14

Implications of Epidemiologic Information for Effective Drug Abuse Prevention Strategies

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1. Introduction 211
2. Prevention Programming and Research 212
   2.1. Defining Drug Abuse Prevention 212
   2.2. Drug Abuse Prevention Research in the United States 213
3. Linking Epidemiological Information to Prevention 215
   3.1. Development of Prevention Interventions 215
      3.1.1. Age of Onset 217
      3.1.2. The Sequencing of Substance Use 218
      3.1.3. Risk and Protection 218
   3.2. Needs Assessments and Program Evaluation 219
4. Conclusions 221
References 222

1. INTRODUCTION

It has been only in the past two decades that drug abuse prevention researchers and practitioners in the United States have recognized the important contributions that epidemiologic study findings and methods have had on the development of

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effective preventive interventions. (Sloboda, 2003). These findings not only include what drugs are being used and in what ways but also the age at which most drug users initiate the use of illicit drugs and what characteristics and factors are most likely associated with increased risk to initiate drug use. It has been this information and advances in our understanding of behavior change that have had the most significant impact on the design of effective drug abuse preventive interventions. Epidemiology provides the knowledge to build prevention intervention strategies and to target interventions as well as providing the tools necessary to evaluate the impact of these interventions on the target population and, overtime, on the communities in which the target population lives.

This chapter discusses the relationship between epidemiologic and prevention intervention research in three sections. The first section will present a brief history of drug abuse prevention programming and research highlighting key landmarks of the progress of these fields. The second section will discuss the implications of epidemiologic findings for the design of prevention interventions and how epidemiologic methods are used for both needs assessments and outcome and impact evaluation studies. Finally, the last section will summarize what we have learned to date and identify key gaps in our knowledge base and suggest future directions for research and policy decisions.

2. PREVENTION PROGRAMMING AND RESEARCH

2.1. Defining Drug Abuse Prevention

Prevention of mental health and substance abuse problems in the United States is an evolving field. As late as the mid-1990s, new perspectives and conceptualization of the purposes of prevention had been discussed (Mrazek and Haggerty, 1994). Relinquishing the medical model of public health of primary, secondary and tertiary interventions, the field developed a new focus on a "spectrum" of interventions. In this spectrum, prevention interventions are implemented prior to the initial onset of a problem (Bukoski, 2003). Once a diagnostic status is achieved (using the DSM IV criteria), treatment interventions would apply. Efforts to assist with compliance to treatment regimens, to remain substance-free, and to be rehabilitated are considered "maintenance" interventions.

The purpose of substance abuse prevention programming in the United States is to delay the initiation of alcohol and tobacco use until the legal age and to reduce or eliminate the general use of these licit substances and of illicit substances including the misuse of solvents or other inhalants and prescription drugs. As the average age of initiation of drug use is between 13 and16, most prevention strategies target early adolescence. Over the past thirty years, the substance abuse prevention field has struggled to develop effective approaches to reach adolescents

with messages that would influence them to make decisions not to use alcohol, tobacco, or illicit drugs. Most prevention programming in the early days focused on school-based curricula that included information dissemination, providing information about drugs and their effects; affective education, focusing on interpersonal growth and self-esteem with little attention to drugs and their effects; and, alternative approaches to substance use, providing recreational or community service activities to enhance self-reliance and to reduce feelings of alienation (Botvin and Griffin, 2003). However, it was not until the late 1970s and early 1980s that sufficient information on the epidemiology of substance use was available and that theories of human behavior were developed to form the foundations for the design and implementation of effective strategies.

2.2. Drug Abuse Prevention Research in the United States

With the establishment of the National Institute on Drug Abuse (NIDA) in 1974, the importance of drug abuse was recognized and its inclusion as one institute within the National Institutes of Health network in 1992 reinforced the noted association between drug abuse and health problems. Almost from the beginning, one of the major missions of NIDA was to create epidemiologic databases to achieve better estimates of the prevalence and incidence of drug abuse in the United States and to identify the determinants or risk factors that lead to drug use and abuse. These databases included population-based surveys such as the National Household Survey on Drug Abuse that targets persons aged 12 and older who reside in national representative samples of households (now under the auspices of the Substance Abuse and Mental Health Services Administration and renamed the National Survey on Drug Use and Health) and the Monitoring the Future Study (conducted under a grant by the University of Michigan) that since1975 targeted 12^{th} graders and since 1991, 8^{th} and 10^{th} graders, attending national representative samples of public and private schools. These surveys are cross-sectional and provide a "snap shot" of the prevalence and incidence of substance use. To complement these surveys, NIDA also supported longitudinal studies that would follow samples of adolescents over time to determine the factors associated with the onset of substance use. Bukoski (2003) identified these databases as landmark events for prevention as they have provided consistent findings relative to the origins and pathways of substance use. In their classic article, Hawkins and his associates (1992) have summarized the risk and protective factors that emerged from this research. This work was enhanced by Glantz and Pickens (1992) with the identification of those determinants that differentiate those among initiators of the use of drugs who become drug abusers or drug dependent.

The risk and protective factors approach to prevention had a great influence on the field and its reformulation of preventive and treatment interventions (Mrazek and Haggerty, 1994). With this information, three levels of prevention have been

defined and embraced by drug abuse prevention researchers and practitioners. These levels address the varying degrees of risk found in the targeted population and are termed: universal, selective and indicated. Universal programs address general populations while selective programs target those segments of the population that present greater than normal risk to develop a disorder and indicated programs focus on those subgroups that exhibit signs or symptoms of developing a disorder. The recognition of the importance of theoretically derived models that specify the attitudes, perceptions and behaviors leading to substance use or other problem behaviors have become the target of prevention interventions (Coie et al., 1993).

The work of Richard Evans and his staff from the University of Houston (Evans, 1976; Evans et al., 1978) is cited as the origin of modern prevention. This group designed a smoking prevention program based on existing social and psychological factors and persuasive communications theory. The program was developed from research that showed that smoking was the result of social influences of peers and the media and that children could be inoculated against these pressures by making them aware of the rationales for these pressures and providing them the tools to resist these pressures and to practice their application. In addition, to address misconceptions students held about the prevalence of smoking among adolescents, periodic surveys were conducted among students on smoking behaviors with saliva sampling used to confirm these behaviors. These survey findings were shared with the students showing them that the actual rates of smoking were much lower than they estimated. The results of the evaluation of this program demonstrated that the students who participated in the program had significantly lower rates of initiating smoking than those in the control group. This was a major breakthrough in the substance abuse prevention field. Subsequent analyses of this work indicated that it was the feedback to the students that smoking was not a normative behavior that explained the findings (Botvin and Griffin, 2003).

Social learning theory that focuses on the interactions between people and their environments also served to shape approaches to prevention programs. The theory states that people learn new forms of behavior by seeing what others do and what the results or consequences are of those behaviors. The concept of self-efficacy expands social learning theory (Bandura, 1977) emphasizing the importance of an individual's belief in his/her competency to succeed in self-determined tasks or behaviors. Epidemiologic evidence indicates that most substance use among adolescents takes place through peer influence, therefore many substance use prevention programs incorporate the concept of self-efficacy, involve group activities, and often use peer models or assistants. These programs are designed (Botvin and Griffin, 2003) to increase students' resistance to those influences that encourage substance use, to focus on providing students with the skills they need to resist offers to use alcohol, tobacco or illicit drugs, and to give students opportunities to practice these resistance skills in virtual situations that are realistic to them.

NIDA has supported the evaluation of newly created substance use prevention programming through the 1980s until the present. The publication of the results of two NIDA-funded prevention studies in the prestigious Journal of the American Medical Association (Botvin et al., 1995; Pentz et al., 1989) gave the substance use prevention field new status in public health. The success of these and other programs led to another 'landmark' in the history of substance use prevention, the first NIDA-sponsored National Conference of Drug Abuse Prevention Research: Putting Research to Work for the Community in September 1996. The publication, Preventing Drug Use among Children and Adolescents: A Research-Based Guide (Sloboda and David, 1997) was a major outcome of the conference and has served as an important resource to prevention practitioners and policy makers. As Bukoski writes, "This publication clearly established the beginning of the evidence-based drug abuse prevention movement that has emerged across the country in the past 5 years." (Bukoski, 2003; p. 6) The Guide summarizes the findings from the research drawing consistent elements of effective prevention programming. This publication was the first of many other events that promoted evidence-based prevention programming. Since 1997, the United States Department of Education and the Center for Substance Abuse Prevention of the Substance Abuse and Mental Health Services Administration have both created processes through which the effectiveness of new prevention programs are reviewed for their inclusion on a list of promising or exemplary models.

3. LINKING EPIDEMIOLOGICAL INFORMATION TO PREVENTION

As indicated in the Introduction, there are two major roles that epidemiologic information serves for prevention. First is in the development of the intervention itself. Second is for conducting needs assessments for a community and to evaluate the outcomes and impact of the intervention.

3.1. Development of Prevention Interventions

In the 2003 edition of Preventing Drug Use among Children and Adolescents (NIDA, 2003), sixteen principles are listed that inform prevention development.

PRINCIPLES OF PREVENTION (NIDA, 2003)

1. **Prevention Programs should enhance protective factors and reverse or reduce risk factors.**

2. **Prevention Programs should address all forms of drug abuse, alone or in combination, including the underage use of legal drugs (e.g., tobacco or alcohol); the use of illegal drugs (e.g., marijuana or heroin); and the inappropriate use of legally obtained substances (e.g., inhalants), prescription medications, or over-the-counter drugs.**
3. **Prevention Programs should address the type of drug abuse problem in the local community, target modifiable risk factors, and strengthen identified protective factors**.
4. **Prevention Programs should be tailored to address risks specific to population or audience characteristics, such as age, gender, and ethnicity, to improve program effectiveness**.
5. **Family-based prevention programs should enhance family bonding and relationships and include parenting skills; practice in developing, discussing, and enforcing family policies on substance abuse; and training in drug education and information**.
6. **School programs can be designed to intervene as early as preschool to address risk factors for drug abuse, such as aggressive behavior, poor social skills, and academic difficulties**.
7. **Elementary school programs should target improving academic and social-emotional learning to address risk factors for drug abuse, such as early aggression, academic failure, and school dropout focusing on self-control, emotional awareness, communication, social problem-solving, and academic support**.
8. **Middle or junior high and high school programs should increase academic and social competence focusing on academic support, communication, peer relationships, self-efficacy and assertiveness, drug resistance skills, reinforcement of anti-drug attitudes, and strengthening of personal commitments against drug abuse.**
9. **General population programs should address key transition points, such as the transition to middle school.**
10. Community programs that combine two or more effective programs, such as family-based and school-based programs, can be more effective than a single program alone.
11. Community programs reaching populations in multiple settings—for example, schools, clubs, faith-based organizations, and the media—are most effective when they present consistent, community-wide messages in each setting.
12. When communities adapt a program for their specific needs they should retain core elements of the original research-based intervention.
13. **Programs should be long-term with repeated interventions to reinforce the original prevention goals**.

14. Programs should include instructors trained in good class-room management practices.
15. Programs are most effective when they employ interactive techniques that allow for active involvement in learning about drug abuse and reinforcing skills.
16. Programs can be cost-effective.

Ten of the 16 principles (in bold in the table) reflect information derived from epidemiologic studies. The information is derived from both descriptive and analytic studies (see Chapter 1) such as age of onset, sequencing patterns of substance use, and risk and protective factors associated with the initiation of substance use. The following discusses the epidemiologic evidence on each of these issues.

3.1.1. Age of Onset

Before discussing the age of onset or initiation of substance use, it is important to have a picture of the extent of drug use in the general population. Briefly, according to the most recent National Survey on Drug Use and Health report (2002) an estimated 19.5 million people aged 12 and older used at least one illicit drug in the month prior to survey. Almost 60 percent of these drug users used only marijuana while an additional 20 percent used marijuana and at least one other drug and another 20 percent used an illicit drug(s) other than marijuana. The information on the prevalence of drug use by age group showed that for three decades the rates of drug use were higher for those aged 18 through 25 than any other age group and that reports of new drug use are highest among teenagers. Information from the Monitoring the Future Survey (MTF) shows that the percentage of teen use of tobacco, alcohol and illicit drugs increases between 150 percent and 200 percent when students move from the 8^{th} to the 10^{th} grade. Clearly, substance use, particularly illicit drug use, is a problem of our youth. Most cross-sectional and prospective studies show that the average age of onset is under age 18 years and generally between 13 and 16. (OAS, 2004).

Patterns of drug use by youth have varied over time. Both the NHSDA (now NSDUH) and MTF have shown that overall drug use among adolescents had peaked in the late 1970s with downturns noted during the 1980s and then short-term increases in the early 1990s. Although marijuana has been the drug of choice through all of these periods, each decade has seen other drugs being used. The late 1970s through the 1980s showed increased use of cocaine while more recent surveys show upsurges in the initiation of drugs such as ecstasy (MDMA), LSD, PCP, and the misuse of prescription drugs. The most interesting observation from MTF is the downward trends in cigarette use peaking among high school seniors

in 1977 when the estimated lifetime prevalence of use was 75.7 percent and then declining to a low of 53.7 percent in 2003 (MTF, 2004). Explanations for these up and down trends have been linked to attitudes about the consequences associated with the use of specific drugs and to perceptions as to the level of general social tolerance for drug use. This is particularly noteworthy for cigarette use as well as for marijuana and cocaine use (Bachman et al., 1990; Bachman et al., 1998).

3.1.2. The Sequencing of Substance Use

A controversial issue in the field of drug abuse epidemiology is the "gateway" theory that explains the initiation of illicit drugs or the sequencing pattern of drug use. The concept was introduced to the field by Denise Kandel in 1975 and in principle states that individuals progress along a specific pathway from alcohol and/or tobacco use to the use of marijuana and from the use of marijuana to the use of other illicit drugs (Kandel et al., 1992). Several other prospective studies of youngsters have had similar findings. Whether there is a physiological or social mechanism at play that explains this pattern of substance use is unclear. What it seems to signify is that one's risk to move on to marijuana is **much** higher than if one never smoked or drank and the risk of moving on to cocaine is **much** higher for someone who ever used marijuana than for someone who never did. It is the lack of a clear mechanism that brings the theory into question. However, the epidemiologic evidence is so consistent that prevention specialists have incorporated the concept of progression into their programs and address the use of tobacco and alcohol as well as other drugs relevant to the age group represented in their target groups. (Scheirer et al., 2001)

3.1.3. Risk and Protection

Until the mid-1970s most of our understanding of the determinants of the initiation of the use of alcohol, tobacco or other drugs by children and adolescents came from cross-sectional studies of adolescent or adult substance users. The nature of these studies could not support causal relationships. With the establishment of a number of longitudinal studies by NIDA that followed children through their teenage years into adulthood it was possible to identify not only those factors that put children at risk of drug use and abuse but also for those children most at risk for using drugs, those factors that protected them from being involved in drug use. Using the findings from both the cross-sectional and prospective studies, several drug abuse epidemiologists have attempted to categorize risk and protective factors (Hawkins et al., 1992; Flay and Petraitis, 2003, Brook et al., 1988, 2003; Newcomb and Felix-Ortiz, 1992; Pandina, 1998). In general, these groupings include personal, family, peer, and environmental determinants. Many of these factors are both direct and indirect contributors to drug using behaviors. Sorting the potential effects of any or all of these factors has become a great challenge to the prevention

field (Flay and Petraitis, 2003). The difficulty has been in attributing degree or level of risk associated with these factors across the developmental periods of a child's life.

By taking the developmental approach, it then becomes clear that at various key social and psychological stages of growth, some of these factors may be more important than others. For example, parents and primary caregivers serve an essential role in providing nurturing, stimulation and modeling to enable infants to bond with other humans and to communicate with the world around them. Failure to form these warm attachments has been linked to a number of problems in subsequent phases such as poor language skills and cognitive ability as well as to inappropriate self-regulatory behavior in early childhood and later, drug abuse. (McCartney et al., 2004).

Research focusing on protective factors supports this perspective (Brook et al., 1990). Investigations of groups of children determined to be susceptible to drug use but who do not become involved with drugs, have found that early attachments to an adult can serve to protect children from initiating the use of drugs. What is yet unclear from this research, however, is the weight these protective factors need to carry to overcome risk. For instance, would having a strong teacher role model counter failure to bond within the early family?

Other research examines the processes that are closer or more proximate to becoming a drug user such as the availability of drugs, knowledge on how to obtain drugs, as well as having more positive attitudes about drugs. For example, research has found that when children understand the negative physical, psychological, and social effects of drugs and when they perceive social disapproval of drug use by their friends and families, they tend to avoid drug initiation (Bachman et al., 1990; Bachman et al., 1998).

More recent studies address the question of progression from use to abuse or dependence on drugs. A significant work that stimulated the thinking in this area was the book, Vulnerability to Drug Abuse (Glantz and Pickens, 1992) that includes papers from a conference held by NIDA in 1989 entitled, Transition from Drug Use to Abuse/Dependence. Glantz and Pickens summarized the findings of this research, differentiating factors associated with drug use from those associated with drug abuse. They point out that although drug use tends to be more related to social and peer factors, drug abuse has more biological or psychological precursors. (p. 9)

Most prevention programs today either address one of more of these risk factors or provide reinforcement to existing protective. (For examples, see NIDA, 2003).

3.2. Needs Assessments and Program Evaluation

Planning prevention programming for communities generally requires an assessment of the extent and nature of the substance abuse problem (Brown, 1997). Studies that compare substance use problems at the community level show that

there is often wide-variation in the types of substances used, in the characteristics of the user population, and in the factors that may be most associated with the initiation and maintenance of substance use. With the greater availability of and pressure to use effective prevention programs, more and more communities are struggling to determine which best meets the needs of their communities. Several planners and researchers have developed planning models that are becoming more widely used by community coalitions, partnerships, and planning boards (e.g., Hawkins et al., 1992; SAMHSA, 2002). Most of these models use a logic system or step-by-step strategic planning approach. In general these steps include conducting a needs assessment and an inventory of available social and physical capital (skills, competencies, and resources), setting priorities among the identified needs, selecting strategies to address these needs, implementing the strategies, and evaluation. Epidemiological methods serve to conduct the needs assessments and to conduct evaluations, particularly when community-wide strategies are used. Several of these methods are discussed in more detail in other chapters of this book. Brown (1997) and others (Hawkins et al., 1992) suggest the use of archival and survey information to establish need. Generally multiple methods are encouraged. Clearly, before any assessments are initiated, it is important for planners first to decide what they want to target. This sounds like a chicken and egg dilemma, however, if the concern is to prevent adolescents at high risk of substance use from becoming drug abusers, other methods may be employed. These may include random drug testing or the use of an assessment instrument such as the Drug Use Screening Inventory (DUSI) (Tarter et al., 1992) or the Problem Oriented Screening Instrument for Teenagers (POSIT) (McLaney et al., 1994).

Archival information provides a snapshot of current drug abuse patterns within the community and if built into ongoing surveillance systems, has the potential of identifying new patterns that should be addressed in prevention strategies that include broad community involvement of law enforcement, the media, the schools, families, faith-based organizations, and local government and businesses. Archival data for juveniles such as school drop out rates or academic standings, child abuse, arrest patterns, and census data help identify geographic patterns of need.

School surveys should be conducted not only with students who are within the "at risk" age group but also with younger students to determine risk status, existing perceptions and attitudes of substance use, intentions to use tobacco, alcohol or other drugs, and actual use. Conducting school surveys on a routine basis, either annually or bi-annually, will help identify new problem areas and to assess the overall impact of prevention strategies. The tools for such needs assessments and evaluations are derived from the field of epidemiology and are discussed in the chapters by Sloboda et al. and Adlaf.

Drug testing as a prevention tool remains somewhat controversial in the United States yet is strongly advocated by the Office for National Drug Control Policy. The controversy surrounding drug testing is two-pronged. The first

issue is whether random drug testing impinges on the rights of adolescents and their parents. The second issue relates to how it is best used within a prevention framework. The outcomes of both drug testing and the use of such instruments as the DUSI and POSIT can be used to identify individuals or can be aggregated for a school or other group setting. Because of the problem of labeling the individual or group, it is important to view these approaches as archival records and surveys as tools of prevention planning.

Just as these data collection approaches are helpful in making an assessment of community needs these also serve as excellent evaluation tools. Communities may consider the needs assessment phase of planning as establishing a baseline prior to implementation of an intervention. Part of the implementation plan should be an evaluation that sets periodic markers that assess progress toward meeting short-, intermediate- and long-term objectives.

4. CONCLUSIONS

Clearly, over the past two to three decades there has been an accumulation of knowledge about the epidemiology and the prevention of drug abuse. However many questions remain unanswered that impede further progress in the prevention of drug abuse. Since the mid 1970s data systems have allowed the monitoring of increases and decreases in the use of illicit substances. However, only crude explanations are available as to why these trends occur. Not only are explanations lacking to explain these up and down trends, but we do not fully understand differential and changing patterns of drug use. For instance, reports from the Community Epidemiology Work Group that is supported by NIDA indicate that drug abuse patterns are defined by time and space. Some patterns are national in scope such as the use of marijuana, heroin and cocaine while others are regional such as the use of methamphetamine and PCP. Some patterns of drug use are long-term (e.g., injecting heroin) while others last but a few years (e.g., L.S.D.).

Furthermore, much of the behavior we call "drug abuse" and its associated etiology is based on the findings from cross-sectional and longitudinal studies. However, the factors implicated with drug abuse are but indicators of a number of complicated underlying processes. The need to develop a set of socio-bio-psychological theories of drug abuse is evident to guide future epidemiologic studies. Such theories must reflect the phased nature of drug abuse behaviors (from initiation through dependency), the interaction of the individual within various social groups and society, and the changing nature of drug abuse within the context of societal structures and processes, norms, values, and interests. Such a theoretical perspective would enable the strategic targeting of preventive interventions.

Finally, and perhaps most provocative, is our failure to understand why the use of illicit drugs among young people is increasing in most countries around

the world. Boundaries between countries and cultures are becoming more porous, easing the transport of drugs. The commonality of patterns of drug use however does not imply that there is a commonality of prevention strategies. More cross-national and cross-cultural studies of these strategies are needed to further the understanding of what aspects of these interventions are the most effective.

We are entering the 21st Century with great challenges ahead. Yet, those who began addressing these issues over three decades ago have provided us the concepts and the tools to advance our understanding of drug abuse in order to halt its devastating impact on individuals, on their families, and on society.

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