial or antisocial behavior. Children are socialized through processes involving three constructs: (1) perceived opportunities for involvement in activities and interactions with others; (2) skills to participate in these activities and interactions; and (3) reinforcement from performance (i.e., recognition) in these activities and interactions with others.

The theory also states that, when socialization processes are consistent, a social bond develops between the individual and the socializing unit. Once strongly established, this social bond has power to affect behavior independent of the above three social learning processes. This social bond can inhibit deviant behaviors through the establishment of an individual's "stake" in conforming to the norms and values of the socializing unit. It also is hypothesized that the behavior of the individual will be prosocial or antisocial depending on the predominant behaviors, norms, and values held by those to whom the individual is bonded. Bonding is cumulative—individuals who develop strong bonds early in life to family, school, and peers that are not involved in drug use or delinquency will maintain bonds of attachment, commitment, and belief in social good. In summary, the Social Development Theory describes a very important research assumption—there are two paths with similar socialization processes, one a prosocial path, the other an antisocial path. Those who develop bonds to drug-using or delinquent family, peers, or school personnel are expected to be encouraged to engage in drug use and delinquency.

Need for Prevention Intervention at an Early Age

Research and clinical practice indicate that adolescent drug use may have its origin early in life (Kellam and Brown 1982; Kellam et al. 1980). For example, research findings suggest that, as early as the first grade, children demonstrate behaviors like shyness and aggression that are predictive of adolescent drug use. These early indicators or markers can be reported by parents and teachers. Other findings

indicate that identifiable early-childhood behaviors and characteristics of high risk for drug abuse do exist and can be utilized to target individuals who should receive the special attention of early preventive interventions. These early indicators include attention deficit disorders, conduct disorders, hyperactivity, and learning deficits that prior research has found to be correlated with adolescent drug use. Research is needed to determine the nature, scope, and magnitude of the relationship of these disorders and drug abuse.

Community Relevance

Development of prevention interventions should focus special attention upon cultural, intergenerational and gender-relevant issues, and protective/risk factors that directly affect the successful design and testing of effective drug abuse prevention strategies (Adcock et al. 1991; Booth et al. 1990; Page 1990; Mayers and Kail 1993; Santisteban and Szapocznik 1982; Trimble 1992). For example, the difficult issues related to acculturation in Hispanic families can be addressed by focusing on their effects on family functioning and by facilitating the emergence of new and alternative forms of relating within the family (Szapocznik et al. 1978). Structural Family Therapy (Minuchin 1974; Minuchin and Fishman 1981), as adapted for Hispanic drug-using adolescents and their families (Szapocznik and Kurtines 1989), addresses the obstacles of engaging the adolescent drug user and his or her family into treatment and in handling situations in which the family is not willing or able to participate. Unquestionably, for these modalities to be effective, knowledge of culture and use of cultural issues as content for the family interactions are important. Yet, cultural knowledge and sensitivity as sole criteria are not, in and of themselves, sufficient for effectively working with Hispanic families (Santisteban et al. 1993). Therapeutic interventions must be based on an integrated treatment model for which there is empirical support concerning its efficacy (Rio et al. 1990).

Thus, only well-developed interventions will meet the needs of vulnerable individuals who may start to use drugs and progress to drug abuse. To address cultural needs and community relevance, a community-based approach grounded in qualitative and quantitative methods that are accompanied by dynamic involvement of the community is desirable from the onset of any study (De La Rosa et al.

1993). The experiences and concerns of each ethnic community and its members are diverse; a culturally appropriate approach is essential for effective policy and prevention program planning (Joe 1993).

Prevention Models

Intervention models can serve as the embodiment of theory in the quest to uncover new knowledge about drug abuse prevention (Hawkins et al. 1992). The need exists for developing and testing viable models of effective prevention interventions—models that capture the unique motivational and environmental contexts that dominate the lives of vulnerable populations. Ideally, such models also would serve as accurate and meaningful guides for developing culturally responsive and effective interventions for drug abuse prevention in culturally diverse and underserved populations. In addition, such models would provide a guiding orientation for relapse prevention among at-risk youth.

To address the unique issues posed by modem drug abuse prevention intervention research with minority and underserved populations, a multistage approach in scientific prevention intervention research is necessary. For example, a multistage approach for culturally sensitive drug abuse prevention research would involve the following stages: (1) selection of ethnographic methods; (2) effective translation of data to valid scales; and (3) model-building and testing (Castro, this volume).

The use of ethnographic methods in the early phase of research can provide culturally appropriate preliminary data that tap the unique aspects of the needs and motivations that influence drug use among members of minority and underserved populations (Taylor and Bogden 1984; Mata and Jorquez 1988). Following the preliminary ethnographic phase, the need exists to translate ethnographically collected, hypothesis-generating data into scales and measures possessing appropriate psychometric properties that allow the subsequent gathering of reliable and valid information on various relevant characteristics of these minority and underserved populations.

Third, a stage of model-building and testing through preventive intervention research is needed in order to evaluate the relationships

suggested by community observational methodologies and clinical experiences. The use of multivariate model-building procedures is needed to perform tests of the complex relationships that occur between the multiple factors that influence drug use, abuse, and relapse. Multivariate methods, such as ordinary least squares regression, logistic regression, path analysis, and covariance structure modeling, are formal approaches that can be used to conduct such model-testing.

The multistage approach would appear to be useful for ultimately generating well-fitting and culturally appropriate models of the multiple and interrelated risk factors that aptly describe processes that promote drug abuse among members of the various minority and underserved populations.

RESEARCH MONOGRAPH: AN OVERVIEW

The chapters in this volume reflect five essential areas necessary for a good research application in prevention research: the theoretical basis for prevention intervention research; hypothesis formulation and testing; research design and other methodological issues; measurement of effectiveness; and special research considerations regarding minorities and ethnicity.

Though not exhaustive due to the ever-changing nature of biobehavioral research, this volume provides the reader with an appreciation for the theoretical and scientifically rigorous bases for drug abuse prevention intervention research while remaining sensitive and responsive to cultural and ethnic concerns in drug abuse prevention research. It is designed to be a resource for potential and current grantees in the state-of-the-art information regarding theory, design, and analyses. Its basic intent is the overall improvement of the quality of applications submitted to NIDA seeking support for drug abuse prevention intervention biobehavioral research.

The second and third chapters by Drs. Kellam and Hansen provide an exquisite argument for the inclusion of a theoretical basis for prevention research as an important component of any application for research support in prevention intervention research. A theoretical

foundation is important not only for a thorough understanding of the past and current prevention intervention literature but also for addressing current research gaps. The contemporary underpinnings of drug abuse prevention research transcend the basic understanding of behavior theory. To understand the elements necessary for developing prevention interventions, investigators must dig deeper to understand the relationships among genetic, biological, and social factors and processes.

Theoretical Basis for Prevention Research Trials

Sheppard G. Kellam, M.D., and colleagues describe the theoretical foundation of prevention research trials that test etiologic and developmental theories. Thus, the integration of three research perspectives underlies the developmental epidemiological prevention model: (1) life-course development that involves following individuals over time and stages of life in an effort to map developmental antecedents along paths; (2) community epidemiology that focuses on variation in developmental outcomes, paths, and processes in a circumscribed population; and (3) particular characteristics of preventive intervention trials that differ from typical clinical research trials in that their purpose is to prevent clinical caseness rather than improve clinical status. The integrated research perspectives focus upon impact on the paths, taking into account in the analyses the developmental processes at baseline as they evolve over time leading to the distal outcome. In this way, Dr. Kellam describes the importance of prevention trials in determining whether a developmental course is changeable for the better or worse and under what conditions. This line of research attempts to understand and test theories on human malleability. The developmental epidemiologic perspective has enabled investigators to follow cohorts within a specified population over time, uncovering antecedents along developmental paths and aiming preventive interventions at specific antecedents along the paths leading to drug use onset and progression to abuse and dependency.

Hypothesis Formulation and Testing

The importance of a theoretical base for prevention intervention research is discussed in the chapter written by William B. Hansen, Ph.D. Substance abuse prevention researchers need to consider

hypothesis development very carefully. The grant applicant can learn much about the sources, roles, and meanings of hypotheses as integral components of research. For example, hypothesis building is described in terms of being an important contribution to the initial formulation of theoretical constructs. Dr. Hansen also points out the cyclic nature of research in stating, "Hypotheses may be derived by theory, but it is equally important to understand that theory is as often derived from the results of tested hypotheses." An overview of the structural similarities and differences of stochastic and explanatory theorizing models provides an analytical understanding of theory presentation that is important as the heart of grant applications. The intention is clear, and the goal is established for improving the quality of science in substance use prevention research. Prevention intervention research needs to include empirical study of multiple hypotheses generated by multiple component research in a systematic way. Hypothesis generation will further increase the quality of theory and methods for the field.

Research Design and Other Methodological Issues

In the next chapter, Mary Ann Pentz, Ph.D., recommends conceptual research designs, interpretation of research findings, and grant proposal development. Dr. Pentz deftly addresses theoretical and methodological issues that identify high-risk populations and respective prevention interventions. She discusses an interaction framework model to determine whether and how preventive interventions should be tailored to the target population according to placement of the intervention in a scheme of strategic prevention level, unit of intervention, and intervention-effectiveness probability.

In an era when methodological complications abound, what can the researcher do to ensure that the best possible research approach is taken, one that will yield data that answer with some degree of confidence the question, "Does this prevention program work?" Linda M. Collins, Ph.D., tackles this problem in her chapter on design, measurement, and analysis. Dr. Collins identifies six common pitfalls to prevention research, including the rationale used to select the length of time between program implementation and data collection points and the tendency to dismiss difference scores as valueless. She advocates that investigators work from a model, a model that delineates the theorized drug abuse onset process and how the

proposed prevention implementation will affect that process. Recommendations for researchers are given.

The chapter written by Ted E. Dielman, Ph.D., provides discussion on the special problems faced in prevention intervention programs that often are directed to individuals in group settings like schools, classrooms, or churches. The clustered sampling technique creates special problems in study design and data analysis. Dr. Dielman proposes a solution to the problem of the design effect. He discusses methods that have been used to correct for the design effect and offers an approach that best suits the needs of prevention researchers. Examples of application of the formula provided make it easy to follow the logic of the correction.

Measuring Effectiveness

To ascertain the effectiveness of all facets of prevention program implementation, a thoughtfully designed analysis plan is required. In the chapter by David P. MacKinnon, Ph.D., an overview of analysis of mediating variables in prevention intervention research is defined with examples of its use. Prevention programs, he argues, proceed from the premise that changes in health behavior such as drug use occur as a result of changing the mediators of that behavior. For example, if the investigator believes that people drink because their social norms endorse drinking, then the investigator will propose a prevention program designed to change the group's mediator to drinking, in this case, social norms on drinking. Dr. MacKinnon emphasizes the importance of explicitly identifying the mediators and establishing the theoretical relationship between the mediators and the targeted behavior. Statistical analysis concerns and procedures are discussed, as are issues of interpretation of findings.

Raquel Crider, Ph.D., and Eleanor Friedenberg, R.N., provide the reader with a summary of critiques from the review of research applications by the panel of extramural experts, non-Federal investigators known also as the Initial Review Group (IRG). The deft overview of the review process will enable applicants to address some of the potential IRG critiques before submission. Particular attention is paid to critiques that occur for more than one application.

Special Research Considerations Regarding Minorities and Ethnicity

Drug abuse prevention intervention research issues as they affect African Americans are described by Lula A. Beatty, Ph.D. She discusses the need to recognize the diversity in the African-American population, examining in particular heterogeneity on socioeconomic, cultural, and drug-risk characteristics. Dr. Beatty provides a brief summary of drug abuse epidemiologic and etiologic work with African Americans, identifying gaps and needs. Drug abuse prevention intervention research is surveyed, and recommendations are made for research.

In the past, research with Latino/Hispanic populations on drug abuse has been characterized by at least two limitations: not enough of it and an absence of a viable conceptual framework. The purpose of the chapter written by Dr. Felipe G. Castro, M.S.W., Ph.D., is twofold. First, he presents a general model, which is not to be used as a final version but rather as a template for application to the diverse Latino/Hispanic populations. Second, Dr. Castro presents a discussion of theoretical and methodological issues that are important for consideration in future drug abuse research with Latino/Hispanic populations in the United States.

Special concerns in research with Native Americans are described in the chapter written by Grace Powless Sage, Ph.D. She writes of the justifiable mistrust many Native Americans have toward research and urges researchers to become knowledgeable about the history and heterogeneity of the Native-American population in order to resist persisting stereotypes and recognize the current needs of Native Americans. Dr. Sage talks specifically about the drug abuse prevention needs of Native Americans and the conceptual and methodological research barriers that one is likely to encounter. Suggestions for setting research priorities emphasize the involvement of indigenous people and communities at all levels of research.

Asian and Pacific Islander populations in the United States have been identified inaccurately as the model minority. Due to a serious lack of research, society has been led to believe that Asian and Pacific Islander populations have low prevalence and incidence rates of drug use. Ford

H. Kuramoto, D.S.W., discusses research issues related to cultural, socioeconomic, politico-demographic, and environmental factors. Dr. Kuramoto examines the interpretation of Asian and Pacific Islander concepts of illness, addiction, and substance abuse and their implications for drug abuse prevention.

FUTURE RESEARCH: OBJECTIVES AND STRATEGIES

Recently, the staff of the Prevention Research Branch, Division of Epidemiology and Prevention Research, National Institute on Drug Abuse, National Institutes of Health, developed a series of research objectives for the improvement of drug abuse prevention research (Prevention Research Branch 1993). The five objectives were formulated thoughtfully to alert the research community to existing needs and gaps in the drug abuse prevention field. The Prevention Research Branch staff also proposed an initial list of strategies by objective for investigators to consider when responding with competitive applications for research support. The following sections briefly describe the research objectives and strategies:

OBJECTIVE: To conduct rigorous controlled research of theory-based biobehavioral drug abuse prevention strategies for young children to prevent or ameliorate developmental risk factors or precursors to drug use and abuse and to enhance resiliency factors that may protect children from subsequent onset of use and abuse of drugs.

STRATEGIES:

- Conduct randomized controlled laboratory-based studies and multisite clinical trials of biobehavioral prevention interventions designed for elementary-age children in order to reduce, ameliorate, or prevent precursor behaviors that appear to be related to subsequent onset of drug use and abuse, such as early signs of aggression, problems with interpersonal relationships, poor impulse control, oppositional behavior, sensation-seeking behavior, poor concentration and inattention, and conduct disorders.

- Study the predictive validity of potential risk and protective factors in order to improve the efficacy of drug prevention interventions; assess the role of mediational mechanisms in the prevention of drug abuse; test prevention theories; increase scientific knowledge of the interactions between risk factors and protective factors within the context of environmental influences; and improve research methodologies, prevention tests and measures, and statistical analysis procedures.

- Assess the role of social influences on the developmental process as it relates to drug abuse prevention by conducting randomized controlled research of prevention programs that build stronger social bonds between the individual and important social institutions, such as the school, family, and community organizations, that improve success in the schooling process at the elementary grade level through expansion of opportunities to learn and to succeed and that promote the development of positive socialization skills where children learn effective techniques to improve their behaviors and social interactions with their parents, other children, teachers, and other significant adults.

- Apply biologic and genetic factors research to design effective preventive interventions. For example, prevention research is needed specifically for children of alcoholics and other drug users who may be at higher biologic risk for subsequent substance abuse and other developmental disabilities.

- Conduct controlled studies of family-based prevention interventions targeting multigenerational risk factors to include maternal and infant effects of drug use and abuse, perinatal exposure to drugs, and assessment of effects across developmental stages and transitions throughout the lifespan.

- Develop and test theory-based precursor drug prevention programs that are specific to diverse cultural groups and sensitive and responsive to the needs of ethnic minority communities.

- Conduct multisite randomized clinical trials in matched communities of promising precursor biobehavioral prevention intervention programs for both children and families in order to study and improve the quality and fidelity of program implementation within diverse school, clinical, and community settings.

OBJECTIVE: To foster rigorous controlled research of comprehensive, multiple-component biobehavioral drug abuse prevention strategies and technologies developed and implemented across one or more social systems involving individuals, families, peer groups, and diverse environments (schools, the workplace, and communities) to determine their efficacy in preventing drug use onset and progression to abuse. Research would include a combination of biobehavioral prevention strategies for both general populations and high-risk subgroups.

STRATEGIES:

- Expand the establishment of multidisciplinary Biobehavioral Prevention Intervention Research Centers to conduct cost-benefit analyses of drug abuse prevention programs and policies.

- Develop and formulate prevention intervention theories and determine the theoretical bases of interventions.

- Devise models for salient prevention interventions utilizing relevant drug prevention theories and the latest in methodological techniques.

- Develop psychometrically sound prevention measures, instruments, and data collection procedures.

- Perform process research that examines the extent to which a prevention program has been implemented as designed.

- Perform outcome research that measures the extent to which prevention programs have achieved their desired effects.

- Conduct a multisite, controlled drug prevention trial in matched communities to determine the efficacy of comprehensive multiple-component prevention interventions for both general populations and at-risk subgroups.

- Perform impact research that analyzes the extent to which prevention programs have altered drug use practices at the school, neighborhood, or community levels.

- Examine the relationship between prevention program process, outcomes, and impact effects.

- Assess how social environments can be structured and strengthened to promote positive self-regulated health behavior change.

- Test the effects of preventive strategies for developing and maintaining behavior skills, cognitive structures, perceptions of harmful consequences, awareness of personal and social disapproval, and affective/emotive impulse controls.

- Study the use of mass media combined with school-based prevention education programs.

- Assess the efficacy of comprehensive drug prevention that includes parent education.

- Assess the efficacy of diverse prevention components designed to help shape and reinforce a common set of positive self-regulated health behaviors.

- Determine the effects of community involvement and commitment to substance abuse prevention.

- Identify effective techniques for community change that involve community advisory boards, task forces, parent groups, professional associations, individual community leaders, and relevant grassroots entities in prevention programs.

- Create and assess innovative techniques to expand and intensify participation in drug prevention by a variety of community groups representing ethnic minority points of view.

- Research the short- and long-term effects of community-based drug abuse prevention on both drug use and abuse and the drug distribution market place.

- Determine how drug-free policies and legislation can enhance the effects of comprehensive drug prevention.

- Establish reliable measures of drug abuse behaviors and related problems to assess community impact of prevention programs.

- Develop new techniques to reliably measure drug behavior changes resulting from prevention programs implemented at the individual and community levels.

- Determine if prevention interventions achieve desired effects, to what extent these effects are achieved, and for whom the intervention is most effective.

- Expand research on cognitive, affective and interpersonal, behavioral, environmental, and therapeutic prevention strategies.

- Define factors that influence the transition stages from initial drug use to drug dependence and test preventive interventions to correct these factors.

- Assess the progression of drug use and the efficacy of preventive interventions through long-term prospective longitudinal studies of general populations and high-risk subgroups.

- Develop new and improved prevention research methodologies, tests and measures, and statistical analysis procedures.

- Assess the application to prevention of etiologic research relevant to biologic, familial, personality, behavioral, environmental, and social factors that may explain onset, frequency, intensity, spontaneous remission, relapse, and progression to drug abuse.

- Identify, develop, and test drug prevention interventions appropriate for women.

OBJECTIVE: To conduct randomized controlled research of bio-behavioral prevention interventions for high-risk youth, young adults, and adults, Prevention interventions should be theory based, scientifically define the concept of high-risk status, and directly address cultural and gender issues.

STRATEGIES:

- Develop a scientifically sound definition of high-risk status, clarify high-risk behavioral patterns, and consolidate common etiologies determining risk to multiple problem behaviors such as delinquency, academic failure, unwanted pregnancies, depression, drug-related accidents, and suicidal behavior. Research should lead directly to the design and testing of preventive interventions.

- Assess the effect of culture, ethnicity, and gender on high-risk status across the lifespan.

- Assess the predictive validity of potential risk factors for high-risk subgroups and develop testable drug prevention theories and models.

- Assess how social environments can be better structured and strengthened to promote positive self-regulated health behavior over the course of each day and throughout a variety of social interactions.

- Advance prevention theory development and testing by the study of etiologic relationships between drug use and transitions across the lifespan, health beliefs and practices, child abuse and neglect, coping strategies, and stressful life events.

- Develop and test comprehensive programs that use multiple strategies and are structured around the multiple pathways to drug use particular to high-risk groups.

- Conduct feasibility studies to identify prevention interventions that can be effective across a range of risk groups.

- Conduct research on prevention programs for high-risk youth that are based outside of schools to include, for example, families, alternative family placements, (e.g., youth in foster care), emancipated minors, the homeless, community-based organizations, and detention settings.

- Conduct research on pharmacologically based smoking cessation programs for youth and adolescents as a prevention intervention against drug use progression.

- Develop and test prevention interventions for high-risk adults that are based in major institutions, including work sites, community organizations, Head Start programs, and hospitals.

- Develop measurement systems to assess prevention outcomes for high-risk subgroups that are reliable and valid in terms of culture, gender, and age.

- Conduct a multisite, longitudinal controlled clinical trial in matched communities to determine the efficacy of comprehensive, multiple-component prevention intervention for youth and adolescents at risk of multiple problem behaviors to include drug use, achievement failure, delinquency, sexual promiscuity, unwed pregnancies, suicide, human immunodeficiency virus (HIV)/ acquired immunodeficiency syndrome (AIDS), and drug-related violence, homicides, and accidents.

- Test the efficacy of drug prevention interventions that target the relationship between drug use and violence.

- Identify protective factors that mitigate high-risk status and design and test prevention interventions to enhance and reinforce their positive effects.

- Stimulate interest in research for high-risk adults by increasing awareness among researchers, professional groups, and the general public through education and training activities.

OBJECTIVE: To identify and test under randomized controlled research promising biobehavioral models to prevent drug use initiation, abuse, and dependency among culturally diverse populations.

STRATEGIES:

- Conduct research to test single and combinations of culturally relevant prevention strategies that focus upon the individual, mass media, schools, family, social networks to include peers, and health policies to both shape and reinforce the process of self-regulated health behavior change.

- Advance prevention research to assess how cultural environments can be better structured and strengthened to promote positive self-regulated health behavior throughout a variety of social interactions.

- Conduct culturally relevant developmental research relevant to the formation of health beliefs and practices; normal drives associated with risk-taking behaviors; developmental psychopathologies predisposing toward drug abuse (e.g., hyperactivity, attention deficit and learning disorders, psychomotor impairments, and hyperaggressiveness); childrearing practices; child abuse and neglect; coping strategies; and the role of drug use in problem behaviors like delinquency, high-risk sexual activity, and adolescent pregnancy. This research would lead directly to the development and testing of prevention interventions.

- Conduct research focused on ecologies (social and environmental variables) at the neighborhood and subcommunity levels, on migration patterns, and on social and economic conditions such as discrimination and poverty that might influence the prevention of drug use.

- Conduct research to determine through epidemiological techniques the distribution of drug use in communities and to meld the data from prevention interventions with community-level statistical indices. This research requires geocoding the residential locations of persons involved in community-based prevention programs.

- Conduct research to better understand the dynamics of prevention programs within communities.

- Perform a multisite clinical trial to test comprehensive, multiple-component prevention interventions for culturally diverse populations and to assess the replicability of research findings across communities with subpopulations that may be particularly vulnerable to drug use onset and progression. Special attention would be given to research conducted in urban settings.

- Carry out theory-based preventive intervention research to focus upon salient risk and protective factors specific to culturally diverse and ethnic minority subpopulations to assess prevention program effects within various ethnic groups and socioeconomic populations.

- Conduct research on culturally appropriate and sensitive theory-based programs focused upon the prevention of the precursors to drug use, such as early signs of aggression, problems with interpersonal relationships, oppositional behavior, and risk factors for abuse that may emerge after drug use has been initiated.

- Perform research focused upon differences within culturally diverse communities by examining, in particular, gender differences in etiology and responsiveness to prevention interventions; involvement of cultural institutions and leaders in efforts to increase the permanency and community acceptance of prevention interventions; school and neighborhood factors in risk assessment, planning, and implementation of controlled research; culturally specific interventions for different patterns of onset and progression; and the role of protective factors in the design of prevention interventions.

- Institute a special initiative on drug abuse prevention intervention models for high-risk males.

- Carry out drug abuse prevention media research that incorporates culturally appropriate information to include drug prevention information campaigns that are based upon culturally appropriate ways of presenting information about behaviors that are considered private (sex) or generally disapproved (drug use); culturally specific conceptualizations of the drug problem that take into consideration cultural values and that utilize appropriate channels for diffusion of the information; and media messages available in English, as well as other languages spoken by the culturally diverse populations under study.

- Develop and test viable models of effective substance abuse prevention intervention models that capture the unique motivational and environmental contexts that dominate the lives of culturally ethnic youth.

- Identify and test fully specified and culturally appropriate drug prevention models that delineate multiple and interrelated risk factors for culturally diverse populations. The research would have several stages, including community analysis and needs assessment to provide culturally appropriate data that tap the unique aspects of the needs and motivations that influence drug use among members of special populations; measurement development that translates hypotheses-generating data into scales and measures that demonstrate appropriate psychometric properties; and prevention model-building and testing through prevention intervention research to assess the relationships suggested by community observational methodologies and clinical experiences.

OBJECTIVE: To pursue a program of research that will identify effective and efficient prevention diffusion mechanisms, increase the capacity of the field to disseminate prevention research findings, and enable high-fidelity implementation of innovative preventive programs by practitioners, policymakers, and the general public. This research would study the stages of prevention program diffusion: awareness, adoption/adaption, implementation, and institutionalization.

STRATEGIES:

- Create a new multidisciplinary Prevention Intervention Diffusion Research Center and more fully utilize existing multidisciplinary Drug Abuse Prevention Research Centers as diffusion research mechanisms.

- Disseminate prevention research findings to the scientific and general community via development of peer-reviewed research publications and monographs.

- Establish direct linkages with representative community agencies to promote in-service training of prevention professionals and communication of prevention research findings.

- Enhance the capacity of professionals in the field of prevention to better integrate new advances, technologies, and theory into drug abuse prevention programming via training, technical assistance, program development, and review.

- Encourage prevention researchers to implement common research protocols, collaborate on cross-cutting research issues, produce joint publications on common research findings, share data bases, provide faculty exchange programs, and jointly plan national prevention conferences and research symposia.

- Create a strong capacity to train predoctoral and postdoctoral students for careers in drug abuse prevention research.

- Establish an academic program for in-service and continuing education for prevention professionals.

- Study activities designed to promote prevention awareness, such as conferences, workshops, newsletters, and electronic bulletin boards.

- Identify strategies that promote prevention adoption, such as materials development, conferences, and workshops.

- Study the process and outcomes of prevention program implementation.

- Study the methods by which a particular prevention program becomes institutionalized (e.g., professional development and accreditation).

- Develop the research methodologies specifically needed for understanding and improving the diffusion of prevention innovations.

- Develop resources that can translate scientific information into a form that can be used more easily by prevention practitioners and policymakers.

- Develop a joint drug education diffusion program (including dual funding) with the Division of Elementary and Secondary Schools and the Office of Drug-Free Schools and Communities of the Department of Education.

- Assess diffusion models that will enhance the transfer of scientific prevention information and technology to educators, health care professionals, and the general public.

GRANT DEVELOPMENT

The salient question for researchers is not simply how drug abuse can be prevented but rather how and under what conditions drug abuse can be prevented, particularly among each of the culturally diverse populations in the United States (National Institute on Drug Abuse 1991). If, for example, it is determined that overestimation of peer drug use contributes to a child's decision to use drugs, interventions should be designed to correct such misperceptions. By observing groups of children as they progress from nonusers to users, researchers can approximate the age(s) at which preventive intervention is most effective. Actual drug use depends on environmental factors such as levels of drug use among peers, peer attitudes toward use, access to and availability of drugs, and assumptions about how significant individuals in one's life will respond to one's use. By better understanding the role of environmental risk and protective factors, drug use may be prevented in certain situations.

An individual's environment can enhance or modulate vulnerability to reduce or increase personal risk. An individual's response to the environment can affect peer behavior, obstruct or facilitate access to drugs, and serve to endorse or modify parental attitudes. Further significant reductions in drug use can be expected as better prevention intervention models are designed to identify the unique motivational and environmental contexts that dominate the lives of minority and underserved populations.

Epidemiologic information can identify those segments of the population that are vulnerable to substance use and abuse and the associated factors that contribute to that vulnerability. This information needs to be translated into preventive strategies for minority and underserved populations. Additional epidemiologic information is needed to confirm the need for further allocation of effort across minority and underserved populations as an appropriate response to the demographic realities of substance abuse in the United States. As additional epidemiologic work is completed, significant gains are expected in the precision of risk identification and design of effective prevention interventions.

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Testing Theory Through Developmental Epidemiologically Based Prevention Research

Sheppard G. Kellam

INTRODUCTION

Prevention research on the problem of drug abuse is not just another discipline-based branch of drug abuse science. It transcends research within the disciplines and holds promise for being a major integrative scientific perspective that encompasses the knowledge gained at the molecular, molar, societal, and cultural levels. The structure of drug abuse research has been, in the past, characterized by isolation of disciplines and even subdisciplines from each other due to a lack of knowledge and a lack of scientific frameworks that bridged disciplines. The thesis presented in this chapter is that prevention research now is very feasible due to marked advances in the several disciplines required, including biology, sociology, psychology, epidemiology, and biostatistics.

The common folklore has been that the field of drug abuse, or mental health more generally, is not ready for prevention research since there is insufficient knowledge about etiology. It is noteworthy that other branches of the National Institutes of Health (NIH), such as the National Cancer Institute and the National Heart, Lung, and Blood Institute, have committed much greater proportions of their budgets over the years to prevention research than have the National Institute of Mental Health, National Institute on Alcohol Abuse and Alcoholism, or National Institute on Drug Abuse, even though major questions remain about the etiology of diseases in the areas addressed by these branches of NIH. The author will argue that prevention research as described here is an indispensable tool for research into etiology as well as prevention and treatment. The author will argue further that all research in the area of prevention should be conceptualized as having theory-building functions requiring explicit description in addition to utilitarian aims.

Over the last decade, the relevance of and opportunities for rigorous prevention research have grown clearer as the required knowledge, theoretical frameworks, and scientific methods have developed to support this rapidly emerging field. The contributing scientific work includes the results of longitudinal epidemiological research into early antecedents; careful empirical work regarding hypothetical etiological processes in the family, peer group, and community; accelerating advances in understanding the relationships among genetic and other biological and social factors and processes; and, last but by no means least, the actual results of preventive intervention trials now being reported.

The model of prevention research derived from integrations of these advances is built upon a concern with life-course developmental and epidemiological thinking and involves the discovery of developmentally important antecedents and conditions in defined populations and targeting specific antecedents for preventive intervention trials. The author has named this approach, when embedded in a population-based framework, the "developmental epidemiological approach" to prevention research (Kellam and Ensminger 1980; Kellam and Werthamer-Larsson 1986; Kellam 1990; Kellam and Rebok 1992). Such preventive intervention trials have two purposes: The first is practical and involves the promotion of health through reduction of risk of drug abuse and other problem outcomes; the second is the testing of etiological and developmental models through the use of experimental interventions directed at specific components hypothesized to have important roles (Kellam and Rebok 1992).

Prevention research trials provide a very important opportunity to test etiological and developmental hypotheses. Indeed, prevention research allows researchers to understand aspects of human development in regard to one of the most salient characteristics, namely, malleability. Through prevention trials researchers can find out whether a developmental course is changeable for the better or for the worse and under what conditions. The prevention research task, of course, is to determine how to change it for the better. The developmental epidemiological perspective enables the specification of subgroups of people at varying levels of risk. In the case of children, it involves following cohorts within a specified population over time, uncovering antecedents along developmental paths, and aiming preventive

interventions at specific antecedents along the paths leading to later drug use.

The integration of three scientific perspectives underlies this developmental epidemiological prevention model and provides the framework for the research of the Johns Hopkins Prevention Research Center:

Life-course development is the first scientific perspective; it involves following individuals over time and through stages of life in an effort to map developmental antecedents along paths. The developmental research task is to model antecedents and the processes enhancing or inhibiting risk, including the individual's characteristics and contextual influences in the family, peer group, classroom or workplace, and other social fields that influence developmental course.

Community epidemiology is the second scientific perspective; it focuses on variation in developmental outcomes, paths, and processes in a circumscribed population within its ecological context. Holding constant general characteristics like poverty level and race, the community epidemiological perspective enabled the study of why some children in the Woodlawn community of Chicago became aggressive while many others did not and why some of those who became aggressive went on to use drugs while others did not. Researchers were able to study which factors in the children, the social contexts, or their responses to the social-task demands differentiated the children within the same community. When the population is defined epidemiologically, researchers can be more secure in assessing the variation in developmental paths with less concern about selection bias or error in inferences due to sampling biases that plague clinic or volunteer samples that do not define who is represented.

Variation in impact from a preventive trial is inherent in community epidemiology, a field oriented to variation as much or more than to central tendencies or averages. Variation in paths and impact is important particularly for theory-building and understanding for whom the intervention was helpful and for whom there may have been undesirable outcomes. While the mean differences in impact between scores at the start and those at the end may show no or slight improvement from an intervention, the reality may be that some did very well while others did not respond at all. Epidemiologically defining the

population allows variation in paths and impact to be studied with greater control of selection bias and other spurious inferences. This does not mean that central tendencies are not useful, but they always should be viewed in the context of the distribution from which they are derived.

The particular characteristics of preventive intervention trials is the third scientific perspective. The purpose of preventive intervention trials is to prevent clinical caseness rather than improve clinical status, and they are very different from typical clinical research trials. Their target is a proximal antecedent of a more distal outcome. They address the questions of whether the proximal target has improved and, if so, whether the distal target has improved. Their effect is likely to be on the developmental processes, not directly on the distal outcome. In other words, researchers look for impact on the paths, taking into account in the analyses the developmental processes at baseline as they evolve over time and lead to the distal outcome. The baseline in a preventive trial is the developmental model without the intervention. Interactions involving initial measures, intervention, and course including distal measures will be frequent in analyses of impact in such trials. Preventive intervention trials are closely dependent on developmental modeling.

The Partnership With the Community and Its Institutions

The developmental epidemiological prevention research model is integrated heavily into the community and its power structure (Jason 1982; Kellam and Branch 1971; Kellam et al. 1972; Kellam and Hunter 1990; Kellam and Werthamer-Larsson 1986; Rebok et al. 1991). In the 1960s in Chicago's Woodlawn neighborhood, Sol Alinsky demonstrated that, in order to do randomized field trials there, the people in positions of power in the community had to agree. In fact, they had to have a sense that their own self-interest was tied intimately to the answers to the research questions being posed by the preventive trial.

Researchers have had success with preventive trials by developing a partnership with the leaders of institutions whom the prevention research must involve. This partnership is based upon mutual self-interests among the leaders and investigators. Leaders such as the superintendent of schools regulate the researchers' ability to randomly

assign children to classrooms and do all the things that researchers need to do in a rigorous design. Leaders allow random assignment of children to classrooms, for example, because their practical goals match researchers' theoretical and empirical aims. At the community level, this sanction generation and maintenance usually is carried out through community boards. However, Baltimore recently began to use a Schools Committee composed of principals of the 12 participating schools; Superintendent Walter Amprey's close representative, Dr. Juanita Lewis; leaders of special services and curriculum; and Prevention Research Center staff. Such committees or boards provide the context for trust-building and maintenance, negotiating, and decision-making. The boards or committees must be comprised of representatives of the constituencies that are required to support the process and the decisions made. The theory and methods of base-building in communities and their institutions must be further developed and taught in the next stage of prevention research in order for required prevention research designs to prosper. The problems that follow if the base-building is insufficient include missing data resulting from nonparticipation and, at the extreme, failure to survive in the community (Kellam et al. 1975; Kellam and Hunter 1990; Brown 1993; Rebok et al. 1991).

Developmental Epidemiology

Developmental epidemiology refers to the integration of community epidemiology with life-course development. This approach entails defining total populations or representative samples of populations and mapping developmental paths over significant portions of the life course. In contrast to developmental psychology and psychiatry, which often focus on precise observations of smaller but less defined populations, developmental epidemiology requires observations of total cohorts or representative samples of cohorts in a defined population within the context of the community and its institutions. Therefore, the developmental epidemiological approach provides a better definition of the population because the data it supplies are more representative of the total population.

Multistage Sampling and Assessment. Ecologically valid and epidemiologically based observations representative of the total population at the first stage can be made efficiently and economically.

Stratified random samples can be drawn based on the first-stage measures for a more precise but still representative second-stage assessment. In like manner, a third-stage representative sample of the strata of the first two stages can be drawn and assessed at an even more micro level of observation. Multistage sampling and assessment allow the strengths of community epidemiology to be combined with those of more microanalytic methods, such as those used in many developmental or biobehavioral laboratories.

The first-stage measures are not merely screening measures since they can impart unique information that, if done well, reflects the actual condition of the individual as observed within the real ecological context. First-stage measures should have strong ecological validity. In the studies conducted in the poor Woodlawn neighborhood of Chicago and later in Baltimore, researchers have been interested particularly in the social-task demands in the classroom and peer group and the adequacy of children's responses to them in the view of the teacher or peers. First-stage measures with strong psychometric properties were constructed to assess these behavioral responses derived directly from the social fields of classroom and classmates/peers. Teacher ratings of aggressive behavior like breaking rules and fighting have been made of all children in the classroom. These first-stage ratings are the most valid measures of how the children are doing at the core tasks of the classroom according to the teacher. The ratings represent the teacher's view of the child in the classroom, and this carries many social consequences.

Teacher ratings at the first stage are useful as a way of drawing a second-stage sample of children for more intensive study of aggression in the school and its origins and consequences. Moreover, the fact that the teacher occupies the position of what the researchers call "natural rater" in the classroom carries important theoretical meaning as well. The teacher defines the rules in the classroom and judges performance; he or she passes or fails children. He or she also refers children for help or recommends suspension or even dismissal. Natural raters, such as a teacher in the classroom, supervisor in the workplace, or spouse in the marital social field, are individuals who are significant to the experience of success or failure. Their ratings of adequacy of performance have important relationships to the individual's psychological well-being (PWB). Failure to achieve in school has an important

relationship to depressive symptoms, either as an antecedent or a consequence (Kellam et al. 1991). In this way, the first-stage measures reveal much about the real world of the classroom and the child's status therein in the view of the teacher, the child's natural rater. Such meaning has far more importance than merely screening.

From a developmental epidemiological prevention viewpoint, those ratings shown to have an important predictive relationship to an outcome, such as later drug abuse, can be important targets for early preventive trials. The trial would ask, for example, whether the socially maladaptive, aggressive response of the individual in a particular social field—the classroom—can be improved and, if it is improved, whether the improvement will result in improved risk of the more distal outcome, such as delinquent behavior or drug abuse.

Bridging Development and Epidemiology: The Life Course/Social Field Concept. Bringing these scientific paradigms together requires a conceptual framework on how the individual developmental path is related to the ecological environment where the others in the population also reside or, in other words, the epidemiological context. Researchers have conceptualized stages of life as having intimate relationships to specific social fields in the broader context of community. This framework, as briefly described here, has guided research questions and measures over developmental time and among variations in the population. It is not the only interface possible between development and epidemiology. However, the framework has been useful throughout work in Woodlawn and in Baltimore, where the central research question has been concerned with the relationships, over significant stages of life, of the experience of success or failure in specific social fields to psychological/psychiatric status. The developmental and etiological direction of the relationships has been almost always central to research on developmental modeling and in targeting preventive intervention trials (Dolan et al. 1993; Kellam et al. 1983; Kellam et al. 1975; Kellam et al. 1991; Kellam and Rebok 1992).

At each stage of life, individuals are involved in a few main social fields (Kellam et al. 1975). In each one, the individual is confronted with social-task demands. As suggested above, a person in authority in each social field, the natural rater, defines the social-task demands and judges the individuals' adequacy of performance within that field.

In some social fields, the judgments are formal, as in the case of grades given by a teacher in the classroom; in others, the judgments are informal, as in the case of acceptance or rejection by peers or parental judgments of good or bad behavior. The consequences of maladapting are important generally and, in many cases, dramatically influence the individual's subsequent life course. Failing in school, divorce in the marital social field, and being fired at work all are evidence of social maladapting in a specific social field.

Social Adaptation and PWB. The social fields relevant to first-grade students in our society usually include the family, the classroom, and the peer group in the context of the community. Within the social field of the classroom, the teacher is the person in authority who defines demands and rates performance. The parent or parents are the corresponding people in the family social field. The demand/response process between individuals and their natural raters has been termed "social adaptation." The ratings made by natural raters are called "social adaptational status (SAS) measures" (Kellam et al. 1975).

Chance, idiosyncratic events, and the compatibility of individuals with their natural raters and others in the field play a role in a person's ratings (Kellam 1990). This is not caused by measurement error, but rather the real condition of life. The consequences of having a harsh teacher, if the child is vulnerable to depression, are probably different than the consequences of having a teacher who is warm and good at providing the child with opportunities for mastery experiences. Preventive trials can be directed at the social adaptational process to increase the experience of mastery of, for example, learning to read in first grade. As was done in Baltimore, the role that mastery of this salient task plays in the course of depression can be studied (Dolan et al. 1993). Researchers at Woodlawn and Baltimore have found that SAS is important for understanding the developmental paths that lead to depression, aggression, heavy drug use, and other specific outcomes, particularly when gender is included in the investigations (Kellam et al. 1983; Ensminger et al. 1983).

Following are the first-grade social-task demands that teachers required of their students in Woodlawn and Baltimore and descriptions of the associated maladaptive behaviors:

- Learning the subject matter (maladapting is underachieving);
- Dealing with rules and authority (maladapting is aggressive behavior);
- Participating socially in the classroom process (maladapting is shy behavior); and
- Paying attention, being ready to work, and concentrating (maladapting is concentration or attention problems).

Social Maladaptive Ratings as Antecedents on Developmental Paths. In 1964, the Woodlawn researchers developed a broad partnership for community mental-health services and research with the leaders of schools and community organizations of Woodlawn, a very poor African-American community on the south side of Chicago. Researchers obtained ratings of each child's SAS in fall, midyear, and spring in the first-grade classrooms, again in spring of third grade, and at age 16 or 17. These ratings were part of the assessments for measuring impact of a prevention and early intervention program.

Using each Woodlawn first-grade teacher's ratings from the 1966-1967 first-grade total cohort, the researchers found that first-graders who were rated as both shy and aggressive by their teachers were at a much higher risk of heavy substance use 10 years later when the children had become 16 or 17 years old (Kellam et al. 1983). Early aggressiveness by itself in males increased the likelihood of their later use of cigarettes, marijuana, hard liquor, and beer and wine. Shy behavior alone, on the other hand, was associated with inhibited later use of these substances. However, the combination of aggressive and shy behavior predicted even more frequent heavy substance use by males. These were children who were socially isolated but aggressive when approached. Very similar results were found in Woodlawn children over time in regard to delinquency and physical assault (Ensminger et al. 1983; Kellam and Rebok 1992). The prevalence of such shy-aggressive children was about 10 percent in males. For females,

neither shy nor aggressive behavior were predictors of later substance use (Kellam et al. 1983). The result concerning aggressive behavior predicting drug use and delinquency has been replicated many times in this country and in England (Anthony 1985; Ensminger et al. 1983; Farrington et al. 1988; Kellam et al. 1983; McCord 1988; Robins 1978; Tomas et al. 1990). School dropout also has been found to stem from early aggressive behavior in the Woodlawn data (Ensminger and Slusarcick 1992). The shy-aggressive prediction has been found in other studies (Block et al. 1988; Ensminger et al. 1983; Farrington et al. 1988; Farrington and Gunn 1985; Hans et al., submitted; Kellam et al. 1983; McCord 1988; Schwartzman et al. 1985; Shedler and Block 1990; Tremblay et al. 1992).

Microepidemiology of Aggressive Behavior in Schools and Classrooms. The levels of aggression just described as predicting heavy drug use, delinquency, and dropout were not distributed randomly across the elementary schools of Woodlawn, nor even the first-grade classrooms within schools. Figure 1 describes the distribution across the 12 schools. Notice that there are three parochial schools; the other nine are public schools. The rates of moderate to

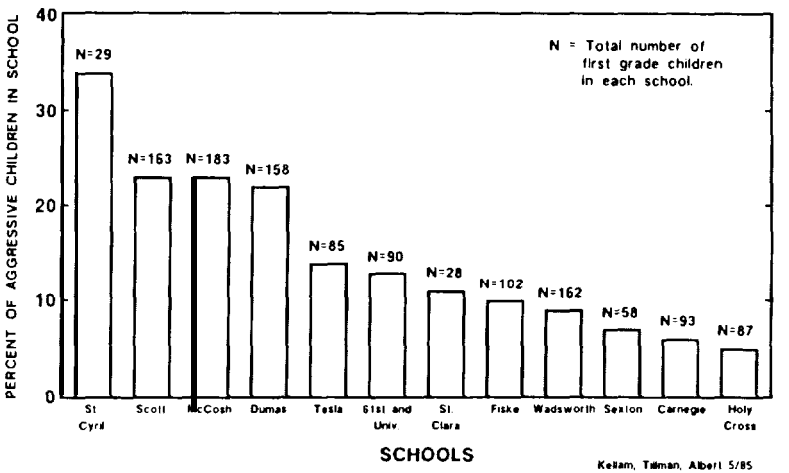

FIGURE 1. *Prevalence of moderate or severe aggression among first-grade children in Woodlawn public and private elementary schools: 1966-1967*

severe aggression are 33 percent at one end and about 7 or 8 percent at the other. The epidemiology then shows that preventive trial designs must take into account this variation and that merely matching on poverty is not sufficient. These all are schools with high rates of poverty-level families and other similar indices.

A preventive trial aimed at aggressive behavior must account directly for the possible nonrandom distribution of aggressive behavior. The problem is more complex, but solvable, when classroom variation is assessed within schools. These schools appear similar, but the first-stage teacher ratings reveal different school environments in regard to aggression. Each bar is a school, and the school collects children from families in that little geographic catchment area. The three parochial schools overlap the public school areas, but, fundamentally, school rates of aggression are a reflection of the family, school, community, and child system. The bars should not be thought to reflect only the children in the school.

A look inside the schools in figure 2 reveals that the distribution in classrooms is similar. The second school from the left has a rate of about 23 percent. Inside there is great variation in aggressive ratings.

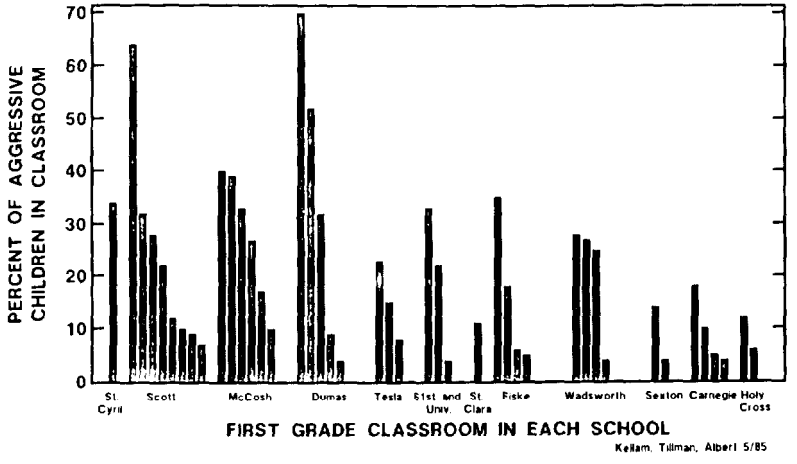

FIGURE 2. *Prevalence of moderate or severe aggression in each Woodlawn first-grade classroom: 1966-1967*

One classroom has a rate of 5 to 7 percent; another has a rate of 63 percent. This marked pattern of variation is characteristic of the classrooms within each school. This is the same school in which the 23-percent rate was masking this marked variation. In one classroom, it was deviant to be aggressive, and in another classroom it was deviant not to be aggressive.

Such classroom variation affects the developmental course of the children (Werthamer-Larsson et al. 1991). How did this variation come about? By school policy, Woodlawn and many school districts assign children nonrandomly to classrooms. This practice is called tracking or ability grouping, and it is justified as a method for increasing the ease and effectiveness of teaching. Children are assigned to first-grade classrooms by the principal within the first 24 to 48 hours of the beginning of school or even during the preceding spring before the children enter first grade based on various criteria, such as Metropolitan Readiness Test scores or kindergarten-teacher assessments and recommendations. However, the evidence is not clear on that issue, and the topic has not been addressed very intensively (certainly not by investigators interested in developmental outcomes) other than by looking at achievement test scores.

A preventive trial must be designed such that nonrandomness is taken into account in the variables that are the proximal targets of the intervention. To not do so allows the school and classroom environment to remain uncontrolled in the analytic model. Merely treating the target as a covariate is not sufficient, since the environment may interact with the intervention and the baseline or the course of the baseline from fall to spring (Dolan et al. 1993). In this way, the epidemiological first-stage measures are important in mapping the context in addition to obtaining measures of the individual children.

In Baltimore, researchers showed similar microepidemiological data to partners in the Baltimore City School District, and they agreed that random assignment of children to classrooms was required to obtain meaningful evaluations of the interventions the researchers and the school district had agreed together to implement and evaluate.

Early Antecedents as Targets for Preventive Trials: The Use of Two Trials in a Parallel Design

The developmental epidemiological work in Woodlawn and in several other research programs led researchers to choose, with the Superintendent of Baltimore City Schools, two targets for interventions. The first was school achievement, and the other was aggressive behavior in the form of breaking rules, fighting, and truancy or tardiness. School achievement had been shown to precede later depressive symptoms and possibly depressive disorder among vulnerable children. Aggressive behavior, particularly when coupled with shy behavior in first grade, had been shown to precede heavy drug use, delinquency, and school dropout. The two targets were correlated, but the causal direction was not known. By designing two trials in a parallel design, researchers planned to test not only the impact of each intervention on its proximal and distal target but the effects of each on the proximal target of the other. If researchers could improve achievement through the intervention aimed at it, the first question was whether depression would improve. Also, would aggressive behavior improve as a consequence of improving achievement? If aggressive behavior could be improved with the intervention aimed at it, would later delinquency improve? Also, would achievement improve as a consequence of improving aggressive behavior?

In this way, the preventive trials together can answer directional effect questions. Consider briefly the two trials in Baltimore, the one aimed at aggressive behavior (because of its role in later heavy drug use and delinquency) and the other aimed at raising achievement test scores (because of its role as antecedent of depressive symptoms in vulnerable children). In Baltimore, 19 elementary schools in varied neighborhoods were selected for the trials. The schools were in five urban areas. Researchers matched the schools in clusters of three or four schools in each of the five areas. Urban areas varied from the very poor to blue collar, lower middle class, and young professionals. In each of the five urban areas, one school was assigned at random to the Good Behavior Game (GBG) intervention, aimed at aggressive behavior. Another school was assigned at random to Mastery Learning (ML), directed at raising achievement test scores. The third and fourth were designated at random as external controls or standard-setting schools. Inside the intervention schools, researchers randomly assigned

children to internal control classrooms or to the intervention classrooms. Overall, there were 8 classrooms in each intervention condition. and 20 classrooms were internal or external controls.

As first-stage measures, the researchers obtained teacher ratings of the children's social adaptation to the basic classroom tasks through interviews with the teachers using Teacher Observation of Classroom Adaptation (TOCA-R) in a quiet room away from the classroom (Werthamer-Larsson et al. 1991). Obtaining ratings from teachers on all the children in the classroom takes about 2 hours in an interview, given an engagement period, time needed to develop trust, and getting ratings on each child on a multi-item measure on each of these domains. While TOCA-R provides the teacher's SAS ratings of the children's performance of classroom-task demands, a peer-nomination measure called the Peer Assessment Inventory provides the children's perspective of each other's SAS in their classmate/peer group.

In the Peer Assessment Inventory, peer nominations regarding aggressive behavior, rejection, likability, and shy behavior, without restrictions as to how many nominations could be made, are gathered from all classmates. This measure is a classroom-administered, modified version of the Pupil Evaluation Inventory (Pekarik et al. 1976). It is administered in a classroom in roughly 25 minutes; following a break, self-reports by the children of their feelings of depression and anxiety are gathered, first using a revised version of the Child Depression Inventory developed by Kovacs (unpublished). The child instruments are administered with great care by two Research Prevention Center staff trained to carry out classroom-administered instruments, including working through the trust issues and systematically obtaining responses on each item. California Achievement Test scores are added to the SAS battery as reported by the teacher. Independent time sampling of the children's behavior also was done during the year.

All of these first-stage measures have strong psychometric properties and provide a battery of social adaptational and PWB measures for the assessment of impact of the trials. Second-stage measures are used to learn more about the first-stage measures, such as following up on teacher ratings of concentration problems on TOCA-R with Continuous Performance Tests and other more diagnostic assessments (Mirsky 1987; Mirsky et al. 1991).

All these measures were done during the two intervention periods in the fall and spring of the first and second grades. After the intervention period, they were done annually in order to measure variation in impact among subgroups of children as revealed by their slopes of impact over the course of years; this was continued at least through the transition into middle school.

Baseline as a Developmental Model. In analyses of effects of treatment in a clinical design, baseline often is treated as a covariate; thus, the treatment and control groups were viewed as though they were equal prior to treatment. In a preventive trial, this is of limited use since the initial measures or targets for the preventive trial often are correlated with moderating and dependent variables, and all are part of an ongoing developmental process. Researchers have argued that baseline is better treated as a developmental model without intervention. Moderating influences that may affect outcome need to be included as variables in the model so that potential interactions can be revealed, whether they occur with initial level of severity, with intervention, or both with the outcome (Kellam et al. 1991). In the Baltimore trials, the baseline developmental modeling guides analyses of impact and theory-building.

Baseline models derived from the fall and spring of first grade show the evolving patterns of co-occurrence among the target antecedents of the two trials. The central role of concentration problems emerged and is now the object of the next stage of preventive trial design. From fall to spring in first grade, concentration problems led to shy and aggressive behavior and poor achievement in both genders and to depressive symptoms among females. There was evidence for reciprocal relationships in females. For example, depressive symptoms led to poor achievement in both females and males; whereas poor achievement led to depressive symptoms in females but not males, at least over the first-grade year. These results provide important epidemiological data relevant to the developmental paths leading to the problem outcomes and suggest analytic models for analysis of impact.

The Short-Term Impact and Specificity of the Two Interventions. Each of the two interventions had a significant and very specific impact only on its own proximal target(s) (Dolan et al. 1993). In addition to main effects, there were theoretically important variations

of impacts among subgroups of children. The GBG appeared to have a greater impact on reducing aggressive behavior among the more aggressive children. The nature of the impact of ML differed by gender, with female high achievers benefiting more from the intervention than female low achievers and male low achievers benefiting more than male high achievers. Developmental, epidemiologically based preventive trials provide a powerful means of addressing questions about etiology and development, particularly around the issue of the malleability of developmental processes. Important questions are whether achievement is improved by improving aggressive or shy behaviors and whether aggressive or shy behaviors are improved by improving achievement. Such investigation would inform the understanding of their etiology.

Crossover Effects. If there was no "crossover effect," as researchers termed this kind of impact modeling, it could be concluded that the correlation between aggression and achievement was due to a third variable, as yet unspecified. The researchers now are satisfied that the following summary is accurate, but the data and inferences are not published yet; they are included here as illustration. Keep in mind that these should be considered preliminary. The results thus far show that, while the two interventions improved their own designated target, there was no evidence of crossover effects in either direction. Improving achievement did not result in improving aggressive behavior, nor did improving aggressive behavior result in improving achievement. The correlation between achievement and aggressive behavior appears likely to derive from a shared third variable. Researchers at the Prevention Research Center have discussed the possible role of concentration/attention problems and other potential influences on achievement and aggressive behavior.

Preliminary Assessment of Impact in Early Adolescence. The course and malleability of aggressive behavior—from a child's beginning elementary school through the transition into middle school—has been examined, although the long-term impact on achievement and course of depression has not been investigated yet. The GBG had a significant short-term effect on teacher-rated aggressive behavior over first grade. The effect disappeared in the third and fourth grades, began to reappear in fifth grade, and grew stronger in sixth grade-the first year of middle school for most of the children. The more

aggressive first-grade males were more likely to benefit from the GBG. Nonaggressive males and females (who also were much less aggressive) did not benefit.

These results appear to support the impact as appearing during times of transition, not continually as one might have expected. The followup was done annually and included periods of major change in social fields and changes in external support that accompany such transitions. Caspi and Moffitt (1991) suggest that such times reveal more individual variation due to the lack of external structure and the demand for adaptive innovation. The lesson for prevention researchers is that the impact may not be continuous but requires periodic monitoring over significant periods of the life course.

CONCLUSION

This chapter has attempted to define a structure of prevention research that emphasizes its intimate links to life-course development and to epidemiology, as well as the unique properties of preventive trials done within this framework. The logical structure is longitudinal, ecologically based, and concerned with variation in individuals rather than merely the average or the central tendency. The thinking is different from traditional to most, if not all, disciplines required, but the analytic and synthetic processes promise to provide a base of knowledge that builds strongly on past research and carries researchers into the period of successful understanding of what makes some lives different from others and of how to strengthen the probability of each person reaching his or her full potential.

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Hypothesis Formulation and Testing in Substance Use Prevention Research

William B. Hansen

NORMAL SCIENCE AND HYPOTHESIS GENERATION

Science and the scientific method are based on testing hypotheses. The first documented scientific test of hypotheses in history occurred in the 16th century when Galileo simultaneously dropped two balls—one metal, one wood—from the Tower of Pisa. The reason that the experiment was thought of at all was because Galileo had engaged in passionate discourses and arguments against the prevailing Aristotelian view of physics. He turned to an empirical test to demonstrate the failure of Aristotle. The purpose of the activity was to test two competing hypotheses. The first hypothesis was derived from Aristotelian physics—lighter objects of the same shape fell toward earth more slowly than did heavier objects (the favored hypothesis). The second was Galileo's—weight made no difference in the speed of the fall if the shape was controlled (the null hypothesis). Since then, scientists have used the hypothesis as a means of generating experiments to settle theoretical disputes. The best tests have pitted passionately held novel ideas against traditionally held explanations and predictions. This tradition of feeling passionately about hypotheses but settling hypothesis-centered disputes with cold objectivity is an oft-overlooked but central theme in the history of science.

Hypotheses are a *sine qua non* of all science. Without the hypothesis, there is no understanding of the meaning behind what is observed or manipulated through experiment. Hypotheses are important because they drive research, link research to understanding, and allow researchers to express their visions of reality.

Classic formulations place hypotheses as an integral component of the scientific method. Both inductive and deductive systems call for

hypotheses to serve as the impetus for experiments. Experiments produce results that then are interpreted theoretically.

There are three sources for hypotheses. First, hypotheses may be suggested by data. Second, hypotheses may be derived from theories or, at least, theory-based ideas. Third, hypotheses may be driven by logic. This point deserves some elaboration because, in fact, there is great variation in how hypotheses are derived. It is as common for hypotheses to be generated from an internal logic as it is for hypotheses to be generated from empirical data. Hypotheses simply are reasoned predictions. Data, grounded theory, and logic all may serve as the rational basis for prediction.

Data

The rationale for prediction can be existing data. Substance use prevention researchers have observed repeatedly that the prevalence of alcohol, tobacco, and marijuana use in the United States begins to increase dramatically during the period of life called adolescence. Yet, there was no theory that would have predicted this prior to observation. Nonetheless, the data led researchers to postulate that other phenomena, such as the use of cocaine and experimentation with inhalants, will follow the same developmental pattern of increase. It is logical to predict that cocaine use will occur later because it is a harder substance to obtain (because users have to find a person who is willing to risk breaking the law). It is logical to predict that the initiation of inhalant use will occur at about the same time as alcohol use since they are easy to obtain (because solvents are found in most homes). It is possible to derive these hypotheses simply from knowing what appear to be relevant facts. Extraneous data, close examination of data from failed experiments, and serendipitous findings all serve as the basis for formulating hypotheses.

Grounded Theory

As fields of research advance, hypotheses are expected to be derived from formal or grounded theory. For example, Social Learning Theory (Bandura 1977), particularly the later version that incorporates the idea of self-efficacy (Bandura 1982), postulates that behaviors are learned through symbolic (verbal) and vicarious reinforcement and are

executed when the person believes that the action will be reinforced. In practice, it seems that Social Learning Theory is given broad, nonspecific reference in substance use prevention research. However, it also is clear that specific postulates of Social Learning Theory have driven some elements of prevention program development. For example, demonstrating and practicing refusal skills will lead students to view themselves as capable of performing specific refusal strategies that will be highly likely to result in reinforcement. The theory can be logically construed to predict that increased self-efficacy will result in turn in decreased substance use, since substance use among adolescents is likely to occur normally under social-influence conditions. Thus, from this example, there are at least two hypotheses. First, skill training that features symbolic and vicarious reinforcement will result in increased self-efficacy. Second, increased self-efficacy will account for reductions in substance use among trained students.

A similar set of conflicting theory-based hypotheses has been discussed recently by Hawkins (1991) and Hansen and Graham (1991). Using Social Control Theory (Herschi 1969), Hawkins (199 1) hypothesized that norm-setting programs have little potential to affect young people who are at risk for substance use because they have not established social bonds with a positive social group. This hypothesis rests on the assumption that only when social bonding has occurred do young people pay attention to and seek to conform to perceived social norms. In contrast, Hansen and Graham (1991) hypothesize, based on the Theory of Reasoned Action (Ajzen and Fishbein 1980), that young people who are not yet socially bonded with peer groups will have increased motivation to comply. Therefore, among poorly bonded individuals, conforming to perceived norms will be viewed as a means of initiating social bonds. This situation increases the potential for norm-setting programs to prevent substance use. These opposing hypotheses have yet to be tested.

Logic

Hypotheses also may serve as the germ of theory and may be the initial formulation of theoretical constructs. Specifically, many of these logical (but not yet theory-driven) hypotheses are likely to occur because researchers find anomalies either in explanation or in data. For example, McAlister (1978) presented findings about the effects of

a peer-led, substance use prevention program. The program taught students how to say "no." However, the explanation of the success of the program was that the effect it had was to change the social norm toward substance use throughout the school.

There were two possible explanations for what was reported. One explanation for the success of the program was that it worked because students mastered skills for resisting pressure. Social Learning Theory would support this explanation. Increasing self-efficacy was, in fact, the basis of the program. The second explanation, that the program changed social norms, did not appear to follow directly from Social Learning Theory. Such an anomaly—incongruence between methods and explanation—can lead to the formulation of hypotheses. It is not unusual in such cases for the hypotheses to be framed as competing. In fact, the second hypothesis might be framed more characteristically as the antithesis of the first (i.e., skill training did not cause a change in the norm). Changes in the norm instead might be hypothesized to be created by other aspects of the program, notably those that revealed to the students, through some feedback mechanisms about rates of use, that the actual behavior and attitudes of peers was low and that it was, in fact, the norm to not use substances and not approve of use.

PARADIGMS AND PROBLEM-SOLVING

Whether formulated as a manifestation of data, as a grounded theory, or as a logical conclusion from available facts, all research typically is couched in the traditions of the researchers in the field. Hypotheses may be derived from theory, but it is equally important to understand that theory is just as often derived from the results of tested hypotheses. Tests of a hypothesis can be viewed as tests of a theory. However, new information, particularly information that is not predicted directly by existing theories, fosters the development of new explanations. The history of science suggests that novel theory development is the result of hypothesis-testing and the astute examination of results.

Ultimately, it serves the interests of science to formulate theories that can guide the development of research practices. A theory is the elaboration of a system of description and explanation that contains

within it the elements necessary for researchers to make predictions about the specific from the general. In his classic work *The Structure of Scientific Revolutions,* Kuhn (1970) points out that theory is more than just the basis of hypothesis generation, that it also is the basis of an overarching view of the world that serves to generate explanations.

Researchers should be aware of the two periods of science that Kuhn postulates. Normal science is that period during which accepted views are explored systematically through research designed to test derived hypotheses. Scientific revolutions are periods characterized by violent conflict about theory, which results in the ultimate emergence of markedly new theoretical formulations.

The period of the 1980s and 1990s in the field of substance use prevention research has many of the characteristics of a period of normal science. During this period, multiple programs were created that referenced an eclectic set of grounded theories, including Social Learning Theory (Bandura 1977, 1982), Attribution Theory (Perlman and Cozby 1983; Michaela and Wood 1986), the Theory of Reasoned Action (Ajzen and Fishbein 1980; Madden et al. 1992), Social Inoculation Theory (Janis 1984; Janis and Mann 1982), Problem Behavior Theory (Jessor and Jessor 1977), and the Theory of Cognitive Dissonance (Festinger 1957). In a sense, all microtheories from social psychology contributed to the paradigm from which allowable hypotheses were formed. Super models, such as those by Flay and Petraitis (in press), were formed to integrate these diverse theories into a single formulation.

Much of the normal science of prevention has been designed to create intervention models that worked in a practical sense. To give programmatic interventions added potential to suppress the onset of substance use, researchers extracted concepts from the theories in the paradigm. These concepts then were used as the basis for developing testable models. In many cases, the hypothesis tested was simply that the program would cause a reduction in rates of substance use compared to control groups. In more sophisticated tests, hypotheses about program action were implicit either in the research design (Hansen and Graham 1991) or in post hoc tests of mediating processes (Botvin et al. 1992; MacKinnon et al. 1991). Many research projects have incorporated important tests of hypotheses, all of which have

been accepted under the overall psychosocial paradigm that has guided prevention research during the recent past.

THE IMPORTANCE OF THE NULL HYPOTHESIS

The purpose of science is to test hypotheses to see under what conditions they fail. All programs that produce researchers teach students that the null hypothesis is at the heart of experimental research. Researchers must set up conditions under which the hypothesis can be allowed to fail; it is from failure that science gains its greatest potential for success. This simply is because researchers look hardest for new explanations only when old ones fail. In science, the only knowledge that is definite is about what is false; truth always is speculative.

One of the important dilemmas of normal science is that progress requires systematic exploration of accepted thought. With this systematic exploration comes the development of acceptable systematic methods, the development of standard methods for measurement, and the adoption of acceptable explanations. Setting such standards allows the field to progress. It is not unusual under such circumstances for scientists to form informal mutual protection societies. Funded researchers enthusiastically protect the ideas that formed the basis of their previous success (defined by either funding or research findings). Moreover, the field comes to eschew challenges to prevailing ideas. Lessons from the history of science imply that a researcher's scientific identity is derived from the promulgation of his or her ideas. This can serve only to dampen researchers' motivations to challenge their own published theories. In such circumstances, the classic assumptions about experiments in relation to hypothesis-testing often change. Instead of conducting experiments to test the null hypothesis, researchers begin to conduct experiments to support the favored hypothesis. Thus, researchers may fail to create experiments in which the favored hypothesis can fail and conduct experiments to demonstrate its success instead.

In an applied area of research like substance use prevention, the powerful political forces that support the field (i.e., give researchers funds to support programs that work) present a significant challenge to

researchers. When the focus of the field is on providing a practical public health outcome rather than increased knowledge, hypothesis development and testing will suffer. Under such circumstances, it is possible for the primary motivation of researchers to be to demonstrate that theories or programs work. A primary focus on building research studies that allow for success by the null hypothesis may be curtailed. Hypothesis-testing as a meaningful activity may be abandoned. Researchers continually should take their attention away from protecting ideas and refocus it on testing ideas. The benefit to science will be continued advances in knowledge and theory development. Political forces that focus exclusively on successful product development need to be educated to understand that the practical products they seek ultimately rely on knowledge that can be gained only from testing for the null hypothesis.

STOCHASTIC AND EXPLANATORY MODELS

In a practical sense, there are two ways of presenting theories. The first method is the stochastic model. Essentially, this is a model that encapsulates variables and relationships among variables in mathematical form. More often than not, stochastic models are expressed as lists of factors that cause other factors. These models note that if a set of conditions exists, a set of outcomes will follow. Stochastic models are portrayed using circles and arrows or other diagrammatic aids. There typically is a direct translation of stochastic models into measurement and structured equation models. Stochastic models are important because they direct measurement and evaluation.

The second way of theorizing involves explanatory models. Explanatory models are not mathematical in form; they typically are based on axiomatic verbal descriptions of what things are and how they work. These explanations tend to be highly verbal and are based on a series of logical statements that are arranged hierarchically. Explanatory models are differentiated from stochastic models in that explanatory models focus on providing an understanding of the inner workings that drive causal relationships. Whereas stochastic models note which variables cause which outcomes, explanatory models insist on providing a rationale for why such causal relationships exist.

Explanatory models are important because they give direction for program and intervention development.

There is, of course, correspondence between the two types of theory presentation. However, there also are striking differences. For the science of prevention research to be complete, both forms of theories are required. In many instances, stochastic models precede explanatory models, although this is not always the case. Observation of the researchers currently in the field of prevention demonstrates that individuals tend to prefer one or the other method of theorizing and do not actively build the bridge between them. Both forms of theory can be used to generate hypotheses. Inclusion of both will be necessary for the field to reach its scientific potential.

JUDGING THE STATE OF THE SCIENCE BY AN EXAMINATION OF HYPOTHESES

From a historical perspective, the best science emerges when research centers on testing hypotheses. Researchers often think of their research proposals as being judged primarily on technical merit and the use of state-of-the-art methodology. The importance of the research must be judged on the degree to which it has the potential to contribute to the advancement of the field. Research that sets out to focus on tests of theory-driven ideas and that successfully incorporates tests of hypotheses is meaningful to the field. Replication and the examination of minor variations in style ultimately are important from a public health perspective but fail by themselves to advance the field. Research that addresses the issues of replication and fine-tuning is best carried out as part of projects that are conceived with a larger vision. Reflecting theoretical issues and creating methods to test theory-generated research will continue to be the quality that separates research that advances the field from the rest.

A BRIEF HISTORY OF THE HYPOTHESIS IN SUBSTANCE USE PREVENTION RESEARCH

Hypotheses About the Causes of Substance Use

Whether or not the data can support such claims, the emphasis of theory is on understanding causation. Prevention program development adapts this emphasis to understand what must be changed to cause a delay in the typical process of onset. During the past 20 years, numerous research projects have examined the issue of causation in substance use and using the understanding of causal mechanisms programmatically.

From among the theories, which are plentiful, hypotheses have been examined systematically. Much of this work has been accomplished through correlational research. As nearly all researchers understand, correlational research has limited ability to provide causal inference. The typical research study that has examined the causes of substance use is faced with an initial, serious methodological dilemma. Succinctly stated, researchers ethically are barred from manipulating conditions to produce substance use effects. In other words, no one can systematically manipulate variables to try to produce experimentation with substances among youth. If it were possible, the explanations that researchers would come up with would be vastly different from what has been produced. Thus, researchers consistently try to use square pegs to understand round holes.

Just as hypothesis-testing influences theory, methods also influence theory. The result of this handicap on research methods is that researchers are forced to use observational methodologies. These methodologies are very limiting and require selecting only those explanations of substance use that can be examined nonexperimentally. At the same time, observational methodologies beneficially force an ecological validity on the research that has clear benefit in addressing the issue of substance use. Imagine that researchers could manipulate the conditions that cause adolescents to experiment with substances. Given this assumption, the field immediately would refer to theory and begin testing hypotheses different from those that are currently tested. The hypotheses would tell researchers quickly which theories were correct.

Instead, researchers are stuck in a correlational world in which causation can never be seen but always must be implied based on the strength of relationships among observed variables. The end result of this dilemma for researchers has been that theory has not been applied adequately to understanding the causes of substance use among youth. Epidemiologic and survey research studies fail to reflect explanatory theory except in the most limited of ways. This is evident from the overabundance of studies that examine risk and protective factors (Hawkins et al. 1992; Newcomb and Felix-Ortiz 1992) as opposed to those that claim to test hypotheses. These research projects capitalize on stochastic models to the exclusion of explanatory models. An emphasis on risk and protective factors demonstrates a failure to examine the process of becoming a substance user.

Hypotheses About Program Effectiveness

Unlike research on causation, programmatic research has been able to manipulate variables and conditions in order to test hypotheses. As a result, it can be observed quickly, from even a cursory examination of the introductory section of journal articles describing the effects of preventive interventions, that significantly more attention has been given to explanatory models and theories in programmatic research.

Even though reference to theory in intervention is relatively common, theory-based hypothesis-testing generally has been overlooked. Researchers who have had funding to create preventive interventions have focused much of their attention on crafting comprehensive programs (Hansen 1992). Little attention has been paid to devising tests to compare competing theory-driven notions. In part, this is due to the methodological constraints of quasi-experimental research about which prevention researchers continually are being reminded (Moskowitz 1989). The politics that drive the economics of social problem-solving has focused attention away from theory-testing and toward program evaluation. For example, many manipulations in school-based prevention studies have focused on delivery method or target population. Such tests have practical rather than theoretical implications. It may be only now, when promise has been demonstrated for multiple component strategies, that theory-based hypothesis-testing has the potential to be seen as economically useful and scientifically valid.

IMPROVING THE QUALITY OF SCIENCE IN SUBSTANCE USE PREVENTION RESEARCH

The differences in methodology for causation and prevention research have led to an interesting diversity of theory. For example, an aggregate view of the focus of causation research compared to that of prevention research demonstrates that different sets of variables have been selected by researchers for testing in their studies. Causation research has focused on the vast array of variables that are suggested by stochastic models. Explanatory models have been relatively ignored. Epidemiologists have not differentiated between the two types of variables (manipulable and context) that lend themselves to programmatic manipulation or that put constraints on programmatic manipulations. Research that looks at the causes of substance use can advance through the incorporation of theory as a source of hypothesis. In addition to including research that compares the predictive power among sets of variables, causation research can expand to examine the process that drives both individuals and groups to experiment with substance use. To examine such processes, theory-based hypotheses will have to be generated. Methods will have to be devised to address the questions posed.

Prevention research needs to focus more attention on testing theoretical issues. Two types of studies are needed: studies that include quasi-experimental manipulations of theory-based components and studies that are built on theory-based tests of mediating processes. Kitchen-sink models of prevention programming, in which the field advocates increasing programs to address all possible causes of substance use, lack efficiency. Such approaches ultimately fail to substantiate theory and create confusion instead. Prevention practice needs to become supported increasingly by empirically based theory. The presence of multiple explanations suggests the existence of competing theories that deserve systematic testing. Multicomponent programs assume that elements have an additive effect. Such assumptions can and should be tested empirically.

Theory Development

There is a need for the field to simplify its theories. There already has been significant integration of multiple stochastic models among

theories (Flay and Petraitis, in press). However, explanatory models have not been integrated and simplified. Explanatory models need simplification in order to solve the hierarchical causation problems that integrative stochastic models typically involve. Available empirical data need to be examined to determine the degree to which any of the components of models, whether stochastic or explanatory, account for behavior.

Expanding the Level of Hypothesis

Survey and prevention researchers have collected data almost exclusively from individuals. It is a natural consequence of this practice that theorizing also has used the individual as the primary unit. Theories postulate that events are interpreted individually and that individuals' personalities, perceptions, attributes, values, and other characteristics predominate as explanations for why adolescents use substances. To date, many of the theories that have been included in prevention research have focused on the individual as the sole unit of theorization. That is, characteristics have been thought of as happening almost exclusively to individuals.

Research reports do not frequently reference group-level theories, and hypotheses are not stated in group-level terms. Methodologically, the difficulties of identifying groups that have sociological identity, collecting data at the group level, analyzing these data, and interpreting these group-level data add complexity to prevention research. The theoretical challenge is augmented because social phenomena appear to be highly labile. Friendship patterns change frequently among youth, whereas even rapidly developing adolescents tend to retain their names, identities, faces, and personalities.

Ironically, prevention research as a practice typically has referred to the small group, the referent group, or the community when developing interventions. In part, this broadened perspective is derived from the fact that programs are delivered in classrooms, which reflects an awareness that there are gains made in effectiveness when delivering programs to groups of students as opposed to individuals. Many programs have used peer opinion leaders, reflecting some notion of social hierarchy within groups and classrooms. Many experimental designs assign schools to conditions, which reflects an understanding

that there is a school-level effect that can be generated. Even though individuals are targeted for skill development, the skills that are taught frequently are skills that will be used in social interaction and are based on findings that suggest that experimentation with substances is primarily a process of socialization. Finally, some individual-level perceptions (e.g., normative beliefs) are postulated to reside within the individual but can be thought of only in sociological terms. Each of these common practices suggests that there should be theorization about how groups function and how this functioning causes or prevents substance use.

There are several theories that do address these issues. For example, Social Control Theory (Herschi 1969) focuses on several group issues, including bonding, as does Peer Cluster Theory (Oetting and Beauvais 1986). These and other sociologically based theories have not had the visibility that is needed in research and hypothesis development. Hypotheses increasingly need to reflect this group-level unit of conceptualization.

CONCLUSION

Research always has relied upon hypotheses as integral to the scientific method. Hypotheses allow researchers to conduct tests that can speak to a systematic body of knowledge. More importantly, the whole business of hypothesis formulation and testing underlies how researchers go about demonstrating their vision of the field in which they are involved. In optimal science, theoretical issues drive hypothesis formulation, hypothesis formulation drives research design, and research results are used to judge theory and, when anomalies arise, to generate new explanations. Scientists still feel passionately about their hypotheses. When pursued with scientific rigor, hypothesis-testing is the source of scientific advancement.

Substance use prevention researchers need to consider hypothesis development carefully. The field has undergone significant development during the past years, but it will complete the process of becoming a fully developed scientific discipline only if hypothesis-testing becomes the basis for future research. Hypothesis generation will further increase the quality of theory and methods for the field.

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Target Populations and Interventions in Prevention Research: What Is High Risk?

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This chapter addresses the theoretical and methodological issues involved in identifying special or high-risk populations for drug abuse prevention research and tailoring interventions to meet the assumed needs of these population groups. An interactional theoretical framework of trainee (subject of intervention) x trainer (implementor) x training (tailored intervention) factors is applied to the identification of target populations according to personal risk for drug abuse (trainee factor), availability of implementors (trainer factor), or intervention setting (training factor). The framework also is applied to determine whether and how preventive interventions should be tailored to the target population according to placement of the intervention in a scheme of strategic prevention (primary prevention education, special events, student assistance programs (SAPs), treatment referral, and mainstreaming); unit of intervention (individual, school, and community); and probability of intervention effectiveness (adoption, implementation, diffusion, and early outcome). Recommendations are provided for conceptualizing research designs, constructing grant proposals, and interpreting research findings for publication according to these considerations.

INTRODUCTION

In the last 5 years, Federal research agencies, including agencies within the Substance Abuse and Mental Health Services Administration and the National Institutes of Health, increasingly have disseminated announcements for alcohol, tobacco, and other drug (ATOD) abuse prevention research that are intended to focus on high-risk populations of youth.

Unfortunately, in attempting to respond to this movement toward targeted populations and interventions, prevention researchers have little definitive information about what constitutes risk and special population needs from past ATOD studies, and they have underutilized findings from other fields of research, notably cultural anthropology, ethnography, and sociology. This gap in knowledge raises two potential problems—one practical and one ethical. The practical problem is that drug prevention researchers submitting proposals or manuscripts based on nominal *assumed* risk status of a population (e.g., minority status) may suffer from poor reviews by ethnographers and others who are more familiar with the complex interrelationships of race, environment, and behavior. The ethical problem is that risk tends to be measured in terms of easily observable variables that are associated with drug use but are not risk factors per se: Equating association with risk contributes to negative labeling of whole population subgroups. For example, a common perception is that minority status is a risk factor for drug use, particularly African-American racial/ethnic status. High rates of cocaine and other illicit drug use found among incarcerated black males may have contributed to this perception (Adams et al. 1990). Yet recent surveys suggest that black youth have a later onset and use drugs less frequently than white youth (Johnston et al. 1989). Given the two apparently discrepant findings, it is highly likely that drug abuse risk has more to do with stressful environment, poor economic conditions, and racial bias than racial group membership. The ethical problem extends to developing appropriate interventions for a target high-risk group. In a research field that is still struggling with the question of how primary prevention programs work, developing an intervention that is tailored to the special needs of a target group is interpreted too easily as testing the generalizability of an existing primary prevention program or modifying an existing program slightly to incorporate the immediate context for that group (e.g., changing role-plays of drug use avoidance in a party situation to a gang initiation situation). Researchers should guard against proliferating the "uniformity myth" of effective primary prevention programs that once characterized psychotherapy research (Goldstein and Pentz 1984).

The purpose of this chapter is to outline research considerations in targeting populations for drug abuse prevention and developing appropriate interventions for these populations. The considerations are

intended to serve as guidelines for constructing grant proposals that are aimed at ATOD prevention with high-risk or special population groups and as qualifications in interpreting prevention research results for publication.

DEFINITION OF TARGET: AN ISSUE OF RESEARCH VALIDITY

A *target* population is not synonymous with high risk, nor is a *target* intervention necessarily synonymous with a program that differs from other prevention programs. A target is what the researcher selects for his or her focus of study and justifies—particularly in the aims, background, and significance sections of a grant proposal or a manuscript—in terms of three types of validity: *internal, treatment construct, and ecological.*

Internal validity refers to whether the study utilizes the intended target population, whether the target population proves to be the target according to measured criteria, and whether the target population is represented equally across experimental groups. For example, a prevention study aimed at intervening with school dropouts has internal validity to the extent that all or mostly school dropouts or expected school dropouts constitute the sample, that the sample is truly dropouts versus absentees or individuals who have moved, and that baseline dropout status and study attrition rates are the same across experimental groups.

Treatment construct validity refers to whether any new development, tailoring, refinement, or revision of an intervention was conducted to fill a need that uniquely characterizes the target population, whether the subsequent content of intervention reflects this need, and whether the impact of intervention can be measured subsequently as a set of unique program mediators of drug use behavior change. To follow the previous example, juvenile delinquency and educational studies suggest that school dropouts show low self-esteem and low social and academic expectations relative to other groups (Jessor and Jessor 1977; Hawkins et al. 1988). A social influences program aimed at training adolescents to resist peer pressure in interpersonal situations might be modified substantially for dropouts to focus first on promoting positive

changes in self-esteem, expectations, and other intrapersonal variables. The modified program has treatment construct validity to the extent that it reflects these changes and that the modification can be measured as, and shown to be, a mediator of subsequent drug use behavior change.

Ecological validity refers to the meaningfulness or fit of a preventive intervention to the target population in the environmental context in which the intervention is delivered. Still following the previous example, a social influences program that teaches resisting offers of cigarettes in a dropout population that already smokes has little or no meaning to this group and may even jeopardize their serious consideration of other, more promising features of the program. Similarly, the intervention may have low ecological validity if it aims at promoting academic expectations that are too high in the short-term. Service providers and program evaluators often mistake consumer satisfaction for ecological validity, i.e., "If they like it, it must be good (or right)." Although satisfaction may be associated with the speed of initial program adoption, dissemination, and implementation, there currently is no evidence to suggest that satisfaction contributes to the quality of program implementation or drug use outcome (Connell and Turner 1985). An illustration is the school-based Project D.A.R.E. Evaluations of D.A.R.E. have shown rapid adoption, dissemination, and satisfaction throughout the United States, but no evidence of changes in drug use exists thus far, and there is questionable adherence to program implementation protocols (Clayton 1990). A post hoc evaluation of D.A.R.E.'s ecological validity would identify and evaluate the target population's need for intervention (identifying the youth actually exposed to the program and their baseline drug use rates and whether other programs are being delivered at the same time), hypothesized program mediators (D.A.R.E. is derived from primary prevention programs that are aimed at changing social influences on drug use and have been shown to be effective in reducing drug use prevalence rates in students), quality of implementation, and relevance of implementors (police officers) and the program as perceived by consumers (students). This approach to evaluating ecological validity is derived from behavior change models and theories of person x situation x environment (P x S x E) and trainer x trainee x training interactions (Goldstein and Pentz 1984; Jessor and Jessor 1977; Hawkins et al. 1988; Pentz, in press-u). As described below, this interactional

perspective is useful in identifying the target for preventive intervention.

IDENTIFYING TARGET POPULATIONS

According to a P x S x E perspective, the target population for intervention can be identified by who has the problem (P), who interacts with subjects or who is available to provide intervention (S), or the environmental focus of behavior change (E). Targeting a special population for intervention requires that a special need for prevention be demonstrated in that population relative to other populations in terms of especially high levels of drug use, high levels of risk for later drug use, or low levels of exposure to other preventive interventions (an underserved population). In reality, an especially needy population targeted for prevention probably will represent an adverse additive combination or interaction of P, S, and E factors rather than adverse levels on a single factor.

Identifying Target Populations by Person Factors (P)

Findings from etiological and epidemiological research are useful in targeting special populations for intervention based on who has the problem. Currently, this research suggests that high-risk groups can be identified on the basis of several personal behavioral and social factors aside from previous self use, including perceived parent use, perceived peer use, perceived social norms for use, perceived approval or Jack of disapproval of use by family members and peers, personal availability of and access to drugs, early childhood aggressive or antisocial behavior, predelinquent or delinquent behavior, low or negative social and academic expectations, and positive expectations about drug use, particularly alcohol use (Newcomb and Bentler 1988; Jessor and Jessor 1977; Hawkins et al. 1988; Kellam et al. 1990; Christiansen and Goldman 1983; Hansen et al. 1987). Identification of high risk on the basis of demographic factors, especially minority status, urbanicity, and socioeconomic status (SES), is less clear than previously believed (Johnson et al. 1990). As noted earlier, drug use prevalence rates for black youth are far lower than rates for white youth, contrary to previous beliefs; however, rates of use among Hispanic youth appear to be increasing at a faster rate than those for either whites or blacks for

some substances (Johnston et al. 1989). Urbanicity and SES differences are drug specific, although some recent studies suggest an overall increase in drug use in poor rural communities (Oetting et al. 1991). Risk identification on the basis of clinical research on familial and genetic factors is even less clear. Most representative of research in this area are studies of children of alcoholics. In contrast to animal model studies that have shown a consistent genetic component to alcoholism, only half of the published studies on humans have shown a significant relationship between parental alcoholism and child predisposition toward alcohol or other drug use; the other half show no relationship (Chassin et al. 1988). Finally, with the exception of indirect evidence from analyses of school dropouts, there has been no research reported on person-level risk for drug use based on underserved or underexposed program status. School dropouts consistently have shown higher rates of drug use compared to school-attending peers, although presumed lack of exposure to school-based prevention programs may be only one of several factors contributing to higher drug use rates in this population (Hansen et al. 1985). Collectively, these research findings suggest that a clearer rationale for identifying target populations based on P factors might be developed relevant to prior drug use, perceptions related to use, expectations, and history of problem behaviors.

Identifying Target Populations by Situation Factors (S)

Findings from psychosocial and survey research are useful in identifying target populations by interpersonal situations or individuals with whom youth interact. In addition to perceived use by others, actual drug use by parents and other adults, peers, and siblings is associated with higher rates of drug use in youth, as are the lack of supportive parent-child communication and the frequency of drug use offers (Hansen et al. 1987; Johnson et al. 1988; Pentz et al. 1989). Risk transmission associated with these variables is assumed to be through interpersonal communication and exposure. An entirely different approach to identifying target populations by situation-level factors is to target individuals or situations that represent opportunities or resources for program delivery. For example, in cities where cross-district or cross-community busing is in effect, it may be difficult to implement a communications-based drug prevention program for parents in a youth's school. However, if a high proportion of parents

gather in a local community service setting regularly, that setting might be a target for intervention. This was the case in urban Kansas City schools in the Midwestern Prevention Project in which a large proportion of inner urban African-American parents could be targeted for a parent preventive intervention through the churches they attended rather than the schools to which their children were bused. Project staff provided training with prevention announcements and messages disseminated through ministers (Pentz 1990). The efficacy of using situational opportunities for identifying target populations for intervention versus situational risks has not been evaluated. Findings thus far would support the latter, with some consideration of the ecological validity provided by attention to the former.

Identifying Target Populations by Environment Factors (E)

Focusing on the environmental unit of behavioral change is an additional approach to identifying target populations for intervention. Ideally, the unit of change should match the unit of experimental assignment, intervention, and analysis (Barcikowski 1981; Dwyer et al. 1989). It also should represent the locus of the major drug use problem, although thus far prevention studies have identified units according to convenience, level of program implementation, or hypothesized mediators of change (e.g., school as a unit based on program delivery to all students in a school and perceived school-level social norms as a hypothesized mediator of change (MacKinnon et al. 1991). In drug abuse prevention research, logical environmental units of change to consider include, but are not limited to, the following. The individual is the focus of change if changing intrapersonal drug use risk in one-on-one or small group interventions is sufficient to change the individual's drug use behavior without changing other factors. The group is the identified target if peer pressure or group norms for drug use constitute the major problem and if changing these factors in a small-group setting produces a change in group drug use. The school is the target if such factors as low teacher morale for teaching, poor school administration, or the lack of school monitoring of on-campus drug use constitute the major problems contributing to drug use and if changing the school environment by including all students and school staff in intervention produces a change in school-level drug use. The community is the target for intervention if community supply and demand for drug use, drug-related crime rates, and perceived social

norms for and acceptance of drug use are high and if use of multiple community channels for program delivery and changing local drug use policy are likely to change community-level drug use. Current research on primary and secondary drug prevention programs suggests that, with social influences constituting the major risk factors for drug use onset and progression to regular use in youth, targeting social units for intervention rather than individuals may have a higher likelihood of changing drug use.

An illustration of the use of P, S, and E factors in identifying target populations for intervention is shown in table 1.

TABLE 1. *Illustration of identifying target populations and interventions in drug abuse prevention research*

Unit of Intervention	IDENTIFICATION FACTOR		
	Personal/ Problem (P)	**Situation/ Trainer (S)**	**Environment (E)**
Individual	School dropout, child of alcoholics	Counselor, nurse	Small group in agency or school
School	Mobility, desegregation/ busing, teacher turnover	Teacher, principal	Class, staff meeting in school
Community	Vandalism, drug-related crime	Law enforcement, judiciary, business, agency leaders	Town hall, neighborhood center

DEVELOPING APPROPRIATE INTERVENTIONS FOR TARGET POPULATIONS

Once a target population is identified, a preventive intervention appropriate to that population is developed. If there is strong evidence from previous research to support high external validity of a particular prevention program and the study or studies in which it was evaluated

provided a theoretical basis of the program that is either culture free or culture flexible, the program may be applied with little or no modification to the target population. Examples of these generalized applications are life skills and social skills training that were developed originally as smoking prevention programs for white, middle-class populations and recently were applied effectively to inner-city black and Hispanic youth for prevention of drug abuse and Acquired Immunodeficiency Syndrome (Botvin et al. 1992; Schinke 1990). However, it is just as likely, if not more than likely, that an existing intervention shown to be effective as a primary prevention program with one population will require extensive modification for use with another target population. If there is no previous intervention research experience with a specific target population and there is reason to believe that the target population is substantially different from other populations, development of an entirely new intervention may be required, drawing on relevant etiologic and epidemiologic research to construct program content and delivery methods. If modification or new development is required, at least three factors should be considered: (1) conceptualization or placement of the intervention in a scheme of *strategic* prevention that yields the strongest internal validity to the study; (2) the unit of intervention that supports treatment construct validity; and (3) the probability of intervention effectiveness, an ecological validity concern.

Strategic Prevention

Some critics argue that current primary prevention programs for drug abuse are wasteful and off the mark because they are most likely to reach youth who will not use drugs (Klitzner et al. 1988; Moskowitz 1989; Newcomb and Bentler 1988). Federal agencies have issued several research announcements since the late 1980s that are aimed toward a delimited type of primary prevention that focuses on youth who exhibit high risk for future drug use based on person-level factors, such as family history of use or situation or environmental-level factors representative of underserved or disaffected groups. However, prevention that is aimed solely or predominantly at high-risk youth may produce negative side effects. The most notable side effect is the possible negative social labeling by peers of youth who are singled out for special intervention (Burk and Sher 1990).

A more humane and internally valid alternative may be studies of prevention programs that represent one or more components of *strategic* prevention in naturalistic settings where youth gather (Pentz in press-*b)*. Taken together, these components implemented in a large social unit such as the school or community would conceivably reach all youth, regardless of risk status. Conceptualizing strategic prevention as a package or scheme of program components enables the researcher to identify: (1) what types of youth are being served or underserved in an intervention setting; (2) which components are readily adopted and implemented and why; and (3) covariates for analysis of effects of individual program components delivered to the target population. Yet, to be evaluated systematically as a package in research, strategic prevention would include at least four components introduced sequentially during childhood or early adolescence and maintained through late adolescence. These components are:

1. Primary prevention programs with whole populations of youth in available, normative settings (e.g., schools, continuation schools, recreational service organizations, and clubs);

2. High-interest, special-topic activities and brief group counseling-oriented programs that are scheduled such that they complement the delivery of primary prevention programs, are elective or voluntary, and address drug use questions that may be too complex or embarrassing to raise within the context of a primary prevention program (e.g., workshops or discussion groups on family alcoholism, depression, or suicide);

3. Standardized SAPs or outreach center counseling designed for youth who have been identified by the school or justice system as being at high risk for drug use and other problem behaviors and which include—for evaluation purposes—standardized written and disseminated program content, procedures for program referral, and training of counselors or other program implementors; and

4. Prevention-treatment linkage consisting of standardized procedures for risk identification, treatment referral, and mainstreaming of youth back into school or job. Relatively little research exists on technologies for accessing, tracking, and subsequently intervening with hard-to-reach populations in unconventional settings (Pirie et

al. 1989). Studies that track and intervene with adolescents by linking health and drug abuse services with schools are one avenue for research in this area. Other possibilities are studies that reach out-of-school youth by utilizing settings and populations associated with treatment or law enforcement (e.g., drug prevention programs that are aimed at youth in families in which adults have been incarcerated for drug-related crimes).

Of these four components, primary prevention education has received the bulk of attention in ATOD prevention studies, but there have been relatively few fine-grained analyses of the differential effects of primary prevention with different target groups (Johnson et al. 1990). Alarmingly, special events/campaigns and assistance programs have been diffused and adopted throughout the United States with little or no evaluation in experimental studies and little specification of standardized content and procedures by which to determine treatment construct validity. These components, particularly suited to hard-to-reach or hard-to-motivate target groups on the basis of face validity, call for vigorous pursuit in future ATOD prevention research. The fourth component, prevention-treatment linkage, can be further conceptualized as a systems intervention (see the discussion of unit of intervention that follows). Since no published ATOD prevention research exists in this area, extensive formative evaluation studies would be recommended before intervention trials are attempted.

Unit of Intervention

Developing an appropriate intervention for a target population requires consideration of three factors:

1. P, S, and E identification factors, particularly who has the major problem and what is the expected or preferred unit of behavior change;

2. Whether behavior change and hypothesized program mediators can be measured at that unit level; and

3. Resources available for and efficiency of delivering intervention at that unit level.

Consideration of these factors in selecting community as the unit of intervention is illustrated by the following complex example of a community (Pentz 1992*a)*. The example is hypothetical. A community experiencing a rapid in-migration of several minority groups is subjected to several variables that serve as stressors on its capacity to organize and implement prevention programs effectively compared to other communities. These stressors include but are not limited to the following. An Anglo-Saxon-dominated government and culture in the United States tends to attribute a minority community's problems to inferiority, genetics, or a failure to socialize; these attributions tend to depress community residents' feelings of empowerment and categorize community leaders and agencies as passive recipients of government and social services. The pervasive myth that a minority community's residents are automatically at high risk for health problems, drug abuse, and criminal behaviors has a self-fulfilling prophecy effect as well as decreasing perceptions of empowerment. Difficulty of acculturation to a majority social norm for behavior and secondary problems in acculturation conflict between adults who may prefer retention of another culture and youth who prefer rapid acculturation to majority norms weakens the capacity of the community and its residents to cope with other daily stressors, such as job and school.

Attempting to accommodate to majority norms, the changing community may show an unusually high tolerance for conditions that would be considered unacceptable to other communities. Thus, by the **time** a critical incident or other initiating event occurs that establishes that community as a target for intervention, it may serve as a flashpoint for aggressive or destructive behavior before positive intervention can be realized. Finally, professionals, resources for prevention, formalized organizational structures to deliver prevention, and longevity of resources and structure may be unavailable or inaccessible to the community. The net result in this community may be a slower, less visible, less powerful community organizational process and support for prevention compared to other communities and a distrust of majority-dominated government and social services that renders achievement of ATOD policy change and dissemination and use of prevention programs difficult.

In this hypothetical example, the unit of change is arguably the community, but the focus of intervention may be on changing systems-delivery services to include more indigenous minority program deliverers and infusing the community with additional prevention resources that are easily accessible to the in-migrating groups. The content of intervention may require a shared or sequential focus on creating job opportunities and making schools safe, as well as on ATOD intervention per se. Treatment construct validity then would be assessed according to whether the intervention includes systems-level change, whether it includes professional or paraprofessional training of community residents from the varied minority groups, and whether drug use change is mediated by change in economic, academic, or empowerment variables. An illustration of considering the unit of intervention in developing appropriate interventions for target populations is included in table 1.

Probability of Intervention Effectiveness

At least four criteria or predictors of effectiveness should be considered in developing appropriate prevention programs for a target population (Pentz 19923). All four are indicators of ecological validity of the intervention; they are:

1. The extent to which prospective program implementors were aware of, or sought information about, a particular drug prevention program or approach that is later implemented (evaluated as an index of baseline technology transfer);

2. The degree of program user-friendliness (evaluated by indices of quality of pilot program implementation and predicted target population program exposure);

3. Consumer satisfaction (evaluated by early technology transfer to other units of intervention, variables representing dissemination and diffusion such as interpersonal communications in support of the program, and intentions to use or participate in the program, *rather than* perceived global satisfaction with the program); and

4. Early changes in interim dependent variables during piloting (e.g., increased parent-child discussions about ATOD prevention or decreased positive expectations about drug use).

FORMATIVE EVALUATION AS AN AID TO IDENTIFYING TARGET POPULATIONS AND INTERVENTIONS

Prevention trials should not be attempted without a formative evaluation phase of the study that is designed to validate that the target population is in need of or underserved in terms of the planned preventive intervention and that the proposed intervention is appropriate to the target population. Depending upon findings of previous research in each area, formative evaluation may consist of targeted surveys, rapid response population surveys, hard- or soft-structured focus groups, feedback and review groups, pilot studies of baseline levels of drug use in the target population, comprehension and appropriateness of proposed measurement protocols, implementor training protocols, and tests of the content and delivery method of the intervention.

Developing an intervention that is ecologically valid may depend on process analyses that are conducted early enough that they serve the function of formative evaluation. Developing a prevention program "in context" means that the interaction of student, teacher, and school factors is evaluated as it relates to the effects of pilot programs or delivery of any previous prevention programs. It also means that the process of the unit of intervention's adopting, organizing, and participating in modifying a program during its development phase also is evaluated. Several process and structural organizational models can be adapted for use in ATOD prevention program studies (Connell and Turner 1985; Pentz 1986).

While it may be treated as a subset of the other in a particular study, implementation evaluation should not be considered interchangeable with process evaluation. Implementation evaluation is, or should be, a highly structured assessment of how well a program is implemented according to predeveloped indices of exposure (amount), adherence, or reinvention (tailoring); it may or may not include assessment of implementor (teacher) training (Burk and Sher 1990). In contrast, process

evaluation documents the presence, absence, and sequence of uncontrolled, less-structured events or interactions, usually according to hypothesized indicators. Both are useful as part of formative evaluation when they are applied to delivery and subsequent modification of a pilot version of a proposed intervention. In developing an intervention that is tailored specifically to the target population, it is particularly important to include the target population's reactions and behaviors in process and implementation analyses, whether measured by observation or self-report.

Onset and prevalence rates of drug use are typically treated as the ultimate "hard" outcomes of ATOD prevention programs, preferred over the numbers of individuals served, consumer satisfaction, knowledge, or attitudinal change as dependent variables in summative evaluation studies. However, onset and prevalence also can be measured in a pilot survey on an independent sample representing the target population or as part of an extended baseline of the target population to validate the need or problem hypothesized in that group.

RECOMMENDATIONS

In summary, it is recommended that the following points be addressed in proposals and publications that focus on identifying target or special populations and interventions for ATOD prevention:

- Clear specification of risk and risk reduction as aims of the study;
- Clear specification of protective factors and their enhancement;
- Inclusion of a theoretical basis for population identification and selection of the proposed intervention that addresses person, situation, and environment factors;
- Inclusion of preliminary studies from related areas as a rationale for selection of the target population and intervention;

- Classification of the target population and intervention according to measurable P, S, and E factors and strategic prevention schema; and

- Use of analyses of predictors of effectiveness and formative evaluation in developing the intervention.

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Some Design, Measurement, and Analysis Pitfalls in Drug Abuse Prevention Research and How To Avoid Them: Let Your Model Be Your Guide

Linda M. Collins

INTRODUCTION

The assessment of drug abuse prevention programs-whether they work, the extent to which they work, and why and how they work-is one of the most important applied research endeavors currently being undertaken in the United States. It is of vital importance to maintain high methodological standards in the field of prevention. One possible consequence of substandard methodology is concluding mistakenly that a program is effective so that the taxpayers' money subsequently is wasted on implementation of an ineffective program; another is failing to recognize the effectiveness of an intervention that could prevent or delay drug use onset for countless children. Both are potentially disastrous.

Maintaining high methodological standards in prevention research is challenging for several reasons. One reason is the multilevel nature of much prevention research, in particular school-based prevention research. The term "level" as it is used here refers to whether and how individuals participating in a study are grouped (Kreft, accepted). In field research, these levels often occur naturally and may or may not be the target of an intervention. For example, because school children are grouped into classrooms and classrooms are grouped into schools, most school-based studies involve several levels: the individual, the classroom, and the school. In many school-based prevention studies, the treatment is delivered at the classroom level, but the outcome at the level of the individual student is the ultimate interest. Hence, important research questions may be posed at the individual, classroom, or

school level. Such hierarchical structures are ubiquitous in prevention studies and often include neighborhood- and school district-level effects as well.

Another reason prevention research is methodologically challenging is that it is often longitudinal. When researchers administer a prevention intervention, they are trying to stop the drug abuse onset process; therefore, a widely adopted strategy is to observe the recipients of the treatment over time along with a control group to see whether researchers have succeeded in slowing or even stopping the process. This longitudinal strategy introduces a degree of complexity that is not present in most cross-sectional studies.

The multilevel and longitudinal nature of much prevention research means that issues such as how to translate research questions into testable hypotheses and how to test the hypotheses appropriately must be given very careful consideration. Often the traditional, routine ways of approaching measurement, design, and statistical analysis fall short when confronted with the complexities of prevention research because they were originally developed with different, usually simpler, research questions in mind. In fact, the routine approaches can lead the researcher into pitfalls due to misunderstandings about what can be accomplished and due to a lack of clarity about exactly what question is being answered.

This chapter will attempt to convince the reader of one general point: *Every drug abuse prevention intervention research study should be firmly rooted in the researcher's model of the drug abuse onset process, including exactly how the intervention impacts this process.* This model then should be used to provide a framework for identifying testable hypotheses, choosing a design, developing and selecting measurement instruments, and performing statistical analysis of the data. After discussing the task of specifying such a model, the chapter identifies several examples of pitfalls and how prevention researchers can avoid them if they let their model be their guide.

SPECIFYING A MODEL OF THE CHANGE PROCESS

Whether a drug abuse prevention intervention study has fairly simple goals or involves a complex set of questions, it should begin with a specification of a complete model of the phenomenon of interest: drug abuse onset and how it is stopped or slowed by a particular intervention. The model will stem directly from the theory motivating the research. In fact, the term "model" as it is used here refers to an operational definition of a theory. The model should specify what variables will be used to represent various parts of the theory and exactly what relations are anticipated among them. In some cases, only part of the model will be tested in a given project. Nevertheless, a complete model should be presented and used to clarify which aspects of the model (1) have been established by prior literature or by previous studies by the authors, (2) are going to be tested by the proposed project, and (3) are outside the scope of the current project and will be left for a future project. When the research is multilevel or the variables in a study involve change over time or both, as is so often the case in drug abuse prevention research, complete specification of a model requires a number of considerations that are unfortunately ignored in most studies.

When multiple levels are involved, as in school-based studies, for example, the model should address the following questions:

What levels are involved? Different models will involve different levels for different effects. Often questions about outcomes are posed at the individual level, even if the intervention was delivered at the classroom level. Some models also will involve classroom, school, and neighborhood levels.

At which levels is the treatment expected to show effectiveness and why? In most studies, it is expected that individuals who receive the intervention will engage in less substance use. Is it expected that classrooms that participate in the intervention will show lower mean substance use than control classrooms? These are not equivalent questions, as will be discussed below.

At which levels are interactions expected to take place, and are cross-level interactions expected? For example, suppose two treatments are being compared, and a gender-by-treatment interaction is expected. Such an interaction may take place at various levels, with different meanings depending on the level. An example of an individual-level interaction is one treatment being more effective for males and the other being more effective for females. In contrast, an example of a classroom-level interaction is classroom mean use being lower for one treatment when the classroom has a high proportion of females and lower for the other treatment when the classroom has a high proportion of males. An example of a cross-level interaction is characteristics of the teacher (a classroom-level variable) interacting with characteristics of the child (an individual-level variable).

When change is expected over time, the model should address the following questions:

Is a variable characterized by continuous, quantitative growth or by movement through a series of more or less discrete, qualitatively different stages? Of course, these both may be useful ways of thinking, depending on the context. Certainly drug use has been thought of productively in both ways. For example, Newcomb (1992) has taken a continuous point of view, thinking of substance use and its determinants and correlates as quantitative variables. Yamaguchi and Kandel (1984) and Graham and colleagues (1991) have taken a discrete point of view, conceptualizing substance use as a series of qualitatively different stages.

Is growth steadily upward or steadily declining, or does upward growth alternate with decline? This will depend partly on how a variable is operationalized. If drug use is operationalized as lifetime use, then it will increase monotonically (that is, go up or stay the same). If it is operationalized as current use, it may fluctuate up and down.

Is the process of growth the same for all subjects, or are there subgroups exhibiting different characteristics of growth? This is an important question for testing the generalizability of the effectiveness of drug abuse prevention interventions. If substantially different

models of the onset process apply to different subgroups, a single curriculum may not be effective for all participants.

There is even more to think about with respect to causal variables. Often causal relationships are described by saying that one variable "leads to" another. When either or both of these variables are processes, the meaning of the term "leads to" must be clarified in at least the following ways:

Does substance use "track along" with a causal variable so that, as the causal variable increases and decreases, substance use increases and decreases?

Is causation instantaneous, or is there a causal lag? For example, if a rebellious attitude "leads to" drug use, does it lead to drug use minutes, hours, days, months, or years later?

Is there a certain point in the process where an effect can take place, or does the effect occur throughout the process? Availability of the "gateway" substances alcohol and tobacco in the home may affect early onset by making experimentation easier to carry out (Graham et al. 1991). However, the availability of these substances in the home probably does not have much of an impact on advanced use.

Do the causal variables differ for different subgroups? For example, parental use may be an important causal factor for younger children while, for older children, peer pressure may be much more important.

Exactly how does the prevention intervention slow or halt the change process? Generally, prevention interventions have their effect in two ways. An intervention will operate directly on a known antecedent of drug abuse, such as (poor) resistance skills or (high) normative expectations, rather than on drug abuse itself. This kind of relationship usually is described as one where resistance skills or normative expectations *mediate* the effects of the program. Most successful interventions also *moderate* the link between causal variables and drug use. For example, a successful program might break the connection between rebelliousness and drug abuse.

These are some of the aspects of the onset process and its causal antecedents that must be specified in a model. Once the model has been specified completely, the researcher then must consider the implications of the model for design, measurement, and analysis. The researcher who overlooks this process may encounter any of a number of pitfalls that affect many prevention studies. Several pitfalls that are encountered frequently in prevention research are listed below.

Pitfall #1: Choosing Temporal Spacing of Waves of Data Collection in a Longitudinal Study Solely According to Logistical Considerations

Consider an example of a typical prevention study. A longitudinal panel study has been carried out, and data are available from the beginning of seventh grade and the beginning of eighth grade. A simple model is being tested where normative expectations, resistance skills, and rebelliousness "lead to" drug abuse. Suppose the researchers have measured all of these variables. They test the model by regressing subjects' eighth-grade use on seventh-grade normative expectations, resistance skills, and rebelliousness.

For the sake of illustration, suppose that normative expectations, resistance skills, and rebelliousness have their effect on drug use after 1 month. However, because of the constraints imposed by the design of this study, drug use after 1 month cannot be determined because measures are spaced more than 1 month apart. Thus, the model actually being tested here is that rebelliousness, normative expectations, and resistance skills have their impact on drug use *after about a year*. Whether or not this is a plausible model, it is the only one that can be tested in this study and, indeed, in any school-based prevention study where measures are taken only once a year.

In this example, drug use after 1 year is a "temporal proxy" for drug use after 1 month (Collins and Graham 1991). The temporal proxy is useful only to the extent that it provides an accurate reflection of the true relation of interest. This in turn depends upon the relation between the true dependent variable and the temporal proxy. In this example, the dependent variable, drug use, changes over time. If this change is such that a high correlation between the temporal proxy and the true dependent variable is maintained, then the temporal proxy will

provide an adequate representation. This occurs when (1) there is little change in the dependent variable over time or (2) the change is such that the temporal proxy is a linear transformation of the true dependent variable, as when individuals are all changing at the same rate. In the case of drug use, both (1) and (2) seem unlikely. Usually there is considerable change in drug use between seventh and eighth grade (Graham et al. 1991) (indeed, if change were not expected, a longitudinal study would not be conducted), and individuals develop at vastly different rates. Thus, the observed correlation between the causal variables and drug use will be considerably smaller when a temporal proxy is used.

The situation becomes more complicated when an intervention is introduced. Most interventions are hypothesized to work through mediating variables, which in this case would be normative expectations and resistance skills. In other words, the intervention directly affects the mediating variables, and they in turn affect drug use. If changing mediating variables are not measured relatively close to substance use, it is difficult to establish exactly what effect they have on substance use. This can make it difficult to understand how an intervention has its effects or even to assess the size of an intervention effect. Many studies have shown that psychosocial variables like these have a statistically significant but small effect on drug abuse (Collins et al. 1987; Chassin et al. 1984). It might be that, if the causal variables were measured closer in time to the effect, the effect size would be larger and act as a more accurate reflection of the importance of these variables on drug use onset.

The choice of which temporal proxy to use is made through the researchers' decisions about the timing and spacing of observations in a longitudinal study. Despite the significant effect that this choice can have on results, few if any studies justify their choice of spacing of observations on anything other than purely logistical grounds. Cohen (1991) and Collins and Graham (1991) explore this issue. These authors point out that, when observations are too widely spaced in longitudinal studies, even large effects can become impossible to detect. They also point out that the temporal spacing of observations is an important design consideration and should be guided by the models the researcher is interested in testing. If a process is believed to be occurring quickly, then observations should be close together. If

a slower process is being studied, then fewer observations at longer intervals will be sufficient. The intervals between observations do not necessarily have to be equal. Singer and Willett (accepted) argue that researchers should consider using the hazard function (risk of onset as a function of time, conditional on onset not having taken place already) as a guide in planning the spacing of observations. They suggest that periods of high risk for onset should contain more closely spaced observations; periods when risk is low may be measured less intensely. It may be necessary to collect pilot data in order to determine what strategy is best for a particular study.

Pitfall #2: Assuming That Causation Implies Correlation

This is related to the first pitfall. Consider a simple relationship, the correlation between a causal variable at Time 1, such as rebelliousness, and an effect variable at Time 2, such as drug use. Even if rebelliousness and drug use track along together perfectly over time, it is possible for rebelliousness at seventh grade to have a zero or near zero correlation with drug use at eighth grade. Table 1 on the following page illustrates this with artificial data constructed so that change in drug use is a function of earlier change in rebelliousness. For each of the five subjects in Table 1, (drug use at $Time_{t+2}$-drug use at $Time_{t+1}$) = (rebelliousness at $Time_{t+1}$-rebelliousness at $Time_t$). For example, Person l's rebelliousness increases by 1 between Time 1 and Time 2, and his or her drug use increases by 1 in turn between Time 2 and Time 3. However, a researcher computing the correlation between each subject's rebelliousness at Time 1 and his or her drug use at Time 4 will find that it is small *and negative* (r = -.10) and, based on this analysis, probably would conclude mistakenly that there is no relationship between rebelliousness and drug use.

The reason for this is that, when a traditional panel correlation is computed, a particular model is being tested. A correlation of 1 between rebelliousness at Time 1 and drug use at Time 4 means that, if an adolescent is, say, one standard deviation above the mean on rebelliousness at Time 1, that student will be one standard deviation above the mean on drug use at Time 4. This model is NOT a model of whether changes in rebelliousness lead to changes in drug use.

TABLE 1. *Artificial data showing a close relationship between rebelliousness and drug use but a small (-.10) correlation between rebelliousness at Time 1 and drug use at Time 4*

	Time 1	Time 2	Time 3	Time 4
Person 1				
Rebelliousness	1	2	5	2
Drug Use	0	0	1	4
Person 2				
Rebelliousness	5	3	10	6
Drug Use	4	2	0	7
Person 3				
Rebelliousness	3	6	5	4
Drug Use	2	0	3	2
Person 4				
Rebelliousness	10	8	9	6
Drug Use	6	6	4	5
Person 5				
Rebelliousness	1	4	8	10
Drug Use	0	2	5	9

The point here is that correlations and correlational procedures, including regression and covariance structure models, do not provide tests of all kinds of causal hypotheses. There are many kinds of causation that are not well represented by a traditional correlational model. To the extent that the model is explicit, a researcher will be able to determine whether he or she is hypothesizing causal relationships that are best tested some other way.

Pitfall #3: Failing To Specify a Model of the Change Process Before Attempting To Measure It

In an influential article, Cronbach and Furby (1970) posed the question, "How should we measure change—or should we?" The article pointed out some of the dangers inherent in measuring and interpreting change, given the limitations of the methodology available at the time. Since the Cronbach and Furby article alerted the scientific community to this important issue, many measurement specialists have turned their attention to the measurement of change. There is good news and bad news. The bad news is that the measurement of change

is in some ways more complicated than ever dreamed. The good news is that there are new approaches to the measurement of change and that more are appearing all the time (Collins and Horn 1991; von Eye 1990). The various approaches to the measurement of change are quite different, but most agree on one point: Every choice a researcher makes about measurement is a choice about a model, either explicitly or implicitly.

Take test-retest reliability as an example. Many researchers believe that establishing substantial test-retest reliability is a desirable goal in longitudinal research. However, when the test-retest reliability model is examined more closely, it becomes clear that this is not necessarily the case. A test-retest reliability coefficient of 1 means that every individual who was K standard deviations above or below the mean at Time 1 is correspondingly K standard deviations above or below the mean at Time 2. As discussed above, where even moderately rapid change is taking place, a high correlation is unlikely. Thus, in any situation where change is likely to take place between Time 1 and Time 2, it is unlikely that test-retest reliability will be high *even if the measurement instrument is precise.*

Test-retest reliability is not a good measure of reliability, nor is it a good measure of stability (even though it is sometimes referred to as a "stability coefficient"). The correlation between Time 1 and Time 2 will be large in any situation where Time 2 scores are a linear transformation, or approximately a linear transformation, of Time 1 scores, The test-retest correlation will be substantial, even perfect, in the presence of a tremendous amount of change, if the change takes place such that all scores increase (or decrease) by approximately the same amount or proportion. (To assess stability, examine the sample means along with the test-retest correlation.)

Even if test-retest reliability is abandoned as a useful definition of reliability, there are still problems with traditional measurement procedures. At first glance, it seems reasonable to go about developing a measure by first ensuring that it has adequate internal consistency reliability (e.g., Cronbach's alpha) and then checking to see that the measure is sensitive to change over time by establishing that it shows a mean change over time. However, Collins and Cliff (1990) show that this approach is not sufficient. They argue that, in

order to assure adequate construct validity, it is important to take as a starting point a model of the change process.

There are several relatively new measurement models that take as a starting point a model of the change process and offer ways of evaluating an instrument on that basis. One example of such a model is the longitudinal Guttman simplex model, or LGS (Collins et al. 1988). This model takes the familiar Guttman simplex model and extends it so that it can be applied to longitudinal panel data. It turns out that this is a model of cumulative, unitary, monotonic growth. Recently this model has been extended to a more general model of growth, where growth may be nonmonotonic (Collins 1992). Embretson (1991) has used an item-response theory approach to developing scales to measure learning over time; this approach has the potential to be useful in measuring substance use and related variables, although as of this writing it has not yet been applied in this context.

Pitfall #4: Assuming That Difference Scores Are Not To Be Trusted

Cronbach and Furby (1970) left many researchers with a fear of measuring change and particularly with a fear of difference scores, which many feel are to be avoided at all costs because "difference scores are unreliable." But as researchers, many inspired by Cronbach and Furby, have continued to ponder the measurement of change, difference scores have staged something of a comeback. Rogosa et al. (1982) and Collins and Cliff (1990) showed that, although it is true that difference scores are often unreliable, *they are not necessarily imprecise measures of change.*

The traditional definition of reliability is phrased in terms of interindividual variability. It states that total variability in an observed score is made up of interindividual variability plus error variability, and reliability is defined as the proportion of total variability that is due to interindividual variability. According to this definition, where there is little or no interindividual variability, there is low or even zero reliability. Difference scores are a measure of intraindividual variability—of change within an individual. If individuals are changing in the same direction at approximately the same rate, difference scores will show relatively little interindividual variability and, hence,

will be unreliable *even if they are perfectly accurate measures of change.*

In short, difference scores may be simultaneously unreliable and highly precise measures of change. There is a problem, but it is not with difference scores. Rather it is with the application of a definition of reliability that is irrelevant to the measurement of change and, therefore, not an indication of how well difference scores measure change.

Pitfall #5: Performing Analyses at a Different Level From the One at Which the Research Question Is Posed

It has become a truism in prevention research that the unit of assignment should always be the unit of analysis. In the author's opinion, this is a mistaken notion. Instead, analyses should be done at the level at which the question is posed.

For example, suppose a researcher is interested in knowing whether a prevention program is more effective with males or with females. He or she has assigned classrooms to conditions so, according to the truism, the analyses should be performed at the classroom level; that is, classroom means should be analyzed on all variables. If the researcher carries this out, he or she will be working with the following: a dummy variable representing whether a classroom participated in the program or was a control classroom; the classroom mean on the dependent variable, such as drug use; and a variable representing the "gender" of the classroom. Usually this would be the proportion of the classroom that was one gender, male for instance, or perhaps a dummy variable taking on a value of 1 if the classroom has more males than females.

Now suppose the researcher finds that gender interacts with the program so that "male" classrooms in the program have lower substance use. This can be interpreted only as follows: Average drug use in program classrooms that are more than half male is lower than drug use in program classrooms that are more than half female. This does NOT answer the original question of whether there are gender differences in program effectiveness: it is perfectly possible for these results to obtain even if there are no gender differences at the individual level

or even if there are gender differences in the *opposite direction.* Table 2 presents some artificial data that form exactly this pattern. This phenomenon is a version of the ecological fallacy first pointed out by Robinson (1950).

TABLE 2. *Artificial data showing means based on classroom-level data in the opposite direction from means based on individual-level data*

	> 50% Male $\bar{x} = 2.5$		> 50% Female $\bar{x} = 7.5$	
	Class 1	Class 2	Class 3	Class 4
Males ($\bar{x} = 5.3$)	3 4 5	2 3 4	8 9	7 8
Females ($\bar{x} = 4.7$)	1 2	0 1	10 6 7	9 5 6

The truism that the unit of assignment always should be the unit of analysis is damaging because researchers who follow it are prevented from doing analyses that address the research questions of central interest in prevention. Of course, there can be problems with performing analyses at the individual level when individuals are grouped in higher levels, such as classrooms. Analyses done at the individual level when there is a higher-level structure in the data can suffer from greatly inflated Type I error rates. However, researchers no longer are forced to choose between analyses at the individual level and analyses at some higher level. One alternative is a procedure for removing the effects of dependency among observations from the analysis of variance (ANOVA), thereby producing a Type I error rate much closer to the nominal error rate (Dielman, this volume). Alternatively, researchers can choose an exciting new approach called multilevel analysis (Kreft, accepted; Bryk and Raudenbush 1992).

Multilevel analysis is a method for modeling the entire multilevel structure in a data set, including interactions between effects at various levels. For example, researchers may hypothesize teacher effects; this probably would be at the classroom level. They also may hypothesize that size of school interacts with type of program; size of school is a school-level effect, and type of program may be one as well. The researcher may hypothesize that academic achievement interacts with the intervention; this is an individual-level effect. Multilevel approaches have many advantages over traditional approaches. One of the most significant advantages is the flexibility in model-testing that they afford.

The unit of analysis question in prevention research is a difficult one. The model-based approach advocated here suggests that multilevel analysis usually is the preferred method. However, computer software and documentation to perform these analyses are not readily available everywhere as of this writing. The correction advocated by Dielman (this volume) requires no special software and is easy to implement for relatively simple designs. If neither of these approaches is an option, the next best alternative simply is to carry out analyses at the level at which the research question is posed, making sure to give careful consideration to possible threats to valid inference. This approach is not without problems, but an answer (even if flawed) to the right question is better than an answer to the wrong one.

Pitfall #6: Examining Subgroup Differences Simply by Including a Variable Representing Group Membership

At first glance, it often seems that models should be developed on an entire sample and, after an appropriate model is found, group differences on that model can be introduced. However, this can be very misleading if, as often is the case, there are group differences in the model itself. The determinants, covariates, and consequences of substance use, as well as program effectiveness and the variables that interact with program effectiveness, may vary considerably depending on such grouping factors as gender and ethnicity.

It is best to carry out the study of group differences systematically. An outline of how to proceed was first suggested by Jöreskog (1971). Essentially, his approach involves first looking for qualitative

differences between groups before looking for quantitative differences. The procedure begins with an examination of whether the model that best represents the process differs across groups. For example, in a covariance structure model, it may be that a particular latent variable appears in one group but does not appear in another or that variables have factor loadings substantially different from one group to another so that the latent variables have different definitions across groups. If either of these situations is observed, then it does not make sense to look further for group differences. The groups are qualitatively different. If the same model holds across groups, then it makes sense to begin looking for quantitative group differences (i.e., differences in mean levels of relevant variables).

One example of this procedure can be found in Collins and colleagues (accepted). These authors were interested in gender differences in early substance use onset. They conceptualized drug use onset as a sequence of stages. Collins and colleagues (accepted) began by specifying a series of models and testing each of the models separately in a male sample and a female sample. The results indicated that the same model represented males and females. Once this had been established, it made sense to look for quantitative gender differences. If qualitatively different models had been needed to describe each gender, then it would have been impossible to make simple quantitative gender comparisons; that would have been like comparing apples and oranges.

When testing models in various subgroups, it is important to be cautious about interpreting group differences. There is a danger of concluding that observed group differences are meaningful when, in reality, they are due merely to normal sample-to-sample fluctuation that occurs when samples are drawn from the same population. Collins and colleagues (accepted) used cross-validation (Cudeck and Browne 1983) to establish that the gender differences they observed were reliable ones. Cross-validation is done by randomly splitting a sample into two (or more) subsamples. Model-fitting is carried out in each subsample separately, and the results are compared. Only when the between-subgroup variability exceeds the between-subsample variability are strong conclusions about subgroup differences warranted.

CONCLUSIONS

Whenever a drug abuse prevention study is designed, a measurement instrument is evaluated, or a statistical analysis is chosen, a statement about a model of the drug use onset process is being made. This chapter has attempted to convince the reader that it is important to make this model explicit and to let it serve as a guide so informed choices can be made. In so doing, the researcher will carry out studies that provide direct answers to the drug abuse prevention intervention questions of most interest and along the way will avoid the pitfalls discussed above. The following section summarizes this chapter in the form of a list of brief recommendations.

RECOMMENDATIONS

1. Treat temporal spacing of observations in a study like any other design consideration; that is, the spacing that is chosen needs to be justified. Ideally, the justification will be in terms of how best to observe the phenomenon of interest. In cases where financial or logistical considerations have limited the choices, any expected impact of the temporal spacing on the results should be discussed.

2. Recognize that routine statistical analyses, such as correlations and procedures based on correlations, do not provide tests of all causal models. The model-based approach advocated here helps the researcher to start with a clear idea of the research question, which is the key to selecting an appropriate statistical analysis.

3. Recognize that, by choosing a measurement model, the researcher is choosing a model of the latent variable he or she wishes to measure. This is true whether a traditional or a new measurement model is chosen.

4. Do not assume automatically that difference scores provide a poor measure of change. Difference scores cannot be evaluated by traditional procedures; measures of change should be evaluated by procedures designed for measuring change.

5. Do analyses at the level at which the question is posed but do not ignore the threats to the validity of the conclusions this may present. Try adjusting the ANOVA for dependency among observations (Dielman, this volume) or use multilevel analysis (Kreft, accepted).

6. If the model suggests subgroup differences, systematically look for qualitative subgroup differences before looking for quantitative differences. Where possible, cross-validate in order to draw the strongest conclusions about group differences.

7. One cost of the model-based approach may be the discovery that traditional or routine statistical analyses will not allow testing of the model. When this happens, the reader is encouraged to investigate some of the new measurement and statistical analysis procedures that are continually being developed. A National Institute on Drug Abuse monograph (Collins and Seitz, accepted) is being prepared to help introduce some state-of-the-art methodological procedures to prevention researchers. The monograph contains chapters on topics such as latent class and latent transition models (Uebersax, accepted; Collins et al., accepted), missing data procedures (Graham et al., accepted), survival analysis (Singer and Willett, accepted), and multilevel analysis (Kreft, accepted), among others.

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Correction for the Design Effect in School-Based Substance Use and Abuse Prevention Research: Sample Size Requirements and Analysis Considerations

T. E. Dielman

The issue to be addressed in this chapter is that of sample size requirements and the use of the appropriate analytic model and standard error estimates in studies where the observational units are sampled in clusters or groups rather than simple random samples. This situation is common in alcohol, tobacco, and other drug (ATOD) use and abuse prevention studies conducted in the schools, where the sampling cluster typically is the classroom or the school and the unit of observation and analysis is the individual student. The problem is generalizable to similar situations, such as studies of hospitals or other organizations, neighborhoods, and communities. In studies of this sort, the standard error is inflated due to the fact that there tend to be within-cluster correlations on the study variables. For example, attitudes tend to be more similar *within* than among neighborhoods, and substance use and abuse patterns tend to be more similar *within* classrooms or schools than among them. This similarity is familiar to most social scientists and is called the intraclass correlation. The intraclass correlation among the elements in sample clusters leads to an inflation in the variance of the study variables that are measured in cluster sample designs. The variance inflation factor has been termed the design effect (abbreviated DEFF) (Kish 1965). A correction of the estimated sample size and standard errors to take the DEFF into account is becoming quite important in the review of research proposals and articles concerning the evaluation of school-based substance abuse prevention programs.

BACKGROUND

Lindquist (1940) recognized the general problem of the non-independence of error when clustered sampling is used with the analysis conducted at the individual level and suggested the use of class means as the appropriate level of analysis. In reviewing Lindquist's text, McNemar (1940) expressed the suspicion that "something is wrong with a test of significance that does not involve the variation of the individuals upon which the means are based." McNemar did not offer a solution to the problem, however. Since 1940, researchers have addressed the problem in various ways, as discussed below, and with varying degrees of success (Kempthome 1952; Lindquist 1953; Lumsdaine 1963; Campbell and Stanley 1963; Raths 1967; Fletcher 1968; Peckham et al. 1969; Glass and Stanley 1970). The correction for the DEFF was introduced by Kish (1965) to correct the standard error term when cluster sampling methods were used. The DEFF also has been termed the "inflation factor" by Donner and colleagues (1981) in epidemiologic applications. Epidemiology researchers pointed out in 1978 that "randomization by cluster accompanied by an analysis appropriate to randomization by individual is an exercise in self-deception, however, and should be discouraged" (Cornfield 1978). In clinical research, the problem was noticed due to within-litter variation among guinea pigs and has been discussed as "extra-binomial variation" (McCullagh and Nelder 1983). Other studies of approaches to the analysis of data resulting from clustered sampling include Cohen (1976), Altham (1976), and Donner (1982, 1985). There is a voluminous body of literature on clustered sampling from the survey research statistics area, which is nicely summarized by Lee and colleagues (1989).

In the educational research field, Barcikowski (1981) recognized the analytic problem and provided tables for situations in which group means were used as the units of analysis. In response, Blair and Higgins (1986) commented, "Apparently unrecognized by Barcikowski, and perhaps by the research community at large, is the fact that under the conditions specified by the use of these tables (i.e., knowledge of the intraclass correlation), one would not generally wish to carry out analyses based on group means since a superior analytic strategy is available in this situation." Hopkins (1982) noted, "The common recommendation to use group means where there may be nonindepend-

ence among observational units is unnecessary, unduly restrictive, impoverishes the analysis, limits the questions that can be addressed in a study, and does not ensure that the relevant independence assumption has been met." Hopkins (1982, p.17) further stated that "when random factors are properly identified and included in the analysis, the results for all common effects (Fs and critical Fs) are identical in balanced ANOVA designs, regardless of the observational unit employed. The use of individual observations, however, also allows other interesting questions pertaining to interaction and generalizability to be explored."

Although the DEFF problem has been recognized and taken into account by survey researchers and others since 1965, the early drug abuse prevention studies did not recognize the parallel, and investigators randomly assigned classrooms or schools to the treatment or control conditions (when random assignment was conducted at all) and conducted the analyses in the standard manner using balanced design models and the standard error terms one would employ if individuals had been sampled randomly and randomly assigned to conditions. Numerous studies used this approach, and references can be found in reviews of the early drug prevention studies (Berberian et al. 1976; Staulcup et al. 1979; Kinder et al. 1980).

Although prevention researchers became aware that the use of clustered sampling accompanied by individuals as the unit of analysis introduced some statistical error, the first approach to remediation of the error, in spite of the earlier literature to the contrary in educational, epidemiological, and clinical research, was to use the classroom or school as the unit of analysis as well as the unit of assignment to conditions, with classroom or school means rather than individual raw scores serving as the dependent variable scores (McAlister et al. 1979; Moskowitz et al. 1984). This amounted to remedial overkill and a great deal of information was lost, for there is typically substantial within-class variation on the dependent variables in these situations. Murray and colleagues (1989) discussed the use of either the analysis of group means or hierarchical analysis of variance (ANOVA) as correction strategies, noting the advantages and disadvantages of each for internal and external validity. In a subsequent paper, Murray and Hannan (1990) favored the hierarchical analysis approach.

Investigators who have used the intraclass correlation in substance abuse prevention studies (Campanelli et al. 1989; Dielman et al. 1989; Murray and Hannan 1990) have found that the intraclass correlation for the dependent variables of ATOD and abuse typically is quite small (ranging from 0 to .05), although usually of a sufficient magnitude to warrant adjusting for it in sample size determination and data analysis. Using the classroom or school as the unit of analysis results in requiring an unreasonably large sample, and using class or school means as the dependent variable scores is based on the untenable assumption that all individuals within a class or school are equal, or nearly so, on their dependent variable scores.

The use of class averages as the unit of analysis also is subject to the "ecological correlation" problem. Regression estimates for group averages will not always correspond to correlations for individuals when the variance inflation is taken into account. This analysis approach also introduced another source of methodological error, especially in prevention studies, which are by the nature of the hypothesis being tested longitudinal in their design. The use of the class or school as the unit of analysis assumes that the classes or schools are composed of the same individuals at each measurement point in the study. This simply is not the case. Students move from one school to another within a district, move across districts and across study conditions after the intervention has occurred, drop out of school, or are absent on different occasions. Furthermore, new students who have never been exposed to the experimental treatment move into districts.

The question being asked in prevention studies generally is whether the experimental treatment results in a *lower rate of increase* on the dependent variables (e.g., ATOD use and abuse) compared to a control group. To test this, individuals must be followed over the measurement occasions. If the individuals move, an attempt should be made to track them and obtain measurements from them at their new location. Individuals who were not in either the control or treatment condition at the pretest occasion should not be included later. Although entire classrooms usually are tested at posttest occasions for logistical reasons and the scores of new students can be used in auxiliary analyses, these scores never should be used in the analyses testing the effectiveness of the intervention.

A second approach to the problem was the use of hierarchical analyses—treating classes or schools or both, within treatment conditions, as nested design factors (McAlister et al. 1979; Hopkins 1982). The usual nested effects model in large-scale studies that assign schools to treatment conditions for two or more communities will have schools nested within communities and treatment conditions and classrooms nested within communities, schools, and treatment conditions. The use of hierarchical analysis models and correction for DEFFs is really a way of dealing with two separate but sometimes related problems. The hierarchical analysis models take nested models into account, while the correction for the DEFF takes clustered sampling methods into account whether or not a nested model is used. The hierarchical analysis approach has the advantages of permitting the use of individual raw scores in longitudinal analyses and use of the nested error terms for the model. The disadvantages are that degrees of freedom are lost in tests of nested effects, the design requires more schools per condition for testing these effects, and the interaction effects between variables where nesting occurs are not testable. Working through a few examples with a good, standard ANOVA text (Winer 1962) will convince the interested reader that the expected values of the mean squares for such designs can become quite complicated and that the interaction effects involving nested factors are not testable (Winer 1962, pp. 104-199). Further, the effects that are testable still are not corrected for the DEFF unless the model includes allowance for correlated error. Recent advances in the field of hierarchical linear modeling allow for this, and use of the appropriate model would correct for the DEFF (Bryk and Raudenbush 1992).

USE OF THE DEFF CORRECTION

Use of the correction for DEFFs has the advantages of enabling use of individual raw scores for individual longitudinal followup, use of all standard statistical hypothesis testing techniques, and testing of interactions that are not totally nested in the design. It also is generalizable to the calculation of sample size requirements, as already noted by Donner and colleagues (1981) and Murray and Hannan (1990). As mentioned above, the problem arose in survey research when researchers sampled clusters (e.g., groups of housing units) rather than using simple random sampling techniques. Cluster sampling results in

increased variances for sample estimates due to the within-class or within-cluster correlations on the dependent variables. This within-class, or intraclass, correlation has been used in social science research for some time, for example, as a method of calculating interrater reliability (Guilford 1954).

The intraclass correlation is simply the ratio of the difference between the dependent variable between- and within-class variances to the total variance, or in its simplest form,

$$\rho = \frac{\left(S_b^2 - S_w^2 \right)}{\left[S_b^2 + \left(\tilde{n}_g - 1 \right) S_w^2 \right]}$$

where S_b^2 is the between-class variance, S_w^2 is the within-class variance, $\tilde{n}_g$ is the harmonic mean group (class or cluster) size, and p is the intraclass correlation. The two variance terms can be obtained from any one-way ANOVA subroutine using the unit of assignment (e.g., classroom or school) as the independent variable. There are more sophisticated subroutines that complete all of the necessary calculations. For example, SUDAAN (Shah 1990), a set of software produced by Research Triangle Institute, allows one to specify both the model and design in the analysis subroutines. Collins and colleagues (1989) have shown that the usual estimators of the intra-class correlation, the least squares and the maximum likelihood estimators, are negatively biased (i.e., they are underestimates of the necessary inflation factor). Donoghue and Collins (1990), working with the derivation of the minimum variance unbiased estimator of the intraclass correlation provided by Olkin and Pratt (1958), have provided a computer program for calculation of the unbiased estimator. The correction was not trivial in the example provided by Donoghue and Collins (1990), and use of the correction is recommended.

The design effect, DEFF = $1+[p(\tilde{n}_g-1)]$, is used to multiply the standard error of the estimate being used in order to account for the intraclass correlation. Once the standard error is inflated by the DEFF,

the statistic can be computed in the usual way, and the confidence intervals for estimates can be ascertained using standard tabled values for the *z*- or *t*-statistic or the *F*-statistic in a close approximation. In correcting the more complicated research designs, it is more precise to specify the appropriate model (e.g., nested effects) as well as the clustered sampling effect.

Use of the DEFF is directly generalizable to sample size calculations. These generalizations as applicable to school-based prevention research are shown quite adequately in Murray and Hannan (1990) and will not be repeated here except for one example. The calculation of the necessary per-cell sample size for the usual longitudinal study, excluding the DEFF, is:

$$N = \frac{[4\ (Z\alpha + Z\beta)^2\ (1 - r)\ s^2]}{d^2}$$

where Za is the critical value beyond which a tolerable Type I error falls, Zß is the critical value beyond which a tolerable Type II error falls, r is the correlation between scores at two points in time (e.g., pretest and posttest), s^2 is the cross-sectional dependent variable variance, and d^2 is the square of the hypothesized magnitude of the final outcome difference between treatment conditions on the dependent variable. Adding the DEFF to the calculation simply requires multiplying the numerator by $1+(\tilde{n}_g-1)p$.

For example, assume that the required n per cell is 100 without taking DEFF into account. In the usual prevention study conducted by the author and his colleagues, the average class size has been around 25, and the usual case involves an average of two classes per grade level within a school, so the average school size has been about 50. The typical intraclass correlation has been around .02 or .03. If the school has been the unit of assignment, and if p = .02, the DEFF calculation usually has resulted in a value of approximately DEFF = 1+(50-1)(.02) = 1.98, and the required per-cell sample size therefore has been 198 rather than 100. When p increases to .03, however, a DEFF of 2.47 and a required per-cell sample size of 247 results, There is a linear increase in the DEFF and the required cell size with further increments in p.

By contrast, using class averages as the dependent variable would require 100 classrooms (rather than 100 subjects), or about 2,500 students (given about 25 students per classroom) per cell, and the disadvantages noted above would remain. The use of hierarchical ANOVA, not allowing for correlated error in the model, also would be subject to the disadvantages noted above. The sample size resulting from the DEFF approach maximizes efficiency and minimizes untenable assumptions, while providing a correction for the DEFF in the determination of the desired sample size and the data analyses. In practice, the DEFF will differ for each dependent variable and for each subgroup (e.g., gender, ethnic group, or grade level) because of differences in the intraclass correlations, including the average class size, on the variables. When calculating the desired sample size, one can proceed by making conservatively large estimates, basing estimated sample size requirements on the DEFF for the variable with the largest DEFF or on the largest DEFF of the variables that are most important in the study. In estimating the intraclass correlation for sample size determination purposes, most difficulties usually arise when the intraclass correlation may differ by location or grade level or both. If no prior local data are available for this purpose, a local pilot study is recommended in order to estimate the magnitude of the intraclass correlation. The calculations are straightforward for the correction for DEFF in the statistical analyses, as mentioned above, and one can calculate the interclass correlations for each subanalysis directly from the study data.

SUMMARY

The typical school-based substance abuse prevention study uses classrooms or schools as the unit of assignment to study conditions. It is inappropriate to use individuals as the unit of analysis in this condition, as the individuals probably are not entirely independent observational units. Early studies proposed using class means as the units of analysis, which discards much individual variance. Superior, more recent strategies are available. The correction of the sampling variances for the DEFF has been available for about 25 years and now is becoming more widely used by researchers in the substance abuse prevention field. This correction should be used for both sample size estimation and subsequent analyses.

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Analysis of Mediating Variables in Prevention and Intervention Research

David P. MacKinnon

This chapter describes mediation analysis in prevention and intervention studies. First, the links between theory and the mediators targeted in prevention and intervention programs are emphasized, and reasons for conducting mediation analysis are listed. Second, the statistical procedures in mediation analysis are given and applied to a drug prevention example. Finally, guidelines for mediational analyses in prevention and intervention grant applications are described.

INTRODUCTION

Everyone has ideas about how to prevent health problems:

- "If we change social norms regarding drug use, we will prevent drug abuse."
- "If women know the importance of detecting cancer early, they will get screened for breast cancer."
- "If athletes know that there are effective nutrition and training alternatives to anabolic steroids, they will not put themselves at risk by using steroids."
- "If pregnant women are warned about fetal alcohol syndrome, they will not drink alcohol while pregnant."

Ideas like these suggest that health problems can be prevented by first changing intermediate behavioral, biological, psychological, or social constructs.

These intermediate constructs thought to prevent health problems are called mediating variables or mediators. Prevention programs are designed to change these mediators. A variable functions as a mediator of a prevention program if the mediator accounts for the relation between exposure to the prevention program and the outcome measure (Baron and Kenny 1986). It is assumed that the prevention program influenced the mediator, which consequently affected the outcome measure (Sobel 1990).

Figure 1 summarizes prevention programs in many substantive areas. In this general scheme, a prevention program is designed to change mediating variables that are hypothesized to be causally related to the outcome. If the mediating variables are causally related to the outcome, a prevention program that changes the mediating variables will change the outcome.

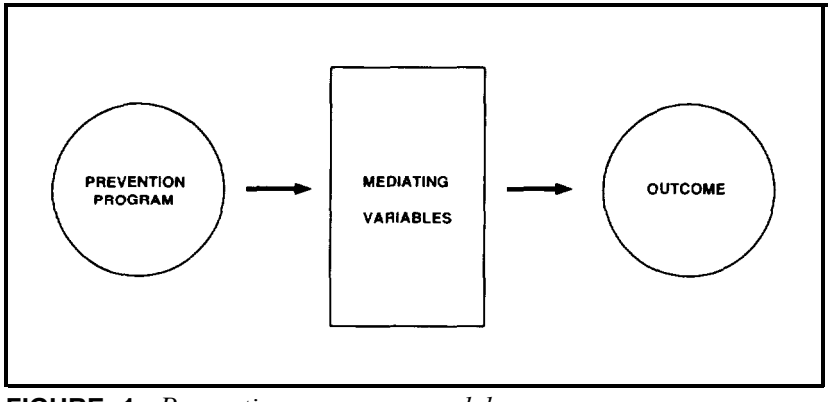

FIGURE 1. *Prevention program model*

A wide range of constructs serve as potential mediators. Mediating constructs can be biological (e.g., blood pressure), psychological (e.g., attitudes), or behavioral (e.g., exercise). Programs to prevent coronary heart disease often target such behaviors as smoking and such biological factors as cholesterol and blood pressure (The Multiple Risk Factor Intervention Trial Research Group 1990). Social influence-based drug prevention programs are designed to increase skills to resist drug offers and establish norms less tolerant of drug use (Flay 1985). Most acquired immunodeficiency syndrome (AIDS) and sexually

transmitted disease (STD) prevention programs are designed to increase safer sex practices and abstinence to reduce infection (Mays et al. 1989).

Figure 1 summarizes secondary and tertiary prevention programs as well. Secondary prevention campaigns to increase screening rates for serious illness, such as mammography and breast cancer, attempt to increase knowledge about early detection of disease, reduce barriers to screening, and change norms regarding screening (Murray et al. 1986; Shapiro 1976). Tertiary prevention in substance abuse treatment programs target mediators like communication and support to prevent relapse (Prochaska et al. 1992). Examples of the mediators targeted in other prevention research studies are shown in table 1.

Mediator analysis is the statistical analysis of: (1) the effect of an independent variable, such as exposure, to a prevention program on mediating variables and (2) the link between program effects on mediators with program effects on outcomes. Mediator analysis also is called process analysis (Baron and Kenny 1986; Judd and Kenny 1981*a)* and effect decomposition (Alwin and Hauser 1975; Hayduk 1987). The term "process analysis" reflects that the chain from the prevention program to the mediator to the outcome is the hypothesized process by which the prevention program is effective. The term "mediator analysis" is used in this chapter, rather than process analysis, because process analysis also refers to the monitoring of treatment implementation (Coyle et al. 1991; Isaac and Michael 1989). "Effect decomposition" is the term most commonly used in nonexperimental studies where the total effect of an independent variable is separated into the direct effect of the independent variable on the outcome variable and the indirect effect of the independent variable on the outcome through changes in one or more mediators (Alwin and Hauser 1975). The terms "mediated effect" and "indirect effect" are used synonymously in this chapter.

The success of prevention programs is determined appropriately by effects on outcome variables, such as death, disease, or drug use. If researchers measure mediating constructs as well as outcome measures, they gain more information about the prevention program and about theories of health behavior. Despite the information gained from

TABLE 1. *Examples of mediators and outcomes for prevention studies*

REFERENCE	TWO MEDIATERS	OUTCOMES
Symtomology in Children of Divorce (Sandler et al. 1988)	Quality of Parent-Child Relationship Child's Active Coping	Conduct Problems Anxiety Depression
Drug Abuse (Hanson 1992)	Social Norms Resistance Skills	Cigarette Use Alcohol Use Marijuana Use
Learning Disorders (Silver and Hagin 1989)	General Social Competency Skills Specific to Learning	School Achievement Standardized Test Scores
Symptomatology After Disasters (Pynoos and Nader 1989)	Affirm Family Support Facilitate Through Grief Stages	Depression Anxiety Fear
Suicide (Shaffer et al. 1989)	Awareness of Hotline Services Referrals to General Psychiatric Care	Suicide Intention Deaths Due to Suicide
Delinquency (Dryfoos 1990)	Educational Achievement Parental Support and Guidence	Arrest Records
Teenage Pregnancy (Dryfoos 1990)	Educational Achievement Parent-Child Communication	Unintentional Pregnancy Unprotected Intercourse
AIDS/HIV Sexually Transmitted Diseases (Coyle et al. 1991)	Safer Sex Practices Abstinence	Unprotected Sexual Relations Sexually Transmitted Diseases
Adolescent Anabolic Steroid Use (Goldberg et al. 1991)	Alternatives Social Norms	Anabolic Steroid Use
Mental Illness (Heller et al. 1984)	Positive Coping With Stress Social Competency	Adjustment DSM 111 Diagnosis

mediational analyses (Baron and Kenny 1986; Judd and Kenny 198 la; McCaul and Glasgow 1985), few prevention studies have reported program effects on mediating variables, and fewer have tested the link between effects on mediating variables and effects on outcome variables (MacKinnon et al. 1988).

THEORY AND SELECTION OF MEDIATORS

Theory provides a framework for understanding health behavior across situations and populations (Flay and Petraitis 1991; Hansen, this volume; Kellam, this volume; Lorion et al. 1989). Theories of health behavior guide the selection of mediating constructs in most intervention and prevention programs. By using theory to design programs, researchers benefit from previous research and synthesis. A prevention program based on established theory may be more likely to change the outcome measure, and the results would provide scientific evidence for the refutation or acceptance of the theory.

Social Learning Theory (Bandura 1977), Problem Behavior Theory (Jessor and Jessor 1977, 1980), and the Theory of Reasoned Action (Ajzen and Fishbein 1980), for example, provide much of the background for drug prevention approaches. These theories suggest that social norms, social skills, and beliefs play important roles in the initiation and progression of drug use. Drug prevention programs attempt to change mediators with one or more of the following twelve program components: information, decisionmaking, pledges, values clarification, goal-setting, stress management, self-esteem, resistance skills, life skills, norm-setting, assistance, and alternatives (Hansen 1992).

Theory is used to target mediators that can be changed. Both theoretical and practical considerations limit the mediators that realistically can be changed in a prevention study. More effort probably will be needed to change personality characteristics like risk-taking behavior than to change knowledge of the risks of drug use, for example.

In many studies, it is not possible to include measures of each step in the hypothetical chain of mediation leading to the outcome measure. For example, it may be impractical to measure each of the six constructs in a theoretical chain from exposure to a program component, comprehension of the component, retention of the component's message, short-term attitude change, long-term attitude change, and long-term refusal to use drugs because of attitude change. In this case, a researcher may measure only an overall attitude mediator rather than all mediators in the chain. Cook and Campbell (1979) make this distinction between molar mediation, where some steps in a theoretical chain are not measured, and micromediation, where each link in a chain is measured. Researchers must decide how many steps in a mediational chain will be measured. Theory can provide a rationale to identify the most important mediator in the chain.

A related choice must be made about outcome measures. The outcome measure in many studies actually is a mediator in a longer mediational chain; for example, cholesterol level may be the studied outcome, but death due to coronary heart disease is the ultimate outcome. In prevention studies without the ultimate outcome variable, theory or past research must link the outcome studied with the ultimate outcome.

REASONS FOR ANALYSIS OF MEDIATING VARIABLES

Below are seven related benefits of conducting mediation analysis in prevention and intervention studies (Judd and Kenny 1981*a;* MacKinnon et al. 1991*a;* McCaul and Glasgow 1985). The discussion of the reasons for mediator analysis assumes that the program was implemented well and that the mediator and outcome measures are sufficiently valid (Pedhazur and Pedhazur-Schmekin 1991; Crocker and Algina 1986).

Manipulation Check

Mediation analysis provides a check on whether the program changed the intervening variables it was supposed to change. If the program did not change the mediator hypothesized to prevent the problem behavior, it is unlikely to change the outcome variable. A program to

increase knowledge about the importance of early cancer detection, for example, should yield program effects on knowledge measures.

Program Improvement

Mediation analysis identifies successful and unsuccessful program components. One interpretation of a lack of program effect on a mediating variable is that a program component failed. If a program component did not change the mediator, then the component must be improved. If no program effects on skills to resist drug-use offers are found, for example, the program may need to improve resistance skills training. A program component ineffective in several studies should be removed or replaced by another component, unless there is evidence that it has an important relationship with other more successful components.

Measurement Improvement

Lack of a program effect on a mediating variable also can suggest that the measures of the mediator were not reliable or valid enough to detect changes. If no program effects are found on skills to resist drug-use offers, for example, the program may need to improve measurement of resistance skill. In an ideal situation, the psychometric properties of mediating variables are resolved prior to the study.

Delayed Effects

Program effects on mediating variables but not outcome measures may suggest that program effects on outcomes will emerge later. For example, the ultimate effects of an elementary-school drug prevention program on drug abuse may not be evident until the students are older.

Testing of the Process of Mediation

Mediation analysis provides information on how the prevention program achieved its effects. Such information increases understanding of the mechanisms underlying changes in the outcome. For example, if prevention program effects on drug use are found, it is possible to study whether the changes in mediators like social norms or resistance skills or another mediator were responsible for the reduction

in drug abuse. In the drug prevention study described below, there was evidence that change in norms was an important mediator of program effects.

Theoretical Implications

One of the greatest strengths of mediation analysis is the ability to test the theories upon which prevention programs are based. Many theories are based on results of cross-sectional studies with little or no experimental verification. In this respect, mediation analysis in the randomized design often used in prevention intervention research is the ideal environment for testing theories. Competing theories of the onset of drug abuse, for example, may suggest alternative mediators that can be tested in an experimental design.

Practical Implications

Prevention programs will cost less and provide greater benefits if effective and ineffective components can be identified. Outcome measures in prevention research usually have clear, practical importance, such as daily smoking or early cancer diagnosis.

STATISTICAL ANALYSIS OF MEDIATING VARIABLES

Important mediators may be identified when the level of a mediating variable can be randomly assigned to subjects. For example, Hansen and Graham (1991) experimentally compared two major social-influence components—one to establish conservative norms, the other to increase resistance skills. They found greater evidence for the mediational pathway through social norms rather than resistance skills. Although randomization of subjects to levels of the mediator is ideal, it often is difficult to accomplish in prevention research. Programs include multiple components targeting many mediators, and it may not be feasible to test the effects of each mediator or subgroup of mediators in separate studies. Even when randomization of subjects to the level of mediators is possible, the link between the program effect on the mediator and the outcome should be tested using the procedures described below.

Mediation Analysis

The parameter estimates and standard errors in three regression equations provide the necessary information for three tests to establish mediation for the case of one mediator and one outcome variable (Judd and Kenny 1981*a,* 1981*b).* The author adds a fourth test.

$$\text{Conclusion 1: } Y_O = \tau X_P + \epsilon_1$$
$$\text{Conclusion 2: } X_M = \alpha X_P + \epsilon_3$$
$$\text{Conclusion 3: } Y_O = \tau' X_P + \beta X_M + \epsilon_2$$

The symbols in the equations are the following: Y_O is the outcome variable; X_P is the independent variable (prevention program); X_M is the mediator; τ codes the relationship between the program and the outcome; τ is the coefficient relating the program to the outcome, adjusted for the effects of the mediator; a is the coefficient relating the program to the mediator; ß is the coefficient relating the mediator to the outcome variable, adjusted for the program; ϵ_1, ϵ_2, and ϵ_3 code unexplained variability; and the intercept is assumed to be zero, so scores are in deviation form. It is assumed that the relationship (ß) between the mediator (X_M) and the outcome (X_P) in the program and control groups differs only in sampling variability.

Conclusion 1: The Prevention Program Causes the Outcome Variable. The test of the statistical significance of the program effect (τ) is conducted in all prevention studies. Judd and Kenny (1981*a)* advise that, if there is not a program effect, the mediation analysis should stop as there is no effect to mediate. Later, Judd and Kenny (1981*b,* p. 207) note it is possible for there to be mediation even when the program effect is insignificant. If some mediators reduce the problem behavior and others increase the problem behavior (a suppressor effect), there may be a nonsignificant overall program effect when mediation actually exists. Prevention programs are designed to have a beneficial effect on one or more outcome variables, and mediators then are chosen to lead to this goal. It is possible that a program component may backfire or not work as planned and actually produce disadvantageous results. In such a case, mediational analyses may uncover such patterns. Models that include positive and negative mediation (suppression) effects are called inconsistent models (Blalock 1969; Davis 1985).

Conclusion 2: The Prevention Program Causes the Potential Mediator. This test determines whether there is a statistically significant program effect on the mediator (a). Program effects on mediators are reported infrequently in research articles, even though such results identify the mediators that the prevention program successfully changed (McCaul and Glasgow 1985).

Conclusion 3: The Mediator Must Cause the Outcome Variable Controlling for Exposure to the Prevention Program. The effect of the mediator on the outcome variable (ß) must be statistically significant when controlling for the effect of the prevention program variable (τ'). If the treatment effect is zero when adjusted for the mediator, there is evidence for mediation (Judd and Kenny 1981*a,* 1981*b).* Baron and Kenny (1986) further refine Conclusion 3 to ensure that the effect is a mediator and not a suppressor by requiring that the program effect (τ) for Conclusion 1 be larger than the program effect (τ') for Conclusion 3.

Conclusion 4: The Mediated Effect Is Statistically Significant. It is unlikely that a single mediator would completely explain prevention program effects (Baron and Kenny 1986). A method to determine the confidence limits of the mediated effect for partial as well as complete mediated effects is needed.

The mediated effect is calculated in two ways. The value of the mediated or indirect effect equals the difference in the program effect with and without the mediator (τ-τ') (McCaul and Glasgow 1985). If the independent variable coefficient (τ') is zero when the mediator is included in the model, the effect of the independent variable is mediated entirely by the mediating variable as mentioned in Conclusion 3.

A second method that yields identical mediated-effect estimates is based on path analysis. The mediated effect is equal to the product of the a and ß parameters. The coefficient relating the independent variable to the outcome adjusted for the mediator (τ') is the nonmediated or direct effect. As shown in figure 2, the rationale behind this method is that mediation depends on the extent to which the independent variable changes the mediator (α) and the extent to which the

mediator affects the outcome variable (ß). The following formulas summarize the effects:

Total Effect = $\alpha\beta + \tau'$
Mediated Effect = Indirect Effect = $\alpha\beta = \tau - \tau'$
Direct Effect = τ'
Proportion Mediated = $\alpha\beta/\tau = \alpha\beta/(\alpha\beta + \tau')$.

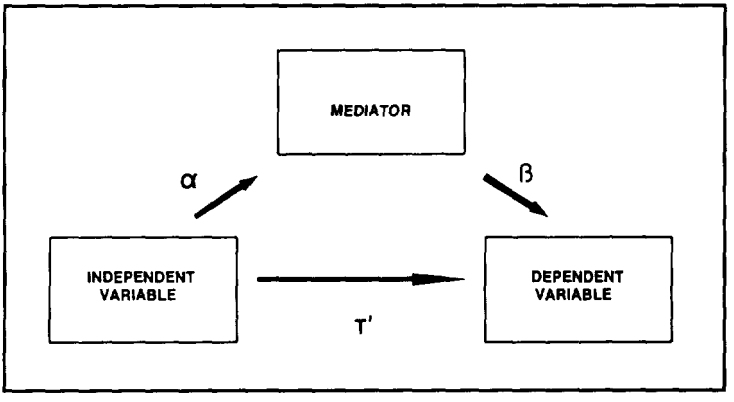

FIGURE 2. *Mediation model*

Standard Error of the Mediated Effect

The large sample variance of the indirect or mediated effect derived by the multivariate delta method (Folmer 1981; Sobel 1982, 1986) is equal to $\sigma_{\alpha\beta} = \sqrt{\alpha^2\sigma_\beta^2 + \beta^2\sigma_\alpha^2}$. The formula is not exact because it does not include a $\sigma_\alpha^2\sigma_\beta^2$ term, but this term is typically small (Goodman 1960; Mood et al. 1974; Rice 1988). Simulation studies (MacKinnon et al. 1991*b,* 1992; Stone and Sobel 1990) indicate that this standard error based on large-sample theory appears to be satisfactory even at small sample sizes under multivariate normality. For the simple mediation model described above and multivariate normal data, the true and estimated standard errors are very similar when the sample size is larger than 50. In a more complicated model studied by Stone and Sobel (1990), the standard error formula performed well at sample sizes of 200 or larger. The standard error

formula also is accurate when the independent variable is binary, as in most prevention and intervention studies (MacKinnon et al. 19916). The large-sample theory standard error may not be as accurate in the presence of nonnormal data and outliers, however (Bollen and Stine 1990). At smaller sample sizes and positive mediated effects, there is a tendency for the confidence interval determined by the sample point and interval estimates to be to the left of the true value too often.

Mediation When the Dependent Variable Is Categorical

The procedure to estimate the mediated effect and its standard error described above does not apply directly in logistic or probit regression because error variances are not fixed in these analyses (Winship and Mare 1983). One solution is to standardize logistic and probit regression estimates and standard errors and then calculate mediated effects as described above (MacKinnon and Dwyer 1993; MacKinnon et al. 1992). By standardizing the estimates and standard errors, the scale is made equivalent across equations (Winship and Mare 1983). The standard error of the mediated effect using this procedure for standardized probit and logistic regression estimates may be conservative, however (MacKinnon and Dwyer 1993).

Measures of the Relative Magnitude of Mediation

The mediated effect ($\alpha\beta$) and its standard error provide a method to test the statistical significance of mediation. The $\alpha\beta$ measure does not provide information on the relative magnitude of mediation, however. One measure of the extent of mediation is the percent of the total effect that is mediated ($\alpha\beta/(\alpha\beta+\tau')$). For example, with this measure, a researcher could state that 67 percent of the effect of the prevention program on cigarette smoking was mediated by program effects on social norms. A second measure is the ratio of the indirect to the direct effect ($\alpha\beta/\tau'$). A researcher could state, for example, that the mediated effect was about two-thirds as large as the direct effect. Simulation studies indicate that the ratio measure is accurate only when sample size is greater than 3,000, even for the simplest mediation model (MacKinnon et al. 1991*b)*. The proportion-mediated measure stabilizes at a sample size of 500. The accuracy of the ratio and proportion measures are a function of parameter values, however. Large direct effects are associated with more accurate proportion and

ratio estimates. Both these measures of the magnitude of mediation should be used only with relatively large sample sizes.

Statistical Power

The statistical power of the test of the mediated effect is less than a test of regression coefficients for several reasons. First, since the program variable is causally related to the mediator variable, multicollinearity may inflate the standard errors in the model for Conclusion 3 (Judd and Kenny 1981*a)*. Second, most mediators are measured with error, generally leading to reduced power in the regression estimates used to calculate the mediated effect. Third, the formula for the standard error combines the unreliability in both the ***a*** and ß parameters. One solution is to increase the reliability of measures by constructing measurement models using multiple indicators of each variable and other techniques (Aiken and West 1991; Fuller 1987).

Longitudinal Models

Figures 3 and 4 display possible longitudinal mediation models for one mediator and one outcome variable measured on two and three occasions, respectively. In these models, the total indirect effect is the effect of all mediation pathways between an independent variable and an outcome variable. In figure 4, for example, the total indirect effect of the program on the outcome at Time 3 equals the sum of b_3b_1, b_4b_6, $b_4b_5b_1$, and $b_4b_2b_5$. Specific indirect effects refer to individual indirect effects. More detailed information on types of indirect effects can be found in Bollen (1987), who makes the distinction between exclusive specific effects, which refer to an individual pathway, and incremental specific effects, which may include a subset of the pathways in the total indirect effect.

The parameters, standard errors, and goodness-of-fit of longitudinal models can be estimated using several computer programs for covariance structure models (Bentler 1980; Bollen 1989; James et al. 1982) such as EQS (Bentler 1989), CALIS (SAS Institute 1990), LISREL (Jöreskog and Sorbom 1988) or LINCS (Schoenberg and Arminger 1990).

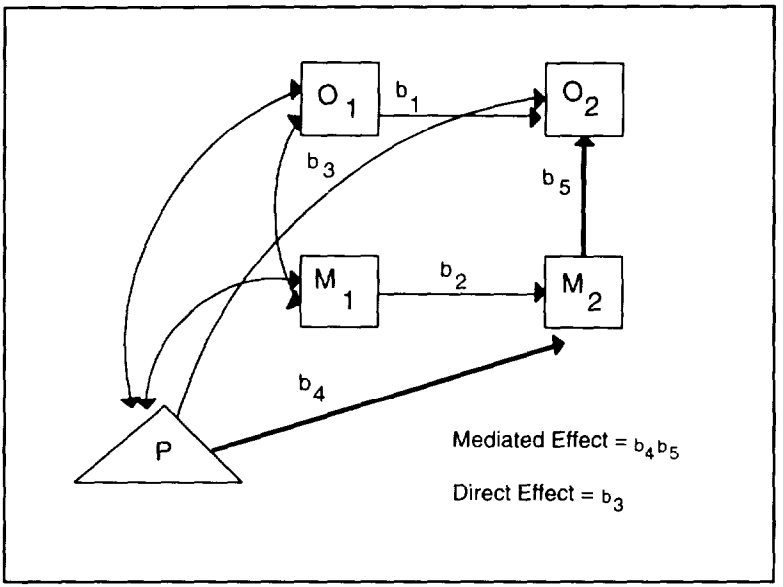

FIGURE 3. *Two-wave longitudinal model*

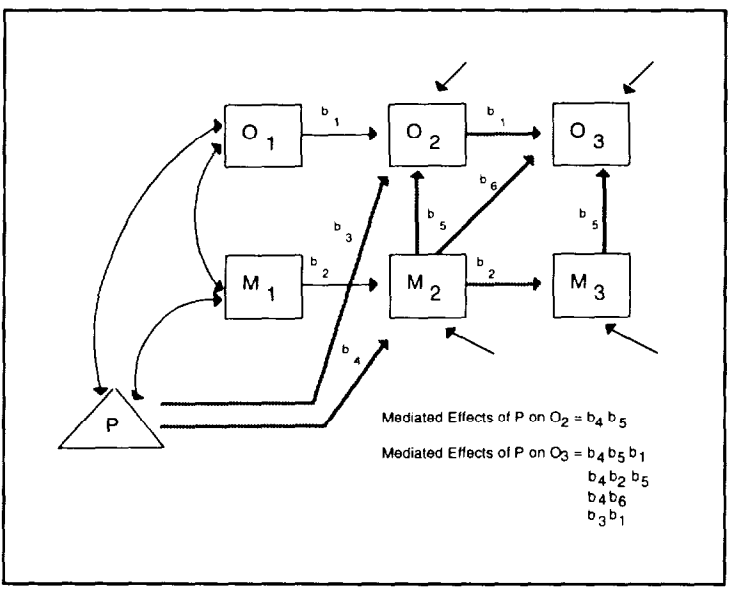

FIGURE 4. *Three-wave longitudinal model*

All four programs compute total direct and indirect effects. Some of the programs (e.g., EQS and LISREL) compute the standard errors of the indirect effects.

Multiple Mediators and Outcomes

The methods described above focused on one mediator and one outcome. The same methods can be extended for multiple mediators and multiple outcomes. A model for an anabolic steroid prevention study where eight mediators are targeted is shown in figure 5. The parameters of the model in figure 5 could be estimated by extending the regression equations described above or with covariance structure modeling. The covariance structure modeling approach is preferable because it can be used to estimate a wide variety of models with one or more mediators and one or more outcome variables (Bentler 1980, 1989; Bollen 1989; Jöreskog and Sorbom 1988).

EXAMPLE OF MEDIATION EFFECTS IN A DRUG PREVENTION STUDY

The mediation analysis described above has been applied to the results of a large community- and school-based prevention project (MacKinnon et al. 1991*a)*. The prevention program, implemented since 1984, was aimed at delaying the onset of "gateway" drug use (alcohol, tobacco, and marijuana) through use of school, parent, community organization, mass media, and health-policy program components (Pentz et al. 1986, 1989). The program targeted mediators primarily are based on social learning and problem behavior theories. The school program was designed to change mediating variables of psychosocial consequences of drug use; normative expectations regarding drug-use prevalence; recognition and counteraction of adult, media, and community influences; peer and environmental resistance skills; assertiveness in practicing pressure resistance; problem-solving for difficult situations involving drug use; and public commitment to avoid drug use. Students in 42 middle and junior high schools in Kansas City, KS, and Kansas City, MO, were measured in the fall of 1984 ($\underline{N}$ = 5,065) and again a year later ($\underline{N}$ = 5,008) after 24 of the schools received the program.

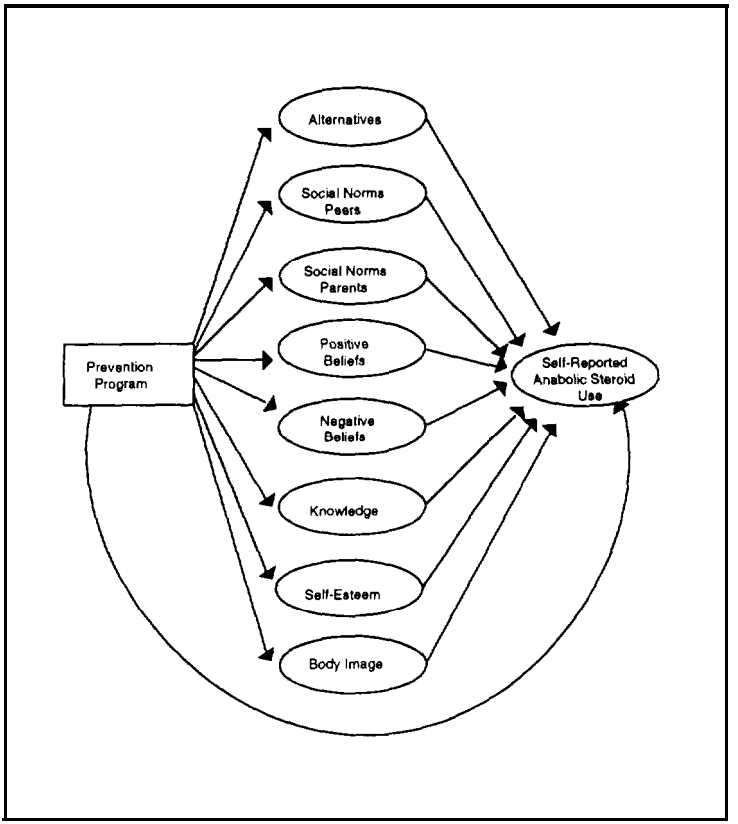

FIGURE 5. *Multiple mediator model for a steroid prevention project*

The mediation of prevention program effects on cigarette use by friends' reactions to drug use is used to illustrate mediation analysis. The dependent variable was the difference in the logit of the proportion of cigarette users between 1984 and 1985 in each of the 42 schools. The mediator was the difference in a summary index of several items measuring friends' reactions to drug use. The regression estimates and standard errors (in parentheses) for the three models are presented on the following page.

Model 1: $Y_0 = .137\ X_P + \varepsilon_1$
(.047)

Model 2: $Y_0 = .045\ X_P - .041\ X_M + \varepsilon_2$
(.043) (.009)

Model 3: $X_M = -2.23\ X_P + \varepsilon_3$
(.685)

Students in schools that received the program (X_P) reported less cigarette use than students in control schools, providing evidence for Conclusion 1. Evidence for Conclusion 2 was obtained with a statistically significant program effect on the friends' reaction mediator (X_M). The effect of the friends' reaction-to-drug-use mediator was statistically significant (ß) even when controlling for program exposure, providing evidence for Conclusion 3. The mediated effect was $\alpha\beta = \tau - \tau' = .092$, $\sigma_{ab} = .035$, with 95 percent confidence limits of .023 and .161, suggesting that the program effect was mediated by friends' reactions to use.

INTERPRETATION OF THE RESULTS OF A MEDIATION ANALYSIS

Program Effects on the Mediator but Not the Outcome

A prevention study may affect the mediator but not the outcome variable. This pattern of results is open to several possible interpretations: (1) The program changed the mediator as intended, but the mediator is not causally related to the outcome measure; (2) the sample size was not large enough or the measures of the outcome measure were not sufficiently valid or reliable enough to detect effects; (3) the effects of the mediator on the outcome may emerge later; or (4) the program effect on the outcome may be nonsignificant due to the presence of both mediation and suppression effects.

Program Effects on the Outcome but Not the Mediator

Effects on the outcome but not the mediator suggest that the mediator is not causally related to the outcome measure. It also is possible that

the measures of the mediator were not reliable or valid enough or the study may not have had sufficient statistical power to detect program effects on the mediator.

No Program Effects on the Outcome or the Mediator

Possible explanations here include: (1) lack of statistical power due to sample size or poor measurement of the mediator and the outcome and (2) an ineffective prevention program. As in any study where the null hypothesis is not rejected, these results do not prove that the theory or the mediators targeted by the program are wrong. The results do raise questions about the theory, intervention approach, and implementation of the program.

Program Effects on the Mediator and the Outcome but Nonsignificant Mediation

It is possible that there are program effects on mediators and outcomes but that the results from the statistical test of mediated effects are nonsignificant. There is some evidence for mediation because the relationship between program exposure and the mediator and the relationship between the mediator and the outcome are statistically significant. In this case, separate null hypotheses that $\alpha = 0$ and $\beta = 0$ are both rejected, which suggests that the program caused the mediator and that the mediator caused the outcome, although the latter relationship was not determined experimentally. Another interpretation of these results, however, is that the prevention program is not causally related to the outcome through the mediator because the confidence limits used to test this process hypothesis (H_O: $\alpha\beta = 0$) included a value of zero. Other interpretations are lack of sufficient statistical power, model misspecification such as reciprocal effects, and potential suppressor effects that may be remedied in another study.

Program Effects on the Mediator and the Outcome and Statistically Significant Mediation

A successful intervention or prevention program will yield statistically significant mediation effects along with effects on mediators and the outcome. In this case, the prevention program changed relevant mediators, and the change in these mediators changed the outcome

measure. The results suggest that the mediator is important and should be emphasized in later prevention programs. Evidence for the theoretical basis of the program is obtained. Other similar outcome measures may be affected by changing the same mediator.

Like any other study where the null hypothesis is rejected, such results must be treated with some caution. First, if the sample size is large, the mediated effect may be small (i.e., not clinically significant), even though it is statistically significant. Second, it is possible that an omitted mediator is the actual mechanism by which the program had its effect.

MEDIATION ANALYSIS IN GRANT APPLICATIONS

Eight aspects of mediation analyses should be described in proposed research:

1. *Link theory and the mediators targeted by the program.* An important aspect of mediation analysis is that it forces the researcher to consider the theoretical basis for how the prevention program leads to changes in an outcome measure. Experimental comparison of mediators suggested by competing theories provides an ideal test of the theories. As described above, such a prevention study will provide information on how to prevent a problem behavior as well as information on competing theories.

2. *Link prevention program components with targeted mediators.* A table with the specific program components and the mediators targeted by each component clarifies the link.

3. *Select mediators that can be changed.* Build an argument for the importance of the mediators based on prior research on the proposed outcome and related outcomes. If personality mediators or other mediators that may not be easily modifiable are included, justify their role as mediators and how the program will be intense enough to change them.

4. *Select mediators that are related to the outcome measure.* Prior research should suggest that the mediator is causally related to the outcome measure.

5. *Describe a program of research.* The identification of putative mediators requires a program of study beginning with the identification of the mediators that are related to the outcome, the development of a prevention program to change the mediators, and the evaluation of the prevention program (West et al. 1991). Replication of previous research results and experimental studies provides the most convincing evidence for putative mediators.

6. *Include information on the psychometric properties of mediators and outcome measures.* The information may include internal consistency, test-retest, and alternative-forms reliability of proposed measures (Carmines and Zellner 1979). Measurement models for the mediators and outcome measures indicate that unreliability of measures is not likely to reduce the statistical power of the tests of mediated effects. The corroboration between biological and self-report measures and multimethod-multitrait analyses further show that the investigators emphasize measurement issues in their proposed work (Campbell and Fiske 1959; Widaman 1985). The match between the content of the measures and the targeted construct should be described.

7. *Include persons in the research team who have experience with mediational analyses and with the strengths and limitations of covariance structure models* (Berk 1988). The three conclusions described by Judd and Kenny (1981*a,* 1981*b)* and methods to determine the standard error of the mediated effect and its confidence limits for Conclusion 4 (Baron and Kenny 1986; MacKinnon and Dwyer 1993; Sobel 1982, 1986) should be described.

8. *Ensure that the proposed research has promise of generating new and important scientific information.* A grant that proposes to test the value of the coefficients (Meehl 1967) in a mediational model, for example, is likely to interest reviewers. To propose such a

model requires an existing line of research and very specific theory regarding the actual value of the quantitative relationships among constructs.

Mediation effects also may occur when a prevention program changes the relationship between a correlate and an outcome variable (Judd and Kenny 1981*a)*. For example, a drug prevention program may remove the effect of norms on alcohol use, such that normative influences predict alcohol use in the control group, but not in the treatment group. A grant application with detailed hypotheses regarding this and other types of mediation (James and Brett 1984) is important because it would be one of the first to test such hypotheses.

SUMMARY

Mediational analysis is one way to test specific hypotheses derived from theory. Although this analysis has been suggested in the prevention literature, mediation analysis rarely is conducted. As the field of prevention matures, more questions about how prevention programs work (or fail to work) will emerge. Studies of mediation can address these questions, thereby reducing the cost and enhancing the impact of prevention programs.

The methods outlined here can be applied in the evaluation of primary, secondary, and tertiary prevention programs. Since most prevention studies include measurement of some mediating constructs, mediation effects can be assessed on many existing data sets. Mediation analysis can be used to test ideas about prevention.

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Summary of Critiques From the Drug Abuse Epidemiology and Prevention Research Review Committee

Raquel Crider and Eleanor Friedenberg

The Drug Abuse Epidemiology and Prevention Research Review Committee (abbreviated DAPA) reviews research applications for the National Institute on Drug Abuse (NIDA). NIDA staff summarize DAPA's comments regarding the scientific merit of proposals for each investigator who has applied for a research grant. While the summary is confidential and provided only to the principal investigator, the National Advisory Council on Drug Abuse, and NIDA staff, an overview of the summaries may be useful to all applicants in this area. The purpose of this chapter is to provide that overview and, therefore, to enable applicants to address some of the potential critiques before submission. Summary statements for research applications reviewed in June 1992 by DAPA serve as the source of material included in this chapter. Particular attention is paid to critiques that occur for more than one application. Where appropriate, a discussion of National Institutes of Health (NIH) policy and general critiques from other meetings have been added.

Most of the critiques provided in this chapter were mentioned during the June 1992 meeting. The comments in the summary statements depend on the types of applications received by DAPA and the reviewers assigned to an application. Reviewers may differ somewhat in the points they emphasize. The emphasis in the critique also will depend on the particular type of research proposed.

The applications reviewed in June 1992 are typical of all applications received by DAPA. There were a total of 29 applications, 45 percent of which focused on epidemiology, 38 percent on prevention, 14 percent on workplace, and 3 percent on other topics.

GRANT REVIEW PROCEDURES

Understanding the overall grant review process will help the applicant interpret the contents of a summary statement. The applications submitted to the Public Health Service (PHS) are reviewed through a dual system in which the first level of review is performed by an Initial Review Group (IRG), and the second level of review is performed by the National Advisory Council. The grant application is submitted through the Referral Section, Division of Research Grants (DRG), NIH. Within the DRG Referral Section, administrative information about the application is entered into the computer system. The application then is assigned to the most appropriate IRG for a scientific merit review. Assignments are based on the scientific content of the entire application, including the specific aims, methodology, and overall focus. The assignment criteria are specified in the IRG referral guidelines.

The initial scientific merit review generally takes place within 4 to 5 months of receipt. The investigator will receive notification of the priority score and percentile within 2 weeks of the initial review and will receive the summary statement within 2 months. The National Advisory Council on Drug Abuse will review the summary statement for policy implications a few weeks thereafter. Awards are made after the Council has met. Revised applications usually are submitted, not for the following round of review, but one round later. When an application is revised and resubmitted, the investigator is not expected to meet the submission date for new applications on February 1, June 1, and October 1. Instead, the applicant may take an additional month and submit under the alternative deadlines of March 1, July 1, and November 1.

Typical of expertise on the IRG are: family research, school-based studies, longitudinal surveys, general survey methodology, measurement issues, workplace research, ethnographic methodology, epidemiology, and advanced statistical techniques. The 15-member committee consists of males and females representing the disciplines addressed in the applications to be reviewed. Every attempt is made to include minority investigators and reviewers from each geographic region of the country. The list of names of individuals in DAPA is public information and is provided to the investigator with each

summary statement. DAPA membership rotates, with one-third to one-fourth changing each year; appointments generally are made for a 4-year term.

The referral guidelines for DAPA include delineation of general substantive categories of drug abuse epidemiology and prevention, with subcategories of workplace research, school-based studies, secondary analysis, etiologic research, vulnerability studies, population-based genetic research, economic investigations, epidemiology, and ethnographic studies.

Mechanisms reviewed include R01, R03, R13, R29, K02, K05, K20, K21, T32, F31, F32, and P50, as described in the grant application kit. The U.S. Department of Health and Human Services (HHS) PHS Grant Application Form PHS 398 with instructions can be obtained from the Grants Information Office, DRG, NIH, Bethesda, MD 20892. The office can be reached by telephone at (301) 574-7248.

As the application is processed through the DRG to DAPA, the Council, and then funding, the contact person changes. The first contact person is the DRG referral officer. Once the application is assigned to an IRG, the contact person is the scientific review administrator. The investigator will receive notification by mail of the names of the assigned IRG and the associated scientific review administrator when the assignment of a review committee is made. After the Council processes the application, the contact person becomes the project officer in the potential funding component. The name of the project officer is provided in the cover letter attached to the summary statement, which is mailed to the investigator a few weeks before the Council meets.

The content of the summary statement is the focus of the present chapter. The content is presented with the header information, such as IRG action and priority score, human/animal subjects, and gender and minority codes first, followed by the critique and comments about personnel, resources and environment, and budget.

HEADER OF THE SUMMARY STATEMENT

On the front page of the summary statement are a number of codes, including IRG action and priority score, human/animal subjects, and gender and minority codes.

IRG Action and Priority Score

As the IRG discusses an application and assesses its scientific merit, there are two levels of evaluation: assignment of priority score and recommendation to the Council. When an application is judged to have significant and substantial scientific merit, it is assigned a priority score. The accompanying percentile essentially is a rank order of the applications that is designed to assist NIDA in making funding decisions. Priority scores range from the most meritorious of 100 to the least meritorious of 500. The percentiles are based on all research applications considered in the three most recent rounds of review.

On the header page of the summary statement, the words "not recommended for further consideration" may appear. Less than 20 percent of the applications receive this recommendation. With this statement, NIDA indicates the application is not recommended for the second level of review, although the Council may choose to examine the summary statements for these applications. Such applications may not be considered for funding. As mentioned above, the first level of review considers scientific merit, which is assessed by the IRG, while the second level of review considers policy implications, which are assessed by the National Advisory Council on Drug Abuse. The recommendation for no further consideration does not preclude the investigator from revising the application and resubmitting it.

Human/Animal Subjects

HHS regulations for the protection of human subjects provide a systematic means to safeguard the rights and welfare of individuals who participate as subjects in research activities supported by HHS. The human-subject codes on the header of the summary statement include "concerns," "comments," "exemption," and "protection adequate." A "concern" constitutes a bar to funding until the investigator addresses the concern discussed in the summary statement to the

satisfaction of the program's project officer and the Office of Protection from Research Risks. A "comment" about human-subject protection may require followup by the project officer and the investigator, although there is no bar to funding. An "exemption" is indicated in the header when human subjects are involved, but the research is exempt from coverage by regulation. An example is the secondary analysis of existing data.

A frequently mentioned human-subject issue for prevention and epidemiologic research in particular is active versus passive consent for parents of minors in school-based or other adolescent studies. Active consent requires that the parent or guardian must give consent for the minor to participate in the study. Passive consent allows the investigator to include the minor in the study as long as the parent or guardian does not object. The Committee also examines this facet of the proposed research before assigning its priority score, For example, in one study for which passive consent was planned, the IRG questioned whether the investigator proposed to make an adequate effort to inform the parent of the study. Although active consent is preferred from the standpoint of human-subject protection, there are research considerations that may preclude the use of this procedure. For example, the investigator may not be able to locate the parent.

Other human-subject comments and concerns are aimed particularly at the protection of minors. In one case, when a child was to be nominated for participation in a drug abuse study by a teacher, the IRG questioned whether this constituted discriminating labeling. IRG members also were concerned when items in the questionnaire were suggestive that certain drug abuse behaviors were normative.

Concerns are mentioned in the summary statement for adult studies as well. IRG members asked, "Will any data be gathered before consent is obtained, such as from personnel records? Is the procedure coercive in any way? For example, is a monetary incentive offered to a social organization on behalf of the participant, suggesting the respondent may feel pressured into cooperating to help the organization? If acceptable, is the amount of monetary incentive appropriate to the task?"

Another recurring human-subject concern relates to the lack of a certificate of confidentiality. The certificate will protect the identity of subjects from subpoena and should be requested from NIDA if the data are sufficiently sensitive, such as data relating to criminal activity.

Because all States now require that the investigator report to authorities offenses such as any evidence of child abuse or neglect observed, the investigator needs to specify in the application how this issue will be handled.

Gender and Minority Codes

Applications for NIH support for research involving human subjects should employ a study design with gender/minority representation appropriate to the known incidence/prevalence of the disease or condition to be studied. The codes on the header of the summary statement are "representation appropriate," representation inappropriate but justified," and "representation inappropriate and justification inadequate." Because the adequacy of the sample is central to the quality of the research, the gender/minority representation is reflected in the priority score, and the adequacy is discussed in the critique section of the summary statement.

When representation is appropriate, the proportion of women and minorities in the sample at least represents the proportion of women and minorities in the population to which the study will generalize. For example, with respect to gender, if one is studying heroin users, the sample would be appropriate with a male-to-female ratio of approximately 2:1 because data from medical examiner cases, emergency room records, and treatment program admissions show approximately a 2:1 ratio.

When representation is not adequate but justified, this sample is acceptable, and no change in the sample is required. A typical example with respect to minorities would be a school-based drug abuse prevention study for a city in which more than 90 percent of the population is white. The investigator would not be required to increase the proportion of minorities to represent the proportion of minorities in drug abuse prevention programs in the United States as a whole. Maintaining approximately 90 percent whites and 10 percent minorities

in the sample would be justified because obtaining a higher proportion of minorities would not be practical. While the investigator would not be required to change the sample, the NIDA program staff might try to balance the research addressing primarily white populations with other research focusing on minority populations within their overall portfolio.

When representation is not appropriate and not justified, the inadequacy of the sample is reflected in the priority score, and a bar to funding will remain until the sample is modified to the satisfaction of the project officer. For example, a sample for a workplace study that includes only male employees would be inappropriate and not justified if the population to which the study will generalize includes both males and females. In this case, the priority score will reflect the problems with the inappropriate representation, and there will be a bar to funding. To correct the problem and lift the bar, the investigator may submit a plan for gathering a more representative sample to the project officer, and the project officer then will determine whether the representation of women and minorities is appropriate and, if not appropriate, whether the sample is justified.

When the description of the sample in terms of women and minority representation is missing, the application will be deferred by the scientific review administrator for one round until the information is received. If the information is not received then, the application will be returned to the investigator.

CRITIQUE

The heart of the summary statement is the critique. The critique will provide a summary of research strengths and weaknesses. Some of the strengths addressed include the importance of the topic, the quality of the literature review, and the unique aspects of the study population. Because the aim of this chapter is to enable applicants to address some of the potential problems in their research before submission, the remainder of this chapter will focus on issues not addressed adequately in applications reviewed by the IRG.

Significance

The significance of an application is one of the criteria that contribute to the priority score assigned to an application. Several significance issues were mentioned in previous summary statements. One issue is the population to which the study will generalize. If the study will apply only to a very restricted population, the study sample may be too restrictive to address the broader questions of drug abuse. It is the responsibility of the investigator to describe the population to which the study will generalize and to justify the sample with respect to significance.

The IRG also has questioned how frequently the results of an investigation will be used. For example, in one case, research was proposed to improve a statistical procedure. However, the IRG did not feel that the procedure to be improved was used with sufficient frequency to warrant the research.

An often-mentioned issue with regard to the significance of the research is the theoretical model underlying the proposed work. For example, in the critique of an intervention study, reviewers felt the investigator needed to specify the theoretical processes involved in developing the intervention. The IRG indicated the application had not demonstrated a theoretical model of how etiological variables operate to reduce substance abuse. IRG members stated that greater theoretical attention would assist with the integration of study hypotheses and allow for hypothesis-testing regarding why the intervention succeeds or fails.

Hypotheses

The IRG has expressed the expectation that each of the hypotheses be developed in all sections of the application, from the literature review to the design, procedures, and data analysis. Obviously, if a large number of hypotheses are presented in one application, a full development of each of these would be difficult within the page limitation. A typical comment made by the IRG is, “While hypotheses 1-4 are well supported in the literature review, background is not presented for hypothesis 5.”

More specifically, the IRG expects the statement of the hypotheses to be consistent with the study design. For example, if a cross-sectional study is proposed, the hypotheses cannot be stated in terms of causality. A common criticism is that the hypotheses are not presented in a testable form.

Literature Review

While this section of the application appears straightforward, the IRG has commented on this section in the summary statement. As mentioned above, it is a matter of concern whether a literature review is presented for each of the hypotheses. Other comments address whether recent, well-recognized, and pertinent references were included.

In cases for which few relevant references could be found, the IRG discussed the need for a review of related literature. For example, if there is little research on Narcotics Anonymous, the literature for Alcoholics Anonymous and other self-help groups might have been included.

As well as mentioning the need to discuss the work of well-recognized scientists in an area of research, the IRG mentioned the need to discuss common theories, such as acculturation, when relevant. This critique was included in several summary statements because some investigators were proposing analyses by ethnic group without the literature review to support this type of analysis.

For all types of research, the IRG has questioned whether the literature on each of the important variables has been presented. On the other side of the same issue, the IRG has questioned whether the application ignored important variables in the literature that should be included in the research.

Sample

The IRG often discussed issues related to the sample. Some of their more important questions were: "What is the rationale for selecting the type of sample and study sites? Are the eligibility criteria so restrictive that few subjects will be eligible to participate? Will the

selection criteria restrict the sample to the extent that the sample will no longer be representative? If special groups, such as college students, are to participate, will the findings generalize to other drug abuse populations? If the sample is drug abuse treatment clients, what are the characteristics of those presenting for treatment? If multiple samples are to be used, will the same data collection procedure be used for each of the samples?"

Measurement

Much of the critique is devoted to measurement issues. The IRG expects the investigator to present reliability and validity data for the instruments proposed. IRG members stated that the instruments should be justified in terms of developmental level of the subject and length of administration.

The investigator may need to discuss whether presentation of the instrument in another language is necessary and whether existing scales or new scales should be used. For some types of research, the application needs to discuss the expected variance in the measures. The IRG also mentioned the need to address site-specific policies that may affect the measurement at different locations.

Important to consider for longitudinal studies are measurement interval, age of respondent, and changes with time. When self-report is proposed, the IRG looks at whether the literature review justifies the use of self-report measures in the type of study proposed.

Biological Measures

The IRG frequently mentioned concerns about relying solely upon self-reports of drug use, particularly in settings in which drug use is strongly prohibited. If biological measures are proposed, a detailed discussion of the procedures for data collection is essential.

In research for which biological tests are to be implemented, the IRG looks for a discussion of whether confirmatory tests are needed and a rationale for the types of tests to be used to confirm the result. In some summary statements, the IRG questions whether the application adequately presented the issues of use versus abuse, rate at which

drugs are metabolized, and concordance between self-reports and biological measures. The interpretation of these tests also has been an issue in the IRG. An important issue is whether participation rates will be reduced if biological measures are utilized.

Data Analysis

The type of study has a direct effect on the analysis to be performed. If a school-based study is proposed, issues include unit of analysis, secular trends, and ongoing programs in the school. For a longitudinal study, a causal analysis is likely to be very important. In these cases, the IRG has asked whether the investigator is familiar with latent variables analysis. The IRG often asks questions like "Has the researcher performed the analysis in the past? Does the research team have publications showing experience with latent variables analysis? Are examples of the types of data analyses to be performed presented in the proposal ? Is the model to be tested presented? Has multicolinearity been considered?"

Power Analysis

Comments concerning power analysis often are mentioned in the summary statement. For example, the IRG questioned the assumptions for the power analysis. An often-mentioned critique is that the cell sizes are not adequate for analysis by age, gender, and ethnic group. It is not an automatic requirement for the study design to provide statistical power to answer the questions posed for men and women, and racial/ethnic groups separately. However, whenever there are scientific reasons to anticipate differences between men and women and between members of different racial/ethnic groups separately with regard to the hypothesis under investigation, investigators should include an evaluation of these gender and minority group differences in the proposed study. The analysis for the subgroups by gender and ethnic/racial status need not be the same analysis as for the general hypotheses under consideration, but a description of the proposed subgroup analysis should be provided.

Analysis of Existing Data

Applications that propose a secondary analysis of existing data have been reviewed by the IRG. In the case of secondary analyses, the IRG expects that the quality of the data and consistency of reporting be discussed in detail. The application should address problems with the reported data and propose specific analyses to address these problems.

In addition, a discussion should be provided concerning the quality of the drug abuse data. A frequently occurring criticism is the number of drug abuse cases involved in the research project. If a data set is to be analyzed that was obtained for a purpose other than studying drug abuse, the number of drug abuse cases may be too small for the analyses proposed. A major concern was raised for one study when the original study was designed for a purpose other than studying drug abuse. The IRG questioned whether the drug abuse measures were adequate and whether they were consistent with standard measures used in other prevention and epidemiology research.

Gender and Minority Representation

As part of the critique section of the summary statement and following the body of the critique, a statement regarding gender and minority representation occurs. During the June 1992 meeting of DAPA, several comments were made that reflected concerns about women and minority representation. Some investigators have designed their studies to permit analysis by gender and minority groups using such techniques as quota sampling and multisite studies. In these cases, the IRG has mentioned that the theme of gender and ethnic differences should be discussed throughout the application. For example, in an application proposing quota sampling by gender, hypotheses related to gender differences should be presented. The literature review should discuss the findings of other studies showing gender differences, and the instruments should include measures relevant to male/female attributes.

Some investigators have argued correctly that no gender differences are found in the literature and, thus, no analysis by gender is required. Exploratory studies related to male/female differences commonly are used when few gender-specific studies can be found or when the

literature is inconsistent with regard to the direction or magnitude of the sex difference.

Other issues have entered the IRG's discussion related to differences for minority groups. If analyses are planned for ethnic differences, the IRG has asked whether the application addresses related hypotheses, such as acculturation, where relevant. Another often-discussed question is whether subcategories of minorities have been considered. For example, the differences between Hispanics of Cuban and Mexican origin may be greater than the differences between Hispanics and whites.

As mentioned above, some investigators have been addressing the women and minority issue with quota sampling by gender and ethnic group and multisite studies with one site containing a high proportion of minorities. These approaches represent a major change in the study design. In some of these cases, the IRG indicated tha! the change in design was not necessary to adequately address the policy of representation of women and minorities. NIH policy states that applications for support of clinical research grants should employ a study design with gender and minority representation appropriate to the known incidence/prevalence of the condition in the population studied.

PERSONNEL, RESOURCES AND ENVIRONMENT, AND BUDGET

After the critique section, the personnel, resources and environment, and budget sections appear in the summary statement.

Personnel

The IRG has commented on whether the personnel proposed have expertise in the area of research proposed, as shown by publications in the field or examples of research showing familiarity with the data, type of analysis, and general topic. According to comments in the summary statements, if the investigator does not have a background in the field of research addressed by the proposal, appropriate consultants should be included. In particular, the IRG looks for documentation in the application of drug abuse expertise for the principal investigator or

consultants. Other questions are: "Are the number and type of staff and allocation of personnel appropriate for the research proposed? Is the time commitment of the senior staff adequate?"

Resources and Environment

As mentioned above, there is an increase in the number of studies proposing multisite research, and an important issue for such studies is between-site coordination. The IRG has commented upon duplication of effort between sites and the differences in cost between sites.

Other than the issues mentioned above, the adequacy of resources frequently is not discussed in the summary statement because most studies originate from a university or other research facility that is well known for constituting an adequate environment for the work proposed.

Budget

The importance of justifying each item of the budget is highlighted frequently in the summary statement. Two examples are the request to attend a number of scientific meetings, in particular before data from the proposed research are available, and the purchase of a computer when computers already are available at the institution.

Some budget issues are tied to points of scientific merit. For example, the investigator is expected to justify the frequency and spacing of data collection. While this is a scientific issue, the budget also is impacted. If the number of data collection points is not justified in terms of developmental stage of the subject, rate of change in the variables to be measured, or access to the data, the IRG may recommend a reduction in the number of data collection points with an appropriate reduction in the budget.

Biological measures also involve high cost. The IRG has asked the investigator to justify the need for the number of urine tests and the type of tests to be performed. The IRG also has asked the investigator to justify the use of urine tests compared to self-report data alone.

Another issue the IRG has been known to discuss is the amount of time needed for the study. Justification needs to be provided for the number of years proposed in the application.

CONCLUSION

The objective of this chapter has been to provide the investigator with a summary of critiques from one meeting of DAPA, although NIH policy and some general critiques from other meetings also are given. Emphasis for this chapter is placed on criticisms repeated in more than one summary statement to enable the investigator to address them before submitting an application to NIDA.

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Issues in Drug Abuse Prevention Intervention Research With African Americans

Lula A. Beatty

INTRODUCTION

Drug use and abuse arguably are the most widespread and devastating social problems affecting the American population, contributing significantly to the incidence of crime, illness, and premature death. The consequences of the abuse of licit and illicit drugs in the African-American population, however, are disproportionately more severe, with comparatively higher crime, morbidity, mortality, and family disruptions caused by drug involvement (Redd 1989; Gary 1983). Consider the following examples. Approximately 25 percent of all reported cases of acquired immunodeficiency syndrome (AIDS) and more than half of the children under the age of 15 with AIDS are African Americans; they contract the virus most frequently through intravenous (IV) drug use or through mothers who are IV drug users, in the case of pediatric AIDS (Centers for Disease Control 1986; Curran et al. 1988). African Americans are more likely to die from smoking-related lung cancer and alcohol-related cirrhosis of the liver in comparison to whites (Jaynes and Williams 1989). About 12 percent of African-American grandparents, in comparison to about 6 percent of Hispanic and 4 percent of white grandparents, have assumed full-time responsibility for their grandchildren, a significant increase from 10 years ago. This increase is due in large part to the addictions of their children, usually to crack cocaine (Minkler et al. 1992).

Other, more elusive changes are occurring. Nobles and Goddard (1989) assert that drugs are threatening the well-being and eroding the social structure of entire African-American communities; their research suggests that traditional family and community values are changing in response to the terrorism of the drug culture. Poverty, discrimination, and inequities in the health care system certainly account for many of the differences found between African Americans and whites, and

those issues must be addressed. However, the prevention of drug abuse is the best line of first attack, particularly for African Americans, since the consequences are more severe and longer lasting than for whites.

Over the last 20 years, there has been substantial field-initiated work and Federal support of prevention demonstrations and research to determine how to prevent drug use and abuse in the American population more effectively; this has led to dramatic advancements in the science of prevention (Tobler 1992; Hansen 1992; Cahalan 1991). What does this still-developing knowledge base reveal about prevention with African Americans? Prevention research depends on epidemiologic and etiologic work in the wide area of drug abuse research. Reviewers of that literature found many methodological and conceptual problems, as well as sheer infrequency and absence of studies that focused on African Americans, and concluded that the literature is a severely limited and flawed knowledge base with respect to African Americans (Prendergast et al. 1989; Harper 1991; Lex 1987). These limitations raise serious challenges for prevention intervention researchers. Prendergast and colleagues (1989), who did an extensive review of the available work on substance use in African-American youth and adults, stated, "(G)iven the limited knowledge regarding substance abuse among Black youth, it is difficult to develop education and prevention programs that are targeted to their specific needs."

There is a near-desperate need for prevention intervention research with African Americans. The purpose of this chapter is to present issues that affect drug abuse prevention research with African Americans. The focus will be on diversity in the African-American population; etiologic concerns, especially risk and protective factors; theory development and expansion; methodological and design concerns; models of prevention intervention and implementation; and the need for increased involvement of African-American researchers.

DIVERSITY IN THE AFRICAN-AMERICAN POPULATION

Researchers always must begin their work with some minimal baseline data of the problem under consideration and an understanding of the population they are studying. This baseline data requirement can vary

for a number of reasons; for example, the requirement differs as the research questions or hypotheses posed change. In research with African Americans, the baseline information regarding characteristics of the population often is missing or deficient in its thoroughness. Because of their relationship to etiology (particularly risk and protective factors), theory development, and prevention intervention design and appropriateness, information areas that are especially important to drug abuse researchers targeting African Americans are sociodemographic, cultural, and drug use risk characteristics and how they vary within the population. These three areas are discussed briefly in the following sections.

Sociodemographic Indicators[1]

Over 30 million people in the United States—12.1 percent of the population—are "black," the term used by the U.S. Bureau of the Census (Bennett 1991). In 1980, blacks comprised 11.7 percent of the population. The group has increased 13.2 percent during the 10-year period from 1980 to 1990, compared to a 6.0-percent increase in the white population and a 9.8-percent increase in the total population. This fast growth, in comparison to whites, is a result of a younger population, higher age-specific fertility rates, and increased immigration of blacks, primarily from the Caribbean. There are some significant differences in the black population on social indicators that often are used to examine or explain differences in behaviors.

Gender and Age. Nearly 47 percent (about 14,255,000 people) of the black population is male. Of blacks age 14 and under, the proportion of males to females is higher. In the black population, males under 18 years of age comprise 35.9 percent, and females make up 30.7 percent of the population. Thereafter, black females outnumber black males in all age groups. This loss of males may reflect census undercounting of black males, or it may reflect an actual loss of men to the general community through premature death (e.g., homicides) or institutionalization.

The median age of the black population is 27.9 years for both sexes, 26.4 years for males, and 29.1 years for females. About 67 percent of the black population is 18 years of age or over. Blacks and whites have different age structures. In comparison to whites, blacks under

age 18 have more children (33.1 percent versus 24.9 percent in the white population), and there are fewer black adults aged 65 or over (8.2 percent versus 12.8 percent in the white population). African-American children under age 18 number about 10 million, or 16 percent of the Nation's child population (National Black Child Development Institute 1991).

Marital Status/Family Type. Nearly 40 percent of African Americans have never been married; a little over one-third (34.8 percent) are married and living with their spouses. Female householders with no husband present account for 43.8 percent of families. In families with children under 18 years of age, over half of black children (51.2 percent) live with their mothers only. Farley and Allen (1987) report that black households headed by married couples are the lowest percentage of any racial/ethnic group. This change has been quite abrupt, with the greatest decrease occurring since the 1970s (Billingsley 1992). About a third of black families live in extended households (Farley and Allen 1987).

Edelman (1989) reports that marriages are declining among young blacks. Among black women age 20 to 24, nearly 80 percent are single; in comparison, among white women of the same age, about 60 percent are single (Edelman 1989). Drugs are contributing to the change in family living arrangements and causing more children to live with grandparents (Minkler et al. 1992), in foster care, or in other institutional settings as a result of parental drug abuse.

Education. Among black persons 25 years of age or over, 37.2 percent have completed high school, and 13.8 percent have completed four years of college or more. The corresponding figures for white Americans are 49.4 percent and 22.0 percent, respectively. In 1988, in the 18-24 age group, about 72 percent of black males and about 78 percent of black females had completed high school; 25 percent of black males and 30.5 percent of black females were attending college. The proportion of black males in the 35-44 age group completing college increased from 7.3 percent in 1980 to 16.7 percent in 1990. The comparable figures for black females were 8.6 percent and 14.5 percent, respectively. These gender differences in college completion rates are not statistically significant.

Geographical Location. The great majority of African Americans live in metropolitan areas (83.8 percent), with over half (56.8 percent) living in central cities. Over half (54.3 percent) live in the South, followed by 19.8 percent in the Midwest, 17.4 percent in the Northeast, and 8.5 percent in the West. They live in every State of the Union, with the highest concentrations in the New York-New Jersey-Connecticut, Chicago-Gary-Lake County, Los Angeles-Anaheim-Riverside, and Philadelphia-Wilmington-Trenton regions. Significant numbers live in other areas like Detroit-Ann Arbor, Baltimore, Memphis, Richmond-Petersburg, Norfolk-Virginia Beach, and Birmingham (U.S. Department of Commerce 1990). The majority of black children live in the South; 56 percent live in central cities, and another 25 percent live in the suburbs of metropolitan areas (National Black Child Development Institute 1991).

Income. Nearly one-third (31 percent) of African Americans were poor in 1989, about the same proportion as in 1979. The median family income for married couples was $30,650. Female householders with no husband present had a median income of $11,630. The black poor are more likely to be children under age 18 living in female-headed households with no husband present; over half (53.9 percent) of such children are living below the poverty line. Black children are three times more likely than white children to live in poverty (National Black Child Development Institute 1991). Black men with incomes on the average make about 69 percent of the earnings of white men. Racial disparities in income between black and white men *increased* during the 1960s and have shown little change since then.

African-American Culture

Cultural diversity within the population of African Americans is frequently overlooked in studies. Taylor (1987), in a critique of the study of black people, described much of social science research on black people as "notably ethnocentric, giving little credence to the distinctive features and internal social organization of Black communities." Many scholars and researchers, as well as lay people, talk about "the African-American population" or "the black community" as if it is an unvarying, cohesive whole. Like all racial/ethnic groups, black people in the United States share a common culture with many similarities in areas such as values, spirituality, family functioning

(Billingsley 1968, 1992; Hill 1972; Nobles et al. 1983), and language (Smitherman 1991). And, like all racial/ethnic groups, black people also display great variations among themselves on sociodemographic indicators and in their life experiences, attitudes, behaviors, and allegiances.

Blacks, or African Americans, by all practical purposes include any person of African ancestry who "looks" black (i.e., has dark skin or African features) or who self-identifies as black or African American. Within this group of blacks, there are the descendants of American slaves—the majority of blacks in this country. There are the offspring of persons of interracial marriages (often black and white parents) who sometimes argue that they are biracial, not African American *or* white, and they express claim to their full, dual heritages. It is not clear how they might affect the outcome of prevention intervention studies that are culturally specific. There are still other groups of foreign-born persons of African ancestry living in America whose numbers are growing. In 1980, these foreign-born blacks represented about 3 percent of the black population. Most are from the West Indies (Farley and Allen 1987). Others include Africans and "nonwhite" Hispanics. These groups sometimes have distinctively different cultures and languages that have to be recognized and that may have impact on drug use and participation in prevention interventions. For example, Way and colleagues (1991) reported that urban Haitian adolescents were less likely to use drugs than American-born blacks or whites. Researchers have to be cognizant of differences within the black population that are caused by such factors as national origin, citizenship status, cultural identification, racial identification, language, and self-identification.

Sowell (1978, p. 23) writes that "slavery is the dominant fact in the history of Black Americans—not only because it spanned more than half of that history, but because of its continuing influence on their geographic distribution, cultural legacy, and economic and social opportunities in a country whose racial attitudes were formed during the era of slavery." It can be argued, therefore, that given the social history of this country and laws regarding the determination of race, in the case of blacks in particular (using, for example, the "proportion" of black blood, recency of black lineage, or the race of the mother), having an African-American parent or appearing to be African

American in physical features effectively makes one African American. Therefore, one is susceptible to the same opportunities and constraints experienced by African Americans in areas such as obtaining credit, health care, education, housing, and employment—all factors that are associated with risk of disease and vulnerability to drug exposure, drug use, and adverse consequences.

Some theorists and researchers have questioned the existence of a distinct African-American culture, one position being that there ***is*** no distinctive African-American culture (Frazier 1966). This "no culture" view argues that, when Africans were brought to America, the campaign to sever all ties with Africa was completely effective and no retentions of African culture exist. People who take this position often put forth theories that suggest that African Americans' culture or lifestyle is the same as white American culture, although it is all too frequently an aberrant or pathological imitation of the dominant (white) American culture. Further, they assume that assimilation into the mainstream is desirable and that it may be the only viable way to achieve social and economic equality. Others (Herskovits 1958; Billingsley 1992; Nobles 1985) argue that African retentions have persisted and have strongly shaped and influenced the way in which African Americans behave, believe, structure, and function in their families. In addition, the unique social experiences of African Americans, most notably slavery, racism, and discrimination, have contributed to cultural styles that are distinctly African American. These theorists argue that African Americans have a cultural style in America that is distinct and different from white American culture (which is Western- or European-based) and that difference should not be read as pathological. These cultural styles can be viewed as adaptations to circumstances encountered in America, but the adaptations themselves reflect an African world view and customs (Nobles 1985; Billingsley 1992; Sudarkasa 1981). Examples of the distinctive nature of African-American culture include family configurations and functions, kinship patterns, gender roles, the emphasis on consanguineal (blood) relationships rather than conjugal (marital) ones, and the prominence of spirituality (Butler 1992; Hill 1972). Butler (1992), in fact, argues that substance abuse prevention programs cannot be effectively designed, implemented, or evaluated with African Americans unless their culture is understood and incorporated into the planning and evaluation process.

Drug Use Risk Characteristics in the African-American Population

Reducing risk for drug use is the goal of most prevention programs. Risk status is defined broadly as increased vulnerability to drug experimentation and use; it refers to any condition that increases the probability that an individual or group of individuals will become engaged in drug use. Risk usually is described as high, moderate, or low. Persons are considered to be at high risk as a result of characteristics of the individual (e.g., biological predisposition to addiction or personality type); family (e.g., living in poverty or with neglecting, abusing, or substance-abusing parents); peer (e.g., pressure to conform or norms of group); and community (e.g., urban residence or availability of or easy access to drugs). Public Law 99-750 as amended by Public Law 100-690 defines a high-risk youth as an individual who is not yet age 21; who is at high risk of becoming or has become a drug user or alcohol abuser; and who has experienced any of a number of other conditions, such as being a child of substance abusers, a victim of abuse, a school dropout, or who is economically disadvantaged, has committed a violent or delinquent act, or has had mental health problems. One problem with these broad-based definitions and conceptions of risk is that they capture whole groups and communities in their net and discourage differentiations of risk that may exist within communities or by age and gender. This concept of high risk would apply easily to the majority of African-American children and families based on such indices as socioeconomic status, urban environment, availability of drugs in the community, and school dropout rates.

Much of the empirical research has focused on individual risk or personality factors like risk-taking, sensation-seeking, early aggressiveness, and being a child of abusers. For African Americans, the research base needs to be broadened to include more studies related to family, community, and the environment, as these are the factors some investigators challenge that make African Americans particularly vulnerable to drug exposure and use. Udin, interviewed by the Institute on Black Chemical Abuse (1991), likens drug abuse among African Americans to historical slavery, comparing the marketing of drugs to "the capture, ownership, and sale of human beings, within a context that gives rise to violence and early death." He notes that, 130 years ago, Africans in this country were believed by some to be

physically immune to alcoholism because so few problems were observed in the African-American population. In contrast, African Americans now often are depicted as being culturally disposed to addiction, crime, and violence—a result, Udin believes, of the African-American community's loss of the sense of its heritage. He suggests that teaching children a pride in self (i.e., African consciousness) that is reinforced throughout the community is the best way to prevent drug abuse. Confirmation of this rationale could come from examining rates of substance use and abuse of African Americans who were politically active during the civil rights movement of the 1960s and 1970s or are members of organizations or movements dedicated to the well-being of African Americans, such as the Nation of Islam.

Nobles and Goddard (1989) assert that drug abuse in the African-American community arises from three general processes: (1) economic deprivation, racism, and stress (stress refers to environmental stress, such as day-to-day survival, high noise and pollutants, limited recreational facilities, and offensive put-downs); (2) general availability of alcohol and drugs in the community; and (3) the impact of the media, a special concern in African-American communities, which are heavily targeted for alcohol advertising (e.g., billboards and magazines). From a study Nobles and Goddard (1989) conducted in Alameda County, CA, to understand the effects of drugs on African-American families, they concluded that drugs had caused a shift in the cultural orientation of the African-American community. The traditional African-American family value orientation, which promulgated such values and behaviors as mutual aid, unconditional love, and respect, is now replaced by a drug-culture value system that promotes such attitudes and behaviors as selfishness, violence, nonfamily orientation, and paranoia.

Intervention, it is argued, must begin with the recognition of the impact of sociopolitical exploitation and racial and cultural dehumanization (domination) on the community. Efforts that target individual risk factors should be secondary. Long-term effectiveness will come from programs that focus on communitywide needs. Three components are advanced as critically important to any program of prevention, intervention, and treatment. According to Nobles and Goddard (1989), they are (1) "to consciously re-claim, evaluate, apply and institutionalize our own traditional techniques of development,

socialization, and enculturation, (2) develop authentic Afrocentric theory and practice and (3) undertake a systematic program of community inoculation through cultural immunology." The latter pertains to building the community's capacity to "resist negative agents" through the reassertion to prominence of traditional African-American cultural beliefs and behaviors.

The Treatment of Race, Culture, and Ethnicity in Research

For many years, the belief was held that America was a place where individual ethnicities and cultures would blend into one overarching American culture that would be inclusive and reflective of everyone. This consensus model of ethnic and cultural melding has not evolved; groups have retained their own value, belief, and behavior systems (Cheung 1990-91*a)*. The retention and persistence of these differences necessitates that adequate time and attention be devoted to understanding and clarifying the role that race, ethnicity, and culture play in problem occurrence, prevention, and treatment. This has proven to be difficult. Often distinctions are not made between race, ethnicity, and culture, and this can lead to problems in the correct approach to and analysis of issues. For example, Heath (1990-91) states that, in alcohol studies, ethnicity is a label used to indicate any of five statuses—bureaucratic category, race, national heritage, religion, and special populations. Cheung (1990-91*b)* similarly reports that the concept of ethnicity is represented simplistically in drug abuse studies (e.g., the interchangeable use of ethnicity and race) and concludes that "despite the large pool of research findings pertaining to ethnic and racial variations in drug use (including alcohol), the relationship between ethnicity and drug use has not been thoroughly examined." Although he observes that major weaknesses in the literature are attributable to methodological shortcomings like selection bias in respondents and different noncomparable measures, the more crippling problem, he concludes, is the lack of conceptual clarity of the meaning of ethnicity and, hence, the lack of well-developed and tested theories specifying the relationship between ethnicity, race, culture, and behavior. This is not a problem peculiar to drug abuse; it is a hindrance in other areas. Researchers note that limited research and critical methodological deficiencies create difficulties in providing effective clinical treatment and counseling to ethnic groups, but emphasize as more important the

lack of construct or conceptual clarity of ethnicity and culture (Tharp 1991; Ponterotto 1988).

Special challenges confront the researcher studying African Americans. First, there may be difficulty in clearly articulating a distinct African-American culture and accounting for it in drug abuse etiology and theory. Furthermore, it has been observed that many African Americans are bicultural and can "codeswitch." That is, they know the norms of each community and are able to function in both the white and black worlds. This raises some interesting concerns and questions for researchers. For example, can codeswitching explain why differences sometimes are not strongly found by ethnicity in school-based prevention studies, a setting where majority (white) norms and language prevail? Which culture exerts strongest influence, in which settings, in which behaviors, and at what ages? Do children/participants respond appropriately to the setting? Does the learning hold up, or does it "wash out" when the individual is in other settings?

Second, there is heterogeneity in the African-American population reflecting diversity on a wide range of economic, social, political, cultural, and regional indices. For behavioral prevention interventions, will it be necessary to plan for groupings with more significant differences like neighborhoods that are heavily West Indian, communities where there are a larger number of interracial families, and communities of higher-income African Americans? Does it matter?

Third, arguments often are made that socioeconomic factors in contrast to race may exert a stronger influence on the behavior and lifestyles of African Americans. For example, it is not the fact that one is African American that is causal or explanatory; it is the fact that one is poor.

Fourth, it can be argued that there is little empirical support for the argument that there is a scientific need for prevention and intervention strategies based on culturally specific or sensitive approaches with African Americans or for the effectiveness or superiority of such prevention strategies. It should be noted that the comparative lack of success or decreased success in the involvement of African Americans in prevention programs and the growing involvement of African Americans in drug use and activity suggest that this argument is without merit.

The task for the researcher is to be aware of these issues and to address them. There must be some appreciation for how the variable of "African American" is used in research. For example, in etiologic work one has to worry about how being an African American is conceptualized. Is it a *risk factor* due to vulnerability to drug use, which is a result of socioeconomic status, poverty, stress, and availability of drugs in the community? For example, in their evaluation of a comprehensive community-based program, Johnson and colleagues (1990) discussed ethnicity as a risk factor. Can it be viewed as a *protective factor,* given the fairly high rates of cigarette and alcohol abstainers in certain subgroups of African Americans, and what arguably could be the lower-than-expected use of drugs, considering the high number and pervasiveness of risk factors in African-American communities (e.g., urban areas and high poverty)? Is it a *mediator or filter* that ultimately has no meaning outside of how it processes information or impacts on perceptions and attitudes, resources, and behaviors? Jessor and Jessor (1977), for example, describe ethnicity as a distal causal agent; it has no direct effect on outcome, but rather indirectly may affect other factors more proximal to the behavior observed.

Epidemiologic and Etiologic Issues: Establishing the Research Need

Are African Americans different from members of the majority culture and others in drug use? Epidemiologic data say "yes." Does that difference automatically require a different theoretical and conceptual approach to prevention ? The etiological empirical data base is not clear. Obtaining local epidemiologic data on the targeted group is necessary. Well-recognized limitations of epidemiologic data sources on the drug use of African Americans include lack of studies that focus on African Americans, insufficient representation of African Americans in national surveys, and underrepresentation or exclusion of African-American high-risk groups (Tucker 1985; Prendergast et al. 1989; Harper 1991). Despite these limitations, there are findings from the literature that are generally accepted to be true because they replicate across studies. Foremost among these findings is the conclusion that there are racial/ethnic differences in drug prevalence, patterns of use, preferences, and consequences. There are, of course, similarities between groups on some gross measures; for example, the lifetime

prevalence of any illicit drug use in the general population is similar for African Americans and whites (National Institute on Drug Abuse 1993). However, the greater message from the field is that the documented differences by racial and ethnic groups are consistent and large enough, and the work on etiology by ethnicity is unexplored enough that race- and culture-specific profiles must be used to guide research and programs.

Similar to other racial/ethnic groups, there are age and gender differences found in drug use among African Americans. In terms of rates of use of alcohol and other drugs, African-American adolescents report that they drink and use drugs less than their white counterparts (Maddahian et al. 1985; Kopstein and Roth 1990; Gillmore et al. 1991; Bachman et al. 1991). The validity of this finding has been questioned most often on methodological grounds (e.g., African Americans may be less likely to self-report use), but the finding seems to be hardy and not an artifact of the design or measures (Gillmore et al. 1991; Bachman et al. 1991).

More is known about alcohol use than the use of other drugs in the African-American population (Prendergast et al. 1989). Redd (1989), in a review of the literature on drug use among African Americans, reports that research from the 1950s found that African-American men had lower rates of drinking in comparison to white men. In the 1970s, investigators found higher consumption rates among African-American men in comparison to white men. Still later in the 1980s, more similarities than differences were found in the drinking patterns of African-American men and white men (Redd 1989). How can these differences be explained? One explanation offered by Herd (Herd 1986, 1990) is that the age associated with drinking patterns differs between African-American and white men. For example, African-American men over 40 years of age were more likely to be abstainers or infrequent drinkers, while white men of the same age increased their drinking. Earlier studies could have masked the age-group effects within the adult male group.

A 1993 National Institute on Drug Abuse (NIDA) study used two age groups to report alcohol use, “12 to 20” and “21 or older.” Within the African-American respondent group, any use of alcohol in the past month was highest for African-American males age 21 or older (58.2

percent). Only 38.6 percent of African-American females in the same age group reported any drinking. Drinking among younger African-American males and females was similar, although males were more likely to report drinking than females (32.3 percent versus 27.6 percent). Heavy use (i.e., five or more drinks per occasion on 5 or more days during the past month) was reported by 10.1 percent of the males age 21 or older; 4.7 percent of the males age 12 to 20; 2.8 percent of the females age 21 or older; and 0.6 of the females age 12 to 20. White males had the highest rate of heavy drinking.

Differences have been found in drinking behaviors, with African Americans showing a preference for higher-priced, brand-name liquors and more social (group) drinking in comparison to whites (Dawkins and Harper 1983). Ironically, low-income African-American communities are high consumers of some of the cheapest fortified wines. This occurs, Harper (1986) suggests, because low-income African-American communities are targeted distribution sites for these beverages. African Americans have different attitudes toward drinking and alcoholism. They are more likely to express liberal views toward drinking and to view alcoholism as a sign of moral weakness, a matter of willpower rather than disease (Caetano 1989). Yet, or perhaps accordingly, African Americans have high rates of nondrinking, especially among women.

There are seeming preferences in African Americans' choice of drugs and drug use. For example, heroin seems to be a greater problem for African Americans than for other racial/ethnic groups (National Institute on Drug Abuse 1993). Once drug use becomes a problem (i.e., once it develops into addiction and dependency), there are racial differences in health consequences and treatment involvement. For example, in comparison to whites, African Americans are more likely to die from substance abuse-related illnesses like lung cancer and cirrhosis of the liver (Jaynes and Williams 1989) and AIDS contracted as a result of IV drug use (Centers for Disease Control 1986). In addition, African Americans are less likely than whites to be admitted to a hospital for treatment following emergency-room treatment (National Institute on Drug Abuse 1993).

Recent NIDA data reveal some interesting findings regarding drug use among African Americans that speak to the need to routinely monitor

and keep abreast of current drug use profiles of African Americans. Using primarily the National Household Survey on Drug Abuse and other national data sets, NIDA (1993) released an updated report on drug use among ethnic minorities. The usual age, gender effects, and place of residence effects were found. Lifetime prevalence rates of any illicit drug use did not significantly vary between African Americans and whites (39 percent versus 38 percent, respectively). African Americans, in comparison to whites and Hispanics, reported significantly higher current use of an illicit drug, that is, during the last month or year. African-American males reported higher rates of lifetime and current use. The African-American age groups reporting highest rates of use were 18-25 year olds and 26-34 year olds, followed by 12-17 year olds and individuals 35 years old or over. Licit drug use among African Americans showed that the majority reported no use of cigarettes during the past month (ranging from 60.1 percent for males over age 35 to 96.5 percent for females 12-17 years of age). Smoking was more likely to be reported by those over age 25, with the heaviest smokers (a pack or more per day) being males over 35 years old (18.6 percent) and between age 26 and 34 (15.8 percent). African-American females who were heavy smokers were more likely to be 26-34 years of age (10.3 percent) or 35 years of age and older (9.0 percent). Place of residence had an effect on smoking, with African Americans living in large metropolitan areas most likely to be heavy smokers and those in nonmetropolitan areas least likely to be heavy smokers.

An analysis of drug use trends since 1985 by ethnicity revealed a very alarming finding, one that has tremendous implications for prevention interventions (National Institute on Drug Abuse 1993). (Caution is warranted, however, since this finding has not been duplicated.) Between 1988 and 1991, there was a decline in past-month illicit drug use for whites and Hispanics, but for African Americans during this same time period, there was an *increase* in use. Two additional findings make this increase even more disturbing. First, all groups, including African Americans, showed a drop in drug use between 1985 and 1988. The drop was attributed to an increase in the public's perception that drug use is harmful. Why are African Americans showing an increase now? Second, one of the shortcomings of the study is that African-American groups at highest risk for drug use are underrepresented. An increase, therefore, in drug use in the general population

of African Americans (from low to moderate risk) raises questions about the effectiveness and reach of current prevention efforts, specifically for African Americans and the forces affecting their susceptibility to use.

In summary, the epidemiologic data suggest that prevention interventions need to target adult populations, particularly young adults of both sexes and males across the adult lifecycle. In addition, if the trend toward increased use in African Americans as reported by NIDA is substantiated, then prevention efforts toward the general population of African Americans may need to be intensified and methods of prevention evaluated to increase their impact.

PROBLEMS WITH ETIOLOGY, THEORY, AND METHODS

There is a paucity of empirical research and theoretical models that take culture into account (Wright and Watts 1988), deficiencies that make it difficult to plan and develop treatment and prevention programs for minority youth. Etiologic studies are few in number, although they are increasing. Of those available, methodological limitations hamper their usefulness to understanding drug use causation among ethnic and minority populations (Tucker 1985). In particular, there are few studies that are scientifically rigorous; studies should use strong designs (such as prospective longitudinal designs) and be theoretically driven. In addition, many studies do not focus on larger systemic issues like racism and discrimination that greatly affect ethnic groups.

It is important that ethnic status be treated as an explanatory variable and not just a descriptive one. That is, there must be a conceptual basis offered that lends guidance to the prevention intervention designed and the ability to discuss outcomes from the intervention in a manner that contributes to greater understanding of that group. There is a need to develop theory that combines what is known about drug abuse prevention with what is known about African-American culture and experiences. Discussing human immunodeficiency virus (HIV)/AIDS prevention in African-American communities, Randolph and Banks (1993) argue that Afrocentric theoretical perspectives (which are

well developed) need to be incorporated into prevention practice and research.

Individual risk or personality factors may need to be emphasized less for African-American populations than factors related to family, community, and the environment, or at least the research base needs to include more studies that are theoretically guided by these factors. As previously discussed, researchers postulate that these variables are conceptually linked to drug use and abuse in African-American communities (Institute on Black Chemical Abuse 1991; Nobles and Goddard 1989).

Research on protective factors shows promising starts for prevention interventions with African Americans. Hawkins and colleagues (1992) state that "protective factors mediate or moderate the effects of exposure to risk," and as such, "the results of research on protective factors are important to prevention policy." Protective factors are not likely to be the same across cultural groups, although there may be similarities. For example, Brook (1993) found differences in protective factors between Puerto Rican and African-American youth. For both groups, family protective factors ameliorated the effects of certain risk factors, such as peer and drug context. However, the specific family dimensions differed between the two groups with, for example, models of low drug use in the family being more important as a protector for the drug context domain than family attachment and control. In Puerto Rican families, the opposite was found. Religiosity and racial consciousness have been posited to play a significant role in protecting African Americans from engaging in detrimental behaviors (Gary and Berry 1986). More etiologic work is needed to identify the specific factors important in African-American individuals and communities and how they can be incorporated into prevention intervention efforts.

As previously mentioned, discussions of methodological issues in conducting drug abuse research in African-American communities are available elsewhere (Harper 1991; Lex 1987; Wright and Watts 1988). Although it is beyond the scope of this chapter to elaborate upon all of them, there are three design issues especially pertinent to prevention research that should be highlighted because they have led to serious problems of research implementation, analysis, and interpretation in regard to African Americans. The first issue is the problem of gaining

access to the African-American community. Researchers working with African-American people have experienced problems of low response rates, high attrition, and refusal to participate; concerns about the validity and accuracy of data provided; and even the active boycott of research by community groups. Reasons for these problems vary, but they include the historical treatment—or more accurately mistreatment—of African Americans in research studies and the general mistrust it has engendered in the community. The most notorious example is the Tuskegee syphilis study of African-American males in which treatment, when it became available, was withheld for the sake of fidelity to the initial research design and questions. Thomas and Quinn (199 1) discuss the legacy of the Tuskegee study for investigators now working with African-American communities, particularly in HIV/AIDS research and prevention. Other factors affecting access include the high mobility of urban, lower-class persons and the difficulty of locating certain groups, such as young adult men who are not "official" members of households. Strides have been made in gaining access to and cooperation of African-American communities, with the most successful strategies emphasizing active community involvement early on in the planning process.[2] These issues are likely to be even more important in prevention intervention research because it demands the cooperation of participants over a period of time, in most cases, for the nonoccurrence of a problem. Groups suspicious of mainstream systems often avoid using them until crises occur.

The second issue is the use of the comparative paradigm. These are studies where groups differing on a variable (e.g., race/ethnicity or sex) are compared on common dependent measures. Too frequently, the use of this design has resulted in the adoption of a deficit approach to the study of African Americans (Azibo 1992; Oyemade and Rosser 1980; McLoyd 1991) in that the conceptual or theoretical underpinnings of the study, as well as the measures used, are almost without exception based on the white sample. The white population becomes the norm or standard against which all others are measured. This again demonstrates the need for researchers to articulate clearly the theoretical significance of race or ethnicity and to frame research questions that focus on the advancement of knowledge about the dynamics and needs of a group rather than the fit of one group to the norms of another. (In a similar way, many researchers argue that studies comparing men and women should use gender conceived as a

broad complex of biologic, psychological, and social factors, rather than sex based on physiological and anatomical structure, as the conceptual and interpretational guide.) If an investigator chooses to use a comparative paradigm (that is, measure differences between racial/ethnic groups), there is a great chance that the focus will be on the differences between groups rather than on the dynamics of the "compared to" group. The comparative design in many instances can lead one to be lazy in that differences between groups are sometimes striking and easy to write (and publish!) without having to closely examine and interpret within-group variations or commonalities that can be intriguing. Other drawbacks of the comparative design include the often-too-small sample size of the subgroups, which can limit meaningful intragroup examinations, and the use of an inappropriate analytic plan. For example, in an analysis of the doll studies purporting to show white preference in African-American children, Banks (1976) showed that the basis for the statistical analysis was flawed and that it led to a misinterpretation of the African-American children's choice responses.

The epidemiologic and etiologic differences in drug use among racial/ethnic groups suggest that researchers need to be extraordinarily careful in clumping groups together and proceeding from a common theoretical base without addressing differences that might be encountered in analyzing and interpreting findings from the research group by group. Related to this issue is the requirement of Government funding agencies that all studies have adequate representation of women and minorities unless there is good reason for not doing so. This is a good and well-intentioned policy; however, adequate representation often is interpreted as proportionate statistical representation that sometimes results in ethnic subgroup samples that are too small for meaningful analysis.

The third design issue concerns the representation of the breadth of the diversity of the African-American population in prevention intervention research. Epidemiologic data suggest that more prevention intervention research is needed, for example, on African Americans who are young adults, males, and out of the easy-to-access captive populations.

Empirical Research on Drug Abuse Prevention With African Americans

Meta-analyses of research reveal that there are prevention strategies that work and that some seem to work better than others (Tobler 1992; Hansen 1992). Tobler, for example, found that peer programs were more successful than knowledge-only, affective-only, knowledge and affective, and alternative programs. Differences in effectiveness were influenced by a number of factors, such as the drug targeted and characteristics of the leader. Hansen found that comprehensive and social-influence school-based programs were more effective. Neither researcher could address fully the issue of culture and ethnicity in their reviews of programs. In the studies they reviewed, ethnicity was inconsistently reported, perhaps reflecting the oft-occurring problem in the literature wherein race/ethnicity is not routinely given. This can be interpreted as indicating that ethnicity makes no difference and that culture does not need to form the basis for prevention models (e.g., the effectiveness of peer models). But some findings suggest that ethnicity/culture might have some important influence on the implementation of the model (e.g., leader characteristics and peer models). It needs to be researched more thoroughly.

African-American youth are included in prevention intervention studies. Meeting the criteria for high risk almost guarantees their inclusion in many urban-based programs. Does being African American change the outcome of or participation in substance abuse prevention studies? One conclusion that can be drawn is that known prevention strategies are as effective with African Americans as with other groups (primarily white groups) considering that differences are not reported. This probably is a faulty conclusion, given the limitations of these studies and what is known about comparative designs and given the relatively few studies that do include African Americans in sufficient number for meaningful within-group analyses.

The empirical research on drug abuse prevention with African Americans (and other ethnic groups) is extremely limited. Moreover, when they are included, analyses are sometimes not conducted by race/ethnicity. At other times, differences by ethnicity do not appear. In their evaluation of a comprehensive community-based program, Johnson and colleagues (1990) had a school sample that was composed

of about 19 percent African Americans. Analyses by race/ethnicity were not run, based on the authors' assumption that ethnicity had no direct influence on substance use (that it is mediated through other variables) and, consequently, it is to be surmised, on prevention efforts. No differences by race on prevention efforts were reported.

Empirical studies that target African Americans specifically tend to focus on making the implementation process or phase culturally specific. They are very few in number, and they do not propose, for the most part, prevention intervention models that are theoretically driven by a culturally specific approach. Rather, they seek to present the model in a way that will ensure participation, enthusiasm, and involvement. For example, Schinke and colleagues (1990) used learning theory with culture, age, and specific learning as a guide to developing an AIDS prevention program. Using a self-instruction guide in a comic-book format as a major part of the intervention, the cultural part of the intervention was the use of characters and language that was reflective of the targeted group (African Americans and Hispanics). Results were inconsistent and did not show clear benefits of the intervention, Jemmott and colleagues (1992), in a study to reduce HIV sex-risk behavior among African-American male adolescents, used an intervention based on reasoned action, knowledge, and skill-building. Facilitators and materials used in the workshops were culturally and developmentally appropriate. Some differences in HIV knowledge and behavior were found between the experimental and comparison group.

Studies to determine if and which culturally specific studies are better at drug abuse prevention with African Americans, in comparison to the generic prevention interventions, are not available. Although that is an underlying question in the field, there is virtually no literature to examine this as an issue. For example, there are no studies that compare variations of several "culturally specific" social skills approaches with diverse groups of African Americans or studies to match any of a variety of culturally specific approaches with subgroups of the African-American population.

Prevention Intervention Research Needs With African Americans

The literature offers starting points for effective prevention programs with African Americans. A number of these suggestions come from prevention intervention demonstration programs (e.g., many of the programs sponsored by the Center for Substance Abuse Prevention [the former Office for Substance Abuse Prevention]). Such efforts, although evaluated, did not require rigorous evaluation designs and methods. For example, Maypole and Anderson (1987) describe "Soulbeat," a community-based drug abuse prevention intervention that uses dramatic presentations followed by discussions. The evaluation of "Soulbeat" was qualitative and based on observations of the project team. No assessments of participant characteristics, attitudes, or behavior were described. There was, however, active involvement of students and community organizations for a period of time. More needs to be known about these types of programs.

Rites-of-passage-type programs for males and females have grown in the last few years. Based on Afrocentric principles, these are comprehensive manhood and womanhood training interventions with multiple goals, the adoption of a healthy, drug-free lifestyle being one of them. They generally have the earmarks of a successful drug prevention activity as suggested by the findings of Tobler (1992) and Hansen (1992). Specifically, they are comprehensive, have strong leaders, use peers, and are conceptually grounded in using social influence and promulgating certain cultural norms and values. Moreover, they are community based and often interact with the families of the participants. The effectiveness of these rites-of-passage programs as drug abuse prevention interventions is not empirically established.

NEED FOR AFRICAN-AMERICAN RESEARCHERS

African Americans historically have served the long-term interest of African-American communities. In particular, African-American professionals have been the primary providers of community-based health care services to African Americans (Jaynes and Williams 1989). African-American educators and the historically black colleges and universities have produced the majority of African-American

professionals, particularly medical doctors and dentists, and have disproportionately provided the undergraduate training for African Americans who later receive graduate degrees at white universities.

African-American students, scholars, and researchers need to become more involved in prevention intervention research. They bring several advantages and vantage points to the field. First, many already are involved in drug treatment service, drug prevention, and other related efforts in the community, but they are not as involved in drug prevention research. Reasons for this include lack of interest and time for research, disdain for or mistrust of research and its potential effects on program evaluation and survival, lack of institutional support and resources to conduct research, and lack of connection or access to the drug abuse prevention research community. Second, African Americans may have an advantage in overcoming community-access barriers. This is true only if they recognize the same issues of sensitivity, respect, and cooperation that all investigators must have. Third, it is more likely that they will have a vested interest in the needs of the population and the strengthening and stabilization of families and communities. They are more likely to be affected by the impact of drugs on the African-American community. Fourth, they are more likely to live in an African-American community, albeit not in the poorest neighborhoods or their community of origin. The majority of African Americans still live in predominantly African-American communities or base their social lives in African-American networks like churches, voluntary associations, and fraternities or sororities. All these reasons converge to form the ultimate benefit of having the involvement of African-American investigators trained and active in drug abuse prevention programs and research—they potentially bring a permanent resource to the various components of African-American communities, including academic institutions, neighborhoods, professional societies, churches, and civic groups.

SUMMARY OF SUGGESTIONS

The following are some suggestions offered in the planning or conducting of prevention intervention research with African Americans based on issues identified in this chapter.

1. Demonstrate knowledge of the culture and diversity of the African-American population. That knowledge should be reflected in the research conceptualization, design, and analysis plan. Limitations pertaining to the adequacy to which culture and diversity are addressed should be identified.

2. Be familiar with the approaches and problems cited by investigators working with the African-American population. Know the theories, methods, and measures they have used and the conclusions they have drawn. In particular, know the design and methodological challenges that a particular problem or approach creates.

3. Redefine and focus on high-risk groups in the African-American community. Use epidemiologic and etiologic work to support the group to be studied. Propose prevention interventions with them. These groups may include adult groups or groups experiencing certain stressful life events, such as long-term unemployment or physical trauma. Prevention interventions with African-American males in early adulthood are especially needed.

4. Expand studies to focus on family- and community-based interventions.

5. Advance theoretical development by incorporating aspects of culture and protective factors in the conceptual base used for the prevention interventions proposed.

6. Rigorously research alternative culturally specific interventions. Address questions pertaining to the fit or match of specific prevention approaches to the diversity of the African-American population.

7. Avoid the pitfalls of the comparative paradigm.

8. Establish working relationships with African-American communities and professionals, as well as other persons or groups with specific experience in drug abuse research.

NOTES

1. Unless otherwise noted, all sociodemographic data in this section come from Bennett (1991).

2. See Milbum and colleagues (1991), Beatty (1992), Debro and Conley (1993), and Jackson (1991) for identification of problems of access to African-American communities and ways to overcome them.

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Drug Prevention Research With Hispanic Populations: Theoretical and Methodological Issues and a Generic Structural Model

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INTRODUCTION

In the past, research on drug abuse with Hispanics, a group including Cubans, Puerto Ricans, and Mexican Americans, has been characterized by two limitations: (1) There has been little of it, and (2) most studies have been conducted in the absence of a viable conceptual framework, especially one that considers the cultural factors that affect Hispanics (Booth et al. 1990).

This chapter presents a generic model that may be used to guide scientific drug abuse research with Hispanics. This model serves not as a final version but rather as a viable "template" that may prompt variations in this model that may be applicable to various populations of Hispanics in the United States. This paper also presents a discussion of theoretical and methodological issues that should be considered in future drug abuse research with Hispanics.

Scientific research is the organized and systematic study of a problem for the purpose of answering one or more important questions about that problem. Customarily, this process of inquiry has been organized around the testing of one or more hypotheses that serve as tentative predictions, that is, proposed answers to these research questions. In this effort, models serve as concrete representations of theory, and they help guide this organized inquiry in efforts to uncover new knowledge (Bukoski 1991; Hawkins et al. 1992). In its simplest form, a model consists of a set of categories (i.e., factors) and the relationships or

linkages between them (i.e, vectors). These connections (i.e., category-linkage-category units) may be conceived to be "hypotheses," which may be tested, as these may apply to a targeted population. The model as an integrated whole provides a set of hypotheses that propose an explanatory story regarding the behaviors of members of a targeted population. The more accurately and completely the model explains their behavior, the better the model.

Not all proposed models are useful. Useful models can be translated from a conceptual to a measured version that then can be tested. Better models offer a balance between parsimony, which is simplicity of presentation and the complexity required to produce adequate fit between predictions from the model and observed data. A useful model also must be adaptable to variations in situations while remaining robust in its applicability to multiple situations. Furthermore, a useful model will provide insights into new aspects of a situation, thus promoting discovery.

Finally, insisting that the researcher specify a priori his or her working model even in conceptual form clarifies how the investigator sees the research problem at that time. This makes more explicit the assumptions, types of variables, hypotheses, biases, and preconceptions (which may be misconceptions) that underlie the proposed research. Explicit a priori model specification forces the investigator to make explicit that which is vague or implicit. It produces a "research map" that indicates where he or she plans to go and how he or she plans to get there. Such specification often exposes unclear thinking and is useful even if the actual direction of research is expected to change during the process of research. In this regard, there is no shame in change that prompts modification of the original working model as the investigator discovers new factors from work in the field. Shame lies in maintaining a misspecified, nonfitting model that ignores new discoveries, indicating a need for changes in the original working model. Moreover, it simply is unscientific and unproductive to gather data without the benefit of an orienting conceptual framework that helps the investigator distinguish useful data from data that is difficult to interpret (Kirk and Miller 1986).

CULTURAL AND METHODOLOGICAL ISSUES IN HISPANIC DRUGABUSERESEARCH

"Culture" is an important yet elusive construct. While there are many conceptions and definitions, culture may be conceptualized as "the standards of behavior that one acquires as a member of a social group" (Harwood 1981, p. 27). Although conceptions of culture emphasize its vertical transmission from elders to youth, drug culture also is transmitted horizontally between peers. This process may be prompted by the breakdown of relationships between youth and elders, as Hispanic elders and those of other cultures typically discourage drug use.

Hispanic Identity and Drug Abuse

Certain distinctly Hispanic experiences may affect the likelihood that a Hispanic individual will use or avoid illicit drugs. The experience of being Hispanic in the United States is shaped by several conditions, including: (1) the person's linguistic dominance (e.g., being monolingual, Spanish-speaking), (2) being raised in a lower-class "barrio" community, and (3) feeling discriminated against and "different" based upon identity as a Hispanic. These conditions create social boundaries that can set limits on social behavior. Identifying with and relating to others who share a common "mother culture" involves sharing common beliefs, values, and traditions. This identification promotes a sense of belonging that influences many behaviors, including drug use.

All Hispanics are not at equal risk for drug abuse, although subpopulations of Hispanics (e.g., youth aged 13 to 17) may be at higher risk for abusing certain substances, such as inhalants. However, this risk may be mediated by both cultural and economic factors, such as living in impoverished communities. By contrast, core traditional ethnic cultures tend to emphasize conservative, family-oriented values. A strong traditional value orientation may safeguard against drug abuse. The abuse of illicit drugs often includes involvement in criminal activities and other antisocial behaviors that threaten family unity and social relations. Thus, the use of illicit drugs for self-gratification or self-medication (Khantzian 1985) may be seen as a "selfish," individualistic activity and generally is discouraged by traditional conservative Hispanic family norms that encourage family unity and collaboration,

While certain ethnic and religious ceremonies may involve alcohol or other drugs (Westermeyer 1984), such ceremonies prescribe the *controlled, limited,* and *reverent* use of a drug. By contrast, addictive drug use involves uncontrolled, irreverent, and abusive patterns that are discouraged by traditional norms (Oetting and Beauvais 1990). However, under poverty, high stress, and disrupted family relations, youth often become detached from traditional familial values while being exposed to "street" conditions that promote drug abuse.

Some Culturally Specific Hispanic Constructs. While some constructs may lose their significance or value cross culturally, other culturally unique constructs may emerge. Within the Hispanic cultures, such culturally unique constructs include: (1) "personalismo" (friendly interpersonal relations), (2) "respeto" (mutual respect), and (3) "familism" (the central importance of the family in relation to the Hispanic individual's personal and social decisionmaking).

"Personalismo" (and the related concept of "simpatia") refer to intimacy and efforts to maintain harmony in personal relationships, Accordingly, this value prompts deference to others in order to maintain harmonious personal relations (Marin and Marin 1991). Actions such as confrontation, contradiction, and disagreement may be discouraged for the sake of group harmony. Here, group well-being is valued above the desires of the individual.

"Respeto" refers to the importance of respect in interpersonal relations. "Respeto" prompts courtesy in behavior and attention to social status and rank in the exchange of greetings and information. For example, "respeto" calls for the formal use of the word "usted" in cases of social interactions between mere acquaintances. Only in more intimate relationships should the word "tu" be used.

Familism refers to the value that most Hispanics place on the family. In many Hispanic families, individual behavior is influenced more by preferences of the family as a collective and less by individual desires, although this pattern varies in relation to level of acculturation.

Moderating Effects of Acculturation. While the above-mentioned three dominant themes and their related constructs are found within Hispanic cultures, variability exists among Hispanic individuals in how

much they accept and practice these traditional Hispanic cultural themes. While acculturation has been recognized as a process of *social change,* acculturation typically has been used to describe the degree to which a person has adopted the language, beliefs, and practices of the host society and the degree to which the person has retained aspects of the mother society and culture.

During the past decade, the variable of acculturation has been measured primarily with modified versions of the Cuellar acculturation scale (Cuellar et al. 1980). The concept of acculturation as operationalized by this scale has been criticized as a linear (zero-sum) conception, one that suggests that the greater acquisition of dominant mainstream (Anglo-American) characteristics necessarily occurs at the expense of characteristics of the mother culture (in this case, Hispanic culture) (Rogler et al. 1991).

The construct of acculturation as measured by the five-point Cuellar scale and its derivatives has enhanced the level of scholarship on Hispanic research conducted during the 1980s although for the 1990s this approach may have reached the limits of its usefulness. For example, current acculturation scales provide a static "here-and-now" measurement of acculturation. Such scales offer a static "trait" measure of acculturation that fails to measure acculturation as a process of evolution and cultural change across time. For example, some Hispanics are acculturating at a rapid rate, while others born into a highly acculturated family have not changed their cultural outlook or experienced acculturation during their entire lifetimes. Yet individuals from either group may have an acculturation score of 4.0 on the 5.0 scale, indicating that they are highly acculturated. However, they clearly have different rates of acculturation such that one person, when measured again in 1 year, may maintain an acculturation score of 4.0, while the other might score closer to 5.0. The need exists for a new generation of Hispanic acculturation-related research that captures the broader richness of acculturation as a process. This may require the development of multidimensional as well as more sensitive models using research that begins with a fresh look at acculturation as it occurs in the 1990s. Here, qualitative approaches may be used as initial hypothesis-generating and construct-generating methods.

Cross-Cultural Equivalence of Constructs

Figure 1 illustrates issues of construct validity, specifically in relation to a construct's conceptual equivalence, as applied to three different populations: (1) mainstream Anglo-Americans, (2) English-speaking and bicultural or highly acculturated Hispanics, and (3) low-acculturated Mexican nationals, a subgroup of Hispanics whose primary or sole spoken language is Spanish and some of whom are undocumented.

The present analysis uses the conventions for covariance structure modeling, where rectangles represent measured variables and ovals represent latent variables (Bentler 1980). The issue of latent factor equivalence across groups first was observed in this fashion in a study that compared ethnic models of the predictors of cigarette smoking (Castro et al. 1987*a)*. The latent variable of social conformity is defined by three measured variables: law abidance, liberalism, and religiosity. As depicted in figure l(a), for the Anglo-American (non-Hispanic white) sample, a confirmatory factor analysis revealed that social conformity is adequately identified by the three measured variables of law abidance, liberalism, and religiosity as shown by loadings that are significant.

By contrast, for the sample of Mexican Americans (high-acculturated or bicultural Hispanics of Mexican descent), social conformity was only partially identified, as only two of the variables exhibited adequate loadings: law abidance (+.73) and liberalism (-.39). Among the Mexican Americans, religiosity was unrelated to social conformity, suggesting that for these Hispanics conformity to American social values is characterized by law abidance and liberalism, but not religiosity.[1] When applied to these Mexican Americans, the construct of social conformity exhibits only *partial* cross-cultural equivalence and, thus, cannot be said to have the same meaning for these Mexican Americans as it does for their Anglo-American peers.

In order to fully specify the social conformity construct for highly acculturated or bicultural Hispanics, a different (perhaps culturally

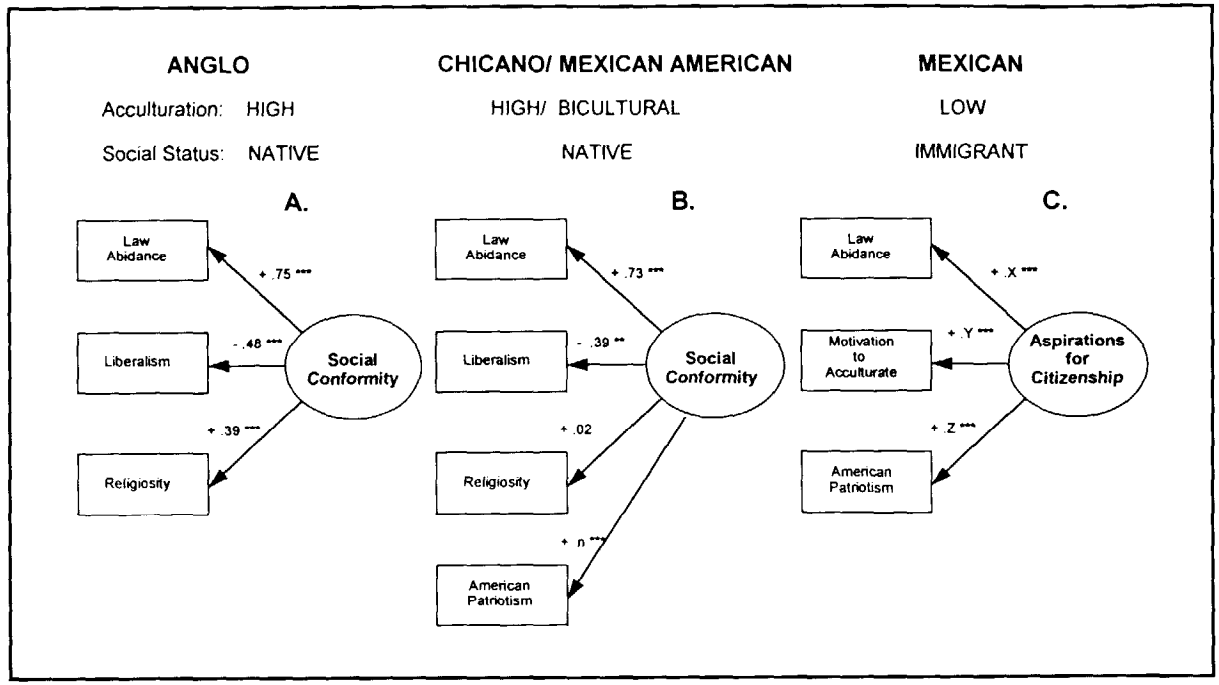

FIGURE 1. *Measurement models depicting issues of latent variable nonequivalence*

unique) measured variable, such as American patriotism, might be needed. As a rationale for this, it might be noted that some Hispanics who have entered the military were prompted to enter by patriotism or later developed patriotism. Thus, for the Mexican Americans featured in figure l(b), the variable of American patriotism might load significantly on the social conformity latent factor and might serve to help define it as related to Hispanics.

In an inferential fashion, figure l(c) illustrates a more extreme case of construct nonequivalence as applied to a group of Hispanics who face certain social constraints not experienced by members of the other two groups. Among Hispanics who are undocumented (like certain Mexican nationals), being a "good citizen" often involves maintaining a low social profile in order to avoid apprehension and earn money for survival and to send to loved ones in Mexico. Although their behavior may be described as social conformity, it may be motivated by concerns over deportation that are otherwise not relevant for Anglo-Americans or for native-born Mexican Americans.

Accordingly, for these undocumented Mexicans, law abidance might load highly on social conformity, although other measured variables that are culturally unique to this group, such as motivation to acculturate and American patriotism, also might operate as measured variables needed to fully define the latent construct of social conformity. As a result, social conformity, as defined for these undocumented Mexicans, no longer represents the same latent variable of social conformity observed for Anglo-Americans and high-acculturated or bicultural Mexican Americans. Moreover, as applied to undocumented Mexicans, the construct of social conformity might have an identity so different from that originally conceived and defined for the Anglo-American group that it is best defined by a different label, such as aspirations for citizenship.

According to this analysis, the construct of social conformity, as defined for the Anglo-American group is an invalid construct when applied to the low-acculturated Mexican nationals. For them, aspirations for citizenship may constitute a valid construct—one that is *culturally unique* to undocumented Mexican nationals—since desire for citizenship is a meaningless construct to U.S. citizens, whether Anglo-American or Mexican American. Behaviorally, despite the fact that all

three groups may exhibit similar prosocial behaviors and attitudes, the underlying motivations for their actions as depicted by this analysis may differ. In conclusion, for the undocumented Mexican nationals, the latent variable of social conformity is no longer equivalent enough to maintain its identity. Thus, the old social conformity factor was replaced by a related but nonequivalent latent variable, aspirations for citizenship.

At a theoretical level, this analysis illustrates the types of thorny cross-cultural issues that must be considered in ascertaining construct validity and in evaluating the cross-cultural meaning of a construct or factor. Based upon the use of covariance structure modeling as a modality for examining the issues of construct equivalence across groups and cultures, the summary below notes the ways in which a construct can be nonequivalent.

Assuming for the index group (i.e., the Anglo-American group) that all three measured variables show significant loadings, for either of the comparison group (i.e., the Mexican Americans or the Mexicans), a latent construct can be evaluated for equivalence in the following ways:

Indications of equivalence:
(1) Loadings for all measured variables are significant.
(2) The signs of all corresponding measured variables are the same.

Indications of partial nonequivalence:
(1) Loadings for one measured variable are not significant for the comparison group.
(2) A new measured variable is needed to define the latent variable in the comparison group.
(3) The sign of one or more loadings does not match that of its corresponding loading for the index group.

Indications of nonequivalence:
(1) Loadings of more than one measured variable are not significant in the comparison group.
(2) More than one additional measured variable is needed to define the construct, thus imposing a new identity into the initial construct. A *culturally unique* construct operates as a special case of this

condition since by definition it has no equivalence in meaning for members of the index group.

(3) In the comparison group, the signs for more than one loading differ from those of their corresponding measured variable for the index group.

Overreliance on Quantitative Approaches

The criticism of overreliance on quantitative methods should not be taken as a criticism of quantitative and multivariate methods per se. To the contrary, sound epidemiologic and model-building methods must be applied to Hispanic populations if researchers are to better describe trends and identify risk factors for the purpose of disease-illness description and program development. However, given the aforementioned issues of observed limitations in conceptualization, measurement, and model-building in past research with Hispanic populations, it is prudent to begin utilizing qualitative ethnographic methods (Taylor and Bogden 1984) as adjuncts to quantitative methodologies. Moreover, for certain exploratory and time-limited studies like those on acquired immunodeficiency syndrome (AIDS) risk among Hispanic populations, ethnographic studies have been adopted as viable methodologies for generating descriptive-level information and for developing hypotheses, given the scarcity of relevant empirical data and the urgent need to develop viable intervention programs (Mata and Jorquez 1988).

A GENERIC STRUCTURAL MODEL OF RISK FACTORS FOR DRUG ADDICTION IN HISPANIC POPULATIONS

Need for a Generic Model

Given the diversity and complexity of contemporary U.S. multiethnic society, it is unreasonable to expect to find a single "one-size-fits-all" model that applies well to all groups or communities. Ideally, each cultural subgroup, Indian tribe, or community subgroup would have its own unique model that accurately describes the unique factors promoting drug abuse among its members. However, it would be most impractical to develop a unique model that accurately describes the

process of drug abuse as it occurs across hundreds of individual communities nationwide.

By contrast, a clear conceptual framework or explicit model is a critical starting point for conducting scientifically sound social science research (Gordon 1989), particularly since scientists cannot conduct research from an atheoretical position. Even studies that fail to state their model explicitly will operate under implicit assumptions that support a certain model (Oetting and Beauvais 1990).

For simplicity, the proposed generic model shown in figure 2 does not present *mediating* relationships, although, as suggested by the Peer Cluster Theory (Oetting and Beauvais 1987), some variables (such as cultural identification) could act as mediators of the direct relationships between antecedent variables and consequential variables shown in this model.

In figure 2, it also is likely that intercorrelations would exist between the latent metafactors that are shown, although for clarity of presentation, two-sided arrows that would depict intercorrelations between these factors are not included. However, the factors presented are considered sufficiently distinct from one another that degree of correlation would not be sufficiently high to produce multicollinearity.

The present analysis will focus on the left side of figure 2, which shows the proposed antecedents of drug use and addiction, with some mention of factors to the right, where this proposed model presents a series of stages that depict various consequences of drug addiction.

Overview of Structural Model

This model presents one approach to addressing the current lack of a viable conceptual framework that is useful for planning drug research studies in Hispanic populations. From prior research with the general population, it is clear that addiction to illicit drugs results from several antecedent factors, both distal and proximal (Flay and Petraitis 1991; Gilchrist 1991; Lettieri et al. 1984). As shown in the present model, two general types of factors operate as antecedents of drug abuse behaviors: (1) those that contribute to drug abuse, called "contributing factors," and (2) those that buffer against or discourage drug abuse,

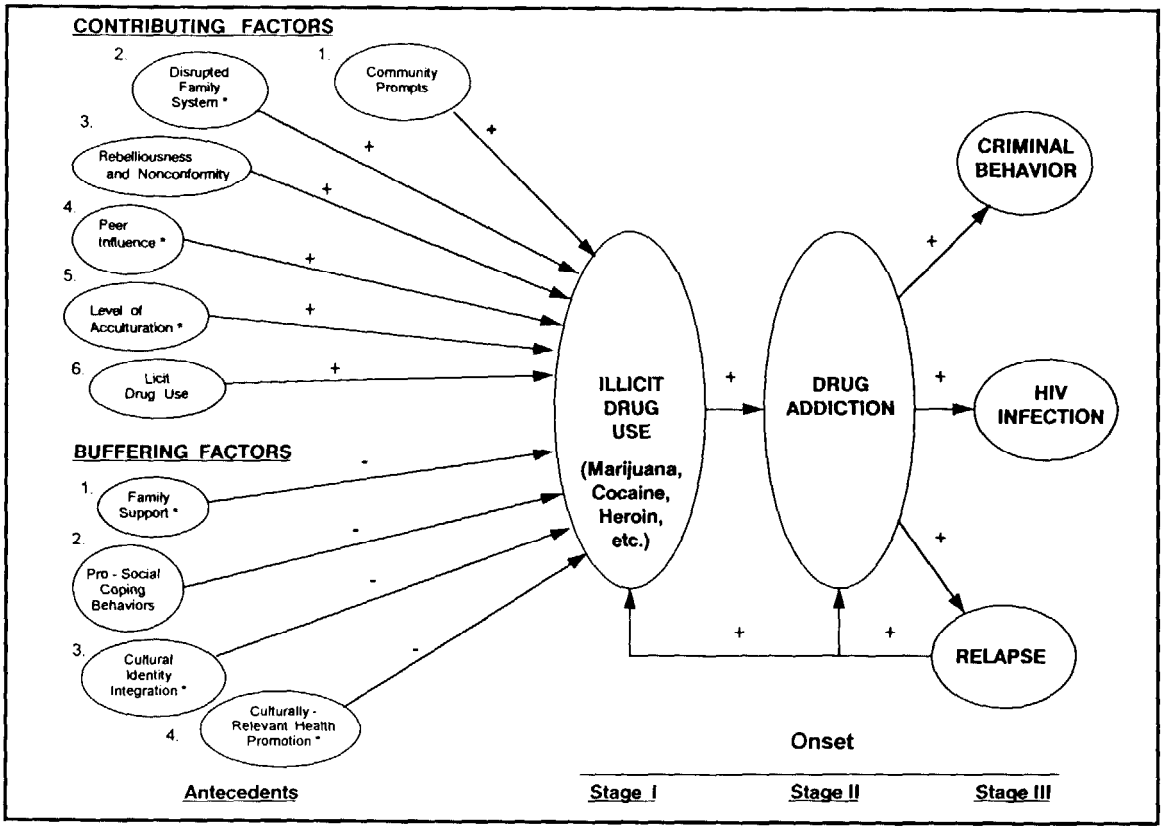

FIGURE 2. *General structural model of the antecedents and consequences of drug use in Hispanics*

known as "buffering factors." To prevent illicit drug use, effective interventions should reduce the potency of contributing factors and increase the potency of buffering factors.

Specific models for subpopulations at risk also are needed—models that may be derived from this generic model. Such submodels could provide more accurate predictions on unique antecedents (i.e., risk factors) of drug use as they occur among members of a specific subgroup of Hispanics. Such models would serve as better-fitting (i.e., more accurate and valid) descriptors of the patterns that define a subgroup's unique risk conditions. By contrast, a generic model as proposed here may serve as a general "template," a less accurate yet general descriptor of broad conditions that influence the risk of drug abuse in several Hispanic populations (Castro et al. 1991).

The following section examines the contributing and buffering factors that may operate as antecedents to drug abuse among Hispanics. Figure 2 summarizes these antecedents in the form of a structural model. Since native (nonimmigrant) Hispanics are raised in the United States, they face common environmental factors (i.e., *culturally common* factors) that also promote risk of addiction among non-minority individuals. However, Hispanics experience additional conditions that exert a unique impact on them; these are *culturally unique* factors. While some Hispanics may be exposed to certain factors that also affect Anglo-Americans, some of these factors may exert a more powerful effect on Hispanics. In figure 2, asterisks (*) identify factors that are expected to exert a culturally unique effect upon Hispanics, depending upon their position on the acculturation dimension. For example, some drug abuse behaviors probably are influenced by noncultural factors such as a disrupted family system. In addition, among Hispanics, certain sociocultural conflicts associated with physical appearance, ethnic identity, or gang membership may contribute unique risks toward drug use.

Outcomes

This generic structural model lends itself to measurement and subsequent testing. This model offers several factors that may operate conjointly to increase the risk of drug abuse among Hispanics. Specific variants of this generic structural model can be generated that

could provide a better-fitting model that further explains the process that leads to drug use and abuse for specific subgroups of Hispanics, such as Mexican Americans, Puerto Ricans, and Cuban Americans.

Outcome 1: Illicit Drug Use. The *initial* use of illicit drugs is seen as a consequence of several contributing factors, including the initial use of licit "gateway drugs" such as cigarettes and alcohol, especially when these are used early in adolescence (Kandel 1975).

Outcome 2: Drug Addiction. The continued use of illicit drugs like marijuana, cocaine, and heroin typically proceeds to a point where the loss of control over drug use includes a significant lifestyle shift in which obtaining drugs becomes the central life activity (Simpson and Sells 1990). As a consequence, health deteriorates as drug use becomes compulsive and sustained (Castro et al. 1992).

Outcome 3: Consequences of Drug Addiction. Figure 2 shows some of the major consequences of drug addiction. These include recurring cycles of recovery and relapse until the person is finally able to maintain complete sobriety or experiences other negative life outcomes. Criminal behavior is a frequent consequence of illicit drug use as the user is forced into burglary, assault, or other criminal activities to sustain heavy drug use. For those who progress to injection drug use and who share needles the risk of human immunodeficiency virus (HIV) infection increases (Schoenbaum et al. 1989).

Contributing Factors

Community Prompts. For many Hispanics, life experiences are shaped by economic inequities and accompanying resource deficits. In addition, living in a community plagued by high levels of drug use also increases a youth's risk of using illicit drugs. Drug availability is another key factor in the likelihood of drug use (Maddahian et al. 1986) and in the type of drug used. The hypothesis suggested by the community prompt metafactor is that impoverished, less desirable living conditions operate as community-level prompts for drug use. There has been little research on the direct effects that high-risk barrio environments exert on the likelihood of illicit drug use among Hispanic youth.

The metafactor of community prompts may consist of social class and inner city-urban/rural-remote factors that characterize the local environment. Relevant measured variables that may be scaled on a continuum (ordinal or interval level) may include:

Ecological factors:
(1) Housing density
(2) Housing conditions
(3) Ambient noise levels
(4) Levels of traffic congestion

Population factors:
(1) Rates of violent crime
(2) Housing conditions
(3) Rates of unemployment
(4) Mean community income
(5) Rates of home ownership
(6) Mobility of residents
(7) An index of drug availability

Disrupted Family System. Regardless of ethnic background, youth whose families are fragmented by divorce, loss of parents due to family conflict, accidents, violence, or disease are at greater risk of engaging in drug use and abuse. A disrupted family system creates conditions that can prompt drug-using behaviors, and, conversely, substance abuse is particularly disruptive to ethnic families (Moore 1990). Generational differences between Cuban-American youth and their parents have been observed as important sources of family discord, which in turn has been identified as an antecedent of adolescent drug use (Rio et al. 1990).

Rebelliousness and Nonconformity. In general population samples, nonconformity and antisocial behaviors are strongly associated with involvement in the use of illicit drugs. High rates of illicit drug use have been observed among adjudicated Hispanic youth aged 13 to 17. (Castro et al., unpublished manuscript; Soriano and De La Rosa 1990). Alienation from the family and parent-child conflicts that are related to differential patterns of acculturation may prompt rebelliousness in Hispanic youth, which in turn may serve as a factor that prompts involvement in drug-using cultures (Moore 1990).

Peer Influence. Regarding drug use, the Peer Cluster Theory has proposed a "cultural identification" hypothesis. This hypothesis asserts that a strong identification with a particular culture "should be related to an increased probability of engaging in behaviors specific to that culture (or behaviors that the individual believes are part of being in that culture)" (Oetting and Beauvais 1990, p. 669). Thus, personally identifying with drug-using peers typically prompts drug use. In conclusion, a youth's *reference group* serves as a potent source of behavioral norms and a source of social reinforcement (e.g., feelings of belonging and acceptance) (Long 1990). If a youth identifies with deviant and drug-using peers, then he or she is likely to begin using drugs as well (Oetting and Beauvais 1987).

In a study of urban adolescents, having friends who approve of drug use and friends who use drugs were two factors that were significant predictors of illicit drug use (Farrell et al. 1992). In another study, peer influence was found to be the most potent predictor of cigarette smoking in a large cohort of adolescents that included Hispanic youth (Castro et al. 1987*a)*. Consequently, for Hispanic youth, it may be hypothesized that *peer identification* and *peer influence* operate as strong antecedents of illicit drug use.

Level of Acculturation. Acculturation generally is defined as the process by which a person from a given culture learns the language, values, and behaviors of a new culture. For Mexican Americans and Mexicans in the United States, the process of acculturation often involves attempts at upward social mobility, since many lower-class Mexican immigrants enter the United States to enhance their economic standing. Among those who fail to progress up the sociocultural ladder, a variety of mental health problems may ensue, including drug use or drug dealing as means of coping with frustrated efforts at social mobility.

For Hispanics, a few studies have suggested that a greater level of acculturation is associated with a greater likelihood of using illicit drugs (Amaro et al. 1990; Burnam et al. 1987; Kamo et al. 1987). A hypothesis for future research involves the direct role that acculturation changes may have in increasing the risk of using illicit drugs.

Licit Drug Use. The gateway conception of drug use postulates that early use of cigarettes and alcohol or other such gateway drugs sets the stage for the subsequent use of illicit drugs (Kandel 1975). These drugs include cigarettes and alcohol and may include inhalants in some Hispanic subgroups.

Buffering Factors

Family Support. The presence of one or more family members, whether from the nuclear or extended family, can serve as a strong source that prompts prosocial behavior. Certain family members also may serve as agents that confront youth and encourage drug avoidance or treatment-seeking. Among Hispanics, confrontation often is avoided, although with alcoholics and other drug users, supportive family confrontation may be necessary to discourage the initial use of illicit drugs or to encourage a drug user to participate in treatment. Regarding behavior change, it has been noted that achieving effective rates of behavior change and maintaining such changes requires a social infrastructure that supports such changes (Coates 1990).

Prosocial Coping Behaviors. Social responsibility and related participation in mainstream social institutions (e.g., obtaining a regular job) serve as coping behaviors that compete with the use of illicit drugs (Newcomb and Bentler 1988). Little is known about this factor in relation to Hispanics, although it may be hypothesized that responsible social activity serves to divert Hispanic youth from drug use. Among certain barrio-dwelling Hispanic males, enlisting in the armed forces or obtaining a regular job may serve as a significant diversion from street life and from drug use and abuse.

Life skills that support prosocial behavior often are associated with efforts at avoiding high-risk behaviors. A healthy lifestyle is characterized by health-related habits that include regular exercise, moderation in diet, avoidance of or moderation in alcohol use, avoidance of drugs, use of seatbelts, and having preventive health examinations. While human behavior is not always consistent, patterns of healthy behavior that influence health status have been observed in relation to lower patterns of drug use (Castro et al. 1987*b*).

Among Hispanics, the value of health and concerns for maintaining it may be hypothesized as antecedents that reduce the risk of developing disease or drug use. As one example, immigrant Mexican women appear to engage in self-care during pregnancy that may operate as a mediator of lower-than-expected rates of low-weight infant births (Scribner and Dwyer 1990). Such outcomes may reflect the mother's commitment to a low-risk lifestyle, in which she actively avoids use of cigarettes, alcohol, and drugs.

A dedication to higher life goals—those that take a long time to attain—also may prompt healthy behavioral patterns that lower risk of drug use. Although a specific lifestyle is dependent in part on a person's social role or life mission, persons engaged in high-level pursuits such as a religious mission or athletic training (e.g., marathon running or Olympic training), or who engage in high achievement activities may develop a life pattern that maintains a low-risk health profile—one characterized by an active avoidance of drug use and abuse. It may be hypothesized that Hispanics who engage in certain prosocial coping behaviors will be less likely to engage in illicit drug use.

Cultural Identity Integration. When Hispanic youth develop ethnic pride and a more mature social identity, this mature identity may promote an avoidance of illicit drugs. The process of developing a stable ethnic identity has been described as a potent shift in identity that, for many ethnic minority persons, often accompanies the ultimate escape from drug addiction (Westermeyer 1984).

Orthogonal cultural identification theory has asserted that "a strong cultural identification should serve as a source of strength and potency," which ostensibly aids in the avoidance of illicit drugs (Oetting and Beauvais 1990, p. 671). Youth and adults who have positive perceptions of self are likely to avoid acting in ways that conflict with a positive self-concept, including avoiding illicit drug use (Castro et al. 1991). Thus, among Hispanics, pride in cultural heritage and in self might serve as a factor protective against drug abuse (Phinney 1990; Westermeyer 1984). For Hispanics, it may be hypothesized that developing strong ethnic identity and pride, along with strong Hispanic cultural values, may serve as a condition that

discourages and protects against the use of illicit drugs (Castro et al. 1991).

Oetting and Beauvais (1987) have found that high cultural identification—whether to the Anglo-American culture, an ethnic culture, or both—has been associated with positive psychosocial characteristics, including positive family relations, high self-esteem, and school achievement. Oetting and Beauvais also found that strongly bicultural youth exhibited the highest self-esteem and the strongest social relationships.

By contrast, conflicts over one's place in the social system, particularly when associated with shame and self-doubt, may promote antisocial behavior (Kaplan 1985). Such behavior may occur in connection with joining a gang or participating in nonmainstream, nonconformist subgroups. Feelings of discrimination and perceived racism are central themes that affect many Hispanic youth and young adults. Hispanic youth who feel disenfranchised because of their appearance or ethnic identity are likely to express their discomfort with social discrimination in angry, aggressive, and antisocial ways unless these feelings are channeled in a prosocial manner.

Culturally Relevant Health-Promotion Program. Youth presented with personalized health-promotion information and activities may develop attitudes and values that are inconsistent with the use of illicit drugs. Peer-related communications and appeals to life issues that are of concern to Hispanic youth are potential health-promotion approaches. Creating culturally appropriate health-promotion messages requires the incorporation of culturally specific values, norms, attitudes, and expectations (Jimenez 1987; Peterson and Marin 1988). In addition, a great need exists for programs that offer a safe environment and programs that involve the family in efforts to avoid drugs (Murphy 1991).

EFFECTIVE DRUG RESEARCH WITH HISPANICS: SOME SUGGESTIONS

Definition and Measurement of Variables

Sound scientific research with Hispanic populations must be based upon reliable and valid measurements of important constructs, whether the investigator uses a quantitative or a qualitative approach. A useful construct is one for which the investigator can formulate several theoretically derived hypotheses, proceed to test them, and then make meaningful predictions (Carmines and Zeller 1979).

Both quantitative and qualitative research strive toward maximal objectivity, which is the simultaneous realization of as much reliability and validity as possible (Kirk and Miller 1986). *Reliability* refers to the extent to which the same observational procedure in the same context yields the same information, while *validity* refers to the quality of fit between an observation and the basis on which it is made (i.e., a criterion) (Kirk and Miller 1986). In quantitative analyses, invalidity occurs when nonrandom error compromises a variable's accuracy in representing the theoretical construct it purports to represent (Carmines and Zeller 1979). In qualitative analyses, invalidity occurs when an investigator mislabels a category of observation (i.e., labels it inaccurately) (Kirk and Miller 1986).

In research with Hispanics, when a specific measured variable such as a depression scale score is obtained for a given sample of Hispanics, it is recommended that the investigator conduct preliminary tests of each scale's internal reliability by calculating Cronbach's alpha coefficient. When a scale developed and validated on a non-Hispanic sample is administered to a sample of Hispanics, a Cronbach's alpha coefficient can be used as a preliminary and convenient test of that scale's reliability when applied to that sample of Hispanics. While adequate reliability does not necessarily indicate adequate validity, it is important to evaluate a scale's reliability, since adequate validity cannot occur in the absence of adequate reliability. Significant drops in a scale's alpha values relative to those for a general population suggest slippage in the scale's internal reliability, perhaps in relation to culturally related incongruities between scale items and the responses of the Hispanics sampled.

From a qualitative perspective, ascertaining the validity of a construct involves a critical assessment of whether that construct (e.g., depression) occurs in the targeted population in the same manner as defined and conceived by the investigator's theory. In other words, does the investigator observe events that are consistent with predictions offered by his or her theory? (Kirk and Miller 1986).

Sampling Considerations

The extent to which a sampling plan deviates from simple random sampling introduces the need for adjustments in the estimation of variable means and their standard errors (Kalton 1983). For example, in large studies multistage sampling is conducted for cost reduction, but this introduces a loss of precision and requires an increase in sample size to offset this loss of precision, This approach also requires adjustments in case-weighing and attention to design effects, as was required in the Hispanic Health and Nutrition Examination Study (HHANES) (Gonzalez et al. 1985).

A major gain from the a priori definition of homogeneous subgroups of Hispanics is the increased precision in the estimation of the sample mean and other estimated parameters. Kalton (1983) recommends a two-phase sampling design when sampling rare populations (i.e., subgroups of the population for which no separate sampling frame exists). More research is needed on efficient methods for sampling from rare populations. The design of a good, economical probability sample of rare populations is one of the most challenging tasks for survey samplers (Kalton 1983).

Study Design

In the past, the most often encountered data analysis and design strategy proposed in research with Hispanics was to use r-tests to examine differences for Hispanics in relation to an index or reference group, usually Anglo-Americans or non-Hispanic whites. Such simplistic comparisons by ethnicity were often ill conceived, and the actual pattern of results was influenced strongly by the mean level of acculturation of the Hispanic group sampled. If a difference was observed, researchers then would attribute the observed outcome—often a negative one—to ethnicity. In other words, the typical

conclusion was that being Hispanic ostensibly "produced" the negative outcome. Such superficial analyses have low internal validity since they often ignore the many confounds associated with self-reports of ethnicity when used as the sole indicator of ethnic identity. Such confounds often originate from initial nonequivalences between groups on variables such as socioeconomic status (e.g., education and income), age, and distribution of cases by gender.

Partial solutions to such problems involve a more careful design of such "comparative" studies, which includes controls for potential confounds at the time of sampling. These controls could involve establishing clear inclusionary and exclusionary criteria in case-sampling. A second partial solution involves the use of regression procedures to partial out (i.e., control statistically) for the effects of such confounding.

Often survey studies that engage in general sampling procedures will contain too few of certain types of cases, thus limiting the conduct of complex data analyses and model-building. One remedy is to utilize a sampling plan that specifies clearly the targeted subgroup of Hispanics and that plans to *oversample* sufficient cases to allow certain multivariate analyses. Enhanced conceptual and operational definitions of homogeneous *subgroups* or cohorts of Hispanics are feasible when these groups are clearly identified as indicated by a culturally appropriate conceptual framework and sampling frame (Castro and Baezconde-Garbanati 1987). Such cohorts can be defined according to age group, by historically based or geographically based migration patterns, and by naturally existing subgroups within a community.

Similarly, the need persists for cost-efficient sampling methods for the sampling of rare cases (Yu and Liu 1992). Certain Hispanic cases are rare when: (1) they exist in low prevalence in a defined geographic region due to narrow or restrictive casewise criteria, (2) access to these cases is limited because of their wide geographic dispersion, or (3) for other reasons access to these cases is limited.

Data Analyses

Quantitative Analyses. In many proposals that seek funds to conduct research with Hispanics, a recurring weakness concerns the limited and

underdeveloped quality of the data analysis section. In research applications reviewed for scientific merit by review committees, it has been observed that researchers often present a vague data analysis plan, one that contains logical and procedural incongruities or discontinuities between the intent of the study and approaches to data analysis. Often hypothesis-testing is described vaguely or not described at all.

One of the most useful ways to develop a well-articulated data analysis section is to begin with a clear conceptual framework or model and a related set of specific hypotheses that are derived from that framework or model. Given a sound model, the actual data analyses that are required often follow clearly and logically from the relationships noted between the research questions, the model, and its derived hypotheses.

Qualitative Approach to Model-Building. One goal of qualitative approaches is to uncover meaning, and this goal may be attained by distilling thematic categories from interview data or life histories—a process that primarily is descriptive. Using such methodologies as *axial coding* and *selective coding* (Strauss and Corbin 1990), a qualitative analysis can be used to identify key categories (i.e., factors) as well as to help describe the linkages between these categories, with this process helping to generate a qualitative "working model."

This working model may be evaluated via a case-by-case testing with the examination of model fit or nonfit in the analysis of the behaviors exhibited by a set of cases. In this casewise approach to gauging the validity of such a working model, the presence of a large proportion of nonfitting cases can suggest pockets of inaccuracy in the working model, that is, model misspecification. In this situation, the working model is missing one or more key variables (i.e., categories or factors) that are needed in order to account for the observed behavior found among the nonfitting cases. This inductive process, which involves filling in missing details in the working model, serves to refine that model by identifying theoretically meaningful variables (Kirk and Miller 1986) and, in so doing, increasing the model's *conceptual density* while also increasing its *conceptual specificity* (Strauss and Corbin 1990). In other words, the model's categories are defined more accurately and in greater detail, and the nature of the links between categories are further clarified, while missing categories (i.e., factors)

are discovered and added to the model. Further, superfluous or nonrelevant categories also may be eliminated from the model.

The major goal of this initial qualitative approach is *not* model confirmation, but rather model definition and development, including the discovery of culturally unique factors in the "emic" tradition of working from within the culture of a targeted group. Thus, process and "causal" relations are defined from the viewpoint of the members of the culture. The goal is to ascertain meaning in terms of the indigenous culture, thus generating a *culturally valid* and well-fitting model.

Needed: A Genre of Ethnographic Quantitative Research

As indicated previously, a major problem for current drug theories and models when applied to ethnic minority populations is suspected model misspecification. In other words, it is not entirely clear that current models offer a *complete* rendition of all or most of the relevant predictive factors, especially culturally unique factors, that may predict drug abuse among members of a given U.S. ethnic minority population. Clearly, more primary work like that described above is needed in order to identify both *culturally common* and as yet unknown *culturally unique* factors. These factors then can be examined for their risk characteristics by using more formal methods of model-testing.

In this light, qualitative and quantitative approaches to research should not be seen as conflicting or mutually incompatible. Effective use of both approaches involves critical thinking as guided by a common aspect, which is that these approaches derive their methodological rigor from well-grounded theory (Strauss and Corbin 1990). From this perspective, the presence of well-grounded theory (or models) provides a common foundation for the complementary and integrative use of both approaches in a single study.

To address the unique issues posed by modem drug abuse prevention and treatment with ethnic minority populations, a composite and staged approach to scientific research appears necessary. Such a staged approach for culturally sensitive research likely would entail three important phases within a single study: (1) ethnographic exploratory

analyses, (2) effective translation of these data to valid scales, and (3) model-building and testing.

As a first step, the need exists for effective representative sampling of special populations, including the use of cost-effective methods for sampling rare or special populations. Given a representative sampling of specifically targeted samples, interviews with key informants and focus groups can provide culturally unique information that provides the groundwork for use of quantitative methodologies. Ethnographic methods used in early stages of such research provide culturally appropriate preliminary data that tap unique needs and motivations (i.e., culturally unique factors) that may exert a unique influence on drug use among members of a special population.

Second, following this preliminary ethnographic phase, sound methods must be used to translate ethnographic, factor-discovering, and hypothesis-generating data into scales and measures that possess adequate psychometric properties. This involves operationalizing the key constructs via methods of scale development. De Vellis (1991) has provided a good overview and useful guidelines for scale development.

Third, a model-building and testing phase is desirable in order to evaluate multiple relationships and to test hypotheses suggested by community-based observational methodologies and clinical experiences. Multivariate model-building procedures should be used to test the complex relationships that occur between the multiple factors that may promote drug abuse in Hispanic populations. Multivariate methods such as ordinary least squares regression, logistic regression, path analysis, and covariance structure modeling are the formal approaches that can be used for such model-testing.

In summary, the use of this three-phased approach when conducted within a single study may help to generate better specified and more culturally appropriate models of the processes that promote drug abuse among members of various U.S. Hispanic populations. Ideally, these models will hold the key to further explaining the process by which Hispanics use and abuse illicit drugs while weaving in the role of cultural factors as these further modify this process.

NOTE

1. In this study, the loading of the law abidance measured variable on the social conformity factor was negative. In the present discussion, the sign of this loading has been reversed for clarity of presentation.

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Drug Prevention Research With Native-American Populations: Some Considerations

Grace Powless Sage

INTRODUCTION

> "...we live in the present, but we hold the past in our hands as something sacred, and together we must plan for the future."
>
> *Rough Face, one of the last chiefs of the Poncas*

This chapter deals with research concerns regarding American-Indian/ Native-American populations in a general context, with a specific focus on drug abuse prevention intervention research as an established need in Native communities. It is hoped that this information from a variety of resources has been synthesized in a way that will be useful to researchers and to those communities of people who participate in research projects. Further, it is hoped that this chapter can be used as a tool for those who pursue grants and wish to develop good research reflecting considerations important to Native Americans; who want to find some success in gaining support from funding agencies and Native communities; and who volunteer hours to review applications and wish to find or increase their understanding regarding other world views.

The author wishes to note that different terms are used to describe broad ethnic groups (e.g., Native Americans, American Indians, and Native peoples are used interchangeably). These terms are used to simplify and ease communication to the reader, but it should be recognized that the appropriateness of the term falls to the groups being discussed and therein lie many individual and group differences. Any one term may be offensive to some people and create unnecessary barriers for researchers who are attempting to work in a variety of communities. Therefore, both the researcher and the reader might wish

to pursue this topic by asking individuals or groups they are working with what term that individual or group prefers (Trimble 1991).

GENERAL RESEARCH CONCERNS

The general area of research for many, if not all, Native-American tribes in the United States remains a sensitive subject. Firstly, many tribal peoples have participated in research studies for investigators from a variety of fields (e.g., anthropology and social work), institutions, and, of course, the U.S. Government. These "studies" often were poorly designed, occasionally involved risks, and often resulted in further negative attributes and stereotypes about Native. Americans (Beauvais and Trimble 1991).

Secondly, despite the increasing evidence and pressing needs for research with American Indians, both drug and alcohol abuse research remain a relatively low priority (Young 1988; Bukoski 1991). Public recognition regarding the extent of the drug abuse problem has been supported only recently at the Federal level, in terms of funding for treatment and prevention research efforts in the general population. As a result, specific population groups, such as American Indians, African Americans, Hispanics, and Asian Americans, commonly experience some delay in research attention. A significant correlate to this dearth of studies and research extends to the area of drug and alcohol prevention intervention efforts. Moreover, scarce resources and keen competition at the Federal grant application level continue to hamper examination of these groups. As a result, researchers lack the basic epidemiologic and etiologic information necessary to understand drug and alcohol abuse among American-Indian adults, youth, and adolescents and, consequently, the foundation for developing prevention programs targeting specific subgroups and developmental stages.

The National Institute on Drug Abuse demonstrated concern and commitment when they published a monograph (Brown and Mills 1987) dedicated to drug and alcohol abuse research concerns for all ethnic minorities, including American Indians. What remains problematic is that, even in publication, some of the information is outdated and, therefore, unable to address the current needs and changes that have taken place for American Indians. For example,

1990 census figures reveal some significant demographic changes in the Native-American population. For example, the population has increased from 1,500,000 to nearly 2,000,000. Mean age has decreased from 18.8 years to 17.3 years. Over half of the American-Indian population lives in urban settings while the other half remains on reservations typically located in rural regions of the country. Furthermore, the population is much more migratory than once was believed, with many more American Indians traveling back and forth between the urban setting and the reservation. Obtaining adequate and accurate data regarding alcohol or drug use can prove to be an insurmountable task with such a scattered group of people or with a small but less transitory group, neither of which population is truly representative and generalizable. Age factors and social acceptance also make compilation of accurate data difficult, in part due to differences in communication styles and barriers to understanding the importance of such research efforts.

Lastly, there is a myth common among people and researchers who live in the United States that American Indians simply do not exist any longer or that American Indians are so few in number that they do not warrant special research attention and focus. Often this is a more complex issue complicated by the stereotypical images presented in movies such as "Dances With Wolves" or "Thunderheart," which perpetuate myths such as, "All American Indians are Sioux," or, "They all live in the West." Frequently, the complexity and the quicksandlike nature of these beliefs and perceptions (self or other) become insurmountable roadblocks to the kinds of salient, meaningful, positive research necessary for all concerned. Even the most thoughtful and well-intentioned researcher can get caught up in the romanticized and inaccurate perceptions of American Indians.

DRUG ABUSE PREVENTION NEEDS IN AMERICAN-INDIAN GROUPS

While research in the areas of mental health and health concerns is vital for understanding American-Indian groups, it is equally important to acknowledge and elaborate specifically on drug abuse prevention research with American-Indian populations. Following are some ideas of the specific criteria that make research salient and meaningful in the

area of drug abuse prevention in Native-American groups. As researchers became interested in Native-American drug use and abuse, it became clear to them how complicated obtaining accurate data could be, as well as how drug use and abuse impacts this population. Initially, minimal attention was given to drug abuse prevention research in favor of building more substantive knowledge regarding alcohol use and abuse prevention and treatment, which has been seen as a more chronic problem that impacts Native Americans. As the pool of alcohol research literature began to grow, it became clear that questions regarding drug use and abuse and related behaviors among American Indians could no longer remain unanswered. In concert with this focus, renewed emphasis and interest in the general public were placed on drug abuse prevention, and researchers suggested that there was a different process and understanding with regard to epidemiological data with Native populations and drug abuse; the evaluation and assessment of the status of drug prevention research in terms of etiological data; the model and theories used to discuss drug use, abuse, and prevention; and making recommendations for drug abuse prevention intervention needs in Native-American populations (Young 1988).

HETEROGENEITY OF AMERICAN INDIANS

Neglected in much of the historical research are the wide cultural dimensions that identify and distinguish American-Indian tribal groups from much of the rest of American society and from each other (Trimble 1988*a;* Fleming 1991). This often results in well-intentioned researchers from different cultural backgrounds "studying" a variety of American-Indian tribes under the guise of studying a monolithic and homogeneous group called "American Indians" (Attneave 1982). While cultural difference is acknowledged to be a basic research concern, it is typically the most often ignored, especially when one is awarded large grant monies based on a "promise to study minorities" (i.e., American Indians), especially in urban settings. Consequently, comparisons and groupings of tribes as varied as Southwestern groups with Northern Plains tribes and Eastern Woodlands with Pacific Northwestern tribes are made. The erroneous conclusions generalized to all American-Indian tribal groups include inferences that often reflect common myths and notions, such as uncontrollable cravings for

substances, aggressive behaviors while under the influence, and easy addiction to substances.

BARRIERS TO DRUG ABUSE RESEARCH

Because of the sometimes intrusive and insensitive communication and behavior of non-Indian researchers, several Indian communities in North America have established rigid guidelines to regulate the research process and the presence of non-Indian researchers (Beauvais and Trimble 1991). Several examples exist wherein non-Indian researchers simply moved into Native communities and collected data with no formal agreement or understanding with tribal leaders. Many times, stereotypes regarding American Indians and drug or alcohol use were reinforced, and the variation that does exist tribally and regionally often was simply neglected or ignored. As a result, all proposals must be presented to tribal members or councils, perhaps on more than one occasion. There may be a request for constant monitoring by a variety of tribal members, as well as the right to review all materials and reports. Long delays often are the result. Regulations and strict rules may seem cumbersome and unsettling to the researcher.

While Native-American people understand that high-quality research can contribute to the health and well-being of their tribe, generally good research methods are typically obscure and unclear to many Native Americans (Trimble 1977). Some of the problem lies in gaining access to Native communities, as many researchers have difficulty in gaining entry due to misunderstanding and misconceived perceptions. Further and more commonly, there is a conflict between research design and Native community ethics and humanitarian concerns. What the American Indian recognizes is that the outcome of any research can have long-term consequences for and damage the reputation of the group forever, inside and outside of Indian country, while the researcher can and will go on to other projects (Manson and Trimble 1982).

The upshot of all this is that research and researchers must have at least a minimal understanding of all levels of the American-Indian community, be willing to compromise with the leadership in the Native communities, and consider different ways to connect with local tribal communities. In addition, practical and applicable results of research for researchers, investigators, providers, Native-American communities, and others concerned is one of the only acceptable outcomes. Native communities are willing to participate in research that will meaningfully impact their families, children, elders, and others by means of prevention efforts and treatment.

NEEDS IN AMERICAN-INDIAN COMMUNITIES

While there are many areas of concern in Native-American communities regarding research, the far-reaching effects and subsequent impact on perceptions, survival, and policy decisions are the focus for many tribes as the 21st century approaches (May and Smith 1988). American Indians can no longer tolerate underrepresentation of American Indians as researchers. American Indians must be supported in their efforts to become active and contributing participants at all levels of research efforts. Given this direction and focus, this chapter now will attempt to discuss some of the research concerns growing out of these awarenesses and concerns.

Native-American tribes, by and large, still are very much interested and invested in research and support in their desire to secure grant monies. They seek to approach agencies and the U.S. Government at a variety of levels and desire equal consideration in that process, whether it be in direct communication, technical assistance, or grant application evaluation. The contemporary Indian people and tribal groups recognize that the ability to successfully meet the demands of the grant research review and funding process requires time and negotiation (Trimble 1977).

One of the initial roadblocks to drug abuse prevention research that Native peoples confront is defining a worthwhile research project that fits within the guidelines of the Request for Application (RFA) or the Request for Proposal. Often American Indians must reconcile what they view as pressing research needs with the needs as represented in

agency guidelines and RFAs. What often seems in desperate need of attention on the reservation or in large urban Indian settings simply is not of interest to the various grant-funding agencies or the Government.

Moreover, two of the frustrations that many Native-American communities have experienced over the years have been (1) the narrowness of definitions and (2) prevailing conceptualizations of health and illness, good and bad, and, to a larger degree, of what is valued and what is not (Locust 1985). This especially is true when one attempts to argue about the value of qualitative research versus quantitative research. One is considered to be of more value—regardless of how faulty the foundation and base of information—and the other is of less. (The reader may ponder which is which.) Of course, dichotomous thinking, different world views, and cultural orientations often leave many groups marginalized and out of the mainstream and, therefore, they are considered to be of no value (Nofz 1988). The need for qualitative data from other population groups (i.e., American Indians and other minorities) in the United States should be a given, and agencies need to be at the forefront of research efforts that design and modify guidelines for future research agendas.

Even if Native peoples were able to determine an area of need that matched a grant-funding agency's concerns, the demands of developing a document that meets minimum requirements and trouble with overcoming other barriers in research efforts, such as methodological issues and evaluation concerns, often can eliminate the most deserving of research applications. American Indians have not had a long and illustrious history in the area of research (Trimble 1991). Priority-setting in the Government and within agencies typically is done in response to the largest constituency and the loudest voice. Limited access to Government and agencies in terms of location, education, and communication almost certainly prevents the assignment of top priority status to most Native-American groups. Because most American-Indian tribal groups have limited experience with conducting, planning, and implementing research, they must trust professionals or others with the tribal research concerns, needs, and interests. Occasionally, this has resulted in the abuse of American-Indian communities and consequent feelings of misplaced and betrayed trust.

Identifying an area of need and establishing the kind of research credentials a group needs to have to possess a competitive edge in the funding process still does not ensure success. Both tribal and urban Indian groups typically experience difficulty in designing a research project that benefits the community, is in keeping with their world view, and gets into a competitive review process with a research center at a university or medical center (Trimble 1988*b)*. The former difficulty often is summarily dismissed due to lack of resources, methodological concerns, and other differences in measurement and design.

CONCEPTUAL PROBLEMS AND BARRIERS TO RESEARCH DESIGN

What are most difficult to explain and understand are differences that are based in world views. For example, how people experience their world may be based on factors that are intrinsically related and interrelated, such as the understanding regarding health and illness. However, when it comes to operationally defining those for the purpose of research, one may lose the abstract and conceptual meaning in favor of getting people to respond to an item on a Likert scale. Measurements often are designed to meet requirements of validity and reliability, which are linear concepts, rather than being related to communities or world views. What results are artificial and often inaccurate "findings" that are meaningless to everyone but that meet the requirements of the grant-funding agency.

An example of this rigid methodological design requirement in conflict with real-world constraints happens on an all-too-regular basis, especially when the review process takes place at such a distance from the scene of the grant application. During a recent grant-review process, one of the reviewers was astonished to discover that sampling procedures would mean that everyone who attended school that day would participate in the study. The reviewer was upset that the researchers had not followed standard randomization procedures. Other members of the review committee informed the reviewer of reservation schools, limited resources, or lack of time to follow true random-sampling procedures. Educating reviewers can be worthwhile but is not always possible. In this case, the reviewer and others realized that

other types of considerations infringe upon the practicality of endorsing certain research strategies.

Another example involves a medical center serving American Indians in urban settings. The center proposed a followup by phone but failed to keep in mind that telephone followup may result in a poor response rate. Since many urban Indians do not have working telephones, the response rate would even more likely be poor. Even followup by mail can fail, unless researchers are willing to follow the migratory behavior of many urban Indians. Issues such as limited means of transportation, lack of electricity, and (all too often) language differences seldom get addressed. Yet the chances of the medical center or university getting funded are high, in spite of these common barriers, which seldom are accounted for and discussed in the application in terms of how they may affect research design and implementation. Thus, institutions continue to submit proposals on a regular basis, regardless of the benefit of their research results (May 1986; Trimble 1988*b)*. Funding agencies have a responsibility to account for and accurately reflect the needs of different population groups by addressing their own limited understanding and education across cultures.

Last of all, basic communication styles and patterns can continue to widen the gap that exists between Native peoples and research efforts. Therefore, data collection may be obstructed when people do not understand the meaning or intent. Often this leads to reactions such as resistance to research when, in fact, more clarification might have produced the kind of cooperation necessary for both the Native-American communities and the researchers. Many modem research techniques, such as methodology, sample size, and evaluation, need to be blended with traditional Indian communications (More 1989). For example, how does one define research, a study, evaluation, restrictions, and limitations to people who see no relationship between the meanings of those words and their community's continued survival and growth. It is difficult for people to agree on common understanding when one group sees ideas as building one on another in some linear fashion, and another group sees things synthesized in some circular and interrelated way. Furthermore, the methods employed by these two groups to explain their way of thinking appear equally disconnected (i.e., story-telling versus didactic lectures). The differences in

thinking often are the same as those found when one examines applied and practical research versus the theoretical and abstract.

SETTING RESEARCH PRIORITIES

While this is a short chapter on research concerns common to many American-Indian tribes and urban groups, as well as specific drug abuse prevention intervention research, some recommendations seem appropriate. These priorities will not necessarily follow the needs or considerations as they were developed earlier in the text, but they are tied to the barriers and deficiencies discussed previously.

First, it seems necessary for agencies, reviewers, researchers, and others involved in the research process to be responsive to and educate themselves about their own racism, sexism, stereotypes, and hetero-sexism. Cross-cultural homogeneity may be an artifact of researchers who conducted research based on assumptions founded on the "melting pot" conceptualization of the United States and ignorance. The multicultural researcher advocates for multiunderstanding and multi-disciplinary approaches in all phases of the research process since he or she understands the pitfalls intrinsic in the current system.

Second, it would be beneficial to both groups to develop relationships between indigenous peoples and technical professionals for planning and implementing research projects. Medical centers and universities would benefit from the diverse experience and expertise that can be developed in collaboration with urban American-Indian programs and reservation sites. Creative opportunities for this kind of collaboration to take place can be found in those settings where researchers have unstrapped themselves from the institutional laboratory and found affiliations in Indian community centers or, more recently, in Indian community colleges. Development of better and more meaningful definitions of the nature and scope of problematic areas, as well as practical ways to apply the results to the different groups, can occur. Inherent in this collaboration is an educative process and success for all involved.

Third, there needs to be continued development in the area of an inclusionary research system that would involve Native Americans at

all levels of the research process. This would eliminate policy, planning, or implementation decisions being made and reviewed without benefit of the group involved or knowledge of the impact on the group involved. Part of this process includes, but is not limited to, the recruitment and retention of young Native students and potential researchers who could serve in a variety of learning roles while establishing their own careers. In addition, it is justifiable to develop entry-level models that are reservation based or urban-Indian setting based, Experience can be gained in an environment that is familiar and supportive and where the standards are responsive to change and different areas of expertise. Another benefit would be the opportunity for interested American Indians to administrate both at the agency level and the research level. This kind of experience would benefit everyone, since many of the barriers to drug abuse research and Native-American communities are related to misperceptions, miscommunication, and limited accessibility.

Fourth, researchers have to come to some understanding of tribal/regional/reservation versus urban versus rural differences in the demographically diverse group of people called American Indians. The flexibility to view the landscape through a wider lens will be essential to both accessibility and research efforts. Adaptation of materials, knowledge of cultural norms, involvement by significant people (i.e., community health representatives, elders, and others), and awareness of community can strengthen research design and methodological concerns. When a researcher recognizes the relatedness of spiritual, physical, and emotional well-being, he or she becomes engaged in a research process rather than merely collecting data. These two systems of research efforts and community needs should not be seen as antagonistic but rather as different views on a continuum. The process that will be beneficial will result in greater insight, understanding, and collaboration through future innovative research efforts.

CONCLUSION

When one glances at the broader issues and concerns, it becomes clear that, while these may be research concerns especially for many Native Americans, they should be research concerns for everyone. Rogler (1989) states the problem as ". . . an impoverished theory of the role

of culture . . . and how to account for it in research." The advantages of broadening the field's knowledge base and understanding seem more than worth the effort. Clarifying information can lead to quality and thought-provoking research efforts even in the face of differences. To do less than make every effort to maximize this outcome is unconscionable.

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Drug Abuse Prevention Research Concerns in Asian and Pacific Islander Populations

Ford H. Kuramoto

DESCRIPTION OF ASIAN AND PACIFIC ISLANDER POPULATIONS

The Population Reference Bureau report entitled "Asian Americans: America's Fastest Growing Minority Group" by William P. O'Hare and Judy C. Felt (1991) gives a summary of demographic information that examines the many different faces of the Asian and Pacific Islander communities. The rate of growth of the Asian and Pacific Islander population in the United States was the fastest of any group in the country during the 1980s. The population grew from 3.8 million to 6.9 million between 1980 and 1989, a growth rate of 82 percent. These figures do not include any errors caused by census undercount, wrongly identifying people by surnames, or undocumented individuals.

The O'Hare and Felt report is cited extensively in this section because it captures the contrasts and diversity in the Asian and Pacific Islander populations: "A large segment of the Asian and Pacific Island community has achieved a higher education level and somewhat higher family income than non-Hispanic whites. On the other hand, poverty rates for Asians and Pacific Islanders are nearly twice those of non-Hispanic whites. Furthermore, among people at the same education level, Asians and Pacific Islanders have lower incomes than non-Hispanic whites, suggesting that this 'model minority' may still face discrimination in the workplace."

In the above report, based on the March 1990 U.S. Census Bureau Current Population Survey (CPS), references made to Asians and Pacific Islanders include people from China, Mongolia, Pakistan, Sri Lanka, Maldives, India, Nepal, Bhutan, Bangladesh, Burma, Laos, Thailand, Vietnam, Cambodia, North Korea, South Korea, Japan, Hong Kong, Macao, Taiwan, Philippines, Malaysia, Singapore, Indonesia,

and the island groups that form Melanesia, Micronesia, and Polynesia. Table 1 shows the countries from which Asians and Pacific Islanders immigrated between 1980 and 1989. The largest sources of immigration were Vietnam, the Philippines, China (including Taiwan and Hong Kong), Macao, Korea, India, and Laos.

The Pacific Islands affiliated with the United States include American Samoa, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Guam, Republic of the Marshall Islands, and Republic of Palau. Individuals born in Hawaii, American Samoa, and Guam are born with U.S. citizenship. They can move freely throughout the Pacific Islands as well as the United States. The same is not true for the other Pacific Island jurisdictions.

Geographical Distribution

Table 2 lists the largest concentrations of Asians and Pacific Islanders by State according to the 1990 census. The States with the largest numbers of Asians and Pacific Islanders are California, with 2,845,659 or 9.6 percent of the State's population; New York, with 693,760 or 3.9 percent; Hawaii, with 685,236 or 61.8 percent; Texas, with 3 19,459 or 1.9 percent; and Illinois, with 285,311 or 2.5 percent. The States with the largest percentage of increases in Asian and Pacific Islander populations from 1980 to 1989 were Rhode Island (245.6 percent), New Hampshire (219 percent), Georgia (208.6 percent), Wisconsin (195 percent), Minnesota (193.5 percent), Massachusetts (189.7 percent), and Florida (171.9 percent).

Counties in Southern California recently have experienced a dramatic shift in Asian and Pacific Islander population patterns (see table 3). In Los Angeles County, the largest populations are Chinese, Filipino, Korean, Japanese, and Vietnamese. In Orange County, the largest populations are Vietnamese, Chinese, Korean, and Japanese. In San Bernardino County, the largest populations are Filipino, Chinese, Vietnamese, Korean, and Japanese. In Riverside County, the largest populations are Filipino, Chinese, Vietnamese, Japanese, and Korean. In San Diego County, the largest populations are Filipino, Vietnamese, Chinese, Japanese, and Korean.

TABLE 1. *Asians and Pacific Islanders by ancestry (1980) and immigration flows by country of origin (1980 to 1989)*

	Population 1980		Immigration* 1980 to 1989	
Ancestry or Country of Origin	Number	Percent	Number	Percent
China**	812,178	22	433,031	15
Philippines	78 1,894	21	473,831	17
Japan	716,331	19	41,739	1
India	387,223	10	253,781	9
Korea	357,393	10	338,891	12
Vietnam	245,025	7	679,378	24
Samoa/Tonga/Guam	76,441	2	6,214	—
Laos***	52,887	1	256,727	9
Thailand	45,279	1	59,638	2
Cambodia	16,044	—	210,724	7
Pakistan	15,792	—	55,900	2
Other	219,953	6	55,485	2
TOTAL	3,727,140	100	2,865,339	100

KEY: * Includes refugees; ** includes Taiwan, Hong Kong, and Macau; and *** includes Hmong. A dash (—) represents less than 0.5 percent.

SOURCE: O'Hare, W.P., and Felt, J.C. "Asian Americans: America's Fastest Growing Minority Group." Population Reference Bureau Report No. 19. Washington, DC: Population Reference Bureau, 1991. p. 2.

Immigration Patterns

According to O'Hare and Felt (1991), the rapid increase in the Asian and Pacific Islander population is due to immigration and an influx of refugees. During the 1980s, 75 percent of the increase was due to immigration. This trend has been increasing over the last 40 years and is likely to continue through the 1990s and beyond, due to U.S. immigration policy allowing family reunification, an increase in the total number of immigrants allowed to enter the United States, and the preference for skilled workers. The proportion of foreign-born Asians and Pacific Islanders varies considerably by specific subgroup. For example, in 1980, 80 percent of Koreans were foreign born, compared with 28 percent of the Japanese population. Asian and Pacific Islander immigration has been coming from two different geographical areas. Immigration from Asian countries (e.g., China, Korea, and the Philippines) was stimulated by family reunification and migration based on kinship ties. Many of these immigrants, because they were highly educated and had skills, were allowed to enter the United States under the employment provisions of the immigration laws. The second largest subgroup of immigrants and refugees has come to the United States from Southeast Asia (Vietnam, Laos, and Cambodia) as a result of the Vietnam War and the U.S. policy allowing refugees to enter after the fall of Saigon in April 1975. Between 1951 and 1960, Asians and Pacific Islanders accounted for only 6 percent of all immigrants to the United States; the percentage was low because the immigration laws were based on quotas of national origin. However, after 1965 the laws were changed to emphasize the preference for family members of persons already in the United States and U.S. employer needs. As a result, Asians and Pacific Islanders made up 42 percent of all immigrants between 1981 and 1989.

As indicated earlier, most Asians and Pacific Islanders live in the western United States. In 1990, about 58 percent or about 4.6 million lived in the West, with an additional 300,000 or more living in the Pacific Islands. Since 1982, most incoming Asians and Pacific Islanders have migrated to the States that already have large Asian and Pacific Islander populations, presumably for family reunification and linking with community networks. Most refugees from Southeast Asia were dispersed systematically throughout the United States when they first "resettled," but many of them relocated to the western States to

join relatives and communities with large concentrations of Asians and Pacific Islanders. This phenomenon has been called the second migration. Most Asians and Pacific Islanders moved to large metropolitan areas in both the central cities and suburbs. Most of those who moved to rural areas were experienced agricultural workers from Southeast Asia. The six metropolitan areas with the largest Asian and Pacific Islander populations in 1980 were Honolulu, Los Angeles, Long Beach, San Francisco, Oakland, New York City, Chicago, and San Jose.

Asian and Pacific Islander Incomes

In 1989, the median income of all Asians and Pacific Islanders was 3 percent higher than that of non-Hispanic white families. Interestingly, the median family income of Asians and Pacific Islanders actually had *declined* from 1979 to 1989. In 1979, the Asian and Pacific Islander median family income was about 9 percent higher than that of non-Hispanic whites. During the 1980s, the Asian and Pacific Islander population, on average, was slightly larger than non-Hispanic whites. During this period, however, the poverty rate among Asians and Pacific Islanders increased and currently is nearly twice that of non-Hispanic whites. This is due to a bimodal income pattern wherein some immigrants are skilled, educated, and able to develop careers in business, while others (e.g., Southeast Asians) tend to lack the education and skills to develop similar careers and businesses in the United States as easily.

It is important to note, however, that income levels of Asians and Pacific Islanders may be due in part to their concentration in metropolitan areas where salaries and cost of living are relatively high. In addition, the income statistic is based on *family* incomes. This statistic may be misleading since Asians and Pacific Islanders tend to have large families and most of the family members work to add to the collective family income. In 1989, Asian and Pacific Islander per capita income was lower than non-Hispanic white per capita income. There also is a dramatic difference between the incomes of Asian and Pacific Islander subgroups. While Japanese and Chinese immigrants had relatively high incomes, the incomes of Laotians and Vietnamese were much lower.

TABLE 2. *National census statistics for Asians and Pacific Islanders*

1990 Asian or Pacific Islander Population Rank	State	1990 Asian or Pacific Islander Population	1990 Percent of State Population	1980 Asian or Pacific Islander Population*	1980 Percent of State Population	Number Change 1980 to 1990	Percent Change 1980 to 1990
1	California	2,845,659	9.6	1,253,818	5.3	1,591,841	127.0
2	New York	693,760	3.9	3 10,526	1.8	383,234	123.4
3	Hawaii	685,236	61.8	583,252	60.5	101,984	17.5
4	Texas	319,459	1.9	120.313	0.8	199,146	165.5
5	Illinois	285.311	2.5	159,653	1.4	125,658	78.7
6	New Jersey	272,521	3.5	103,848	1.4	168,673	162.4
7	Washington	210,958	4.3	102,537	2.5	108,421	105.7
8	Virginia	159,053	2.6	66,209	1.2	92,844	140.2
9	Florida	154,302	1.2	56,740	0.6	97,562	171.9
10	Massachusetts	143.392	2.4	49,501	0.9	93,891	189.7
11	Maryland	139,719	2.9	64,278	1.5	75,441	117.4
12	Pennsylvania	137,438	1.2	64,379	0.5	73,059	113.5
13	Michigan	104,983	1.1	56,790	0.6	48,193	84.9
14	Ohio	91,179	0.8	47,820	0.4	43,359	90.7
15	Minnesota	77,886	1.8	26,536	0.7	5 1,350	193.5
16	Georgia	75,781	1.2	4,457	0.4	5 1,224	208.6
17	Oregon	69,269	2.4	34,775	1.3	34,494	99.2
18	Colorado	59,862	1.8	29,916	1.0	29,946	100.1
19	Arizona	55,206	1.5	22,032	0.8	33,174	150.6

TABLE 2. *National census statistics for Asians and Pacific Islanders* (cont.)

1990 Asian or Pacific Islander Population Rank	State	1990 Asian or Pacific Islander Population	1990 Percent of State Population	1980 Asian or Pacific Islander Population*	1980 Percent of state Population	Number Change 1980 to 1990	Percent Change 1980 to 1990
20	Wisconsin	53,583	0.8	18,164	0.4	35,419	195.0
21	North Carolina	52,166	1.0	21,176	0.4	30,990	146.3
22	Connecticut	50,698	3.2	18,970	0.6	31,728	167.3
23	Missouri	41,277	0.7	23,096	0.5	18,181	78.7
24	Louisiana	41,099	1.1	23,779	0.6	17,320	72.8
25	Nevada	38,127	1.9	14,164	1.8	23,963	169.2
26	Indiana	37,617	0.7	20,557	0.4	17,060	83.0
27	Oklahoma	33,563	1.3	17,275	0.6	16,288	94.3
28	Utah	33.371	0.9	15,076	1.0	18,295	121.4
29	Tennessee	31,839	0.6	13,963	0.3	17,876	128.0
30	Kansas	31,750	0.5	15,078	0.6	16,672	110.6
31	Iowa	25,476	3.6	11,577	0.4	13,899	120.1
32	South Carolina	22,382	1.8	11,834	0.4	10,548	89.1
33	Alabama	21,797	0.5	9,734	0.2	12,063	123.9
34	Alaska	19,728	3.6	8,054	2.0	11,674	144.9
35	Rhode Island	18,325	1.8	5,303	0.6	13,022	245.6
36	Kentucky	17,812	0.5	9,970	0.3	7,842	78.7
37	New Mexico	14,124	0.9	6,825	0.5	7,299	106.9
38	Mississippi	13,016	0.5	7,412	0.3	5,604	75.6

TABLE 2. *National census statistics for Asians and Pacific Islanders* (cont.)

1990 Asian or Pacific Islander Population Rank	State	1990 Asian or Pacific Islander Population	1990 Percent of State Population	1980 Asian or Pacific Islander Population*	1980 Percent of State Population	Number Change 1980 to 1990	Percent Change 1980 to 1990
39	Arkansas	12,530	0.5	6,740	0.3	5,790	85.9
40	Nebraska	12,422	0.8	7,002	0.4	5,420	17.4
41	District of Columbia	11,214	1.8	6,636	1.0	4,578	120.3
42	Idaho	9,365	0.9	5,948	0.6	3,417	57.4
43	New Hampshire	9,343	0.8	2,929	0.3	6,414	219.0
44	Delaware	9,057	1.4	4,112	0.7	4,945	120.3
45	West Virginia	7,459	0.4	5,194	0.3	2,265	43.6
46	Maine	6,683	0.5	2,947	0.3	3,736	126.8
47	Montana	4,259	0.5	2,503	0.3	1,756	70.2
48	North Dakota	3,462	0.5	1.979	0.3	1,483	74.9
49	Vermont	3,215	0.6	1,355	0.3	1,860	137.3
50	South Dakota	3,123	0.4	1,738	0.3	1,385	79.7
51	Wyoming	2,806	0.6	1,969	0.4	837	42.5

*The 1980 numbers for Asians or Pacific Islanders shown in this table are not entirely comparable with the 1990 counts. The 1980 count of 3,500,439 Asians and Pacific Islanders based on 100-percent tabulations includes only the nine specific Asian or Pacific Islander groups listed separately in the 1980 race item. The 1980 total Asian or Pacific Islander population of 3,726,440 from sample tabulations is comparable to the 1990 count; these figures include groups not listed separately in the race item on the 1980 census form

The population counts set forth herein are subject to possible correction for undercount or overcount

SOURCE: *Rafu Saimpo,* March 26, 1991

Poverty Among Asians and Pacific Islanders

According to O'Hare and Felt (1991), the high poverty rate among Asians and Pacific Islanders is largely unrecognized and misunderstood due to the relatively high incomes of a few of the Asian and Pacific Islander subgroups. In fact, the poverty rate among Asians and Pacific Islanders in 1989 was 14 percent, almost twice the rate of non-Hispanic whites. Furthermore, the proportion of Asians and Pacific Islanders living in poverty has been *increasing*. Fifty-nine percent of poor Asians and Pacific Islanders lived in households that participated in at least one welfare program with a means test in 1990. Many Southeast Asian refugees began their lives in the United States receiving welfare. There is little truth to the view that Asians and Pacific Islanders do not receive or accept Government welfare or that the strong family and kinship support systems prevent Asians and Pacific Islanders from requiring welfare assistance. New immigrants from Southeast Asia have the highest poverty rates among Asian and Pacific Islander subgroups. Refugees and immigrants from Vietnam, Cambodia, and Laos comprise the largest proportion of immigrants who were poor when they came to the United States.

Income also is related to family structure. Asian and Pacific Islander families are more likely to live in large family households and work in family businesses. At the time of the CPS, about 76 percent of the Asian and Pacific Islander population lived in married-couple families, compared to 73 percent of non-Hispanic white households. Asian and Pacific Islander families lived in extended family households at twice the rate of non-Hispanic whites. Asian and Pacific Islander adult children were more likely to live with their parents than non-Hispanic whites, and most Asian and Pacific Islander children grew up in families with both parents. Asians and Pacific Islanders tended to marry later and remain married in larger proportions than non-Hispanic whites. Asians and Pacific Islanders also had children at a later age.

All of these factors tend to support the development of higher incomes in Asian and Pacific Islander families. According to the O'Hare and Felt data (1991), Asian and Pacific Islander cultures place a heavy emphasis on education, hard work, and striving for educational opportunities and excellence. What was striking about the educational patterns among Asians and Pacific Islanders was that the high school

graduation rates were similar to non-Hispanic whites. However, Asians and Pacific Islanders tended to continue their education in college at about twice the rate of non-Hispanic whites: 40 percent versus 23 percent. While some Asian and Pacific Islander subgroups were well educated in their own countries and, therefore, allowed to immigrate to the United States, there were other subgroups who lacked education and skills that were marketable in the industrialized U.S. economy. In 1990, 20 percent of Asians and Pacific Islanders did not have a high school diploma, a slightly higher percentage than that of non-Hispanic whites. This contrasts with the "whiz kids" image of Asians and Pacific Islanders (Brand 1987).

Economic Returns on Educational Investment

Even though Asian and Pacific Islander families averaged slightly higher incomes than non-Hispanic whites and more Asians and Pacific Islanders attended college, Asians and Pacific Islanders earned less than non-Hispanic whites. In all age groups, non-Hispanic white males earned more money than Asian and Pacific Islander males with the same age and educational background. Even though Asians and Pacific Islanders had more education than non-Hispanic whites, the economic return in earnings was 21 percent lower. This indicates that the "glass ceiling" effect and employment discrimination may be keeping Asians and Pacific Islanders from benefiting appropriately from their education and work performance.

Policy Implications

The sample size in the March 1990 CPS did not allow for studies that looked at the population by region, metropolitan status, marital status, and education simultaneously. However, as the population continues to grow, more and more attention will be placed on public policy issues. It is hoped that better data will be collected in order to obtain an accurate picture of the complex nature of the demographic characteristics of Asians and Pacific Islanders. With the continuing emphasis on accepting immigrants who have skills needed by U.S. employers, the Asian and Pacific Islander immigration rate may continue to be very high in the foreseeable future.

TABLE 3. *Populations of five largest Asian groups in Southland Counties, 1990*

County	Chinese	Filipino	Japanese	Korean	Vietnamese
Los Angeles	245,033	219,653	129,736	145,431	62,594
Orange	41,403	30,356	29,704	35,919	71,822
San Bernardino	8,462	16,171	5,046	6,289	6,697
Riverside	4,704	12,748	3,920	3,877	4,618
San Diego	19,686	95,945	17,869	6,722	21,118

SOURCE: *Asian Week,* May 24, 1991. p. 1.

Finally, the demographic characteristics of Asians and Pacific Islanders are considerably more complex than the so-called myth of the model minority would imply. The relative economic success of Asians and Pacific Islanders tends to make them targets of the frustrations of other groups, such as non-Hispanic whites who are threatened by the growing economic power of Pacific Rim countries. This also may be one of the reasons for the tensions that have developed among Asians and Pacific Islanders and other people of color. The O'Hare and Felt study (1991) shows that the American dream and the image of America as a melting pot are not proven by the Asian and Pacific Islander experience. Asians and Pacific Islanders have encountered the glass ceiling of employment discrimination, racism, and barriers to human services, political power, and appropriate recognition by the public and private sectors.

DESCRIPTION OF DRUG ABUSE AMONG ASIAN AND PACIFIC ISLANDER POPULATIONS

As a historical note, Trimble and colleagues (1987) found that opium abuse among Chinese immigrants in the period from 1920 to 1960 was very high. Chinese patients were overrepresented among opium

addicts in treatment at the U.S. Public Health Service (PHS) Hospital in Lexington, KY. The profile of the Chinese addict in treatment is very revealing: "An immigrant from China, English-limited facilities, mean age of 53, a social isolate with a lack of social, recreational, and spiritual outlets." These individuals certainly were high risk based upon their social circumstances.

The literature on drug abuse among Asian and Pacific Islander populations is very limited. In general, because local, State, and Federal agencies do not collect comprehensive data on specific Asian and Pacific Islander populations, it is impossible to fully describe drug abuse among them. Dr. Toshiaki Sasao conducted a drug abuse needs assessment in California funded by the State Department of Alcohol and Drug Programs (Sasao 1991; California Department of Alcohol and Drug Programs 1991). One resulting report, entitled "Statewide Asian Drug Service Needs Assessment: A Multimethod Approach," indicates that the lack of substance abuse data on Asians and Pacific Islanders tends to reinforce the myth of the model minority. As a result, drug abuse service needs often are neglected. While Asians and Pacific Islanders avoid mainstream services that are not culturally relevant, these individuals will seek services provided by agencies that address their needs in a culturally competent manner. The Sasao study found the following:

1. There was a significant alcohol, tobacco, and other drug (ATOD) problem in many Asian and Pacific Islander subgroups. Marijuana and cocaine use was found in more assimilated Asians and Pacific Islanders, as well as in newer immigrant groups. The major factors associated with the marijuana and cocaine use were peer pressure and the discrepancy between Government policies regarding drug use and cultural norms in the immigrants' native countries.

2. There is a lack of public awareness and education regarding the health and related consequences of ATOD use among Asians and Pacific Islanders. This is especially true among Southeast Asians. The effort to increase public awareness and education regarding ATOD use must be provided in a culturally competent manner. At the very least, this means involving bilingual, bicultural staff in prevention and treatment programs.

3. There is a lack of culturally competent service providers serving Asian and Pacific Islander populations. There are only a handful of Asian and Pacific Islander prevention and treatment providers throughout the United States, and many of these programs are operating on Federal demonstration grants that are unlikely to be continued by local and State funding.

4. Providing ATOD prevention and treatment services to Asian and Pacific Islander populations requires a great deal of related social services due to the multiple needs of these families In addition, many new immigrant subgroups are unfamiliar with Western procedures for seeking health and social services and have difficulties expressing their needs to public officials.

5. Further research needs to be done on the needs of all the Asian and Pacific Islander subgroups, especially the Vietnamese, Hmong, Laotian, Mien, and Cambodians from whom research data are harder to obtain without extensive data-gathering efforts. These Southeast Asian subgroups have more difficulty understanding research methods and are more resistant to participating in substance abuse research.

In general, alcohol abuse will not be the focus of this chapter. However, most of the generalizations regarding drug abuse among Asians and Pacific Islanders also apply to alcohol abuse. Some assume that Asians and Pacific Islanders have no alcohol problems, in part because of the "flushing reaction" (they experience the difficulty in metabolizing alcohol that is common among these individuals). The existing research shows that many Asian and Pacific Islander subgroups do have alcohol problems in spite of the flushing response. One region in which this is true particularly is the Pacific Islands. According to Hanipale and Whitney (in process), the alcohol consumption in American Samoa is many times higher than the national average, and this alcohol abuse problem exists in many other Pacific Islands. The heterogeneity of the Asian and Pacific Islander group leads to varying patterns of substance abuse among them. For example, Koreans use high levels of alcohol but relatively low amounts of tobacco and illicit drugs; recent immigrants from Japan, as a group, have a much higher proportion of heavy drinkers than Caucasians,

while later-generation Chinese tend to consume more alcohol than immigrant Chinese.

As with alcohol abuse, this chapter will not focus on tobacco use. However, it is important to mention that the *Healthy People 2000* objectives developed by the U.S. Department of Health and Human Services identify smoking as a problem among Southeast Asian men. The objective is to reduce cigarette smoking to a prevalence of no more than 20 percent among Southeast Asian men. The baseline with which to measure progress was 55 percent in 1984.

In a literature review conducted by Sasao (1991) during a needs assessment study, assessing the extent of drug abuse among Asians and Pacific Islanders was made more difficult by various cultural and psychological factors. While most of the past research indicates relatively infrequent drug abuse and relatively low use of substances among Asians and Pacific Islanders compared to the general population, there is increasing evidence that more and more Asians and Pacific Islanders are abusing drugs. For example, 95 percent of the Asians and Pacific Islanders in California prisons were incarcerated for drug-related crimes. The Asian American Drug Abuse Program in Los Angeles has been treating Asians and Pacific Islanders with its comprehensive drug treatment program for 20 years.

Due to the lack of drug treatment programs specifically designed for Asians and Pacific Islanders, many potential clients seek treatment through Asian and Pacific Islander social service, primary health care, and mental health service agencies, and private physicians. In addition, help-seeking behavior often includes contacting the clergy, elders within the community, and native healers. Cultural norms vary a great deal among Asians and Pacific Islanders. For example, Asian and Pacific Islander cultures are based in Confucian, Buddhist, Shinto, Catholic, Protestant Christian, Moslem, Hindu, and tribal belief systems. Other factors that vary among the Asian and Pacific Islander subgroups are immigrant status, levels of acceleration, language ability, socioeconomic class, and social support systems.

In Sasao's view, the tendency for the existing research to indicate that Asians and Pacific Islanders have a low incidence of drug abuse is related to the limited research on this population and the nature and

difficulties of deriving data from both treated and untreated cases. This issue will be discussed later in the section entitled "Specific Asian and Pacific Islander Research Concerns."

GENERAL DRUG PREVENTION RESEARCH ISSUES

A major issue is the degree to which emphasis is placed upon pathology and a deficit-oriented model in approaching ATOD research. A better balance is needed between a focus upon pathology and deficits and the contrasting focus on wellness, health promotion, and resiliency factors. Prevention research should place more emphasis on why individuals, families, and neighborhoods are successful in preventing substance abuse. Asians and Pacific Islanders often will respond more favorably to being asked to discuss supportive factors when interviewed than to requests to discuss what causes an individual to abuse substances.

The stereotyping of Asians and Pacific Islanders is another important general issue. The myth of the model minority tends to stereotype Asians and Pacific Islanders as a group that is unaffected by drug abuse. In reality, however, there are Asian drug traffickers producing and smuggling illicit drugs from the "Golden Triangle" in Asia to the United States, some of which then are distributed in the United States by Asians and Pacific Islanders. The media, though, tend to overdramatize the extent to which these groups are involved with drugs. The movie "Year of the Dragon" depicts New York's Chinatown as an underworld of drug lords, gambling, and organized crime. "Showdown in Little Tokyo" characterized Little Tokyo in Los Angeles as being controlled by the Yakuza for drug dealing.

Leukefeld and Bukoski (1991*a)* point out that the field of prevention research needs to develop drug abuse prevention models and clearly define terms like "prevention." Establishing accurate norms for sample groups is an important task, especially for people of color.

Perhaps the most important general issue is the relationship of cultural identity to Asian and Pacific Islander ATOD abuse. While research in this area is very limited, Akutsu and colleagues (1989) found no relationship between acculturation (as measured by generation) and

drinking. It is speculated, however, that a relationship may be found if acculturation is operationalized to reflect a continuum of traditional to acculturated values with specific reference to drinking.

Zane and Sasao (submitted) list the following methodological issues in research on Asian and Pacific Islander substance abuse:

1. Population heterogeneity,
2. Cultural differences versus ethnic differences, and
3. Measure development and application.

These issues again point out the complex nature of Asian and Pacific Islander populations. In addition, the various cultural factors must be interrelated with ethnicity. Finally, the instruments and measures that are applied to this population must be used carefully so that the results will be reliable and correctly applied.

The National Institute on Alcohol Abuse and Alcoholism (NIAAA) publication *Alcohol Use Among U.S. Ethnic Minorities* (1989) lists several recommendations for improving minority-focused research. These recommendations are included because they also apply to drug abuse research among Asians and Pacific Islanders:

1. *Continued support for secondary analysis of existing data sets:* For Asians and Pacific Islanders, this would include data from the National Center for Health Statistics and the Centers for Disease Control and Prevention.

2. *Standardized identification of race and ethnicity in data bases:* This is one of the highest priorities for Asians and Pacific Islanders.

3. *Research on cultural variations within racial and ethnic groups:* This is a very high priority for Asians and Pacific Islanders because of the many diverse subgroups and cultural variations that would affect high-risk factors, as well as resiliency and other mitigating circumstances.

4. *Research on the effects of immigration and migration on alcohol use:* Because of the high number of Asians and Pacific Islanders who are immigrants, this also is a high priority.

5. *Research on treatment and prevention issues, with a special emphasis on cultural factors:* The role of culture must be clarified, especially as acculturation modifies traditions and cultural norms.

6. *Continued need for small-scale studies:* Because of the relatively small populations of Asian and Pacific Islander subgroups, small-scale studies are needed to provide much-needed data where larger studies may not be feasible or may take a long time to implement.

7. *Need for ethnographic research:* Along with small-scale studies, researchers need the ethnographic data for Asians and Pacific Islanders to complement quantitative data.

8. *Collaboration with minority experts in designing studies:* This applies to National Institute on Drug Abuse (NIDA) and NIAAA.

9. *Continued liaison between the minority alcohol research community and NIAAA and NIDA to develop appropriate prevention research programs:* This need for dialogue also applies to NIDA. NIDA should develop a major research strategy for addressing Asians and Pacific Islanders.

10. *Support for training of minority researchers:* Asian- and Pacific Islander-focused research will not flourish without more Asian and Pacific Islander researchers.

SPECIFIC ASIAN AND PACIFIC ISLANDER RESEARCH CONCERNS

The absence of Asians and Pacific Islanders in any systematic incidence and prevalence studies (e.g., to gather data for specific subgroups) is a problem that must be emphasized. There is nothing comparable to the National High School Senior Survey and the National Household Survey for Asians and Pacific Islanders. Thus, little data exist to define fully and accurately the nature and extent of

drug abuse among Asians and Pacific Islanders. As a result, the assumption often is made that Asians and Pacific Islanders have no drug abuse problems.

Sasao (1991) pointed out that most of the existing research on substance abuse among Asians and Pacific Islanders is based on face-to-face personal interview surveys in untreated cases in community samples and research on treated cases observed in treatment facilities. Assessing substance use by self-report among a sample of untreated Asian and Pacific Islander university students is difficult because they tend to underreport levels of use. Furthermore, data that are reported regarding Asian and Pacific Islander populations usually are not broken out into specific subgroups (e.g., Korean, Samoan, and Cambodian). The classification of "Asian" or "Other" makes interpreting findings difficult.

Further, many sociocultural variables have not been considered in previous studies. In an Indochinese refugee study, 45 percent of the sample reported problems with alcohol and/or smoking tobacco but no problems with drug use. The respondents indicated that using alcohol and tobacco was an acceptable way to cope with their stress.

In examining the research on treated cases (utilization data) to estimate prevalence, the problem, according to Sasao, is the sample-selection biases involving socioeconomic, administrative, and other factors. Utilization data do not necessarily reflect the prevalence of problems in Asian and Pacific Islander communities. In fact, the lack of culturally competent drug abuse services and a variety of other cultural and related factors tend to steer Asians and Pacific Islanders away from mainstream treatment services. Thus, underutilization of existing services may be more a function of the lack of culturally competent services rather than the absence of drug abuse problems in this population.

A monograph edited by Trimble and colleagues (1987) indicated that there are problems with existing studies of Asian and Pacific Islander drug abuse. Improving the drug abuse research methodology of Asian and Pacific Islander populations requires the following:

1. Appropriate sensitivity of data-gathering methods for cultural norms and behaviors;
2. Behavior-anchored operational specification of drug use;
3. Improved quantification of use and abuse;
4. Time-specific anchoring to describe use and abuse;
5. Greater range in the use continuum;
6. Greater specification of use and abuse patterns: dosage, state of use, and polydrug use;
7. Improved sampling techniques;
8. Use of longitudinal designs;
9. Use of control groups;
10. More replicated studies; and
11. Studies of drug use and abuse in a normal population.

Problems of interpreting research data regarding Asians and Pacific Islanders include the following:

1. Limited data base,
2. Reinterpretation of inaccessible studies,
3. Inaccuracies from key informant need assessment data,
4. Inaccuracies from prevalence estimates based on treated cases, and
5. Lack of complete documentation of clients' drug abuse concerns.

According to Trimble and colleagues (1987), two other factors must be considered. First, the mindset of the research investigators, providers, and administrators of service, research, and training programs must be culturally sensitive. If researchers stereotype Asians and Pacific Islanders as the model minority with no drug abuse problems, they will tend to:

1. Not evaluate for such occurrences,
2. Not document such problems,
3. Not collect information relative to frequency and extent of such events, and
4. Not consider such issues to warrant investigation, funding, and research.

Second, researchers must have the necessary sensitivity, cultural awareness, and bilingual and bicultural expertise to effectively perform research regarding Asians and Pacific Islanders. There are few, if any,

NIDA grants that have focused on Asians and Pacific Islanders using culturally competent researchers.

Leukefeld and Bukoski (1991*b)* identified several prevention models. One is the Biopsychosocial Vulnerability Model, which suggests that biological, psychological, and social factors explain vulnerability to drug abuse. This model aids understanding of certain aspects of Asian and Pacific Islander prevention issues. Research into the biological effects of illicit drugs on Asian and Pacific Islander populations is greatly needed. As stated earlier, many Asian and Pacific Islander subgroups metabolize alcohol, as well as certain prescription medications (Lin 1989), differently from other groups. Thus, it is important to study how the use of illicit and other drugs biologically affects Asians and Pacific Islanders.

Socioeconomic, political, and environmental factors are relevant to Asian and Pacific Islander populations in that many individuals are political refugees from war-torn countries where substance abuse may have been viewed differently from how it is viewed in the United States. Socioeconomic factors, including poverty, racism, and anti-Asian violence, have an impact on substance abuse that needs to be understood. It is important to note that many Asians and Pacific Islanders are involved in small businesses, such as restaurants, grocery and liquor stores, cocktail lounges, and bars, all of which may serve alcoholic beverages from Asian and Pacific Island (foreign) countries. The nature of these businesses has an impact on prevention and treatment of substance abuse for Asians and Pacific Islanders and other communities that needs to be fully understood. The civil disturbance in Los Angeles in April 1992 is an example of the implications of this business pattern.

Psychological, identity, and cultural factors among Asians and Pacific Islanders need to be researched. Already there is considerable research that indicates that these factors are important, but more research must be done since these factors apply differently to each of the specific Asian and Pacific Islander subgroups. Because of the high proportion of immigrants in these subgroups, international studies are needed to capture the cultural factors from the country of origin that affect immigrants.

The relative aversion to self-disclosure, desire for privacy, and avoidance of public displays of emotion are characteristics of many Asian and Pacific Islander subgroups that make research (as well as prevention and treatment services) more difficult. Research methodologies need to address this problem. They also must recognize that Asian and Pacific Islander university students' self-reports tend not to be a very reliable source of drug abuse prevalence data and that it may be necessary to try other assessment techniques, such as urinalysis and hair sampling. Although there are problems with these more intrusive methods, they should be studied.

Asian and Pacific Islander attitudes regarding health, illness, addiction, and personal and family problems are heavily laden with cultural factors that make research into prevention and treatment of drug abuse complex. Many Asians and Pacific Islanders would be reluctant to define and publicly disclose a "problem" with drug abuse or accept the Western idea of the "dysfunctional" family. The nature and cause of illness also may vary greatly depending upon the Asian and Pacific Islander subgroup involved in drug abuse treatment. For example, what is considered a drug abuse problem in one group might be considered an imbalance in spiritual matters rather than a matter of remedial treatment in another group.

Furthermore, the concept of addiction and substance abuse may not be compatible with the interpretation of the nature of substance abuse held by certain Asian and Pacific Islander subgroups. Among Samoans, a problem with alcohol or drugs is not necessarily seen as the westernized version of an addicted personality with a lifelong Alcoholics Anonymous-type problem. Instead, the matter may be understood as an episodic event caused by a mistake in judgment. This mistake can be rectified through a ritualized apology to the affected parties, and the individual will not necessarily be considered to have a chronic maladaptive personality problem.

Finally, each Asian and Pacific Islander subgroup needs to be studied individually to establish baseline data for each subgroup. The incidence and prevalence data, risk factors, and data related to prevention and treatment must be addressed specifically for each of the Asian and Pacific Islander populations. Although it is much more difficult, expensive, and time consuming, there is no effective generic research

approach for all Asian and Pacific Islander populations. A body of knowledge needs to be produced so that the prevention and treatment needs of Asian and Pacific Islander populations can be served in a culturally competent manner based on long overdue research. Asians and Pacific Islanders should not have to choose between going without drug abuse services or being forced into mainstream prevention and treatment programs because culturally competent services are unavailable.

CONCLUSION

The *Healthy People 2000* (U.S. Department of Health and Human Services 1991) objectives for Asians and Pacific Islanders include the development and implementation of a national process to identify the significant gaps in disease prevention and health promotion data for racial and ethnic minorities, which include Asians and Pacific Islanders. There is no process at present for drug abuse research among Asians and Pacific Islanders. Although there are about 10 million Asians and Pacific Islanders on the U.S. mainland and in Hawaii, Alaska, and the Pacific Islands, there is a need for NIDA-supported research regarding these populations. The lack of knowledge regarding substance abuse among Asian and Pacific Islander populations can be addressed through research applications to NIDA and other PHS agencies.

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