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REFLECTIONS ON 40 YEARS OF DRUG ABUSE RESEARCH: CHANGES IN THE EPIDEMIOLOGY OF DRUG ABUSE

RICHARD R. CLAYTON, ZILI SLOBODA, BRYAN PAGE

The discipline of epidemiology utilizes the constructs of agent, host, vector, and environment to study the incidence and prevalence (i.e., the nature, extent, distribution, correlates) and the contexts, and consequences of drug abuse in the United States. This paper provides a selected review of the results of 40 years of epidemiological study of drug abuse using surveillance systems, general population surveys, ethnography and qualitative research approaches. It then addresses the challenges in conducting research on drug abuse epidemiology. The paper concludes with some missed opportunities and lessons learned in four decades of a large portfolio of research studies conducted by an impressive array of distinguished scientists.

INTRODUCTION

Epidemiology is a discipline that:

> "Studies the distribution of health problems in populations to determine the nature of the health problems, the characteristics of the population affected with the health problems and the environmental conditions or circumstances

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Richard R. Clayton, PhD, a sociologist, is Associate Dean for Research and the Good Samaritan Foundation Chair in Health Behavior in the College of Public Health at the University of Kentucky. He has been involved in research covering a broad range of topics concerning drug abuse since the early 1970s. **Zili Sloboda,** Sc.D., is Senior Research Associate at the Institute for Health and Social Policy, The University of Akron. Her research focuses on drug abuse epidemiology and prevention. Currently she is conducting a randomized controlled trial assessing the impact of substance abuse prevention programs delivered by D.A.R.E. officer-instructors. **J. Bryan Page,** Ph.D. is Professor and Chair of the Department of Anthropology at the University of Miami. He has engaged in the anthropological study of street-based drug use in many different settings during the last three decades. His studies have led to productive collaborations with diverse disciplines, including molecular biology, virology, immunology, ophthalmology, internal medicine, and psychiatry. Each of his studies begins by establishing a perspective on the use of drugs in the natural habitat of the user.

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that are uniquely associated with the health problems and the affected populations" (Sloboda, 2002, p. 2).

Epidemiologic constructs of agent, host, vector, and environment help to measure and to describe trends in drug abuse in the United States. The agent in the epidemiologic model is the drug. Given the diversity of drugs available for abuse, a number of drug-specific "epidemics" have captured our attention. The host is the person and population groups abusing various drugs (defined largely by age, sex, race and ethnicity, socioeconomic status, geographic location). The vector is the organizational mechanisms by which the agents are distributed. The agent, host, and vector all operate within an environment that includes familial, social, cultural, historical, economic, political, legal, and media factors (Compton, Thomas, Conway, & Colliver, 2005; Sloboda, 2002).

Setting the Stage

Groundbreaking epidemiologic research was conducted at the U.S. Public Health hospitals in Lexington and Fort Worth by O'Donnell (1969) and Maddux and Desmond (1980). The findings from these two studies and earlier studies (see Winick, 1962) were critical foundations for the field. The declaration of drug abuse as "public enemy number 1" and President Nixon's establishment of the Special Action for Drug Abuse Prevention (SAODAP) gave the field unprecedented attention, priority, and resources. Concern about drug use among soldiers fighting in Vietnam and returning to the U.S. prompted studies by Robins (1973; 1974; 1993) and O'Donnell, Voss, Clayton, Slatin, and Room (1976). These studies and the development of surveillance systems to monitor drug use across the country by SAODAP were major "tipping points" in the history of research on the epidemiology of drug abuse leading to the establishment in 1974 of the National Institute on Drug Abuse (NIDA). This action was a crucial step in legitimizing and institutionalizing epidemiology as a key intellectual partner in the scientific community of drug abuse research.

Surveillance Systems

One criterion of the evolution and maturity of a substantive area of public health is the reach, penetration, sophistication, and sustainability of its epidemiologic surveillance systems. Without accurate knowledge of the epidemiology, the development and implementation of prevention, treatment, and policy mechanisms to deal with drug abuse cannot succeed. On this criterion, the accomplishments of the drug abuse field are impressive.

One of the earliest and most unique drug abuse surveillance systems was a register of narcotics addicts in New York City established in the mid-1960s (Amsel,

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Fishman, Rivkind, Kavaler, Krug, Cline, Brophy, Conwell, 1971). The register was used as a reference to estimate the number of narcotic users in New York and in the country. Another early surveillance system was the Drug Abuse Warning Network (DAWN) that measures drug episodes resulting in a visit to a hospital emergency department and drug overdose deaths recorded by medical examiners. DAWN has become an essential part of the infrastructure of epidemiology of drug abuse. An early attempt at surveillance of the treatment population, the Client Oriented Drug Abuse Program (CODAP), was preceded as well as succeeded by an impressive series of longitudinal studies designed to measure the effectiveness of treatment. The Drug Abuse Reporting Program (DARP) initially covered the period from 1969 to 1972. The Treatment Outcome Prospective Study (TOPS) covered the period from 1979-1981. More recently, the Drug Abuse Treatment Outcome Studies (DATOS) have focused on measuring the effectiveness of components of treatment programs. DARP, TOPS, and DATOS have used large samples of treatment programs and large numbers of clients to track the effectiveness of different types of treatment longitudinally, have charted the epidemiology and evolution of treatment in the U.S., and have identified some of the predictors of long-term outcomes of treatment. One of the most important and innovative surveillance systems in drug abuse epidemiology was established in 1976. In the Community Epidemiology Working Group (CEWG), Nick Kozel and his community correspondents have met twice a year for over 30 years to assess indicators and trends at the local level, often detecting new patterns of drug abuse earlier than most other surveillance systems (Sloboda & Kozel, 2003). Finally, data from the Epidemiologic Catchment Area (ECA) studies, the National Comorbidity Study (NCS and NCS-Replication), and the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) have confirmed the importance of the nexus between drug abuse and other comorbidities (Conway, Compton, Stinson, & Grant, 2006).

GENERAL POPULATION SURVEYS

The National Household Survey on Drug Abuse first appeared as part of the President's Commission on Marihuana Abuse in 1971/1972 (Shafer, 1972). Now called the National Survey on Drug Use and Health, this survey provides annual data representative at the national and state levels for the household population 12 years old and older. The Monitoring the Future (MTF) annual surveys of 12th graders began in 1975 and added new samples of 8th and 10th graders in 1991. The MTF is actually a cohort-sequential design with samples of each cohort followed every two years. The oldest cohorts are now in their forties. In many ways, MTF plays a key role regarding drug abuse in American society that is similar to that played by the annual Surgeon General's Reports on smoking. The release of the annual results

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reinforces the need to keep drug abuse among adolescents high on the public policy agenda and highlights the changes occurring as well as the progress being made to address drug abuse among youth. The MTF surveys have documented the general decline in drug use from 1978 to 1991, the increase in drug use in the early to late 1990s, and the subsequent decline to the present, as well as shifts in which drugs are being used and abused by America's youth. One of the most important findings from MTF has been the clear connection between increases and decreases in perceived harmfulness and disapproval and the prevalence of marijuana and cocaine use in particular (Bachman, Johnston, & O'Malley, 1990, 1998; Bachman, Johnston, O'Malley, & Humphrey, 1988; Johnston, O'Malley, Bachman, & Schulenberg, 2004). The epidemiologic research conducted by Kandel (1975) and her colleagues (Yamaguchi & Kandel, 1984) has drawn particular attention to the modal sequences in onset of use of various drugs.

Ethnography, Qualitative Research, and Epidemiology

Like most areas of epidemiologic research, drug abuse epidemiology is primarily quantitative. However, because of a number of forces, the drug abuse field has been open to qualitative ethnographic research. Ethnographic researchers have added rich narrative texture to the quantitative data emerging from more traditional epidemiological studies. As Sloboda (2002) notes: "[T]he integration of qualitative and quantitative or ethnographic approaches has provided significant information about drug-using populations that has been useful to both prevention efforts and treatment providers as well as to policy makers" (p.5). She then lists some of these approaches, including capture-recapture, multiplier methods, dynamic modeling, rapid assessment, snowball sampling, key informant interviews, and focus groups.

Challenges in Research on Drug Abuse Epidemiology

Major accomplishments in the epidemiology of drug use and drug use disorders include:

> "Systematic and regular monitoring of large scale shifts in the landscape of drug use, the prevalence and timing of the onset of illicit drug use, the estimation of drug use disorders in the United States, the identification of substantial comorbidity between drug use and drug use disorders with mental disorders, and the linking of drug use, especially injection drug use and high risk sexual behaviors, to the spread of HIV" (Compton et. al., 2005, p. 1494).

Despite significant progress, a number of challenges still confront researchers studying the epidemiology of drug abuse. These include: (a) non-coverage of population groups that would be expected to exhibit high rates of use and abuse, (b)

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the absence of theories about the "etiology" of drug epidemics (Johnston et al., 2004), (c) little consensus on "best practices" for collecting data on patterns of drug abuse, and (d) a relatively poor record of anticipating the emergence of drug epidemics.

While many of our epidemiologic surveys and surveillance systems are national in scope, their effects are often felt most acutely at local levels where the casualties are most apparent. Yet, epidemics have to start somewhere. Even within communities, the degree of reach and penetration of local drug epidemics differ. Anticipating these epidemics and developing explanations for intra- and intercommunity differences remains a major challenge.

SOME MISSED OPPORTUNITIES AND LESSONS LEARNED FROM RESEARCH ON THE EPIDEMIOLOGY OF DRUG ABUSE

When the field decides to pursue one direction, other opportunities will be missed. The field has not: (a) developed mechanisms to ensure that the massive amounts of existing epidemiologic data are mined, (b) used existing national surveys for conducting strategically designed prospective longitudinal studies or as a way to link individuals to neighborhood and other types of contextual/environmental data at the community level, (c) been as involved in measuring the efficacy and effectiveness of supply-reduction interventions as demand-reduction initiatives, (d) given as much attention to continuation, progression that may or may not lead to dependence, regression, cessation, and relapse as it has given to initiation, (e) given as much attention to smoking and nicotine as it has to marijuana, (f) parlayed a strong tradition and the critical mass of ethnographic researchers into ethnographic field stations in sentinel communities that, together with more quantitative approaches to epidemiology, could have provided a more robust understanding of drug abuse, (g) seriously addressed disparities in health and health care associated with drug abuse, (h) focused enough attention on the "independent" variables compared to the dependent variables, and (i) made itself essential to the formulation and implementation of public policies about drug abuse (see Musto, 1999).

THE FUTURE OF RESEARCH ON THE EPIDEMIOLOGY OF DRUG ABUSE

While research on the epidemiology of drug abuse has experienced incredible progress over the past 40 years, this now more mature field will become increasingly more involved in research with other disciplines focused on understanding drug abuse in the future. The remarkable progress made in the development of brain imaging systems and the enhanced knowledge from neuroscience offer significant opportunities for integration with research on the epidemiology of drug abuse.

The mapping of the human genome has great future potential for drug abuse epidemiology. However, marketing of the benefits of genetics has promised more than could be delivered and promised that the effects would be felt sooner rather

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than later (Insel & Collins, 2003). Part of the future of research on the epidemiology of drug abuse lies with genetic epidemiology, but this will require more strategic than tactical thinking. If we have had difficulty finding the genes associated with rare diseases, how likely is it we will easily find the genes responsible for more complex diseases? To this point in time, drug abuse epidemiologic research has failed to characterize the environmental contexts of drug abuse. If we had spent more time measuring the phenotypes of environmental/contextual influences on drug abuse we would be better able to understand the g x e interactions that surely exist.
Personal Reflections on Research on Drug Abuse Epidemiology

Bryan Page

My plan as a graduate student hurtling toward dissertation planning and implementation had been to apply for a grant to study automobile use in Mexico City. Some of my former anthropology professors still ask me if I was ever able to do that study, and I have to tell them that I never got around to it. I took a different path than that of the typical graduate student in anthropology of that era, actually being pressed into service in a large, well-funded project to help a transdisciplinary team led by William E. Carter, then director of the Center for Latin American Studies and Paul. L. Doughty, then chair of the Department of Anthropology, both at the University of Florida, to collect data on the consequences of long-term marijuana use in San Jose, Costa Rica. I agreed to join the team, partly because of the research topic: long-term marijuana use and its effects, and partly because of the composition of the team: world experts in several different health areas.

The project's principal investigators were familiar with my ability to sing Mexican rancheras (and other genres) accompanied by guitar, and they figured that if there were any marijuana use among musicians in San José, I would find it. My fluency in Spanish was also a potential asset in conducting field work in a Spanish-speaking country. Neither surmise turned out quite as my advisors had anticipated. Hardly any of the musicians in San José, popular or classical, had much experience in smoking marijuana, especially not at the levels required to become part of our targeted sample. Also, my formal Mexico City Spanish did me little good in San José, where I was required to learn the pachuco argot of that city's street people to learn what was happening (cf. Page, 1977). Nevertheless, I was eventually able to recruit, along with my co-field workers, Bill True and Claudine Van Ghegenam, a total of 84 marijuana smokers who had between 10 and 27 years of experience smoking marijuana and 160 nonusers to serve as study controls.

Within a short period of time, these activities plunged me into a variety of social and scientific settings that I had never imagined. With the help of Carter and Doughty, I eventually recognized the appropriate neighborhoods and social settings from

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which to recruit marijuana users and controls, and those neighborhoods were the ones with reputations for crime and deviant behavior. I became corner companion to small-time dealers and their coteries of customers, listening to hours of repartee about soccer, race, government, sex, family, and marijuana. I met with ministers in the Costa Rican government, one day even visiting the presidential mansion for a meeting with the wife of the President of the Republic. I also cohosted visits of officials from a brand-new agency in the National Institutes of Health, NIDA. Project officers Eleanor Carroll, Jean-Paul Smith, and Stephen Szara inspected our offices, visited the hospital facilities, and went out to the barrios with us to meet the study participants. I became aware of a sister project that had begun before ours in Jamaica, meeting Lambros Comitas and Vera Rubin for the first time at the annual meetings of the American Anthropological Association in Mexico City. All of this experience now seems especially privileged because we had the honor of being among the first drug ethnographers supported by NIDA funding. We heard news first-hand about new efforts to understand how drug use fits into the human condition in places outside the U.S. We received draft copies of studies done by Dreher (1976) and Shaeffer (1975) among ganja smokers in Jamaica and *Ganja in Jamaica* (Rubin & Comitas, 1975). Our advisors came to town with stories of the meetings of the New York Academy of Science, where ethnographers working in several parts of the world were characterizing different patterns of cannabis use. A project like that gives a graduate student the feeling that he or she is truly working at the cutting edge of science. Eminent scientists in ophthalmology, electroencephalography, pulmonology, and neuropsychology listened to our field experiences and asked our advice on questions of appropriate analysis and competing causes. We were made to feel important to the project as a whole. Our advisors deserve the credit for placing us in positions that demonstrated our importance to them.

Our field team's naïve expectation that marijuana use might be decriminalized in the U.S. by the time we returned was perhaps the most ironic aspect of the Costa Rican experience. The irony derived from two facts: (a) we had "stacked the deck" to find deleterious effects of cannabis, using finely tuned instruments aimed directly at the identified problem areas, and (b) we had badly misapprehended the capacity of the North American population to believe that marijuana was a dangerous drug. The experience of conducting this kind of research project and then seeing how the public and the scientific community received the results formed my approach to the next 30 years of research on drug use. Lessons learned in Costa Rican project influenced how I approached my research in the following ways:

1. **Publish in peer-reviewed journals, not books.** We published all of our findings in a book that came out five years after we returned from San José,

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and of course, despite developing something of a cult following among advocates of changing marijuana laws, the book was largely ignored by the drug research community.

2. **Always start the project with solid ethnography.** Examining the behavior of interest first-hand and in cultural context is the only way to learn how to ask the right questions.
3. **Do not rely on police promises of immunity.** Collaborative arrangements with police tend to disintegrate, and even when honored, may do more harm than good. It is better to avoid any illegal activity as an observer and rely on the informants' experience in avoiding detection. Friendly relations with police are not good for the field researcher.
4. **Actively seek collaborators from other disciplines if they can help your overall research plan.** The science usually has an established understanding of the question of interest. To understand that question better, creative addition of specialized disciplinary expertise will strengthen most studies of drug use.
5. **International collaborators have long memories and they may be able to help again.** We were able to return to Costa Rica for three additional studies, collaborating with members of the original local research team, eventually answering questions that we could not have addressed in the original study.
6. **If you treat study participants with respect and humanity, they will welcome your attempts to conduct longitudinal studies of their behavior and health status.** This particular principle has been reconfirmed scores of times in subsequent research projects in Little Havana, Valencia, Little Haiti, Overtown, Liberty City, and Opa-locka.

Zili Sloboda

My introduction to the field of drug abuse epidemiology began in 1967 when I was hired as the Research Associate for the New York City Narcotics Register. It was a job of convenience, but one that set me on an erratic career path that was both exciting and frustrating. In the past 40 years, I have observed and, at times was honored to be an active participant in the shaping and growth of drug abuse epidemiology.

When I reflect over the past 40 years, there are particular "standouts" that I feel have established drug abuse as a special area of epidemiology and have influenced perceptions of the field by other researchers, the public, and policy makers. These are studies of the incidence and prevalence of drug abuse and drug abuse patterns and of the origins and pathways of drug use and drug abuse.

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In the late 1960s, heroin use was seen to be a major problem in New York City, and the New York City Narcotics Register was developed to better inform city government about the number of narcotic addicts that came in contact with treatment programs, law enforcement, emergency rooms and other medical care facilities, and the medical examiner. The consistency of the data made the Register a valuable tool, and several researchers and policy makers at the time used the register data to estimate the number of narcotic abusers in the country. Probably the most often used estimate, the Baden formula, was based on comparing names of narcotic-related deaths to the names in the Register. Baden, the associate medical examiner, found that 50% of those who died were known to the Register, and, since, at the time (1968), there were 42,500 registered narcotic addicts, he estimated that there were 85,000 narcotic users in New York City. Many believed that half of the nation's narcotic addicts resided in New York City, and using a fudge factor, it was estimated that between 200,000 and 300,000 narcotic addicts lived in the U.S. This figure was widely quoted despite the crude methods for estimation. The Bureau of Narcotics and Dangerous Drugs, using similar methodologies, but focusing on rearrests, estimated 315,000 narcotic addicts nationally (Holahan, 1972).

Since that time, particularly with the establishment of NIDA, the field has developed a wide range of direct and indirect methods for estimating the prevalence of drug abuse by drug type and consumption patterns. The specifics of these approaches are detailed in the book, *The Epidemiology of Drug Abuse* (Sloboda, 2005). A variety of innovative methodological and statistical techniques has not only advanced the field of drug abuse epidemiology, but also has informed other fields of research, such as HIV and AIDS. Some of the most useful methodological tools have come from NIDA-sponsored Community Epidemiology Work Group (CEWG). This group of drug abuse experts from sentinel areas across the U.S. has been in existence since 1974 and grew out of work of the Narcotics Treatment Administration (NTA), a Washington, D.C. treatment organization directed by Robert DuPont. The NTA brought together representatives from D.C. agencies that had data on drug abusers or knowledge of the local drug situation. The sharing and interpretation of information guided outreach and treatment efforts and monitored existing and emerging drug use patterns. When NIDA was established, Dr. Dupont became its first director and used this approach to monitor national drug use patterns. The CEWG model has not only been a model for other countries, but also for local communities and is part of recommended needs assessment guidelines for planning both prevention and treatment programming.

In conjunction with the advancement of estimation techniques for monitoring drug abuse at all levels, the other major area of progress is the research aimed to understanding the determinants for initiating the use of drugs and for the maintenance

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and progression of use. NIDA's early support of large longitudinal studies of adolescents has had a dramatic impact on the fields of drug abuse epidemiology and prevention. The consistency of findings across these studies and over time shows the strengths of this work. Most significant of these findings has been the differentiation of those factors related to initiation of drug use and to progression to dependence (Glantz & Pickens, 1992).

With so much progress in this area, it remains disappointing that so few drug abuse epidemiologic researchers are bona fide trained epidemiologists. Most of the prominent researchers in the field have been trained as psychologists, anthropologists, or sociologists. The strengths that these researchers bring are substantive, developing science- and theoretically-based frameworks to their research. However, more research is needed to explore the underlying mechanisms of the process of becoming a drug user, particularly a dependent drug user. In addition, the general field of epidemiology would bring research and statistical methodologies that would improve how we view drug abuse in a variety of settings.

Other areas that warrant attention to advance our understanding of drug abuse emerge from the development of more refined definitions of drug abuse viewed within a public health perspective and focus more on differential health consequences. Such a framework would include more natural history studies, particularly of adolescent drug abusers and further examination of "epidemics" or outbreaks of new drug use patterns.

Richard R. Clayton

I can't believe how fortunate I have been. I seem to have always been in the right place at the right time. Because of this, I have been able to observe and on occasion participate in some of the research on the epidemiology of drug abuse conducted over the past 40 years. Almost all of my reflections involve interactions with the scientists responsible for what is now known about the epidemiology of drug abuse, scientists and scholars for whom I have deep respect and affection.

I am one of those sociologists that Zili mentioned, not formally trained in epidemiology. I joined the faculty in the Department of Sociology at the University of Kentucky in August of 1970 with a specialization in sociology of the family. Clyde McCoy, a demographer by training, joined the faculty at the same time. If someone had told us then that our entire professional life would be devoted to studying the epidemiology of drug abuse, both of us would have probably laughed.

My career in drug abuse epidemiology began in 1973 when John (Jack) O'Donnell, who had a distinguished research career at the narcotics hospital in Lexington, asked me to join a research team to conduct a nationwide survey of drug abuse. I believe the gist of my reaction was: Jack, I don't know anything about drug

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abuse or epidemiology. He quickly assured me that he would teach me about drug abuse; that he wanted me on the team because I was a methodologist. Experience with epidemiology was evidently not an important criterion.

Since the early days when expediency sometimes trumped clarity and rigorous science, the organizational and environmental context within which research is conducted has changed dramatically. It was helpful to have the Special Action Office for Drug Abuse Prevention (SAODAP) in the Executive Office of the President. SAODAP had commissioned Lee Robins to conduct a study of soldiers returning from Vietnam in September of 1971. That study, which used questionnaires as well as urine analysis, found a high prevalence rate for drug abuse. Fearing that returning veterans with drug problems would overwhelm the existing drug treatment system, Jack O'Donnell and Robin Room (an alcohol epidemiologist at Berkeley) assembled a research team to conduct a nationwide study of drug abuse among men. The O'Donnell-Room research team decided that a sample similar to the sample of Vietnam veterans in the Robins' study would be ideal. The most logical source of such a sample was the Selective Service System because the draft was still in existence at that time. However, the research team encountered strong resistance and a number of bureaucratic barriers as we tried to gain access the Selective Service System files to draw a sample consonant with the sample used by Lee Robins. David Nurco, a community-based epidemiologist and part-time consultant to SAODAP, persuaded a very high-ranking administration official to "encourage" the Director of Selective Service to allow us access. In the resulting SAODAP-funded nationwide survey of young men born into the 11 birth cohorts (1944 to 1954), O'Donnell and colleagues (1976) found that the level of drug use among soldiers in Southeast Asia was merely part of a larger epidemic of drug use occurring in the U.S. We also conducted a separate, more etiologically-focused epidemiologic study among young men in the same 11 birth cohorts selected from selective service boards covering known high drug use areas of Manhattan (Clayton and Voss, 1981). Between 1973 and 1976, I learned a great deal about drug abuse and epidemiology and got "hooked" on both.

It is tempting to tell a host of stories. Instead, I will reflect on some of the broader themes that characterize research on the epidemiology of drug abuse over the past 40 years.

Our field is rich in the amount, quality, and diversity of epidemiologic research. This includes not just the general population surveys (e.g., MTF, National Survey on Drug Use and Health), but also the incredible array of data systems (e.g., DAWN, DATOS, and CEWG). We are indebted to Lloyd Johnston, Jerry Bachman, and Patrick O'Malley for keeping drug abuse among adolescents on the public policy radar screen and high on the list of priorities. Even so, we have not been as fortunate with data systems that capture the casualties of drug abuse epidemics. It would

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have helped greatly if the ongoing data and human face of suffering from DAWN, DATOS, and CEWG had been given more attention.

Our field has also been able to effectively link epidemiology and etiology through a wide range of longitudinal studies, such as those fielded by Judith and David Brook, Denise Kandel, Rob Pandina and his colleagues from Rutgers, and the longitudinal studies of treatment populations conducted by Dwayne Simpson and his colleagues at TCU and by Doug Anglin and colleagues at UCLA. The broad field of drug abuse research has benefited significantly from the state-of-the-art statistical techniques developed by Pete Bentler, the Muthens, and Linda Collins and her colleagues at Penn State. Methodology and statistics are at the heart of a robust field of research on the epidemiology of drug abuse.

In the developmental history of any field, "what might have been questions" are always present. What would we know if the field had developed longitudinal studies early on that focused on those responsible for the "episodes" counted in the DAWN system, and made the data system both episode and individually based? This limitation occurred in spite of advice to NIDA on this opportunity over the years. What would we know about the mechanisms of drug abuse epidemiology if NIDA had established long-term ethnographic field stations to amplify and explicate the results from more quantitatively oriented epidemiologic research? What would we know if the field had developed and implemented epidemiologic data systems focused on prevention just like those focused on treatment? We still don't have a road map of the community-based prevention initiatives, but the field has benefited substantially from the many longitudinal (and in many ways epidemiologic) studies conducted on prevention (e.g., those by Gil Botvin, Mary Ann Pentz, David Hawkins and Richard Catalano, Richard Spoth and their colleagues). What would we know if the scientific rigor and discipline established in the epidemiology of drug use and abuse on the "demand-side" had been replicated in research on the "supply-side" of drug abuse? Further, what would we now know if rigorous demand- and supply-side epidemiologic research had been characterized by collaboration? Unfortunately, these what might have been questions remain unanswered, but it's not too late. Perhaps in the next 40 years our field, defined in the broadest sense of the term, will become even more transdisciplinary and collaborative, and inform an enlightened public policy infrastructure in the United States and globally to deal effectively with the symptoms as well as the underlying causes of drug epidemics.

It has been a high honor and privilege for me to be a part of these four decades of research on the epidemiology of drug abuse. I believe that all of us have done well and been reasonably good stewards for the field and have set the stage for those fortunate enough to be observers of and participants in the next 40 years of research on the epidemiology of drug abuse. I hope that those involved in the next

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40 years of research on this topic have as much fun and get as much meaning out of their journey as we have on our journey.

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