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paper 65

**THE AIMS AND OBJECTIVES OF
THE MONITORING THE FUTURE STUDY
AND PROGRESS TOWARD
FULFILLING THEM AS OF 2006**

Lloyd D. Johnston
Patrick M. O'Malley
John E. Schulenberg
Jerald G. Bachman

Monitoring the Future: A Continuing Study of the Lifestyles and Values of Youth

As its title suggests, this study is intended to assess the changing lifestyles, values, and preferences of American youth on a continuing basis. Each year since 1975 about 17,000 seniors have participated in the annual survey, which is conducted in some 130 high schools nationwide. In addition, subsamples of seniors from previously participating classes receive follow-up questionnaires by mail each year.

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INTRODUCTION

Specific Aims of the Project

Monitoring the Future (MTF) is an ongoing program of research designed to accomplish three broad and complementary aims:

- (1) To monitor drug use and potential explanatory factors among American secondary school students, college students, other young adults, and middle-aged adults (detailed under Objectives 1 through 3, below); and to monitor, among young adults, risk and protective behaviors related to transmission of the human immunodeficiency virus.
- (2) To distinguish which of three fundamentally different kinds of change—age, period, and/or cohort—are occurring for various types of drug use, including the use of tobacco and alcohol (Objective 4 below).
- (3) To study the causes, consequences, and (where relevant) developmental patterns associated with these different types of change in drug use (detailed under Objectives 5 through 9, below).

Objectives 10 and 11 list additional methodological, policy, data-sharing, and other objectives.

In pursuit of these three interrelated aims, the project employs a cohort-sequential research design consisting of (a) annual cross-sectional surveys of large, nationally representative samples of high school seniors (beginning with the class of 1975) and 8th and 10th graders (beginning in 1991); and (b) follow-up surveys of each senior class annually through age 30, and at half-decade intervals thereafter.

At present, some 44,000–50,000 secondary school students located in approximately 410–420 secondary schools are surveyed annually—about 17,000 eighth-grade students in about 150 public and private schools, about 15,000 tenth-grade students in about 130 public and private schools, and about 16,000 seniors in approximately 125–140 public and private high schools. In addition, the follow-up surveys of previously graduating classes yield an annual sample of 8,000–8,200 respondents in the age range of 19 to 30, which includes about 1,500 young adults who are actively enrolled in a two- or four-year college and comprise the college student sample.¹ Additional follow-ups are

¹For an in-depth description of the study's research design, see Bachman, J. G., Johnston, L. D., O'Malley, P. M., & Schulenberg, J. E. (2006). *The Monitoring the Future project after thirty-two years: Design and procedures* (Monitoring the Future Occasional Paper No. 64). Ann Arbor, MI: Institute for Social Research. A less detailed description can be found in Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2006). *Monitoring the Future national survey results on drug use, 1975–2005: Volume I: Secondary school students* (NIH Publication No. 06-5883). Bethesda, MD: National Institute on Drug Abuse.

conducted at ages 35, 40, and 45, and are being proposed at five-year intervals thereafter. These several data sets, in addition to a panel survey of three of the 8th-grade cohorts (surveyed as 8th graders in 1991–1993), provide the information base with which the multiple aims of the study are being pursued.

The first of the broad aims—monitoring drug use and related factors in order to provide social indicators of historical change, as well as to explain those changes—clearly implies an ongoing effort. The same is true for the second broad aim of distinguishing the three types of change—age, period, and cohort. Although it may be less obvious, the third broad aim—exploring causes, consequences, and developmental patterns—is also an ongoing effort, involving analyses at both individual and aggregate levels. At the aggregate level we continue to document the emergence of new secular (and recently cohort) changes, as well as the emergence of new drugs. At the individual level of analysis, the process is ongoing in part because new developmental stages are being added to the study, and also because the underlying relational patterns are themselves subject to change (e.g., see Bachman, Johnston, & O’Malley, 1981a, 1989; Bachman, O’Malley, & Johnston, 1986; Johnston, O’Malley, & Bachman, & Schulenberg, 2006c). Further, new policies and programs are constantly being introduced (e.g., decriminalization, legalization of marijuana use, lowering of the legal blood alcohol level for teen drivers, changes in the minimum drinking age, the parent group movement, national advertising campaigns against drug and cigarette smoking), so having this “social observatory” in place permits a more timely, and often a prospective, assessment of their impacts.

We believe that the multiple aims of the study are interconnected and mutually facilitating. Thus, a substantial efficiency results in addressing them in a single project rather than a number of separate ones, and in some important ways, the total product is greater than would be possible under a more fractionated approach.

Overview of the Eleven Objectives

To provide an overview, the 11 specific objectives of the study are listed below without commentary. Then, after a section on the theoretical background and conceptual framework which gave rise to the many variables included in the study, each of the 11 objectives will be discussed separately. Each will be explained more fully, its logic and rationale presented, relevant theory and literature (sometimes an extensive literature) cited, and the study’s progress to date in accomplishing the objective briefly summarized.

Objective 1: To continue monitoring a broad range of drug-related behaviors, as well as potential explanatory factors—including attitudes, beliefs, and perceptions—across nationally representative samples of eighth-, tenth-, and twelfth-grade students. This annual monitoring began in 1975 for twelfth-grade students, and in 1991 for eighth- and tenth-grade students. The specific characteristics to be monitored are:

- a. Self-reported use of over 50 classes and subclasses of drugs, both licit and illicit. (Listed in Table 1.)
- b. Patterns of initiation of use and noncontinuation of use.

- c. Patterns of multiple drug use, both concurrent and nonconcurrent.
- d. Beliefs about the harmfulness of various types of drugs at various levels of use.
- e. Personal disapproval of various types of drugs at various levels of use.
- f. Perceptions of disapproval by peers of the use of various drugs (i.e., perceived peer norms).
- g. Beliefs (or stereotypes) regarding cigarette smokers and frequent marijuana users.
- h. Extent of direct exposure to use of various drugs, and proportions of friends using various drugs.
- i. Perceived availability of the various drugs.
- j. Contexts in which drugs are used (when, where, and with whom).
- k. Personal reasons for use of the various drugs, for abstention, and for discontinuation.
- l. Self-reported use under medical supervision of stimulant-type prescription drugs for the treatment of attention deficit disorder, hyperactivity, or both (Attention Deficit Hyperactivity Disorder, or ADHD).

Objective 2: To continue to monitor and study these same drug-using behaviors and potential explanatory variables among nationally representative samples of American college students, their noncollege age-mates, and nationally representative samples of young adult high school graduates generally (modal ages 19–30); also to continue to monitor risk and protective behaviors related to HIV transmission among young adults of modal ages 21 to 30.

Objective 3: To monitor and study longer term patterns and consequences of drug use beyond young adulthood by continuing to conduct follow-up surveys at ages 35, 40, 45, and by adding age 50.

Objective 4: To attempt to distinguish among three basic types of change in drug use and related factors at the aggregate level: age, period, and cohort.²

Objective 5: To attempt to explain, at the aggregate level of analysis, secular trends and lasting cohort differences in drug use, emphasizing changes in cultural influences, attitudes, beliefs, value orientations, price, and availability as possible explanatory factors.

Objective 6: To examine at the individual level of analysis the natural history of drug use and related factors from early adolescence through middle adulthood, and to attempt to explain age and social role effects on the initiation, maintenance, and cessation of drug use.

²Age effects are consistent changes with age observed across different birth cohorts (or in this case, across graduating class cohorts). Period effects are consistent changes over an historical period observed across various age groups. Cohort effects are enduring differences among cohorts compared at equivalent ages.

- a. To assess, during the *secondary school* years, the impact of individual characteristics (e.g., values, beliefs, lifestyles, and other behaviors such as delinquency, school performance, and religiosity) and social environments (e.g., part-time work, sports and other extracurricular activities, activities outside of school, peer groups) on drug use and related factors, with particular emphasis on the specification of risk and protective factors.
- b. To assess, during the *post-high school* years, the impact of individual characteristics and major social environments (e.g., college, military service, civilian employment, homemaking, unemployment) and roles (e.g., marriage, pregnancy, parenthood, divorce) on drug use and related variables.

Objective 7: To assess both the short- and longer term consequences of various types of drug use—particularly heavy use—on a number of outcomes in the domains of physical and psychological health, status attainment, role performance, family and social relations, driving performance, deviant behavior, etc.

Objective 8: To give special emphasis throughout to the more frequent or heavier users of the different drugs, i.e., individuals most likely to be characterized as abusers. (This objective crosscuts most of those above.)

Objective 9: To continue to study drug use and drug-related attitudes and beliefs among a number of subgroups historically underrepresented in drug abuse research. These include women, ethnic minorities, and young adults who do not attend college, as well as those in military service, civilian employment, or homemaking after high school. (This objective also crosscuts those above.)

Objective 10: To continue to make methodological, substantive, and policy-relevant contributions to the larger fields of social, behavioral, educational, and medical research dealing with drugs and/or youth.

- a. To refine methodologies for the analysis and interpretation of self-report measures of drug use, including documenting the reliability and validity of such measures.
- b. To continue to provide measures for, and stimulate comparability of measurement in drug research at the local, state, national, and international levels and to provide national norms for comparison.
- c. To continue to conduct research of policy and program importance, particularly the evaluation of “natural experiments” that can build upon the main study with great economies in cost and time and to facilitate the use of MTF data for policy studies by and with external collaborators, who often combine MTF data with other relevant data sets.
- d. To continue to provide measures of progress toward the accomplishment of various national goals, including the National Education Goals (now ended), the National Health Goals, the President’s National Drug Control Strategy goals, the Department of Health and Human Services reports on child well-being, and the Surgeon General’s reports on smoking and on adolescent violence.

Objective 11: To continue to facilitate the use of the MTF databases by others—including investigators in a variety of substantive and disciplinary fields—while adequately protecting the confidentiality of the study’s many respondents.

Even this comprehensive listing of objectives does not provide a complete enumeration of the questions and hypotheses that the study can be used to address, or has addressed already. These are spelled out in much greater detail below under a separate discussion of each objective.

Part 1

THEORETICAL BACKGROUND AND CONCEPTUAL FRAMEWORK

In 1980, Lettieri, Sayers, and Pearson edited a volume presenting 43 different theoretical perspectives on drug use, and since then there has continued to be a great deal of development of new and existing theoretical approaches (e.g., Akers & Cochran, 1985; Baumrind & Moselle, 1985; Brook, Brook, Gordon, Whiteman, & Cohen, 1990; Catalano, Kosterman, Hawkins, & Newcomb, 1996; Catalano et al., 2005; Dodge et al., 2006; Donovan, 1996; Donovan, Jessor, & Costa, 1991; Elliott, Huizinga, & Ageton, 1985; Elliott, Huizinga, & Menard, 1989; Flay & Petraitis, 1994; Hawkins, Lishner, Catalano, & Howard, 1986; Herting, Eggert, & Thompson, 1996; Johnston, 1991b; Kandel, 1998, 2002; Kaplan, 1985; Kumpfer & Turner, 1990; Lonczak et al., 2001; Marcos, Bahr, & Johnson, 1986; Massey & Krohn, 1986; Newcomb, 1997; Newcomb & Bentler, 1988; Newcomb & Earleywine, 1996; Oetting & Beauvais, 1987; Pandina & Johnson, 2005; Rhodes & Jason, 1990; Schulenberg & Maggs, 2002; Szapocznik & Coatsworth, 1999; Tarter & Mezzich, 1992; Windle & Davies, 1999; Zucker, 1989, 2006).³ The various perspectives run a wide gamut in terms of: (a) the classes of substances encompassed (e.g., heroin only, alcohol only, any illicit substance, etc.), (b) the stage of involvement being explained (e.g., initiation, continuation, transition to “abuse,” cessation, or relapse), (c) the classes of determinants under consideration (e.g., social, psychological, economic, physiological, etc.), (d) the more general theory of human behavior, if any, upon which the specific drug use theory is grounded (e.g., behavioral, developmental, ecological, psychoanalytic, social field, social learning), and (e) the level at which the phenomenon to be explained is measured (e.g., levels of use at the individual, institutional, or societal level). Yet in spite of—or perhaps in part because of—this breadth and diversity of theorizing in the drug field, the research in this area has long been described as mostly atheoretical (Kandel, 1980; Radosevich, Lanza-Kaduce, Akers, & Krohn, 1980). This is not surprising, considering that theories in this area—particularly social-psychological theories—are still very much “in process.” Although there have been some efforts made toward developing fairly general theories (Kaplan, Martin, & Robbins, 1982; Kaplan, Martin, Johnson, & Robbins, 1986; Kaplan, Johnson, & Bailey, 1987; and Jessor & Jessor, 1977, to cite just two early examples), most of these theoretical perspectives are still rather limited in scope, and are what Merton called “theories of the middle range, theories intermediate to the minor working hypotheses evolved in abundance during day-to-day routines of research, and the all-inclusive speculations comprising a master conceptual scheme.” Such theories consist of a “general

³The word “theory” is used rather loosely here, as is common practice in this field; we take a broad-based view of the term and recognize that its meaning can range from conceptual frameworks to elaborated and specific systems of testable hypotheses.

orientation toward data, suggesting types of variables which need somehow to be taken into account, rather than clear, verifiable statements of relationships between specified variables” (Merton, 1957, pp. 5, 9). Writing much later, Petraitis, Flay, and Miller (1995) commented that “. . . as social scientists we might be aware of many (if not most) of the constructs that contribute to [adolescent substance use], but we do not yet know how all these constructs . . . fit together” (p. 67).

We certainly regard the theoretical approach that has guided much of the development of our work to be middle-range; *and* it is eclectic, since we did not feel that any single extant theoretical approach was sufficiently comprehensive and specified to serve as the sole basis for selecting measurement and guiding analysis in this large and ongoing study. The fact that MTF has the multiple objectives described here makes it particularly impractical to take a single theoretical stance. Our theorizing provided a general approach for generating hypotheses, conceptualizing the measures, and organizing many analyses. There are a great many hypotheses implied in our conceptual framework that are described later; but there are many more we had in mind at the outset and that we have added over the life of the study. Thus our approach to theory, like most others mentioned here, has actually been an evolving process in which further elaboration and specification have occurred and are to be expected in the future. It is an iterative process, in that the theoretical framework leads to some empirical tests, which in turn yield some revisions and/or elaborations of the framework. This process is consistent with what Cattell (1966) described as the “inductive-hypothetico-deductive spiral.”

In the present study, a theoretical structure has been evolving to provide explanation of trends in drug use at the societal or *aggregate* level. Building upon a set of measures of perceived risk, disapproval, and peer norms, which were included in the study from the start (Johnston & Bachman, 1980), we have tested our hypothesis that these are important determinants of changes in drug use. When marijuana use began to decline after peaking around 1979, we described changes in perceived risk as a likely determinant because of its correlated upturn (Johnston, 1982; Johnston, Bachman, & O’Malley, 1981). More evidence was presented from the reasons quitters and abstainers gave for not using marijuana and from the trends in the frequency with which they gave these reasons (Johnston, 1982, 1985). At that time, we also advanced the hypothesis that changes in perceived risk may be helping to drive changes in disapproval of use (and, derivatively, in peer norms). Trends in marijuana use, related attitudes, and beliefs continued to evolve in the predicted way throughout the 1980s and 1990s, providing additional evidence to support this theoretical position. Further, one major competing hypothesis—that changes in availability were driving the downturn—was not supported by our data (Johnston, O’Malley, & Bachman, 1989). Another alternative hypothesis offered by Jessor (1985)—that a shift in young people toward a more conservative lifestyle could have caused the downturn—was addressed and found inadequate (Bachman, Johnston, O’Malley, & Humphrey, 1988). The latter article also demonstrated that if one looked separately at trends across high school classes within each level of perceived risk, no downturn in use occurred, but rather some increased. (A subsequent article dealing with the same issues with regard to the downturn in cocaine use led to much the same conclusions [Bachman, Johnston, & O’Malley, 1990a].) Later, as marijuana use rose again, changes in both perceived risk and disapproval proved to be

leading indicators of the turnaround in use (Bachman, Johnston, & O'Malley, 1998; Johnston, O'Malley, Bachman, & Schulenberg, 2006a). Based on our original set of hypotheses, the confirmation of many of those hypotheses over a number of years, and other correlated evidence, we offered a first statement of a fairly comprehensive theory covering the spread, maintenance, and contraction of drug epidemics (Johnston, 1991b). Subsequently, the country entered what we have characterized as a "relapse phase," for which further theoretical formulations were added. See Johnston, O'Malley, Bachman, and Schulenberg (2006c and earlier volumes in this series) for a discussion of the roles of "generational replacement" and "generational forgetting," as well as other factors at the societal level.

At the *individual* level of analysis and explanation, there certainly has been much progress toward cataloguing the multitude of individual and contextual influences on drug use and attempting to place them within a coherent conceptual framework (e.g., Catalano et al., 2005; Chassin, Hussong, et al., 2004; Glantz & Hartel, 1999; Hawkins et al., 1992; Pandina & Johnson, 1999, 2005; Petraitis et al., 1995; Schulenberg & Maggs, 2002; Szapocznik & Coatsworth, 1999; Windle & Davies, 1999), but there is not as yet a comprehensive theory to deal with all aspects of drug use. We are not unduly discomfited by this fact, nor are we especially uneasy about taking a somewhat eclectic (though certainly not arbitrary) approach to the development of our measurement and analysis. About four decades ago, Dudley Duncan, in discussing next steps in social reporting, wrote at some length about the "theorist" versus the "inductivist." His comments are sufficiently fundamental to theory in the drug area, and particularly to our own approach, that we quote them here:

. . . It is a rare body of theory in the social sciences (and perhaps even in the natural sciences) that is sufficiently complete and detailed to specify exactly how to accomplish the relevant measurement. On the contrary, many quantities now considered to be well-measured became so only as a result of a long process of trial and error, leading to an evolution of the measurement technique, and ultimately a standardization of it . . .

It can hardly be the case that any serious effort at measurement is undertaken on the basis of a theoretical *tabula rasa* . . . A fortiori, a social scientist steeped in the conceptual framework of his discipline could not, even if he wanted to, undertake a job of measurement without its being affected by some set of ideas . . . of how the quantity to be measured relates to other variables of interest . . .

. . . But to the degree that one sees a body of understanding as a *crescive* structure with ragged edges in the neighborhood of recent increments, one should expect the . . . "theoretical" quality of a collection of measurements to emerge *pari passu* with the growth of the measurements themselves. (Duncan, 1969, pp. 8–9)

In our view, this describes much of what has been happening in the drug field in recent decades. There has been a good deal of measurement (some more theoretically

guided, some less so) as well as a good deal of relational analysis; this activity has contributed importantly to the further development and refinement of theory. We see our own research, past and future, as providing valuable ingredients for this ongoing process as we and others continue gradually to advance theory relating to drug use (some of our recent work in terms of advancing a developmental perspective—e.g., Schulenberg & Maggs, 2002; Schulenberg, Maggs, & O'Malley, 2003—is described later when considering Objective 6). But, to repeat the point, we did not think it appropriate to have premised such a large and ongoing research endeavor, with its many varied research purposes, on any single theoretical position.

Domain of Variables and General Theoretical Grounding

Our approach to theory is at the broadest level social–psychological, in that nearly all determinants under consideration are social or psychological characteristics of the person, or characteristics of his or her social environment. (Thus, we omit several domains of undoubted importance: in particular, genetic, biological, and physiological.) The general theoretical approach to human behavior that we have brought to the selection and analysis of variables has its roots in Lewinian field theory, which also underlies our previous work on the Youth in Transition study (Bachman, Kahn, Mednick, Davidson, & Johnston, 1967; Johnston, 1973), and which, incidentally, underlies the theoretical perspectives of others in the drug field, such as Jessor and Jessor (1977). The three major components of Lewinian theory are the person, the environment, and behavior; additionally, a distinction is made between the perceived environment and the actual environment (Deutsch, 1968; Bronfenbrenner, 2005).

Within Lewinian field theory, it is the subjective perceptions of the environment (e.g., perceived peer disapproval of drug use) that are considered critical in determining the motivation and intention to act. In the present study, nearly all measures of the environment are of this type (though aggregating answers of students in school does provide a more objective measure of aspects of the environment than can be commonly observed).⁴ The “person” refers to the psychological characteristics of the individual (attitudes, values, beliefs, and perceptions) as well as to directly observable characteristics. Certainly the central contribution of Lewinian field theory was the emphasis it placed on the environment, and on the interdependence between

⁴While recognizing the potential for discrepancies between the “objective environment” and the “subjective environment” as perceived by the person, we have chosen not to focus on the measurement of those discrepancies (which would have required an even more elaborate research design involving data collection from direct observation, significant others, and/or archival records), nor do we here theorize about the importance of them. For many of our measures of social context, there should be relatively little discrepancy due to unconscious distortion or misperception (e.g., presence of family members in household, enrollment as a student or holding a paid job on a particular date, the size of the high school or college, etc.). Some measures of perceived attitudes of significant others (e.g., status ascribed to particular behaviors by students in the school) can be checked against aggregate data from those students. An important example exists in our comparing perceived norms regarding drug use with the aggregated self-reported attitudes of peers: our conclusion that there often is a “collective ignorance” about others’ attitudes is a case of looking at the discrepancy between objective and subjective environments. However, for some measures (such as friends’ or parents’ expectations of the respondent) we rely on the subjective reality reported by the respondent.

characteristics of the person and characteristics of the environment in determining behavior. Bronfenbrenner's human ecology framework (e.g., Bronfenbrenner, 2005) has extended many aspects of field theory, and has helped to bring considerations of the social context to the forefront in psycho-social research in general, and developmental research in particular.

The Basic Conceptual Framework

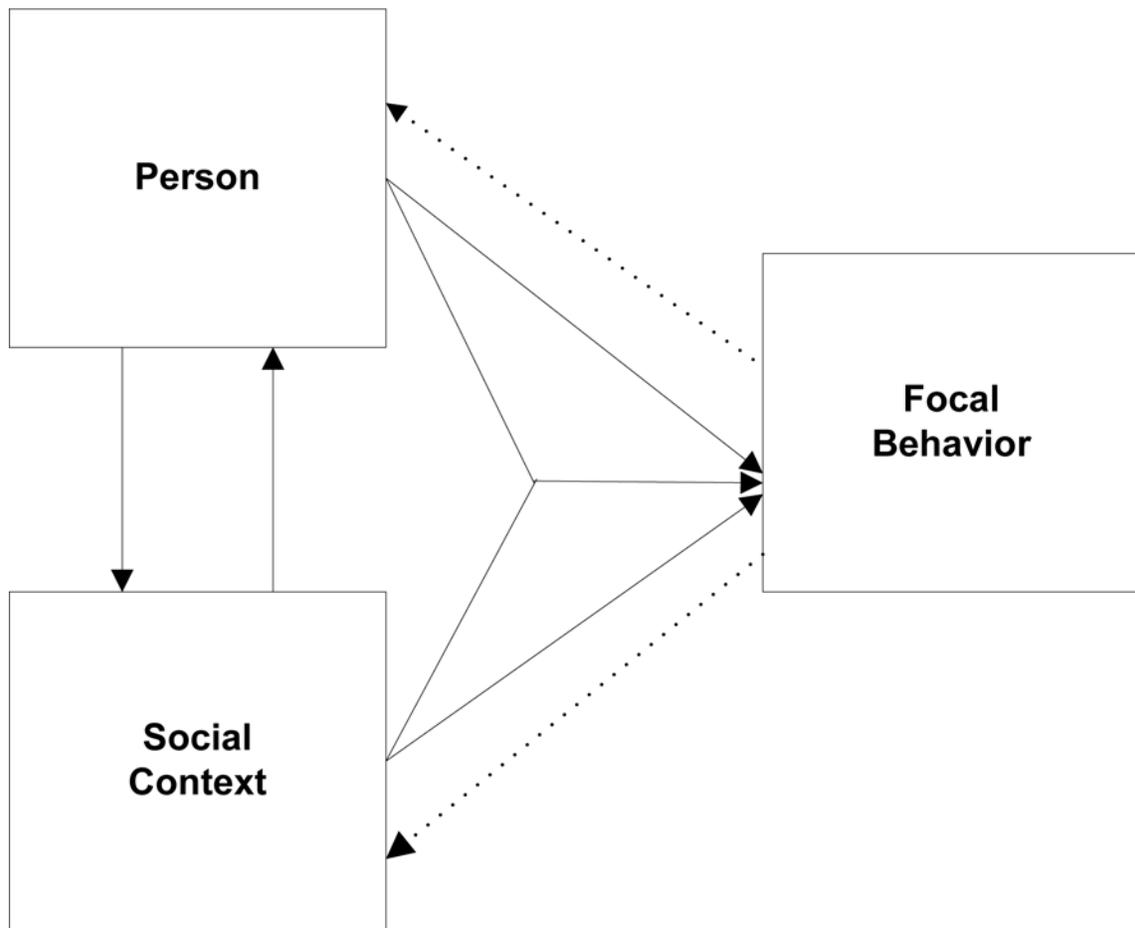
In its most rudimentary form, our basic conceptual model contains three elements: (1) the focal behavior to be explained, (2) the characteristics of the person (including all other behavior), and (3) the characteristics of the social context. All three elements are nonstatic and are posited to influence all others, and characteristics of the person and the environment are posited to have interactive effects on the focal behavior. This basic model is presented schematically in Figure 1.

For the sake of brevity, we will leave the "focal behavior" broadly stated in the following discussions. It should be noted, however, that in this study we include as eligible for this status the use of (or *changes* in use of) any *one* of the substances under study (defined by period prevalence, frequency, quantity, or some combination of these); use (or changes in use) of empirically defined *constellations* of these drugs; and/or *stage transitions* in one or more of the indexes of drug involvement, discussed under Objective 1b. We find it useful for heuristic purposes, however, to segment and elaborate portions of the other two elements in the model—the person and the social context.

First, there is a class of person characteristics that cannot accurately be said to be influenced by the other elements in the model, namely, family background and ascriptive characteristics. Further, since nearly all of these come prior to, and have important effects on a number of the other characteristics of the person, the family background and ascriptive characteristics have been placed earlier in the causal sequence. Figure 2 shows this placement, as well as some other elaborations of the model that are discussed in the next paragraphs.

The social context has been segmented into two very broad domains: (1) the proximal immediate domain, including those aspects of the context with which the individual interacts directly and in person; and (2) the distal domain, including those aspects that are more distant and conveyed through the media, books, and other sociocultural influences. The current study contains a rather modest amount of measurement relative to the latter aspects of the social context. (We have, however, added questions about exposure to antidrug and antismoking ads in the media, and about perceived drug and cigarette use and related attitudes among public role model groups.) We chose to include the distal social context here explicitly to illustrate that we view such sociocultural influences as extremely important, particularly for explaining changes in behavior at the aggregate level (see Johnston, 1991b). Like the ascriptive characteristics, this class of variables has no reciprocal causation posited to affect it. The characteristics of the larger society are presumed to influence characteristics of the

Figure 1.
Basic Elements in the Theoretical Framework



person's immediate social context, as well as the person's own behavioral and personality characteristics directly. They are posited to affect a person's role status indirectly through these other elements.

A third class of variables is delineated separately in the framework because it contains elements that are characteristics of both the person and his or her social context. These are the role statuses held by the individual: his or her student status, work status, marital status, parental status, and so forth, as listed in Figure 3. Holding these statuses (and equally important, *moving into and out of* these statuses; see e.g., Bachman et al., 2002; Schulenberg & Maggs, 2002) is posited as influencing some of the personality and behavioral characteristics of the person; the characteristics of the proximal social context(s) being experienced by that person; and through them, the focal drug-using behavior. Only one causal arrow leads to "role statuses" in the model (i.e., the arrow from behaviors and other person characteristics); this is because the *act* of entering or leaving a role (i.e., a "role transition") is classified with the other behaviors. The influences of the other major elements in the framework on role status (and they are nearly all certainly assumed to affect role status) are mediated through their effect on the role transition behavior. Many family background and ascriptive characteristics, as well as features of the larger social context, are presumed to influence one's role status via their impact on the person's proximal social context, which in turn influences his or her role transition behaviors.⁵

Before expanding on these basic elements in the model, however, we should note that a great deal of additional theoretical discussion is contained in Part II of this occasional paper in the sections dealing with the many objectives of the study. While there is theoretical discussion throughout, the discussion of Objective 6—dealing with risk and protective factors in adolescence and explaining the changes in substance use in the transition to adulthood—contains additional theoretical considerations and explication of the approaches we are taking in our own analyses.

⁵Perhaps we should make explicit here that, in our actual analyses of data, we sometimes examine relationships where there are no arrows shown. Thus, for example, the ascriptive characteristics of parental educational level may relate to role status as a college student or as a high school student in the college preparatory curriculum. We *theorize* that such relationships occur via social contexts, role transition behaviors, etc.; nevertheless, we may not have measured such contexts and behaviors adequately, and thus are not able to represent the hypothesized intervening processes in our analyses.

Figure 2.
Elaboration of the Elements in the Theoretical Framework

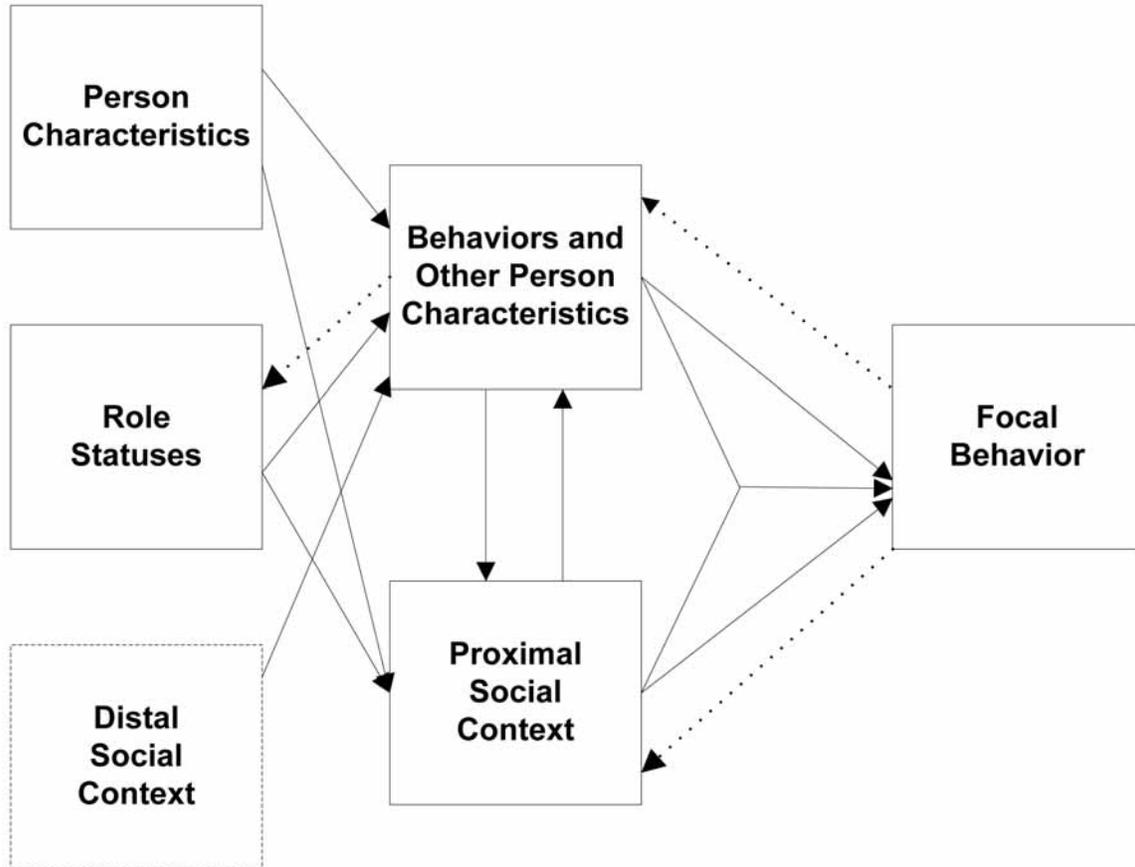
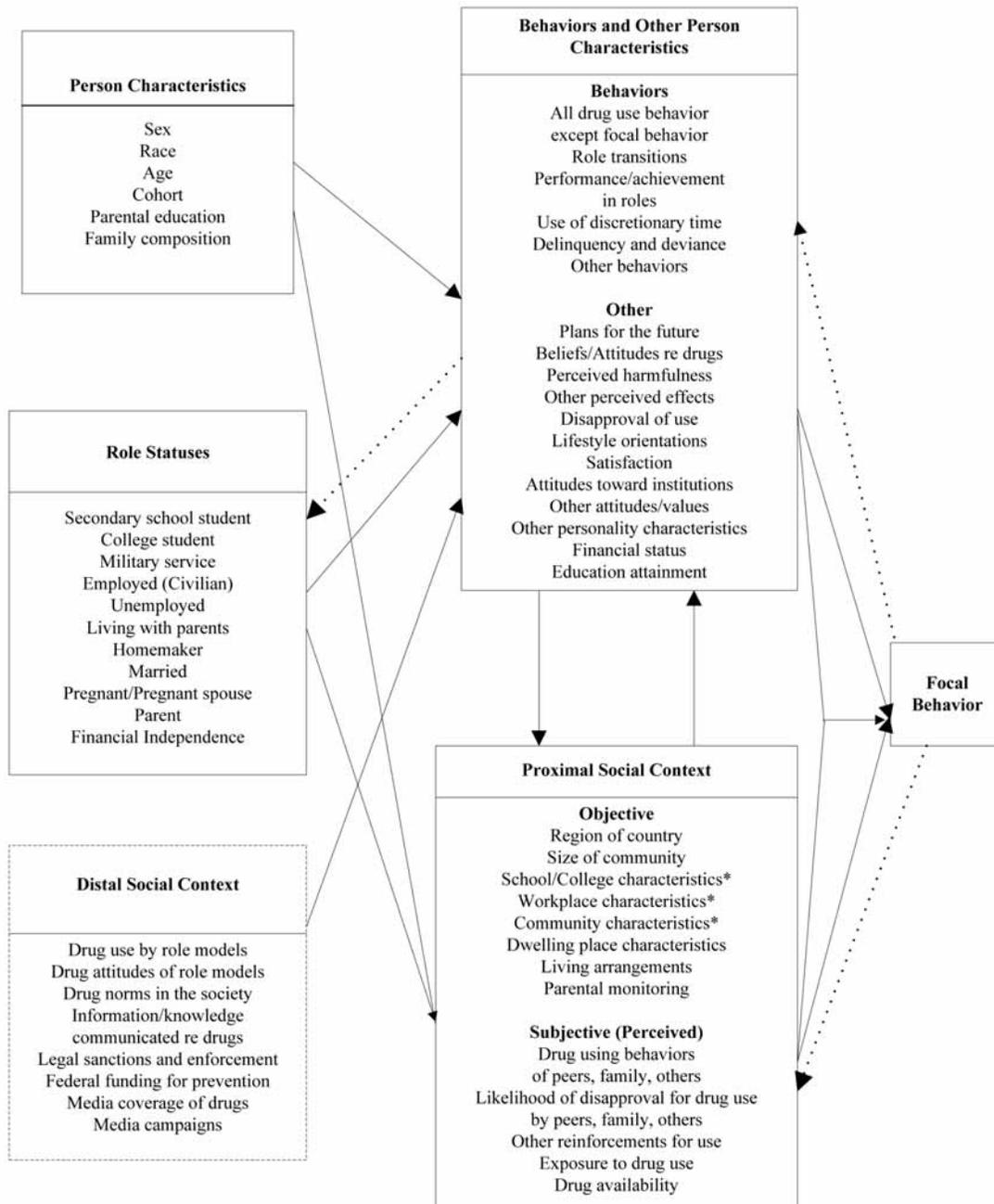


Figure 3.
Further Specification of the Elements in the Theoretical Framework



*Including drug prevention programs and policies.

The Proximal Social Context

Social influence processes. While Lewinian field theory may be thought of as the source of the emphasis we give to subjectively measured characteristics of the social context, and to person–context interactions, a number of other theoretical approaches have contributed to our theoretical elaboration within this framework. The selection of particular environmental variables has been guided in substantial part by the social learning theory of Bandura (1977) and others, with its emphasis on modeling and imitation, and by social role theory more generally (e.g., Sarbin & Allen, 1968; Simons, Conger, & Whitbeck, 1988), with its emphasis on the communication of role expectations. (Stephens [1985] provides an example of an earlier theoretical approach to drug addiction that is explicitly role-theoretic, and a more recent example is provided by Bogart, Collins, Ellickson, Martino, & Klein, 2005.)

We believe that the social expectations of others in the individual’s immediate context—particularly peers—and the models they provide comprise an important set of determinants (social influences) for the various types of drug-using behavior under investigation. (For further discussion, see Objectives 1f and 1h). Thus, quite a number of measures having to do with modeling and role expectations in the proximal social context are included in this study, most of them addressed to more proximal elements—that is, to people with whom the individual interacts in person. However, we also believe that important role expectations and models are presented through the media and other more remote elements in the social environment. (This emphasis on the larger social environment is consistent with the contextual approach that has been advocated by, for example, Biglan, Glasgow, and Singer [1990] and Dent, Grube, and Biglan [2005].) We have added some measurements in this domain in more recent years, and we continue to consider external measures of what we hypothesize to be important variables in the larger (distal) social context in our search for the causes of changes in aggregate levels of drug use—such variables as levels of cigarette advertising and promotional expenditures, media coverage of antidrug commercials, levels of media coverage of the drug issue in the news, federal expenditure levels on drug prevention in schools, and (when they become available) levels of portrayal of smoking and other forms of drug use in movies and television entertainment programming. While finding correlated trends between these types of factors and our aggregate levels of drug use is not sufficient to prove causation, it certainly helps to narrow the list of plausible explanations because, in the absence of a correlation (with or without a time lag), many potential explanations can be eliminated. It also permits us to adjust the probabilities we can attach to various possible explanations, even if some cannot be eliminated outright.

For each of the elements in the conceptual framework, Figure 3 provides a specification of the general classes of variables that are hypothesized to predict drug use. Under the Immediate Social Context are listed three classes of variables hypothesized to have their effect on drug use through these social influence processes—namely, the drug-using behaviors of salient others, the perceived likelihood of their disapproving of the subject using drugs, and the felt pressure from them to use drugs. More specifically, these include the attitudes (or norms) regarding drugs perceived to be held by three particularly salient roles in the subject’s immediate social environment: parents, close friends, and the

student body in general. Also of hypothesized importance, because of their social influence via modeling and imitation, are the actual drug-using behaviors of these three groups. The proportion of students in the school using drugs can be determined from school aggregate data, while the proportion of close friends using drugs is asked directly of the subject. (Parental use cannot be asked of students, unfortunately, due to practical considerations including the willingness of schools to participate, although we do ask about parental use in the follow-up surveys.) It should be noted that we see the effects of these social influence factors on drug use as working in part through their effects on the respondent's own attitudes, beliefs, and perceptions regarding those drugs. We also predict they will have effects that are not mediated by these intervening variables.

Parental monitoring and influence. Another element in the proximal social context that is particularly relevant to understanding drug use among adolescents is “parental monitoring.” This refers both to the amount of time spent in the parental home (presumably under parental influence) and the extent to which students perceive their parents as taking an active role in their lives (e.g., educational pursuits). There are several measures contained in the study that are of direct relevance to this factor including, for example, how many nights per week the young person goes out for fun and recreation, the extent to which parents help with homework (for 8th and 10th graders), and whether the young person is living in the parental home (for young adults). (These are discussed at some length in Part 2—especially Objective 6a—of this occasional paper.) We judge this factor to be reflective of one of the more important sources of social control for drug use—parental influence or monitoring (e.g., Bachman et al., in press; Baumrind, 1985; Brook et al., 1990; Chilcoat & Anthony, 1996; Collins & Laursen, 2004; Dodge et al., 2006; Duncan, Duncan, Biglan, & Ary, 1998; Hawkins, Catalano, & Miller, 1992; Hops, Andrews, Duncan, Duncan, & Tildesley, 2000; Murray & Perry, 1985; Pilgrim, Schulenberg, O'Malley, Bachman, & Johnston, 2006; Steinberg, 1987; Wills, Resko, Ainette, & Mendoza, 2004).

Of course there are other positive and negative reinforcements in the proximal social context besides the disapproval or approval of parents, friends, and the larger student body. These are represented in the model in the aggregate as other reinforcements for use. (The influences of having a spouse and children are discussed below under Role Transitions.)

Availability. Other important environmental determinants built into our theoretical structure are availability and opportunity to use. These derive in part from the “availability proneness theory of illicit drug use” explicated by Smart (1980). (This theory, incidentally, fails to take into account the social influence processes of the type just mentioned.) It emphasizes availability as a major determinant, and availability refers to the set of physical, social, and economic circumstances surrounding the ease or difficulty of obtaining drugs (Smart, 1980, p. 47).

Respondents in the Monitoring the Future study are asked to rate their access to various drugs, in terms of how difficult it would be for them to get some if they wanted them. (See Objective 1i in Part 2 of this occasional paper.) We expect market access to vary from school to school and among the different types of environments entered after

high school. The longitudinal panels provide a particularly good opportunity to assess dynamically the strength of the relationships between access and use. The effect of price can to some degree be addressed in the reasons given for abstention and quitting by nonusers. Externally gathered price information can also be used in conjunction with the study's usage data. Such analyses have now been conducted; see, for example, Grossman, Chaloupka, and Brown (1996a, 1996b); Pacula et al. (2001); and Tauras, O'Malley, and Johnston (2001).

Our own position is that access is a necessary, but by no means sufficient, condition to cause use. We have argued elsewhere that the other necessary conditions are: (1) an awareness of the drug and its alleged psychoactive effects, (2) reassurance about its safety, (3) a willingness to violate the law and/or predominant social norms, and (4) a motivation to use (Johnston, 1991b). The motivation for use may be any of a broad variety, including curiosity, rebellion, social facilitation and/or expression, and psychological coping with negative effects (Johnston & O'Malley, 1986). The evidence presented from the study so far (e.g., Johnston, O'Malley, Bachman, & Schulenberg, 2006c) supports the notion that use of a specific drug in the aggregate can decline with either little or no change in availability (as in the case with marijuana) or an actual increase in availability (as with the case of cocaine). In at least one case, there appeared to be evidence that a reduction in availability influenced use of a specific substance. Following the closure in 2000 of a major production lab by the Drug Enforcement Administration, LSD use declined, very likely due in large part to the disruption of supply.

Other aspects of the proximal social context. The proximal social context is also a function of the region of the country and the size of the city in which the individual resides, and the particular characteristics of his or her school, workplace, and dwelling. We therefore expect them to be predictors of the more proximal contextual factors just discussed—that is, of relevant modeling, role expectations, availability, and exposure to use. The characteristics of the school, workplace, and dwelling in turn are very much a function of the role statuses (or combination of statuses) held by the respondent. (See Objectives 5 and 6 for an elaboration of the measurement content in the above areas, as well as some of the analysis possibilities.)

Person Characteristics

Age and cohort. The effect of age, cohort, and period, singly and in combination, are discussed later in this occasional paper under Objective 4. For discussion purposes, we focus here on age and cohort (which together define period), though we might just as well have chosen age and period (which together define cohort), or even cohort and period (which together define age). These are ascriptive characteristics of the person that are often forgotten or overlooked in social science but which, as we will document later, are generally very important determinants of behavior—particularly drug-using behaviors.

We hypothesize that the role expectations of others (both parents and peers) and the modeling behavior of others (in particular, peers) will vary according to the age of the respondent and the cohort in which he or she grew up. Obviously illicit drug use would

have been viewed by both parents and peers as a more deviant behavior for a teenager in a 1940s or 1950s cohort than it is for a teenager today. Similarly, marijuana use is likely to be more strongly disapproved by both parents and peers for an 8-year-old than an 18-year-old. Others' beliefs about what is age-appropriate behavior, which of course can lead to expectations about appropriate role behavior for oneself, probably also account for the early peaking of inhalant use (Johnston, O'Malley, et al., 2006c) and for the sequential nature in which delinquency, drug use, and other problem behaviors emerge (e.g., Elliott et al., 1985; Jessor & Jessor, 1977; Kaplan, 1995; Johnston, O'Malley, & Eveland, 1978; Johnston et al., 2006b). It may also help to account for the ages and sequences in which these behaviors tend to extinguish.

Thus, we believe role expectations and modeling effects are a function of the age and cohort of the respondent. Further, we expect cohort to be predictive of attitudes and beliefs about drugs in ways other than through the role expectations and role modeling of others in the immediate environment; more specifically, we expect them to occur because of changes taking place simultaneously in the larger culture (e.g., in the role modeling, norms, and social expectations transmitted through the media). Johnston (1991b) has argued that modeling and communication of role expectations regarding drug use by older cohorts to younger ones is one of the important mechanisms by which the forward momentum of an epidemic is maintained after some of the historical forces that initially gave rise to it (e.g., the counterculture and antiwar movements) have ceased to exist. While not explicit in our graphical presentations, we obviously expect cohort to covary with many such characteristics in the larger social context that are changing over time.

Finally, age and cohort are certainly predictive of whether an individual is likely to hold various adult role statuses; thus age and cohort are expected in part to work through whatever effects those role statuses have. To take an example, if being married tends to reduce illicit drug use (as we know it does), then the deferral of marriage, seen in more recent cohorts, may cause an increase in drug use during the early and mid-20s (Schulenberg & Zarrett, 2006).

Financial status. Recall that in our earlier discussion of availability, the other component, besides market access, was the financial means with which to acquire drugs. We hypothesize that discretionary income, moderated by the market price of drugs, is a predictor of use. Discretionary income, in turn, is a function of total income and of adult role responsibilities, many of which carry financial burdens. We assume that many of the role responsibilities listed in Figure 3 include, among other things, financial obligations that have a high priority lien against total income. Obviously, our purpose here is not to do a careful financial accounting, but rather to show major factors likely to predict financial status. We have already demonstrated that total income is predictive of drug use during high school (Bachman, Johnston, & O'Malley, 1981b; Bachman & Schulenberg, 1993). The role of adult responsibilities has been examined to some extent in this data set, and consistent with others' findings (e.g., Bogart et al., 2005; Flora & Chassin, 2005; Leonard & Homish, 2005), we have found that marriage and parenthood relate negatively to drug use in the years after high school (e.g., Bachman, O'Malley, & Johnston, 1984; Bachman, Johnston, O'Malley, & Schulenberg, 1996; Schulenberg, O'Malley, Bachman, & Johnston, 2005).

Discretionary time. We also expect adult role responsibilities to operate through another closely related intervening variable—the amount of discretionary or leisure time available for activities such as recreational drug use. The less time available, the less such use is predicted. In other words, like discretionary income, discretionary time may be a necessary resource for at least some forms of drug use, but it may also be more than that. For the person with few role responsibilities, uncommitted time may actually be a burden and, in addition to providing a necessary resource, may also provide an increased motivation to use substances (Johnston & O’Malley, 1986). While we do not have a direct measure of discretionary time, we do have some indirect indicators (e.g., hours worked, school enrollment), plus the ability to make some deductions from the person’s role status configuration and self-reported reasons for use. In addition, we have a set of questions about activities in which the respondent engages during leisure time. We analyzed these “routine” activities (Osgood, Wilson, O’Malley, Bachman, & Johnston, 1996) within a “Routine Activities Perspective.” We found consistent evidence that socializing with peers away from home and authority figures is closely related to deviant behavior, but only in the absence of a structuring agenda such as going on a date or participating in sports. These routine activities may help explain why or how transitions in social roles (work, family, living arrangements) are related to changes in drug use.

Other drug-using behavior. The use of other drugs, and in particular the previous use of the drug being predicted, are obvious and central predictors of the focal behavior, for reasons discussed elsewhere (see Objective 1b). Having these variables is critical for analyses using any stage model of drug use (e.g., Kandel, 1975, 2002), and it is important to control for past drug experience when looking at the effect of role status or almost any other variable.

Role transitions and achievement/performance in role. As will be discussed under Objective 6, role transition and role performance, and developmental transitions in general, are important dimensions to search for possible effects of drug use (e.g., Bogart et al., 2005; Leonard & Homish, 2005). And they seem to be likely determinants of use for a number of reasons. For one, they are apt to influence the person’s self-concept and satisfaction in some fundamental ways. Kaplan (1980) states that one aspect of self-concept, self-derogation, is an important determinant of use. Performance in some of these roles is also likely to affect the probability of choosing particular lifestyles, especially a deviant one. Poor role performance is likely to add to the stress experienced by individuals, for which some drugs may be used as palliative. Finally, most roles bring with them a role set of other people who have influence on the individual, marriage being a particularly salient example.

As we have discussed and shown in our work, performance in one role (say academic performance in high school) can influence not only the transition made out of that role (e.g., dropping out), but also the transitions made into other roles (e.g., going to college, getting a job) (Bachman, Schulenberg, O’Malley, & Johnston, 1990; Bachman et al., in press; Schulenberg, Bachman, O’Malley, & Johnston, 1994; Schulenberg, O’Malley, Bachman, & Johnston, 2000; Schulenberg & Maggs, 2002; Schulenberg, O’Malley, et al., 2005). Thus the impact of poor performance in one role can reverberate and lead to further impact via transitions or performance in other roles (Schulenberg &

Maggs, 2001; Schulenberg, Bryant, & O'Malley, 2004). Role statuses, in turn, are important not only because of their possible psychological and economic effects on the person, but also, as is discussed above, because of their substantial impact on the type of proximal social context experienced by that person.

1. Marriage, Pregnancy, and Parenthood. One set of role transitions that is common in early adulthood involves some or all of the following: engagement, marriage, pregnancy, and parenthood. Not infrequently, divorce and possibly remarriage follow some or all of these. One would expect such transitions to influence drug-using behaviors for a number of reasons. First, engagement and marriage mean that the respondents must deal with the expectations of a very significant person in their lives. Since most young adults disapprove of drug use and most do not use drugs (e.g., Johnston et al., 2006d), we expect that the majority who get married receive additional role sending (and reinforcement) from their spouse not to use. We have reported that becoming married has a deterrent effect on use (Bachman et al., 1984; Bachman, Wadsworth, O'Malley, Johnston, & Schulenberg, 1997; Bachman et al., 2002; Schulenberg, O'Malley, Bachman, Johnston, 2000; Schulenberg, O'Malley, et al., 2005). The fact that some of this "marriage effect" actually precedes marriage, and shows up after the point of engagement, is consistent with the interpretation that role sending from the mate is an important factor. There may be other factors helping to account for a marriage effect, of course, including a change in self-concept, financial responsibilities, social activities, and friendship patterns. As will be described later, we have done considerable work on the effects of this and other major role transitions in recent years.

For the woman, pregnancy carries the burden of protecting the fetus from the effects of drug use, and we have shown substantial effects from this temporary role transition (Bachman, Johnston, & O'Malley, 1991a; Bachman, Wadsworth, O'Malley, Johnston, et al., 1997, Bachman et al., 2002; Schulenberg et al., 2000; Schulenberg, O'Malley, et al., 2005). Having children adds to the financial responsibilities of the parent, which may make the opportunity cost of drug expenditures higher; but perhaps more important, parents may be concerned about the underlying effects of their own behaviors on their role performance as a parent. For these reasons, we hypothesized that parenthood will have deterrent effects on drug use, particularly as the children get older and become more aware of their parents' behavior, and parents become more concerned about their own modeling effects on their children.

2. Jobs and Career Stage. We also hypothesized that as young people advance further into their careers, the potential loss of their job from drug use being discovered rises; thus, such individuals will be more likely to desist use. Also, we think that those who have a higher possibility of discovery—in particular those subjected to drug testing in the workplace—will also be more likely to desist from use. (Certainly the trends in drug use in the military would suggest this.) Both of those hypotheses have become testable in the evolving data set (e.g., Bachman, Freedman-Doan, O'Malley, Johnston, & Segal, 1999a; Merline, O'Malley, Schulenberg, Bachman, & Johnston, 2004; Schuster, O'Malley, Bachman, Johnston, & Schulenberg, 2001).

3. Lifestyle Orientations. A great deal has been said about the presumed or hypothesized importance of lifestyle orientations, as well as other values and attitudes (e.g., Jessor, 1998; Johnston, O'Malley, & Bachman, 1987). We expect at least some types of drug use to relate to them in some historical periods because (1) such use can serve as a public, symbolic expression of a lifestyle orientation or, more likely, of a particular value/attitude stance; (2) it can serve as a ritual through which to express or attain group cohesion or loyalty; and (3) it is a behavior that, by its intrinsic nature, is either consistent with a certain part of the belief system (e.g., the counterculture emphasis on inner directedness and subjectivity) or inconsistent (e.g., the antichemical orientation of the "back to nature" or "healthy lifestyle" movements) (e.g., Johnston, 1973, 1991b). Being part of the "rave" scene is a more contemporary example of the connection between drug use and lifestyle. The prevalence (or even existence) of many lifestyle orientations will be heavily influenced by the age and cohort under study, of course.

Attitudes and Beliefs About Drugs

As the above discussion illustrates, many complex causal chains can be elaborated within the rather simple theoretical framework we have specified. We have tried to describe those that at present seem the most salient, given the domain of determinants within which we are working. However, as stated earlier, we view this as an evolving and iterative process in which the theory will instruct the analysis and the analysis will further instruct the theory (cf. Cattell, 1966). One of those elaborations involves a set of person characteristics in the form of beliefs about the harmfulness of drugs.

At the outset of the study, we hypothesized that beliefs about the dangers of drugs and attitudes about the acceptability of their use could be important determinants of use, and of aggregate changes in use over time. We also believed that they may vary independently for the different drugs, and for different levels of use of those drugs, and as a result made a considerable investment in measuring these attitudes and beliefs separately for the various drugs and levels of use. (In fact, we now believe that it would have been valuable to have such measures on even more drugs [such as PCP].) This investment in measurement has yielded results of considerable theoretical and practical importance. Indeed, we now conclude these beliefs are, or can become, a major deterrent to initiation of use and continuation of use, and we have provided evidence in support of this interpretation over the past two decades (Bachman et. al., 1988; Bachman, Johnston, et al., 1990a, 1991a, 1998; Johnston, 1985; Johnston, O'Malley, et al., 2006c, and many preceding volumes in the same series). While the use of some drugs appears to have fallen for reasons other than a change in perceived risk (Johnston, 1991b), perceived risk appears to have played a pivotal role in the cases of marijuana and cocaine, and very likely in the cases of LSD, PCP, and crack (although we have more limited empirical data to support the argument in these cases, because perceived risk was not measured prospectively, as it was for many of the other drugs). In positing some of the social dynamics in the emergence, maintenance, and decline phases of an epidemic, we suggest (Johnston, 1991b) that there must be some reassurances about the dangers of a drug *before* a significant proportion of the population will even initiate use, which probably explains the low levels attained for several of the drugs perceived to be most dangerous, such as heroin, crack cocaine, and crystal methamphetamine. (Certain modes of

administration are undoubtedly seen as more dangerous, as well, such as intravenous injection and the inhalation of hot fumes.) We also posit that, because most drugs have adverse side effects, there tends to be a natural correction cycle wherein the consequences eventually manifest themselves, become known to the population, and motivate people to avoid or desist using. However, this cycle can range from several days to several decades, depending on how severe and obvious the acute and chronic effects are. Cigarettes have undergone one of the longest cycles observed so far, marijuana a long cycle of perhaps 15 years, and PCP and crack some of the shortest cycles of just a few years. We note that these cycles can be shortened by two intentional and purposeful activities—increased research on consequences and clinical monitoring for adverse effects, and more rapid dissemination of the results to the population at risk. These constitute important ways in which science and education can help to reduce drug use, and have increasingly become the strategies pursued by the National Institute on Drug Abuse in recent years. (For example, NIDA pursued this strategy aggressively with the drug ecstasy.)

We also argue that through a process of vicarious learning, the public learns from the experience of “unfortunate public role models,” whose own tragic consequences resulting from drug use have the effect of changing the risk others associate with the drug in question. Examples include River Phoenix, John Belushi, Chris Farley, Len Bias, and Lyle Alzado. In fact, Alzado, who attributed his brain tumor to his longtime use of anabolic steroids, intentionally set out to present himself as a negative role model for young people. Based on this, we expected to see a change in perceived risk, and perhaps in active steroid use among students, very much like the sharp drop in cocaine use (accompanied by a sharp increase in perceived risk) that occurred in the year after Len Bias’ death in 1986. Our prediction was confirmed a year later. (Our findings on the importance of perceived risk are parallel in many ways to findings in the public health literature in other domains, and the similarities to the Health Belief Model are discussed in Johnston, 1991b.)

We hypothesize that perceived risk operates on the relevant drug-using behavior directly, by increasing the expectation of negative health consequences, but also indirectly by influencing peer norms about the acceptability of using the drug (Bachman, et al., 1988; Bachman, Johnston, et al., 1990a; Johnston, 1985, 1991b). Perhaps the clearest example of this indirect effect can be seen in the case of cigarettes, where norms about use have changed dramatically since the release of the 1984 Surgeon General’s Report on the health consequences of smoking (U.S. Public Health Service [USPHS], 1964). In more recent years, an additional factor has become salient and contributed to a further change in the norms, namely an increased awareness of the effects of smoking on *others* in the smoker’s environment. While most other drugs do not appear to involve a direct physiological impact from passive consumption of the drug, they have an analogous impact on people in the user’s role set who are adversely affected by the user’s behaviors as a result of using the drug.⁶ For example, heavy cocaine users, crack users,

⁶The impact of a pregnant woman’s drug use on the fetus is one important example of the direct effects of passive consumption, and it appears to operate for most drugs. Indeed, we have found evidence that concern about this type of derivative consequences has appreciably influenced the drug-using behaviors of pregnant women (Bachman, Johnston, et al., 1991b).

and crystal methamphetamine users are now understood to be dependent, and therefore desperate enough to steal from those around them in order to maintain their habit; heavy marijuana users are seen as functioning poorly in their various social roles; and so on. Thus, we believe that disapproval of these drug-using behaviors has risen as a result of changes in the consequences perceived to be associated with their use, in particular the deleterious consequences for the users; but also the derivative consequences for others in the users' immediate environment. In any case, this expansion of our theoretical framework, with its emphasis on the direct and indirect effects of the risks perceived to be associated with various forms of drug use, has proven to be an exciting and, we believe, important one.

Comparison with Jessor and Jessor's Original Theoretical Approach

Those familiar with the theoretical work of the Jessors and colleagues will see a number of similarities between our own conceptual framework and that proposed by them for explaining problem behavior (Jessor & Jessor, 1977, p. 38). This is due in large part to the fact that both their work and ours (which began in the mid-1960s with *Youth in Transition*) grew out of the Lewinian field-theoretical approach, as well as the fact that both also draw heavily upon social learning theory. However, it may be useful to highlight some of the differences between the two theoretical frameworks. First, we do not include most of the elements listed under the general rubric of "socialization" in their conceptual framework (e.g., parental ideology, home climate, friends' interests). Secondly, our model, as illustrated in Figure 3, contains one major element not in the Jessor model—the role statuses held by the person—and emphasizes the *cohort* of the person as a determining variable under ascriptive characteristics. Some other important differences are to be found in the variables listed under the personality and behavioral systems in the two frameworks. While we have considerably more variables dealing with role performance and role achievements, the Jessors include at least one additional "problem behavior" (i.e., sexual precocity) that we do not, primarily for practical reasons. The current study also lays a great deal more emphasis on a broad array of lifestyle orientations and other social values and attitudes, given the extensive measurement we devote to those areas. We also include more variables having to do with access to drugs, as well as the means for acquiring them. Under contextual determinants, we emphasize characteristics of high school and post-high school environment(s) in which the person is located. Finally, the emergent importance in our own work of the perceived risk associated with various types of drug use is another distinguishing characteristic of particular import.

Another type of difference may be found in the fact that the Jessors and colleagues group their behaviors separately from the personality system, whereas we group all behaviors except the focal drug-using behavior with the personality system. Their approach is dictated partly by the fact that they define their dependent variable more broadly as "problem behavior," and most of their behavioral measures relate to this hypothetical construct. In *Monitoring the Future* we have a very wide range of behaviors, many of which we think have direct and indirect causal impacts on drug use; separating them from the focal behavior helps to make that clear. We have also concluded that a general deviance factor, such as the one posited by Jessor and Jessor (1977) under

“problem behavior,” accounts for only a part of the explainable variance in various forms of drug use (Osgood, Johnston, O’Malley, & Bachman, 1988). Further, our conceptual definition of “lifestyles,” which comprises an important set of person characteristics to be related to drug use, can include not only attitudes and values but also behaviors. Therefore, grouping all of these person characteristics together in the framework helps to show that they will be examined together as we attempt to discover and document latent variables in the lifestyle domain.

Indexes Versus Individual Variables

One noteworthy characteristic of the study has been the extent to which we treat many variables on a stand-alone basis, rather than combining them into scales or indexes—particularly the measures of drug use and drug-related attitudes and beliefs. We have done this because we have learned that each class of drugs varies differently over time (Johnston, O’Malley, et al., 2006c, and preceding volumes). Had they been treated in a combined way, much important and explainable variance would have been lost, along with key findings based on it. Likewise, attitudes and beliefs—in particular, perceived risk—tend to move quite independently over time for the different drugs, suggesting that much of what is learned about drugs is drug-specific. A global index of “perceived risk of drugs” would have lost much of the real action found for marijuana and cocaine, for example. In fact, we have separate measures of perceived risk associated with different patterns of use of any specific drug (for example, perceived risk of harm from experimental versus regular use of cocaine); we have found these distinctions to be important. The most striking example came with cocaine, where usage rates did not change in the early 1980s, despite an increase in the perceived risk of regular cocaine use. Only when the risk associated with experimental or occasional use began to change—which occurred after 1986—did adolescents’ use of cocaine begin to decline. In sum, these distinctions proved very important both theoretically and empirically.

We have built a number of indexes and used them extensively when that seemed appropriate, but we are also mindful that critical information can be lost in the process of combining variables. Where drug use and related attitudes are concerned, we believe that our propensities have been well rewarded over the years by the way in which reality has unfolded. If anything, our one regret is that we did not have information on additional individual drug classes, so that we could perform similar analyses to the ones we have conducted on marijuana and cocaine, on which we have full complements of measures.

Having reviewed the core theoretical and conceptual underpinnings of the study, we return to discussion of its multiple objectives. We hope it will be clear how our approach to each objective fits into the larger theoretical and conceptual approaches we have adopted. As should become obvious in the discussion to follow, there are additional theoretical perspectives that have emerged as our experience with the study has cumulated and, particularly, as the panel data have accumulated and could be analyzed.

Table 1. CLASSES OF SUBSTANCES INCLUDED IN THE STUDY¹

Any illicit drug [*]	Narcotics other than Heroin ^{*†} , including
Any illicit drug other than marijuana [*]	OxyContin [*]
Any illicit drug, including inhalants [*]	Vicodin [*]
Cannabis [*] , plus	GHB [*]
Marijuana, specifically	Ketamine [*]
Hashish, specifically	Inhalants [*] , plus
Hallucinogens [*] , including	Amyl and Butyl Nitrites,
LSD [*] , specifically	specifically
Hallucinogens other than LSD ^{*†}	Alcohol [*] , plus
PCP, specifically	Beer [*] , specifically
MDMA [*] (“Ecstasy”)	Wine, specifically
Sedatives, including	Wine Coolers [*] , specifically
Barbiturates [*] , specifically	Hard Liquor, specifically
Methaqualone, specifically	Flavored Alcohol Beverages [*] ,
Rohypnol [*] , specifically	specifically
Tranquilizers ^{*†}	Cigarettes [*]
Amphetamines ^{*†} , plus	Bidis ^a
Methamphetamine [*]	Kreteks ^{*a}
Crystal Methamphetamine (“Ice”),	Smokeless Tobacco [*]
specifically	Anabolic Steroids [*]
Ritalin [*]	Androstenedione [*]
Stimulant-type and nonstimulant	Creatine ^{*‡}
prescribed medication for	Over-the-Counter Psychoactive Substances,
ADHD [*]	including
Cocaine [*] , plus	Diet Aids
Crack [*] , specifically	Stay-Awake Stimulants
Powder cocaine, specifically	“Look-Alike” Stimulants
Heroin [*]	Over-the-Counter Cough or Cold
Heroin with a needle [*]	Medicines [*]
Heroin without a needle [*]	Any drug by injection

¹All classes are included in the 12th-grade base-year and the 12th-grade follow-up questionnaires except for a few that are not included in the follow-up questionnaires—Methaqualone, the nitrite inhalants, GHB, Ketamine, Ritalin, bidis, kreteks, androstenedione, creatine, and smokeless tobacco.

^{*}Included in 8th- and 10th-grade questionnaires.

[†]A more detailed listing of specific drugs in this class is asked of 12th graders, and the results are reported annually in Johnston, O’Malley, et al., 2006c (*Volume I*), Appendix E.

[‡]Not a psychoactive substance.

^aThese were dropped from the 8/10 questionnaire in 2006.

Part 2

AN ELABORATION OF EACH OBJECTIVE, ITS RATIONALE, RELEVANT LITERATURE, AND PROGRESS TO DATE

Each of the objectives and subobjectives listed earlier is now elaborated and discussed in the context of the relevant literatures and theories. The study's progress to date in accomplishing each is also discussed.

Objective 1: To continue monitoring a broad range of drug-related behaviors, as well as explanatory factors of change—including attitudes, beliefs, and perceptions—across nationally representative samples of eighth-, tenth-, and twelfth-grade students. This annual monitoring began in 1975 for twelfth-grade students, and in 1991 for eighth- and tenth-grade students. The specific characteristics to be monitored are:

- a. Self-reported use of over 50 classes and subclasses of drugs, both licit and illicit. (Listed in Table 1.)
- b. Patterns of initiation of use and noncontinuation of use.
- c. Patterns of multiple drug use, both concurrent and nonconcurrent.
- d. Beliefs about the harmfulness of various types of drugs at various levels of use.
- e. Personal disapproval of various types of drugs at various levels of use.
- f. Perceptions of disapproval by peers of the use of various drugs (i.e., perceived peer norms).
- g. Beliefs regarding cigarette smokers and frequent marijuana users.
- h. Extent of direct exposure to use of various drugs, and proportions of friends using various drugs.
- i. Perceived availability of the various drugs.
- j. Contexts in which drugs are used (when, where, and with whom).
- k. Personal reasons for use of the various drugs, for abstention, and for discontinuation.
- l. Self-reported use under medical supervision of stimulant-type prescription drugs for the treatment of attention deficit disorder, hyperactivity, or both (Attention Deficit Hyperactivity Disorder, or ADHD).

During the 1980s, there was a sustained, overall decline in drug use, and a change in many related attitudes and beliefs toward drug use, among the nation's high school seniors. Although this good news suggested that the nation was making important strides in the "war against drugs," it was clear that a serious drug problem among youth continued (Johnston, O'Malley, & Bachman, 1991; Oetting & Beauvais, 1990). The substantial increases that were observed in the early to mid-1990s demonstrated

emphatically that the drug problem had not been solved (Johnston, O'Malley, & Bachman, 1995). As Musto (1991) and Johnston (1991a) have argued, once the lessons of the most recent epidemic are forgotten, the stage may be set for a new one. We have used the phrase "generational forgetting" to capture this notion.

Continued monitoring of drug use among the nation's youth is necessary if we are to advance our understanding of national drug epidemics. In particular, continued monitoring of the various potential explanatory factors of drug use is essential to furthering our knowledge of national trends in drug use over time. The results, of course, will bear directly on matters of prevention and policy intervention. In addition, continuing to monitor drug use and related factors among the nation's 8th and 10th graders will permit an examination of factors that contribute to initiation and maintenance of drug use throughout adolescence, as well as a more precise consideration of variation in the short- and long-term consequences of drug use as a function of age of initiation (cf. Rutter, 1988; Schulenberg et al., 2003). The specific potential explanatory factors to be monitored are detailed under the subobjectives below.

Objective 1a: To continue to monitor self-reported use of several (now more than fifty) classes and subclasses of drugs, both licit and illicit. (See Table 1 for a full listing.)

For the sake of efficient discourse we often use the term "drug use," although this term actually refers to a rather large number of discrete behaviors that can be, and are being, measured and monitored separately. Sets of measures are provided for each of the following classes of drugs: cigarettes, smokeless tobacco, alcohol (including beer, liquor, wine, wine coolers, and flavored alcoholic beverages, separately), cannabis, LSD, other hallucinogens, PCP specifically, MDMA (ecstasy), cocaine, crack cocaine specifically, powdered cocaine specifically, amphetamines, methamphetamine, crystal methamphetamine (ice) specifically, Ritalin specifically, tranquilizers, sedatives (including barbiturates), Rohypnol, methaqualone, heroin taken by injection and heroin taken by other means, narcotics other than heroin, OxyContin and Vicodin specifically, GHB, ketamine, inhalants, nitrites specifically, and steroids. (See Table 1 for a full listing of the drugs.) More detailed measures of some of the specific drugs within these general classes are included in one of six questionnaire forms used for the 12th-grade students (see Johnston, O'Malley, et al., 2006c, Appendix E, for a complete listing of the specific hallucinogens, tranquilizers, stimulants, and narcotics other than heroin). For the psychotherapeutic drugs, most questions deal with use that is not "under a doctor's orders," although some limited information on medically directed use is also obtained. Specific questions about use under a doctor's orders of stimulant-type prescription drugs (Ritalin, Adderall, etc.) were added in 2005.

Data on frequency (and prevalence) of use is obtained for three time intervals for most classes of drugs—lifetime, last 12 months, and last 30 days. A current daily, or near daily, use measure (that is, use on 20 or more occasions in the last 30 days) is derived from the 30-day measure. For cigarette and smokeless tobacco use, annual use is not obtained and daily use is obtained directly. In a few cases of newer, less-used substances,

including bidis, kreteks, and creatine, only the last 12-month interval is used in order to conserve precious questionnaire space.

Recognizing the substantial difficulties involved in determining quantities of illicit substances ingested, in terms of standard weights or other measures, we have included two surrogate measures of quantity: (1) the length of time the person stays “high” on an average occasion of use; and (2) the person’s subjective assessment of how high he or she usually gets. For marijuana, two other quantity measures are also included: ounces per month and number of joints smoked per day.

Findings on levels and trends for the frequency/prevalence and quantity measures are routinely presented in the study’s annual NIDA-published monographs (e.g., Johnston, O’Malley, Bachman, & Schulenberg, 2006b, 2006c, 2006d) and the annual volumes of descriptive results (e.g., Johnston, Bachman, & O’Malley, 2006).

Objective 1b: To continue to monitor patterns of initiation of use and noncontinuation of use.

A key issue in the study of drug abuse is initiation, the movement from being a nonuser to being a user (Clayton, 1992). It is important to know the age at which individuals begin to use various drugs, in part because that information provides a guide for the timing and nature of various interventions in the school, the home, and the larger society (for example, media campaigns or in-school curricula). Any such interventions are likely to be considerably less effective in preventing drug use if administered after, or substantially preceding, the ages of peak initiation. Users’ ages of peak initiation vary according to drug and tend to progress from drugs seen as the least risky, deviant, or illegal toward those that are more so.

Monitoring the Future has been tracking the age (or more precisely, the grade level) at which American young people say that they initiated use of the various licit and illicit drugs since 1975 for 12th graders, and since 1991 for 8th and 10th graders. One would not necessarily expect today’s 8th, 10th, and 12th graders to give the same retrospective prevalence rate for a drug, even for a given grade level (say by 6th grade), because the three groups differ in a number of ways. First, the lower grades contain some students who will drop out of school. The lower grades also have lower absentee rates. Both factors should cause prevalence rates derived from students in 8th grade to be higher for a given calendar year than the retrospective prevalence rates for 8th grade derived from the same cohort of young people who are still students in 10th or 12th grade. Second, because each class cohort was in 8th grade in a different year, any broad secular (historical) trend in the use of a drug could contribute to differences in respondents’ reports of their experiences when they were in 8th grade. Third, because the 8th, 10th, and 12th graders are in three different class cohorts, any lasting differences among cohorts (“cohort effects”) could contribute to a difference at any grade level, including 8th grade.

Two types of method artifacts could also explain observed differences in the retrospective reports of use by 8th, 10th, and 12th graders. One is that memory errors are

more likely for the older respondents. They may forget that an event ever occurred (although this is unlikely for use of drugs) or they may not accurately remember just when an event occurred. For example, an event may be remembered as having occurred more recently than it actually did—a kind of “forward telescoping” of the recalled timing of events (Johnson & Schultz, 2005). Another is that the definition of the eligible event may change as a respondent gets older. Thus, an older student may be less likely to include an occasion of taking a sip from someone’s beer as an occasion of alcohol use, or an older student may be more likely to appropriately exclude an over-the-counter stimulant when asked about amphetamine use. While we attempt to ask the questions as clearly as possible, some of these drug definitions are fairly subtle and are likely to be more difficult for the younger respondents. (In fact, in our annual reports, we omit 8th and 10th graders’ data on their use of sedatives/barbiturates and narcotics other than heroin [as a class] precisely because we judged them to contain erroneous information.⁷ We do report data on OxyContin and Vicodin, because we believe these can be reported accurately.)

We routinely report findings on grade of first use in terms of the percentage of students who (retrospectively) report having used as of a certain grade. “Average age of initiation” (first use) is another way to report data on grade of first use, but we believe that it can be misleading at times. For example, the average age of initiation could be lower in more recent classes because fewer people are initiating use at later ages than were doing so previously (perhaps due to a downward secular trend at that time). There may be no more that started at younger ages at all. Or the average age of initiation could be rising because more people are initiating at older ages (perhaps because of a recent upward secular trend), again with no necessary change in the proportion starting at young ages. We suspect that most observers, when they hear that the average age of initiation has gone down, conceptualize this fact as reflecting some shift in the propensity to use at younger ages, independent of any secular trends, and therein lies the potential confusion. For this reason, we have chosen to report data in terms of trends in lifetime prevalence at different grade levels.

As we indicated earlier, one would not necessarily expect today’s 8th, 10th, and 12th graders to give the same retrospective prevalence rate for a drug, even for a given grade level (say by 6th grade), and indeed we find some differences. In the 2005 surveys, 6.1% of 8th graders reported having used marijuana by the end of 6th grade, compared to 5.6% and 2.9% of the 10th and 12th graders, respectively. This pattern of higher estimates for the younger grades is consistent across all substances, and is not surprising, for the reasons noted earlier.

Noncontinuation. Another key issue in the study of drug abuse involves the decision to continue use, once initiation has occurred (Clayton, 1992). The complement of continuation is noncontinuation. Just as it is important to track initiation rates, so too is it important to track those who cease to use after having initiated use. One indication of

⁷We have found that follow-ups of high school seniors into young adulthood lead to a higher recanting rate for the psychotherapeutic drugs, in contrast to the illegal drugs. We interpret this discrepancy as reflecting, in part, a better understanding of the distinctions between prescription and nonprescription drugs in young adulthood. (See Johnston & O’Malley, 1997.)

the proportion of people who try a drug but do not continue to use it can be derived from calculating the percentage of those who ever used a drug (once or more), but who did not use it in the 12 months preceding the survey.⁸ Given this operational definition, we prefer the word “noncontinuation” rather than “discontinuation,” because the latter might imply discontinuing an established pattern of use, whereas our current operational definition includes noncontinuation by experimental users as well as established users.

Whenever prevention programs are designed—whether for schools, families, communities, or the media—questions arise as to what should be prevented and what can be prevented. While it is clear that the initiation of use should and can be prevented, there is considerably less consensus as to whether the discontinuation of use is a realistic goal. We believe that the results we have been reporting help to inform that debate.

It is clear that the totality of social forces that brought about the large declines in drug use during the 1980s and the substantial increases in use during the 1990s operated through their effects on both initiation rates and noncontinuation rates. As discussed in Johnston et al. (2006c), the observed decreases and subsequent increases in annual and 30-day prevalence of use rates were considerably larger than could be explained by fluctuations in initiation rates alone. These findings show that noncontinuation can change, and has changed, appreciably; therefore, any comprehensive prevention strategy should include increasing cessation as one of its objectives.

We have found that it is important to distinguish among users at different levels of involvement. Very appreciable proportions of beginning users can be dissuaded from continuing their use, as demonstrated by the high noncontinuation rates. For example, of the 12th graders in 2005 who had ever used cocaine, 37% were “noncontinuers.” But once users have reached a certain level of involvement (even as few as 10 occasions of use), only very modest proportions have been dissuaded from continuation—even in the best of times. For example, of 12th graders in 2005 who had used cocaine 10 or more times, only 11% were “noncontinuers.” This makes early intervention not only a viable goal for prevention, but also a particularly important one.

Objective 1c: To continue to monitor patterns of multiple drug use, both concurrent and nonconcurrent.

The term “multiple drug use” includes two quite different concepts: (1) concurrent use, that is, use of more than one drug for overlapping effects; and (2) nonconcurrent use, that is, use of multiple drugs over longer time intervals. (The term “polydrug use” is also used [Collins, Ellickson, & Bell, 1998].)

In the case of concurrent use, the drugs may be taken sequentially for offsetting effects, as is often the case for “uppers” and “downers,” or they may be taken

⁸This operationalization of noncontinuation has an inherent problem in that users of a given drug who initiated use during the past year by definition cannot be noncontinuers. Thus, the definition tends to understate the noncontinuation rate, particularly for drug use that tends to be initiated late in high school rather than in earlier years.

simultaneously for enhanced effects—for example, marijuana with cocaine. The method put forth by Johnston (1975) for systematically measuring such concurrent use was adopted in the Monitoring the Future questionnaire in Form 1 (12th grade only); it obtains concurrent use for selected pairwise combinations of multiple use of 10 classes of drugs. As an illustration, we found that the concurrent use of cocaine and marijuana among the nation's high school seniors steadily declined over the decade of the 1980s, a period of declining drug use in general. In 1980, one in three cocaine users indicated concurrent use of marijuana most times or every time they used cocaine during the past year. That ratio dropped to one in four in 1984, and to one in five in 1988 (Bachman, Johnston, & O'Malley, 1981a, 1985, 1991b). By 1997, however, following a period of increasing use, two in five cocaine users indicated concurrent use of marijuana (Johnston, Bachman, & O'Malley, 2001). Because these and other changing patterns of concurrent use are of rather obvious importance from the perspectives of education, prevention, and treatment, we believe that monitoring and reporting these patterns can provide policymakers and the treatment community valuable information on an ongoing basis. It may also identify patterns of use worthy of further investigation by the research community.

Nonconcurrent use has been dealt with in the research literature in several different ways: (1) creation of a composite measure of involvement, usually emphasizing the seriousness of involvement; (2) conceptualization of a hypothetical, latent construct, usually for use in structural equation modeling; and (3) establishment of an index that captures the sequence of use. Some analysts have derived an index that attempts to combine in a single summary measure some important properties of drug use; for these purposes, some type of explicit or implicit "seriousness" index is usually involved. Such an index has a practical benefit because it allows the investigator to utilize a single variable for analysis purposes, rather than numerous separate drug use indicators. Lu (1974) and Clayton and Voss (1981) provided detailed examples of this type of index development. Needle, Su, and Lavee (1989) have compared the empirical utility of three different strategies for constructing such a measure.

In other analyses, particularly those involving structural equation methods, a hypothetical latent construct is sometimes invoked. For example, in examining the several possible consequences of adolescent drug use, Newcomb and Bentler (1988) relied on an adolescent "Drug Use" construct based on the commonality among the frequency of cannabis, hard drug, and alcohol use; Kaplan, Johnson, and Bailey (1988) employed measures of marijuana use, narcotic use, and selling of narcotic drugs as indicators of "Drug Use" in their series of analyses; recently, we used a latent drug use variable based on cigarette use, alcohol use, and marijuana use to examine risk factors for drug use at the 8th and 10th grades (Pilgrim et al., 2006). Latent class analysis (Uebersax, 1994), latent trait analyses (Collins et al., 1994), and growth mixture models (Muthén, 2001) also utilize a hypothetical latent construct to investigate patterns of drug use.

Still another and particularly fruitful way to use information on multiple drug use is to investigate the sequential nature of involvement. A useful question is whether there is a modal pattern of progression of use through various types of drugs, usually based on lifetime use; if so, then one can establish stages into which users may be categorized, a

topic that has been of continued importance for more than three decades (e.g., Donovan & Jessor, 1983; Elliott et al., 1989; Golub & Johnson, 2001; Hays, Stacy, Widaman, DiMatteo, & Downey, 1986; Hays, Widaman, DiMatteo, & Stacey, 1987; Huba, Wingard, & Bentler, 1981; Johnston, 1973; Kandel, 1975, 1988, 2002; Kandel, Yamaguchi, & Chen, 1992; Newcomb & Bentler, 1986b; O'Donnell, Voss, Clayton, Slatin, & Room, 1976; Single, Kandel, & Faust, 1974; Welte & Barnes, 1985; Windle, Barnes, & Welte, 1989; Yamaguchi & Kandel, 1984a, 1984b).

These various approaches to nonconcurrent use share many similarities. The first (seriousness) and third (sequential) often produce very similar categories, as well as indexes that have Guttman-like scaling properties. However, the third (sequential) approach explicitly incorporates a developmental progression, whereas the first (seriousness) and second (latent constructs) usually do not. The first two approaches can, of course, be used to study longitudinal changes in drug use, but in general they do not explicitly attempt to model sequences of use.

A second feature that varies among the three approaches is the inclusion or exclusion of licit drug use, particularly the use of cigarettes and alcohol. The sequencing approach almost always includes such licit substances as components of the initial stages, whereas the seriousness of involvement approach has often excluded alcohol or (more frequently) cigarette use, because the seriousness of alcohol and particularly cigarette use is difficult to compare to the seriousness of using various illicit drugs. The latent construct approach sometimes includes licit substances (e.g., Newcomb & Bentler, 1988) and sometimes does not (e.g., Kaplan et al., 1988).

As indicated above, conceptualizing drug use in such composite indexes yields the practical advantage of allowing the investigator to utilize a single variable for analysis purposes, rather than numerous separate drug use indicators. From a theoretical standpoint, it permits the examination of predictors of various stages or degrees of involvement with psychoactive substances (Kandel, 1980), and the examination of certain user groups for whom use of one drug is not confounded with the use of others. For example, in much of our own work we have separated those who have used only marijuana from those who have also used other illicit drugs (Johnston et al., 1995; Johnston et al., 1978). Many other researchers have made the same distinction. When investigating the possible connection between marijuana use and delinquent behavior, we found that the marijuana-only group was very close to the abstention group in their levels of theft, vandalism, and interpersonal aggression. Had all marijuana users, including users of other illicit drugs, been included in those comparisons, the apparent association between marijuana use and delinquency would have been far stronger, and misleadingly so, we believe.

In another example of the possible disadvantages of grouping marijuana and all other illicit drugs into one category, we have found that various illicit drugs have had quite different patterns of change in use over time (Johnston et al., 2006b). While the proportion of high school students using marijuana had been rising steadily in the 1970s, the proportion who became involved with other illicit drugs remained fairly stable. During the 1980s, these two proportions decreased steadily. But this synchronous change conceals

important changes in cocaine use, which increased in the late 1970s, changed little between 1979 and 1984, peaked in 1985 and 1986, and declined substantially for some years thereafter.

Although not based on multiple drug use indexes, a related finding of this type has emerged regarding the connection between alcohol use and marijuana use. Some time ago, a popular hypothesis, particularly among marijuana advocates, was that increased use of marijuana would lead to a decline in alcohol use, since both drugs are used for many of the same reasons. While our data on reasons for use do show a very similar profile for these two drugs (Johnston & O'Malley, 1986), our usage data at the aggregate level have not supported that sanguine hypothesis. As marijuana use among students increased considerably in the 1970s, the frequency of alcohol use did not decline; rather, it rose slightly. Conversely, as marijuana use declined during the early 1980s, the prediction made by some observers that alcohol consumption would rise, or had already risen, received no empirical support; instead, alcohol use decreased. And while marijuana use increased substantially in the mid-1990s, alcohol use was relatively stable or increased slightly. In other words, contrary to what we have labeled the "displacement hypothesis," the overall demand for, or propensity to use, alcohol and marijuana moved in the same direction, not in opposite directions. This information is useful in conducting critical tests of competing theoretical perspectives concerning drug epidemics and the nature of substance use during adolescence. There are some circumstances, of course, when a composite substance use measure is possible and useful, as we have found in some of our own recent cross-sectional analyses with 8th and 10th graders (Pilgrim et al., 2006); still, being vigilant to comparison difficulties when attempting to combine across substances is essential, especially when looking across historical and developmental time.

As mentioned previously, the topic of drug use sequencing during adolescence has been of continued importance over the past few decades (Kandel, 2002). Determining whether there is an invariant sequential progression of drug use, and, if so, delineating that sequence and identifying the factors that contribute to progression, are essential steps for an understanding of the etiology and prevention of drug use during adolescence and young adulthood (Kandel, 1988). Although there were other studies relevant to drug use sequencing (e.g., Jessor & Jessor, 1977; Johnston, 1973; Kaplan, et al., 1982), Kandel (e.g., Kandel, 1975; Single et al., 1974) conducted the first in-depth study of drug use sequencing during adolescence. Among the several important findings, Kandel offered a four-stage model of drug use sequencing during adolescence: first, beer/wine (termed the "entry drugs"); then cigarettes and/or hard liquor; followed by cannabis; and finally, other illicit drugs (e.g., Kandel & Yamaguchi, 1993, 1999).

Although several of the studies cited earlier provide some support for a generalized sequence similar to the one delineated by Kandel, whether there is a specific invariant sequencing during adolescence is still at issue. Specifically, in contrast to this "stage theory," there is a "common influence theory," in which no invariant sequence is assumed, but rather a general proclivity towards drug use (e.g., Huba & Bentler, 1983; see also Kandel, 1988), an assumption consistent with problem behavior theory (Jessor & Jessor, 1977). There have been several studies comparing elements of these two perspectives. Using structural equation modeling techniques with lifetime drug use data,

Huba, Wingard, et al. (1981) compared a simplex model (in which alcohol use contributed directly to cannabis use but not to hard drug use, and cannabis use contributed directly to hard drug use) to a common-factor model (in which all three constructs were permitted to correlate); in support of the stage theory, they found that the simplex model provided a more parsimonious fit to the data. In contrast, Hays et al. (1987) found that a common-factor model provided a better fit than a simplex model, and that a four-factor model (with hard drugs separated into an “enhancer” factor and a “dampener” factor) provided a better fit than a three-factor model. They used current drug use data, which may have partially accounted for findings inconsistent with the Huba, Wingard, et al. (1981) findings; and in fact, in an earlier analysis, Hays et al. (1986) found evidence suggesting that the simplex model is more appropriate for lifetime than for current drug use data. Nevertheless, in a later study employing current drug use data, Windle et al. (1989) accepted a four-factor (including enhancer and dampener factors) simplex model over a common-factor model.

These apparent inconsistencies in the findings regarding simplex and common-factor models suggest the need for additional studies and, we believe, additional approaches. As suggested by Newcomb and Bentler (1986b), the discrepancy between the two models may be a matter of differences in level of abstraction, with the common influence model being a higher-order representation, and the stage model being a lower-order or manifest representation. The two models may also represent different approaches to the data, with the common influence model reflecting a variable-centered analytic approach, and the stage model reflecting a pattern-centered analytic approach (cf. Magnusson, 1988; von Eye, 1990). To illustrate, in some earlier, unpublished analysis, we took a pattern-centered approach to analyzing the retrospective data from the 1990 high school seniors regarding the grade that they first used the various classes of substances. Our preliminary findings were quite consistent with a stage model. For example, focusing on four classes of substances that we hypothesized would be used in sequence (cigarettes and/or alcohol, marijuana, pills, crack cocaine and/or heroin), we found that: (a) among those who used only one of these classes of drugs, 99% used the first class; (b) among those who used any two classes of drugs, 70% used cigarettes and/or alcohol first and then marijuana, 18% used both classes during the same year, only 5% used marijuana first and then cigarettes and/or alcohol, only 7% used pills, and none used crack and/or heroin; (c) among those who used any three of these classes of drugs, 87% had a sequencing pattern consistent with that hypothesized, and less than 1% had ever used crack and/or heroin; and (d) among those who used all four classes of substances, 88% had a sequencing pattern consistent with that hypothesized. Findings were generally the same across gender, although females were typically quicker to move into pills than were males—perhaps for the instrumental purpose of weight control.

In addition to the appropriate representation of any sequential ordering, there are several other unresolved issues in the relevant literature (Kandel, 2002). For example, as suggested by Newcomb and Bentler (1986b), Graham, Collins, Wugalter, Chung, and Hansen (1991), and Labouvie and White (2002), the age of entry into the sequence may have an impact on any ordering effects, and in fact, there may be several minisequences between adolescence and young adulthood. Furthermore, insufficient attention has been given to potential gender differences in sequencing (but see Welte & Barnes, 1985;

Windle et al., 1989; Yamaguchi & Kandel, 1984a, 1984b, 2002), to potential racial/ethnic differences in sequencing (but see Donovan & Jessor, 1983; Gilbert & Alcocer, 1988; Welte & Barnes, 1985; Yamaguchi & Kandel, 2002), and particularly to potential cohort differences in drug use sequencing (but see Donovan & Jessor, 1983; Golub & Johnson, 2001), all of which represent critical concerns in any attempt to establish a universal sequential ordering. These and other concerns related to the appropriateness of the ordering (e.g., whether alcohol represents a true gateway drug—see Newcomb & Bentler, 1986b) or to the generalizability of the ordering (e.g., regarding potential regional or urbanicity differences due to specific drug availability, or whether the introduction of a new drug such as crack may alter the progression) can be addressed best via large-scale prospective investigations like MTF that incorporate a longitudinal cohort-sequential design supplemented with retrospective data. Accordingly, by adding the surveys of the nation's 8th and 10th graders, begun in 1991, we are now in a better position to provide needed understanding regarding the sequencing of drug use during adolescence and young adulthood. In our recent analysis of 8th-grade panel data from Monitoring the Future (Bachman et al., in press), we modeled cigarette use as a cause of marijuana use (measured for the same period), and we modeled marijuana use as a cause of cocaine use (measured two years later).

Objective 1d: To continue to monitor beliefs about the harmfulness of various types of drugs at various levels of use.

Connections between beliefs and behaviors have long been at the crux of several conceptualizations regarding changes in health-related behaviors (e.g., Ajzen & Fishbein, 1980; Rosenstock, 1974) and have been extended specifically to changes in drug use behaviors (e.g., Johnston, 1991b; Petty, Baker, & Gleicher, 1991). As we have demonstrated, the trends in perceived risk of substance use have played an important part in the declines in marijuana use in the 1980s (Bachman et al., 1988; Johnston, 1982, 1985; Johnston et al., 2006c, and prior volumes), the declines in cocaine use in the late 1980s (Bachman, Johnston, & O'Malley, 1990a, 1990b, 1991b; Johnston, 1991a; Johnston et al., 2006c, and prior volumes), and the increases in marijuana use in the 1990s (Bachman, Johnston, et al., 1998; Johnston et al., 2006d, and prior volumes).

Other findings provided further evidence for the power that perceived harmfulness of drugs has in influencing drug use during adolescence (Newcomb, Fahy, & Skager, 1990; Nucci, Guerra, & Lee, 1991). Continued monitoring of these and related beliefs has permitted further testing of our model, and the turnaround in marijuana use among 12th graders in 1992 was actually predicted by a turnaround in the perceived risk of marijuana, meaning that it was a leading indicator on this occasion. Changes across time in the perceived risk of marijuana, cocaine, and a number of other drugs have been consistent with our theoretical predictions (Johnston et al., 1995).

Beginning in 1989, we included questions regarding perceived risk of anabolic steroid use. This is particularly important given that formal and informal sanctions against anabolic steroid distribution and use were stepped up during the late 1980s and early 1990s; for example, in the Anti-Drug Abuse Act of 1988, distribution of an anabolic steroid to a minor without a prescription became a felony (Yesalis, 1991). Based on our

theory of drug epidemics (Johnston, 1991b), and based particularly on the predicted impact of “unfortunate role models”—public figures who suffer adverse consequences from using drugs—in the first edition of this occasional paper, written in 1991, we stated, “We expect that the example and activities of Lyle Alzado, a professional football lineman who attributes his brain tumor to his use of anabolic steroids (Alzado, 1991), may well have a similar effect on adolescents’ perceived risk for steroids as Len Bias’ death had on their perceived risk of cocaine.” As predicted, the 1992 data on perceived risk showed a five percentage point jump at all three grade levels (8, 10, and 12) in the proportion seeing “great risk” in taking steroids.

Between 1991 and 1997, the annual prevalence rate for anabolic steroids was stable in the 8th and 10th grades; but in 1999 use jumped (from 1.2% to 1.7%) in both grades. Almost all of the increase occurred among boys. Twelfth-grade anabolic steroid use increased very gradually from 1992 to 1999. The data from 12th graders showed a distinct drop in perceived risk of steroid use after 1998. (Unfortunately, the questions about perceived risk and disapproval were dropped from the 8th- and 10th-grade questionnaires in 1995 in order to allocate space to other questions.) The sharp drop in perceived risk among 12th graders suggests that some particular event (or events) in 1998 changed beliefs about the dangers of steroids. One likely such event was the disclosure by baseball player Mark McGwire, who in the 1998 season set a new, highly publicized world record for home runs, that he used androstenedione. We interpret the jump in use by young boys as having been due largely to the positive “role modeling” unintentionally provided by McGwire (who subsequently publicly renounced the use of androstenedione). A part of our theory on the determinants of epidemics (Johnston, 1991b) is that public role models can influence the use of various drugs by adolescents. The examples of Lyle Alzado, Len Bias, and Mark McGwire are particularly nice examples, though we suspect that many other figures—particularly including stars in rock and pop music—have served as public role models, and as “unfortunate role models” when drug use threatened or took their lives.

Monitoring beliefs about the perceived harmfulness of psychoactive drugs is important for a number of reasons, both theoretical and pragmatic. It can provide policymakers and the public at large with advanced warning of things to come. The accuracy of adolescents’ standing beliefs about harmfulness can be assessed in light of existing scientific knowledge, and when young people appear to have an unrealistically low assessment of the dangers involved, remedial educational efforts can be mounted (e.g., Bukoski, 1991). For example, only about one third of the 1978 seniors felt that regular users of marijuana took a “great risk” of harming themselves physically or in other ways, and that proportion had been dropping steadily since 1975, accompanied by a continued rise in the number of regular marijuana users. However, between 1978 and 1991, there was a dramatic increase (more than doubling—from 35% to 79%) in the proportion perceiving regular marijuana use as involving great risk. During the same time period, the proportion of those who indicated that even occasional users of marijuana were at great risk of harming themselves rose from 12% to 41%. This dramatic shift may well have been due to the fact that scientists, policymakers and, in particular, the media provided considerable attention to the increasing levels of marijuana use among young people, and to the potential hazards associated with such use. If so, the implications for

prevention strategies are important—particularly given the decline in actual marijuana use that accompanied the increase in perceived risk (Bachman, Johnston, et al., 1991b; Johnston 1985, 1991a, 1991b; Johnston et al., 2006c, and previous volumes in the series).

When further research indicates that use of any particular drug carries substantial health hazards, these indicators of perceived harmfulness can be extremely useful for gauging whether and when the new facts become incorporated by young people. A case in point is cocaine. During the early 1980s, in spite of numerous negative experiences by well-known individuals (John Belushi, Richard Pryor, McKenzie Phillips, Stacy Keach, and others), the perceived harmfulness of regular or experimental cocaine use among the nation's youth had changed rather little. In fact, perceived risk of harm from experimental use was actually lower in 1985 (34%) than it was in 1975 (43%); it had dropped to a low point of 31% in 1980. During that same ten-year period, there was some increase in perceived risk of regular use of cocaine, from 73% in 1975 to 79% in 1985 (it dipped to 68% in 1977). Still, given the media attention to the potential harmfulness of cocaine use on the one hand, and its considerable potential for dependency on the other (Johanson, 1984), these figures seemed inappropriately low (as we stated in 1985). This was particularly the case given that (a) experimental use of other drugs with less dependence potential (e.g., LSD) showed distinctly higher levels of perceived risk, and (b) crack cocaine, widely reputed to be highly habit-forming, was becoming readily available.

Then, for the senior class of 1987, we reported a dramatic increase in the perceived harmfulness of cocaine use. Between 1986 and 1987, the proportion of students who perceived regular use of cocaine as placing the user at great risk of personal harm rose from 82% to 89%; for occasional use, the corresponding percentages were 54% and 67%; and for experimental use, the percentages were 34% and 48%. After 1987 this increase continued, with the most substantial gains occurring for experimental use. For both crack cocaine and powdered cocaine (which we began to monitor separately in 1987), there was also an increase in perceived harm at all levels of use. As we have discussed at length elsewhere (e.g., Bachman, Johnston, et al., 1991a; Johnston, 1991b; Johnston, O'Malley, & Bachman, 1991a, 1991b), we believe these changes in attitudes have resulted from two factors: (a) the greatly increased media coverage of cocaine and its dangers that occurred beginning in 1986, including many antidrug spots (see also Black, 1991; Donohew, Lorch, & Palmgreen, 1991); and (b) the tragic deaths in 1986 of sports stars Len Bias and Don Rogers, both of which were attributed to the effects of cocaine. The deaths of these unfortunate role models underscored the points that no one, regardless of age or physical condition, was invulnerable to being killed by cocaine, and that one does not have to be an addict or regular user to suffer such adverse consequences. Indeed, given the heightened feelings of invincibility that are apparently characteristic of adolescence (Elkind, 1985), perhaps these points could penetrate this shield of invincibility so quickly only because of well-publicized tragedies involving nationally known and respected individuals who were young and at the peak of health.

The study has identified still a third situation in which perceived risk among young people appears to be out of sync with what is scientifically known about a particular drug. Even as recently as 1996, only 50% of 8th graders thought there was a "great risk" of a pack-a-day smoker harming himself or herself physically or in other

ways. Progress has been made on this dimension in recent years, as new initiatives to prevent underage smoking have been undertaken, and antismoking campaigns have been carried out at both state and national levels; by 2005, 62% of 8th graders saw great risk.

Another example of drug use waxing and waning with perceived risk is ecstasy (MDMA). There was a dramatic increase in use of ecstasy in the late 1990s; we stated in 2001 that we believed the use of this drug would not decline until more young people came to see its use as dangerous. Perceived risk did in fact rise rapidly in the early 2000s, and use decreased in those years. We believe that the unusually rapid changes in perceptions of risk about ecstasy reflect the effects of a three-part effort: media coverage of adverse events associated with ecstasy use; the substantial efforts of the National Institute on Drug Abuse to get research completed on the subject and to disseminate information about the adverse consequences found to be associated with ecstasy use; and efforts by the Partnership for a Drug-Free America and the Office of National Drug Control Policy to discourage ecstasy use through an ad campaign, begun in 2002, that addressed the hazards of use.

We should mention here that, because we believed that the radio and television antidrug public service announcements (PSAs) aimed at illicit drug use might prove important in changing attitudes and behaviors, we began to monitor seniors' perceptions of these PSAs in 1987. At that time, about two thirds (65%) of seniors indicated that they saw or heard at least one PSA a week, and the majority indicated that the PSAs had made them less approving toward drugs to at least some extent (54%), and less likely to use drugs at least to some extent (55%).

This high rate of exposure to PSAs, and the likely impact on respondents' own behavior, continued through 1990 among seniors, before starting to drop substantially. Weekly recalled exposure was reported by 66% of the class of 1990 versus 46% of the class of 1995. The proportion saying such advertising had made them less likely to use drugs to at least "some extent" fell from 56% to 39% over the same interval, as would be expected given the reduced exposure. The Partnership for a Drug-Free America reported a drop in the placement of their ads between 1989 and 1994 of about 25%, consistent with the students' perceptual reports. All of this corresponds, of course, to the drop in perceived risk for a number of drugs among American adolescents. (Since 1995, there have been renewed attempts to advertise the dangers of drugs, and weekly recalled exposure was at 53% for the class of 2000; however, the proportion saying the advertising made them less likely to use actually declined a bit more, to 37%.) One particular campaign, in part generated by the findings from MTF that inhalant use was high and rising in the early 1990s, showed evidence of success at changing the perceived risk associated with that class of drugs. Between our 1995 and 1996 data collections, the Partnership for a Drug-Free America launched an inhalant prevention campaign, and MTF measured a four to six percentage point jump in perceived risk among 8th and 10th graders over that one-year interval. That change, in turn, was followed by declines in actual inhalant use over a number of years. Recently, however, there is evidence that this improvement has halted, quite possibly as a function of generational forgetting of the risks as a result of generational replacement (Johnston et al., 2006c).

Media efforts appear important in influencing use of illicit drugs, and much of that effect presumably occurs through the effect on perceived risk of harm. Use of licit drugs can also be affected. Antismoking ad campaigns have been an important part of the efforts to reduce smoking among American young people for the past two decades. MTF data were used to track the overall extent of exposure to antismoking advertising in the media among American youth from 1997 to 2001, examining how youth react to such advertising, and how exposure levels and reactions vary by sociodemographic characteristics. Self-reported levels of recalled exposure to both electronic and print antismoking advertising were measured over this interval, as well as the judged impact and perceived exaggeration of such advertising. We found that significant increases in overall exposure to antismoking advertising occurred over the study time period. These increases were associated with (a) increases in the self-reported likelihood that antismoking advertising diminished the probability of individual smoking behaviors, and (b) increases in the perceived level to which antismoking advertising exaggerates the risks associated with smoking. Further, these trends were significantly associated with various characteristics—most notably, ethnicity, smoking behaviors, and residence in a state with an ongoing tobacco-control program having a media component. More specifically, states were grouped according to when they introduced their own antitobacco media campaigns, and the levels and trends in recalled exposure and judged impact for these different sets of states tracked the timing of these campaign introductions, lending credence both to the validity of the measures and the effectiveness of the campaigns in reaching youth (Johnston, Terry-McElrath, O'Malley, & Wakefield, 2005).

MTF data were also used in a very different approach to assessing effectiveness of antitobacco advertising in a report by Emery et al. (2005). These researchers examined how commercial ratings data on mean audience exposure to televised antitobacco advertising were correlated with MTF student data on smoking behavior and attitudes. More potential exposure to the advertising was significantly associated with greater perceived risk of harm and lower odds of being a smoker. A broader approach to the issue of tobacco control was examined by Tauras et al. (2005). This report examined the association between the amount of state-level expenditures on tobacco control and smoking among MTF students. Expenditures were found to have a significant negative impact on youth smoking.

Objective 1e: To continue to monitor personal disapproval of various types of drugs at various levels of use.

Related to beliefs about harmfulness is the dimension of personal disapproval of various types of drug use. Based on earlier work, Johnston (1973) pointed out that there were undoubtedly some gross distortions (largely media created) in the public's perception concerning the receptiveness of most young people to a drug culture. Serious distortions remain in various forms today. For example, when we published findings regarding the lower rates of drug use among African-American high school seniors compared to White seniors (Bachman, Johnston, et al., 1991a), along with an accompanying press release, several editorials were written in the popular press about the incredulity that the findings engendered vis-à-vis what is typically expressed in the media

about African-American youth. The point here is that stereotypes regarding youths' approval or disapproval of drug use, along with other related public perceptions, represent powerful social norms (Johnston, 1991b) that, in turn, can have strong impacts on young people's decisions to use, or not to use, drugs (see also Bukoski, 1991; Martin & Pritchard, 1991; Perkins & Berkowitz, 1986; Rhodes & Jason, 1990).

The set of questions about disapproval begins, "Do you disapprove of people (who are 18 or older) doing each of the following?" Several intensities of use (e.g., use once or twice, occasionally, or regularly) for each drug class are then listed and the respondent indicates whether he or she (1) does not disapprove, (2) disapproves, or (3) strongly disapproves of that drug-using behavior. (The 8th- and 10th-grade version includes an additional answer category, "Can't say, drug unfamiliar," and does not include the parenthetical expression about people who are 18 or older.) These questions have consistently reflected conservatism among the great majority of seniors in relation to the illicit drugs other than marijuana. In 1975, over 74% disapproved of even experimental use (i.e., using once or twice) of each of the five illicit drugs listed (cocaine, LSD, amphetamines, barbiturates, and heroin), and over 90% disapproved of regular use of each (Johnston, Bachman, & O'Malley, 1979). The corresponding percentages in 2005 were over 85% for experimental use, and over 94% for regular use (Johnston et al., 2006c), illustrating the increased conservatism toward use of illicit drugs. Some important changes occurred that paralleled those for perceived risk. Disapproval of experimental use of cocaine was at about 80% during 1984–1986, and then jumped to 87% in 1987; after that, it steadily increased to an all-time high of 94% in 1991. Likewise, disapproval of experimental and regular marijuana use rose steadily from lows in 1977 of 33% and 66%, respectively, to highs in 1992 of 70% and 90%, respectively.

As is the case with perceived harmfulness, changes in disapproval of use of various classes of substances tend to be in the opposite direction from changes in use; we have attributed these relationships as causal ones, in which disapproval, along with perceived harmfulness, has contributed to the declines in marijuana and cocaine use (Bachman, Johnston, O'Malley, & Humphrey, 1986; Bachman et al., 1988; Bachman, Johnston, & O'Malley, 1990a, 1990b, 1991b, 1998; Johnston, 1985, 1991a; Johnston et al., 2006c, and earlier volumes). Beginning in 1991, we also asked questions regarding disapproval and perceived harmfulness in the 8th- and 10th-grade surveys. Our findings since 1991 suggest that age differences depend on the drug. Among the three grade levels, 8th graders have been the most disapproving of marijuana use but the least disapproving of LSD use (Johnston et al., 2006c). We have argued (Johnston, 1985) that disseminating the results of the yearly surveys may prove useful in prevention efforts aimed at shoring up the resolve of those trying to resist immediate peer group pressures to use licit and illicit drugs (e.g., Botvin, Baker, Dusenbury, Tortu, & Botvin, 1990; Dielman, Shop, Butchart, Campanelli, & Caspar, 1989; Pentz et al., 1989; Perkins & Berkowitz, 1986).

Disapproval of substance use can be important not only at the individual level, but at a more aggregated level as well. Using logistic nonlinear hierarchical models, Kumar, O'Malley, Johnston, Schulenberg, & Bachman (2002) showed that the school-aggregate level of disapproval had a significant negative effect on the probability of students' use of

cigarettes, heavy drinking, and use of marijuana, controlling for the students' individual disapproval and for student and school demographic characteristics.

Objective 1f: To continue to monitor perceptions of the extent of disapproval by peers of the use of various drugs (i.e., perceived peer norms).

There is considerable evidence, listed under Objective 1h, that peers play an important role in influencing drug behaviors. Not only is exposure to peers' use or nonuse likely to be important, but peers' expectations and attitudes are likely to matter, as well (Jessor & Jessor, 1977; Kandel, 1974). Indeed, it appears that perceived peer norms can be as influential as perceived peer behaviors on adolescents' drug use, and particularly on their alcohol use (e.g., Biddle, Bank, & Marlin, 1980a; Hansen & O'Malley, 1996; Harford & Grant, 1987; Newcomb & Bentler, 1986b; Robin & Johnson, 1996; Rooney, 1982; White, Johnson, & Horwitz, 1986; Wilks, Callan, & Austin, 1989). Consequently, two sets of measures addressing these potentially important sources of social influence are being used each year. One asks the respondent to rate on a disapproval scale "How do you think your close friends feel (or would feel) about your doing each of the following things?" Various drug-using behaviors are then listed. The second set asks how drug use is viewed by (a) most students in the school, (b) most of the respondent's own group of friends, and (c) the respondent himself or herself. (Both of these sets of variables are asked of 12th graders only.)

Peer norms differ considerably for the various drugs and for varying degrees of involvement with those drugs, but overall peer norms tend to be quite conservative. The great majority of seniors say that their friendship circles do not condone use of the illicit drugs other than marijuana, and in 2005, eighty percent believed that their friends would disapprove of regular marijuana use. In fact, in 2005, sixty-one percent believed that their friends would disapprove of their even trying marijuana. At the aggregate level, these questions show a fairly close correspondence in results with the self-reported attitudes described in the previous section, and their trends track so closely (see Johnston et al., 2006c) that we decided not to ask both sets of questions of the 8th and 10th graders.

In contrast to the close correspondence noted above, another set of questions shows substantial discrepancies among (a) seniors' reports of their own beliefs, (b) their perceptions of what their own group of friends believe, and (c) their perceptions of what the majority of students in their schools believe in terms of whether using drugs (other than alcohol or marijuana) causes a student to be looked up to or looked down on. About half of the 2005 seniors (52%) reported that they personally looked down on such drug use "a lot," over a third (38%) reported their own group of friends felt that way, but only 18% thought the majority of students in their school felt that way. This large disparity implies substantial underestimation of the degree to which drug use is perceived in negative terms—a form of collective ignorance that might be modified with appropriate interventions.

Taken across time, the measures we have outlined reveal some important changes in the social reality experienced by young people. The measures about close friends can also be used longitudinally to monitor shifts in social reality occurring with age and

transition into new environments. At the individual level of analysis, their predictive importance can be assessed along with their relative importance vis-à-vis other factors contributing to drug-using behaviors.

Objective 1g: To continue to monitor beliefs (or stereotypes) regarding cigarette smokers and frequent marijuana users.

Adolescents have always had a colorful nomenclature for various segments of their number: “jocks,” “heads,” “preppies,” “punkers,” “burnouts,” “nerds,” “loners,” “druggies,” “partyers,” and so on (e.g., Brown, 2004; Brown, Dolcini, & Leventhal, 1997; Clasen & Brown, 1985; Durbin, Darling, Steinberg, & Brown, 1993; Mosbach & Leventhal, 1988). These labels usually carry a rich set of connotations that can vary with time and with group membership. Insofar as various classes of drug users are seen as a group with shared characteristics, it is relevant to monitor what those characteristics are presumed to be, because they are likely to determine the attractiveness of the behavior for many potential users. Indeed, this notion of being drawn to drug use because of perceptions about what may be gained in terms of self- and/or social image or, more broadly, that problem behavior can be viewed as purposeful and constructive from the adolescent’s perspective, is central to many conceptualizations concerning the etiology and prevention of drug use during adolescence (e.g., Chassin, Hussong, et al., 2004; Chassin, Presson, & Sherman, 1989; Jessor & Jessor, 1977; Kaplan, 1985; Loewenstein & Furstenberg, 1991; Rhoades & Maggs, in press; Rhodes & Jason, 1990; Schulenberg & Maggs, 2002; Silbereisen & Noack, 1988). Three and a half decades ago, the National Commission on Marijuana and Drug Abuse (1972) believed that the symbolic aspect of marijuana use was so important to its etiology and maintenance that they entitled their first report “Marijuana: A Signal of Misunderstanding.”

For a number of years, Monitoring the Future has included a set of measures asking respondents’ opinions concerning certain characteristics of marijuana users and users of other illicit drugs. Various dimensions are rated, some having positive connotations (interesting, creative, independent, concerned with people), others negative (not sensible, not hard-working, emotionally unstable, weak-willed, criminal). Respondents are asked to state whether or not they think “people who use marijuana several times a week” tend to have these characteristics more or less than average. This same series of questions is then repeated for “people who use illegal drugs (other than marijuana) several times a week.” During the 1980s, there was a clear trend for regular marijuana users to be viewed more negatively. Specifically, between 1980 and 1990, high school seniors became more likely to view regular marijuana users as less sensible and hard-working than average, and also more emotionally unstable, weak-willed, and criminal than average. The possible positive attributes of regular marijuana users changed little, although regular marijuana users were less likely to be viewed as above average in creativity in 1990 than in 1980. With the rise in marijuana use during the 1990s, the trend reversed. Regular marijuana users were viewed in less negative ways, and even the positive attributes changed, with respondents seeing marijuana users in a more positive light. For example, in 1990, twelve percent of seniors thought users were more creative than average, and 15% thought they were more interesting than average; in 2005, those figures were 25% and 28%, respectively.

In the 1980s, attitudes toward illicit drug users seemed to harden somewhat. For example, in 1980, sixty percent of seniors thought drug users were “more weak-willed,” and 59% thought they were “more criminal” than average, compared to 64% and 68%, respectively, of seniors in 1990. After 1990, attitudes toward illicit drug users seemed to go the other way, softening somewhat: in 2005, forty-eight percent of seniors thought drug users were “more weak-willed” than average, and 49% thought they were “more criminal” than average.

Since 1981, the social connotations of cigarette smoking have also been monitored. These questions provide clear evidence that high school seniors have a negative image of cigarette smokers. For example, in 1981, in response to what smoking made a male look like, only 6% endorsed “cool, calm, in-control,” 9% endorsed “rugged, tough, independent,” and 5% endorsed “mature, sophisticated.” In 1990, the corresponding percentages on these positive attributes were still only at 5%, 10%, and 3%, and in 2005 they were at 5%, 10%, and 5%. In response to what smoking made a female look like in 1981, again only 6% endorsed “cool, calm, in-control,” 11% endorsed “independent and liberated,” and 7% endorsed “mature, sophisticated.” In 1990, the corresponding percentages were still only 4%, 10%, and 5%, and in 2005 they were at 4%, 8%, and 4%. By way of contrast, large proportions of the students viewed smokers their age as “trying” to look mature and sophisticated; 61% and 65% of male and female smokers were so viewed in 1981. By 2005, these figures were both at 58%—not quite as high as they were two and a half decades earlier, but still fairly high. Clearly, the modal picture provided by high school seniors of regular cigarette smokers stands in contrast to the one provided by cigarette advertisements. As is the case with disseminating information about disapproval of drug use, providing information about the extent to which cigarette smoking is viewed negatively may have some useful value in designing prevention programs. (We did a special press release on this subject for much the same purpose.)

Again, these attitudes or stereotypic views occupy a role in our theoretical model parallel to that for disapproval and beliefs about harmfulness—namely, that of an intervening variable between a number of environmental influences and actual drug use. It seems clear that what is intentionally or unintentionally symbolized by use remains a factor likely to have significant impact on usage patterns.

Objective 1h: To continue to monitor the extent of direct exposure to various forms of drug use, and to monitor the proportions of friends using various drugs.

When given the choice, most adolescents indicate that they would prefer to spend time with their friends than with anyone else; likewise, most indicate that they are happiest when they are with their friends (e.g., Brown, 2004; Crockett, Losoff, & Petersen, 1984; Csikszentmihalyi & Larson, 1984). Against this backdrop, it is not surprising that matters and activities related to drug use are the domain of the peer group. Indeed, Kandel (1974) has argued that “marijuana use by one’s friends may not only be an important variable, but may be the critical variable” (p. 208) in explaining an individual’s marijuana use. At the same time, it is noteworthy that friends often represent the one and only resource that adolescents would use if they were having difficulties with

substance use (Johnston, 1973; Windle, Miller-Tutzauer, Barnes, & Welte, 1991). When considering the broader developmental tasks of adolescence, and particularly that of forming close reciprocal friendships, substance use may serve as a way of facilitating bonding (e.g., Maggs & Schulenberg, 2005; Schulenberg & Maggs, 2002).

Since Becker's seminal work (Barnes & Becker, 1952), the notion that drug use is initiated through a peer social-learning process has received widespread acceptance and support. A number of investigators have shown a high correlation between an individual's illicit drug use and that of his or her friends (e.g., Bailey & Hubbard, 1990; Barnes & Welte, 1986; Bates & Labouvie, 1995; Biddle, Bank, & Marlin, 1980b; Blum, 1970; Brook, Nomura, & Cohen, 1989; Chassin, Hussong, et al., 2004; Dielman et al., 1989; Dishion, Capaldi, Spracklen, & Li, 1995; Dishion & Owen, 2002; Duncan, Tildesley, Duncan, & Hops, 1995; Guo, Hill, Hawkins, Catalano, & Abbott, 2002; Hundleby, 1987; Jessor, Costa, Krueger, & Turbin, 2006; Jessor, Jessor, & Finney, 1973; Jessor & Jessor, 1977; Johnston, 1973, 1980; Kandel, 1982, 1985; Kandel, Davies, & Baydar, 1990; Kandel, Kessler, & Margulies, 1978; Mosbach & Leventhal, 1988; Newcomb, Maddahian, & Bentler, 1986; Oetting, 1992; Simons-Morton, 2004). While these correlations may certainly be explained in part by users seeking friends who are also users (Ennett & Bauman, 1994; Schulenberg & Maggs, 2001; Schulenberg, Bryant, Bachman, O'Malley, & Johnston, 1999), there is reasonable evidence for the common-sense notion that having friends who are users increases one's own likelihood of becoming a user, other things being equal (e.g., Bailey & Hubbard, 1990; Brook, Nomura, et al., 1989; Brown, 2004; Dishion & Owen, 2002; Jessor et al., 1973; Kandel, 1974, 1978a, 1985; Kandel et al., 1990; Newcomb & Bentler, 1986b; Oetting & Beauvais, 1987; Sieving, Perry, & Williams, 2000; Welte, Barnes, Hoffman, & Dintcheff, 1999).

In an article on the interpersonal determinants of adolescent drug abuse, Goldstein (1975) suggested that some of the factors that have emerged from research on interpersonal attraction could explain the importance of peer usage. In addition to the obvious ones—providing accessibility to the drug and social pressure to use it—these factors include providing models of appropriate behavior, providing a more comforting and less uncertain situation in which to experiment with a new behavior, teaching about the proper techniques and paraphernalia for use, and reassuring the subject as to the safety of the new behavior. If these are some of the key intervening variables through which peer influence works, it follows that as some of these processes are mediated through other social means, particularly the media, use by friends may become a less important determinant of a person's drug use. However, it seems likely that peers will continue to play a unique role in influencing drug use of adolescent peers. Because we expect that exposure to use in general, and modeling by close friends in particular, will remain important factors, they are also included in our theoretical model of the determinants of drug use. We have also argued that intercohort transmission from older acquaintances and siblings to slightly younger ones is an important dynamic through which an epidemic is sustained, once begun (Johnston, 1991b).

Built into the monitoring system are several sets of questions dealing with exposure to various types of drug use (“being around people who were using . . .”) and

use by one's friends. Responses on these measures were reported for the first time in 1979; we found that responses about being around people who were using drugs to get high in the last 12 months showed a high degree of correspondence at the aggregate level with reports about use by friends. Reports of exposure and friends' use also corresponded closely with the figures on seniors' own use. Not surprisingly then, the highest levels of exposure involved alcohol (a majority said they were "often" around people using it to get high) and marijuana (39% "often" and 25% "occasionally" around people using it to get high). It was more surprising to find that fully 32% of all seniors said that most or all of their friends get drunk at least once a week, and this has changed rather modestly—the corresponding figure for 1995 was 27%, and for 2005 it was 29%. The marijuana figures have changed over time in a manner consistent with individual use rates—that is, peaking in 1978–1979, declining through 1991–1992, increasing sharply through the mid-1990s, before declining some. For example, in 1979, thirty-six percent of seniors said most or all of their friends smoked marijuana, compared to only 10% in 1991, 21% in 1995, 23% in 2000, and 18% in 2005. For each of the drugs other than marijuana or alcohol, a majority of seniors (usually a large majority) report that in the past year they had not been around people using the drug to get high, and most indicate that none of their friends use the drug.

An additional benefit derived from inclusion of questions on friends' use of drugs and exposure to drug use has to do with validating the trends in self-reported use. Presumably, there is considerably less motivation for a respondent to conceal information on the proportion of unnamed friends who use, or the extent of their own exposure to use, than there is to conceal their own use in the self-report usage questions. Therefore, a high degree of correspondence in the aggregate level data between seniors' self-reports of their own drug use, and their reports concerning friends' use and exposure to drug use, suggests that there has not been a serious change in underreporting of own use. To date we have found a high degree of correspondence, and this provides additional evidence for the validity of the self-report trend data (Johnston et al., 2006c).

If there should be any future change in the extent to which high school seniors are willing to be candid in reporting their drug use, then reports of friends' use and exposure to use might begin to diverge from self-reports. However, as long as these indicators move in concert, we will continue to feel comfortable about their validity.⁹

In 1991, we began to monitor the same peer usage perceptions among the nation's 8th and 10th graders. Like the data from the 12th grade, these data show trends that are highly consistent with the trends in self-reported use.

⁹In fact, a question about the validity of our reported downturns during the late 1970s in rates of cigarette use was raised, based on just such a hypothesis about changed willingness to report cigarette use in an era when cigarette use was starting to be viewed with more disfavor (Mittelmark, Murray, Luepker, & Pechacek, 1982). The fact that reported friends' use was also declining helped to answer that question (O'Malley, 1984).

Objective 1i: To continue to monitor perceived availability of the various illicit drugs.

Availability is a necessary condition of use, and MTF gathers measures of availability based on population survey data rather than social agency and control agency statistics. As we stated nearly 30 years ago:

Various indicators of drug availability through illicit channels have been developed—for example, indexes of price and purity of drugs bought on the street by undercover agents and police informants. However, most of these efforts have been addressed specifically to heroin availability. To our knowledge, there has been much less effort to measure the availability of most other drug classes and there has never been an attempt to sample systematically either populations “at risk,” e.g., high school students, or actual users, for the purpose of monitoring through survey techniques their perceptions regarding the availability of drugs. In this study we attempted to make such an assessment (Johnston, Bachman, & O’Malley, 1977, p. 179).

We use the term “perceived availability,” but we recognize that availability is multidimensional, and that respondents may take into consideration a variety of factors, including knowing where to get access to a drug, the difficulty of getting to an access place, and perhaps also the monetary cost.

There are substantial differences in the perceived availability of the various drugs. In general, the more widely used drugs are reported to be available by high proportions, as would be expected. Also as would be expected, drugs are generally perceived to be more available to older adolescents than to younger adolescents. Both associations are consistent with the notion that availability is largely attained through friendship circles; the higher the proportion of a friendship circle that uses a drug, the greater the proportion of students who have access to it.

Similarly, in general, as use increases (or decreases) over time, availability tends to increase (or decrease); however, there are some very important exceptions to this generality.

Of special note is the fact that marijuana has continued to be perceived as almost universally available by high school seniors, even though use has fluctuated considerably. At its peak of popularity, around 1979, about 90% said that marijuana was readily available (that is, “fairly easy” or “very easy” to get). At its low point in 1992, 83% said that it was readily available, and at the most recent data collection in 2005, 86% said so. Thus, although use varied greatly (annual prevalence was 51% in 1979, 22% in 1992, and 34% in 2005), availability stayed consistently high. The ready availability of cocaine, including crack cocaine, increased steadily for a number of years until 1989, then declined significantly; nevertheless, 55% of the 1990 seniors indicated that they could easily obtain cocaine, and 42% said crack cocaine could be obtained easily—vastly more than reported ever having used these drugs. By 2005, forty-five percent said they could

easily obtain cocaine, and 39% said they could easily get crack. The clear message here is that mere availability does not appear to be closely linked to the usage levels: marijuana use continued to decline, then increase, then decline again, despite its continued high level of availability. When cocaine use was dropping sharply after 1986, perceived availability actually climbed for several years, strongly suggesting that other factors explained the change (such as perceived risk and disapproval, which moved in the expected direction).

With respect to heroin, however, availability probably played an important role in the increase in use during the 1990s. There was a significant expansion in the world supply of heroin in the early 1990s, which had the effect of dramatically raising the purity of the heroin available on the streets. This change in drug supply and purity provided an opportunity for users to get high from heroin without having to inject it; the noninjectable forms of ingestion contributed in a major way to the subsequent increase in heroin use.

Another instance in which availability likely affected use was with respect to LSD. The Drug Enforcement Administration was able to close a major LSD-producing site in late 2000, and availability and use of LSD declined thereafter.

Fluctuations in price can also influence trends. Even though the perceived availability of marijuana remained high throughout the 1980s and 1990s, price fluctuations appear to have contributed to at least some of the observed trends in use (Pacula et al., 2001).

Because supply reduction has long been a major part of the federal strategy for drug abuse control (Domestic Council Drug Abuse Task Force, 1975), any indicators that may reflect the success or failure of that strategy are clearly useful for policy purposes. Indicators of marijuana and cocaine availability, and even heroin availability, suggest that the stepped-up interdiction efforts of the 1980s were not particularly successful, at least among the nation's high school seniors. We have called this to the attention of the public and national policymakers through our press releases, annual monographs, policy papers, interviews with the media, etc. Certainly surveys of consumers and potential consumers provide a valuable supplement to the existing system of indicators. Furthermore, having such data on individuals from 8th grade through young adulthood permits an investigation into which young people in what environments acquire access to illicit drugs—an intriguing and highly researchable question.

Objective 1j: To continue to monitor the social and physical contexts in which drugs are being used by young people (i.e., when, where, and with whom drugs are used).

The social contexts and situations in which the various drugs are used is an important perspective from which to gain an understanding of the functions of drug use (e.g., Elliott, 1993; Harford & Grant, 1987; Jessor & Jessor, 1977; Maggs & Schulenberg, 2005). Obviously, if a drug is used primarily when the respondent is alone, it is not being used to facilitate social interaction. Conversely, if it is used primarily at parties and other social situations, it is probably not being used to deal with chronic anxiety or depression.

One of the six questionnaire forms used with high school seniors delves into the social contexts of drug use. For each class of drug it contains a set of questions, addressed to those reporting any use of that drug in the previous 12 months, which asks about social context and setting. The questions ask what proportion of usage occasions were when the respondent was alone, with just one or two people, at a party, in the presence of a date or spouse, in the presence of people over 30, during the daytime, at the respondent's home, at school, and in a car.

These data were used by the Department of Education in its publication, *What Works: Schools Without Drugs* (U.S. Department of Education, 1986). It pointed out that one third of recent marijuana users in the class of 1985 had used marijuana in school. Our trend data showed that this was a substantial improvement over 1976, when nearly half of all recent users had used marijuana in school. Current data show that by 2005 the rate was down to one in five among recent users. More recently, the National Education Goals Panel, for whom we provided special reports annually for some years, used these and some newer measures of use at school to help track the progress of the nation's schools in dealing with drugs.

Such information permits us to characterize types of users more accurately, and to describe some of the social contexts in which each class of drug may be used. It also permits us to monitor the extent to which drug use occurs outside of the observation of adults. Finally, using the longitudinal panels, the extent of use in different social or physical settings in various major post-high school environments (college, military, civilian employment, etc.) can be examined.

Objective 1k: To continue to monitor the reasons that young people give for their use of the various drugs, for abstention, and for discontinuation of use.

Self-reported reasons for use of a given drug, and the anticipated function of the given drug, are thought to be critical to understanding the onset and maintenance of drug use (e.g., Bauman, 1980; Goldman, Del Boca, & Darkes, 1999; Harford & Grant, 1987; Hesselbrock, O'Brien, Weinstein, & Carter-Menedez, 1987; Jessor & Jessor, 1977; Johnston, 1991b; Maggs & Lee, 2005; Maggs & Schulenberg, 1998). Monitoring the Future has incorporated into one questionnaire form for high school seniors a standard list of reasons for use to be checked, when relevant, for each class of drugs. Thus it is possible to construct a profile of reasons for use of each drug, including alcohol, which can be compared across drugs at one point in time, across cohorts on a drug-by-drug basis, and across longitudinal intervals. Such studies of the many reasons for use of different drugs require large representative samples. We have published one extensive article based on cross-sectional and cross-time trend analyses of these variables (Johnston & O'Malley, 1986). In general, we found that reasons for drug use clustered into (a) those related to social/recreational purposes (e.g., "to have a good time with my friends," "to get high"), (b) those related to psychological/coping purposes (e.g., "to get away from my problems," "to get through the day"), (c) simple experimentation based on curiosity, and (d) instrumental motives ("to stay awake," "to lose weight"). The profile of reasons varied from drug to drug, arguing against a unidimensional or monolithic view of drug use from the adolescent's perspective. Illustrating the study's capacity to monitor

qualitative as well as quantitative shifts in substance use, one finding showed that the number and percent of daily alcohol users who mention psychological/coping reasons for their use had been rising steadily over the years. Another cross-time trend indicated that amphetamines were being used more often for instrumental and coping reasons than for social/recreational reasons.

We have recently extended these analyses through 2005, examining 30 years of trends in reasons for use (Terry-McElrath, O'Malley, & Johnston, in preparation). In general, social/recreational reasons for drug use (such as "to get high," "to have a good time," and "to experiment") continued to be the most commonly reported reasons for the use of most drugs. However, for psychotherapeutic drugs including amphetamines, barbiturates, and tranquilizers, coping with negative affect and physical needs reasons (for example, "to relax," "to sleep," "to get more energy") were most commonly mentioned. Significant differences in primary motivations were found between males and females (with males more likely to report social/recreational and drug-effect usage reasons, and females more likely to report coping with negative affect and physical needs reasons), as well as indications of significant differences by race/ethnicity (with White students somewhat more likely to report social/recreational reasons than minorities, and some indications that minority students were more likely to report compulsive use reasons, at least for specific substances).

As successive class cohorts pass into adulthood and progress into their 30s, 40s, and beyond, it is possible to monitor whether levels of illicit drug use will continue into the adult years or whether they will decrease or be discontinued. Some measures relevant to the cessation or reduction of use are also contained in our instruments. One set asks whether, for each of a list of drug classes, the respondent personally feels that he or she should cut down or stop using the drugs. Another set of questions asks whether the respondent feels that his or her use of various drugs has caused problems of a number of types; insofar as experiencing these problems predicts the reduction or cessation of drug use, we have inferential evidence of the reasons for cessation and/or reduction.

In the specific cases of marijuana and cocaine, respondents are explicitly asked which of a list of factors contributed to their either abstaining from or quitting use. Over the years, some interesting shifts have occurred in the reasons given for not using marijuana. Between 1976 and 1990, among those seniors who had abstained from or quit marijuana use, there were significant increases in the proportions citing concern about the following: psychological consequences (up 14 percentage points to 69%), physical consequences (up 16 percentage points to 70%), becoming addicted (up 23 percentage points to 58%), loss of control (up 14 percentage points to 54%), and loss of energy or ambition (up 10 percentage points to 38%). In fact, early observation of these trends provided important data indicating that perceived risk does indeed have a causal influence on actual drug-using behavior (Johnston, 1985). All of these changes were progressive and consistent across a number of years, although they leveled in the latter part of that period.

In 2005, as in most previous years, "concern about possible psychological damage" (endorsed by 58%) and "concern about possible physical damage" (55%) were

among the leading reasons for abstention out of a list of 17 possible reasons. Probably because these concerns have been in decline in recent years, they were exceeded by “don’t feel like getting high” (62%) and “my parents would disapprove” (62%). Lack of availability was dead last at 7%, preceded by “I might have a bad trip” (22%), “not enjoyable” (23%), and “too expensive” (24%). These data, in combination with the availability data, strongly suggest that supply-side efforts have been particularly ineffective in controlling marijuana use, and that demand-side factors predominate.

Because these reasons for refraining from or discontinuing use of marijuana are important for the understanding of both the epidemiology and prevention of drug use, and because it appears that decisions to use or not use marijuana typically occur long before the senior year, we also began asking some of these questions in the 8th- and 10th-grade surveys in 1991. The pattern of responses is generally similar to that for the 12th grade. In 2005, “not available” ranked lowest for 8th and 10th grade, just as for the 12th grade. “My parents would disapprove” ranked first for grades 8 and 10, and second for grade 12. “Concern about physical damage” was second for grades 8 and 10, and fourth for grade 12.

Starting in 1989, we began to monitor reasons for refraining from or for discontinuing use of cocaine among seniors. (From 1989 to 1996, the questions were asked separately for powder cocaine and crack cocaine; the answers were highly similar, so we dropped the crack cocaine set in 1997.) The answers given by the class of 2000 are informative. First, they rate quite a number of reasons as “very important” in explaining their nonuse of powder cocaine. The three reasons most often cited are concern about becoming addicted, concern about physical health, and concern about psychological damage. Eighty-one percent to 83% of the nonusers rated these reasons as very important. Lack of availability ranked last on the list of reasons (34%), although 59% of the nonusers rated “too expensive” as a reason. These data have important policy implications and are critical to understanding the etiology and prevention of illicit drug use. However, because of the declines in use of cocaine, both in powder form and crack form, and because the reasons for refraining from use or for discontinuing use were not changing much over time, we dropped these questions in 2002. Should the situation with cocaine use and noncontinuation of use change, we could reinstitute the questions.

Objective 11: To continue to monitor self-reported use under medical supervision of stimulant-type prescription drugs for the treatment of attention deficit and hyperactivity disorders.

These questions were first introduced in the 2005 survey, so we have as yet only limited information on trends in use under a doctor’s supervision of stimulant-type drugs for treatment of attention deficit disorder, hyperactivity disorder, or both (attention deficit hyperactivity disorder, ADHD). The responses in 2005 indicated fairly appreciable rates of such use, with 8% to 9% of 8th, 10th, and 12th graders reporting having taken such drugs in their lifetime. Three percent to 4% indicated that they were taking the drug(s) currently. About 40–45% of each grade level reported that they first took the drugs before reaching age 10.

We will report these findings publicly and continue to monitor the use of these substances, and will examine the extent to which use varies by various individual and social/demographic characteristics. We will also seek to determine whether there is any indication that use of these drugs at an early age appears to have deleterious consequences later on.

Objective 2: To continue to monitor and study these same drug-using behaviors and potential explanatory variables among nationally representative samples of American college students, their noncollege age-mates, and nationally representative samples of young adult high school graduates generally (modal ages 19 through 30); also, to continue to monitor risk and protective behaviors related to HIV transmission among young adults of modal ages 21 to 30.

Since 1976 we have been following randomly selected samples from each senior-year cohort into adulthood. By 1980, enough follow-up years had accrued to characterize young people one to four years past high school, which included a large number of college students. Thus, we have been able to report annual data on the prevalence and trends of drug use and related factors among college students since 1980. Since 1986 we have had samples encompassing 10 years post-high school (modal ages 19–28), which we judged to be adequate to begin routinely reporting trend data. This “transition to adulthood” age segment is particularly interesting because it is a period highly sensitive to both historical and developmental changes in terms of substance use (O’Malley, Bachman, Johnston, & Schulenberg, 2004). Of particular interest, this aspect of the MTF integrated design has been in place over the past quarter century, a period that has witnessed considerable changes in the timing and content of social role transitions and developmental pathways (Settersten, Furstenberg, & Rumbaut, 2005), resulting in an extension of this “in-between” time that Arnett has termed “emerging adulthood” (Arnett, 2000, 2004).

In terms of when to conclude the young/emerging-adult surveys, we initially thought that age 32 (corresponding to the seventh follow-up after graduation from high school) represented a reasonable point to stop the biennial surveys of young adults and to shift to a five-year cycle of continuing follow-up surveys into middle adulthood beginning at age 35 (see Objective 3). Continuing the panels in this way allowed us to cover the seldom-studied middle adulthood years (starting with age 35 and continuing with ages 40, 45, and 50) and to extend the age range covered in the cohort sequential analyses at a lower cost and with less respondent burden. We have been able to make good use of the follow-up of 19- to 32-year-olds, because these are the years of higher education, military service, job attainment, family formation and dissolution, pregnancy, childbearing, and so on. Continuing the coverage of the panels through age 32 allowed us to encompass enough of such events that they could be meaningfully studied (see particularly Bachman, Wadsworth, O’Malley, Johnston, et al., 1997; Bachman et al., 2002). Although coverage through age 32 initially proved useful, we nevertheless concluded that stopping the biennial surveys at age 30 would not be detrimental in any important way, and would allow for some cost savings. Thus, beginning with the follow-up surveys in 2002, biennial surveys are conducted through age 29 or 30 (corresponding

to the sixth post–high school follow-up), with the next survey occurring at modal age 35 (17 years after the base-year survey) and at five-year intervals thereafter.

Monitoring the various social indicators concerning licit and illicit drug use among young adults generally, and among college students in particular, has provided valuable additional information on prevalence and trends. This epidemiological monitoring has been reported in a series of annual volumes, the latest of which are Johnston et al., 2006c, 2006d. Generally speaking, during the 1980s and into the early 1990s, annual and monthly use rates and their historical trends were not very different among the post–high school age groups compared to high school seniors. However, there were some important exceptions: first, levels of cocaine use were strikingly higher for the older age groups. For example, in 1990 lifetime prevalence was roughly 41% by age 32 compared to 9% among high school seniors; annual prevalence of cocaine use was about 9% among those 1 to 14 years beyond high school, compared to 5% for high school seniors. Lifetime prevalence differences persisted through the 1990s, and in 2000 lifetime prevalence was 30% at age 32, compared to 10% among seniors. Annual prevalence (which can change more quickly than lifetime prevalence), however, had actually reversed with 6% use among seniors and 5% among those 1 to 14 years beyond high school. These sorts of historical shifts in age trends highlight the importance of ongoing monitoring of older and newer cohorts of individuals as they progress from high school through young adulthood.

Second, cigarette use has also shown an unusual pattern in relation to age: Current smoking increases moderately with age, but heavy daily smoking increases much more so, reflecting the fact that relatively few new smokers are recruited after age 18, but many who were moderate smokers move into a pattern of heavier consumption during the first one or two years after high school. This age-related pattern, which corresponds to a reduction in parental and school constraints after high school, has continued despite historical variations in the levels of smoking. This has important implications for the developmental timing of prevention efforts, because once started, the cigarette habit is very likely to continue. Indeed, the consistent cohort effects we find with cigarette use (Johnston et al., 2006c), which does not reflect what is generally true for other substances, argue clearly for early prevention.

Another way in which these follow-ups are vital to accomplishing the objectives of the study will become clear in the discussion of Objective 4, dealing with the separation of period, age, and cohort effects. Without the larger age band made available for study by the follow-up surveys, we would not have sufficient data to make these distinctions, which have proven to be very important. One example of a cohort effect that we were able to identify because we simultaneously monitor adolescents and young adults was the upturn in the use of marijuana and other illicit drugs that occurred in the early 1990s. It was observable mainly in adolescence, not in young adulthood (Johnston, O'Malley, & Bachman, 2001a; Johnston et al., 2006d). This unusual pattern of change points directly to educational and socializing factors as the likely causes of these upturns—a conclusion that has guided our search for explanatory factors.

An important feature of the follow-up design is that it generates an excellent national sample of college students every year. This design feature has advantages over a more typical design that first samples colleges and then samples students within them, because in the present sample the students are not clustered in a limited number of colleges. For trend estimation purposes, we have limited the age band to the most typical one for college attendance—one to four years past high school, corresponding to modal ages 19 to 22. According to 2004 statistics from the United States Census Bureau, this age range encompassed about 73% of all undergraduate college students enrolled in college full-time in 2004 (down from 79% in 1989). While extending the age band an additional two years would have covered 83% of all enrolled college students, it also would have reduced by two years the interval over which we could report trend data. However, we determined in an early look at the data that the differences that would have resulted in the 1985 prevalence estimates under the two definitions were extremely small. Based on 1985 estimates, the annual prevalence of all drugs except cocaine would have shifted only about one or two tenths of a percent. Cocaine, which has the greatest amount of change with age, would have had an annual prevalence rate only 0.8% higher if the six-year age span had been covered rather than the four-year age span. A replication of these analyses in 1997 yielded virtually the same results. Thus, for purposes of estimating all prevalence rates except lifetime prevalence, the four- and six-year intervals for characterizing college students are nearly interchangeable.

On the positive side, maintaining a consistent age band allows for trend estimation by controlling for changes in the age composition of college students over the years. Otherwise “college students” characterized in one year might represent a noncomparable segment of the larger population when compared with college students surveyed in another year.

College students are explicitly defined as those follow-up respondents one to four years past high school who say they were registered as full-time students at the beginning of March in the year in question *and* who say they are enrolled in a two- or four-year college. Thus, the definition encompasses only those who are one to four years past high school and are active full-time undergraduate college students in the year in question. It excludes those who may previously have been college students or already may have completed college.

The college student population, however defined, is an important one to be studying and monitoring for several reasons. Obviously, because of the selection process involved in admission to college, this population is not likely to hold a very large proportion of addicts. It is useful to note, however, that there generally have not been great differences in illicit drug use found between the college population and those respondents the same age not attending college (Dawson, Grant, Stinson, & Chou, 2006; Johnston, O’Malley, et al., 2006d; O’Malley & Johnston, 2002). And, while the college students’ cigarette smoking rates have been distinctly lower than their noncollege counterparts (clearly a selection effect), their binge drinking rates have been much higher (not a selection effect) (e.g., Bachman, Wadsworth, O’Malley, Johnston, et al., 1997; McCabe, Schulenberg, Johnston, O’Malley, Bachman, & Kloska, 2005; O’Malley & Johnston, 2002; Schulenberg, & Maggs, 2002; Schulenberg, O’Malley, Bachman, et al.,

2000, 2005; Slutske et al., 2004; White, Labouvie, & Papadaratsakis, 2005). So college students are of interest in their own right, both because they represent a population of particular importance for the future leadership of the country *and* because some important changes in substance use occur during the college years (Greenbaum, Del Boca, Darkes, Wang, & Goldman, 2005; Jackson, Sher, & Park, 2005; Schulenberg & Maggs, 2002). Also, they are in a young-adult segment of the population in institutions that are able and willing to adopt policies and programs aimed at prevention (National Institute on Alcohol Abuse and Alcoholism, 2002).

Moreover, in the larger context of understanding national epidemics of drug use, college students are important as forerunners of change that will be occurring in the society at large. The broad epidemic of illicit drug use of the late 20th century began on the American college campus, before spreading outward and downward in the age spectrum. More recently, it appears that the spread of MDMA, or “ecstasy,” first occurred in the college population, although it then spread and became more prevalent off campus (Johnston, O’Malley, et al., 2006d; Johnston, O’Malley, & Bachman, 2001b). As has been mentioned, the resurgence in the early 1990s of the broad drug epidemic evolved primarily in adolescence, but this may not always be the case. Thus, keeping our finger on the pulse of America’s college students may provide both forewarning of new problems and greater knowledge of the epidemiological dynamics of those new problems.

In addition to having an excellent national sample of college students, Monitoring the Future also generates an equally important representative sample of young adults who complete high school but do not attend college. The non-college-attenders have been referred to as “the forgotten half” (William T. Grant Foundation Commission on Work, Family and Citizenship, 1988), largely because so little is known about this group. Although non-college-attenders are typically more difficult to study than “captive groups” of college students, nonstudents also exhibit problematic patterns of drug use as we (e.g., Bachman et al., in press; Bachman, Wadsworth, O’Malley, Johnston, et al., 1997; Schulenberg, Merline, Johnston, et al., 2005; Schulenberg, O’Malley, et al., 2000, 2005) and others (e.g., Lanza & Collins, 2006; Sheffield, Darkes, Del Boca, & Goldman, 2005) have shown. For example, nonstudents may be less likely to mature out of heavy drinking in early adulthood, and therefore also represent an important target for prevention (White & Jackson, 2004; White et al., 2005).

In addition to the obvious benefits regarding our understanding of the epidemiology of drug use, our panel data on young adults provide many advantages for understanding the etiology and prevention of drug use (cf. Biglan, Mrazek, Carnine, & Flay, 2003; Chassin, Ritter, Trim, & King, 2003; O’Malley et al., 2004; Rutter, 1988; Schulenberg et al., 2003; Schulenberg, Maggs, Steinman, & Zucker, 2001; Sher, Grekin, & Williams, 2005; Tarter, 2002; Zucker, 2003). In particular, we have been able to track the same individuals before, during, and after the transition to young adulthood, one of the most critical developmental transitions in the life course (e.g., Arnett, 2000, 2004; Arnett & Tanner, 2006; Petersen & Ebata, 1987; Settersten et al., 2005). At the same time, with the cohort-sequential design, we have several panel samples that provide, among other things, important evidence regarding any true developmental trends (e.g., Bachman, Wadsworth, O’Malley, Johnston, et al., 1997; Elliott et al., 1989; Schulenberg,

O'Malley, Bachman, et al., 2000, 2005). It is only with the integrated MTF cohort-sequential longitudinal design that we can maintain our focus on both historical and developmental trends among those ages 19–22 in college and not in college as they progress through their 20s.

Risk and Protective Behaviors for HIV/AIDS. During the three-decade span of the Monitoring the Future study, the spread of the human immunodeficiency virus (HIV), which leads to the acquired immunodeficiency syndrome (AIDS), has become a serious public health concern. In an attempt to understand the forces behind the epidemic, there has been an increase in research on the prevalence and patterns of various behaviors that put individuals at risk for infection, and on how those patterns vary across different subgroups of the population.

While numerous behaviors put individuals at risk for infection, there are a select few that account for a vast majority of the infections in the U.S.—heterosexual contact, injection drug use, and male-to-male sexual contact—and this is the case among both adolescents (Rengel, Gavin, Reed, Fowler, & Lee, 2006) and adults (Centers for Disease Control and Prevention, 2005a, b; 2006). Heterosexual contact is a risk behavior for both genders, and accounted for 17% and 76% for males and females, respectively, of all HIV/AIDS diagnoses in 2004 (CDC, 2005a). Injection drug use is also a risk behavior for both genders, accounting for around 16% of HIV/AIDS-related diagnoses in each gender in 2004 (CDC, 2005a). While homosexual contact is not considered a risk behavior for females, male-to-male sexual contact is the largest risk behavior for males, and accounted for 61% of all male HIV/AIDS diagnoses in 2004 (CDC, 2005a). Rengel et al. (2006) focused on diagnoses among adolescents and young adults only, and found similar percentages.

Rates of infection vary across different subgroups of the U.S. population, and the group differences are fairly similar across the age range. Numerous studies suggest that the number of HIV/AIDS cases is marginally higher among males than it is among females (CDC, 2001, 2005a, 2006; Morris et al., 2006), and the higher rate among males is largely attributed to the differential risk of same-sex sexual contact for men and women. Thus, the higher rate of infection among males is largely driven by a small, acutely at-risk subset of the overall male population—those men who have sex with other men (CDC, 2005b). Rates of HIV/AIDS infection also vary dramatically across different racial groups, with non-Hispanic African Americans and Hispanics being particularly overrepresented (CDC, 2005a, b; Morris et al., 2006; Rengel et al., 2006). For example, the most recent data available (for 2004) indicate that the highest annual rates of infection (per 100,000) were among non-Hispanic African Americans (76.3), followed by Hispanics (29.5), American Indian/Alaskan Natives (11.1), non-Hispanic European Americans (9.0), and Asian/Pacific Islanders (7.2) (CDC, 2005a).

The MTF study is uniquely suited to address many of the key gaps in the literature concerning HIV/AIDS-related risk behaviors. First, the data set now includes measures for each of the key risk behaviors: (1) injection drug use (the lifetime and 12-month frequency of injecting drugs without a doctor's order; the lifetime and 12-month frequency of using a needle that respondents "knew or suspected had been used by

someone else”); (2) heterosexual contact; (3) homosexual contact; and (4) the number of sex partners the respondent has had during the 12 months prior to the survey, and whether those partners had been exclusively male, exclusively female, or both male and female. Second, MTF also has measures to identify key at-risk groups including African Americans and men who have sex with men. Third, MTF has data on protective behaviors including frequency of condom use in the prior 12 months, lifetime and 12-month prevalence of being tested for HIV, and rates of having an HIV test and actually getting the results of the most recent HIV test (because some people who take a test fail to get the results).

All the other features that make MTF an important and needed epidemiologic and etiologic study of drug use also make it an important and needed study for tracking HIV/AIDS-related risk behaviors: (a) it is population based with large representative samples and thus captures the full range of life paths during emerging adulthood; (b) it is prospective so that it can follow young people across their transition to adulthood to examine stability and change in related behaviors; and (c) the cohort-sequential design allows for the identification and separation of historical and developmental trends, which is especially important given that HIV/AIDS-related risk behaviors clearly reflect a moving target in terms of populations and behaviors involved. Finally, the fact that MTF has especially rich measures of drug use can provide needed depth to the understanding of how drug use relates directly (through injection drug use) and indirectly (through engaging in risky sex while being high) to the risk of HIV and AIDS.

Objective 3: To monitor and study longer term patterns and consequences of drug use beyond young adulthood by continuing to conduct follow-up surveys at ages 35, 40, and 45 and by initiating follow-up surveys at age 50.

The follow-up panels have become increasingly valuable, as the biennial series of surveys of drug use and other experiences has extended to cover all of young adulthood. However, the pace of age-related change in drug use and related attitudes and behaviors tends to slow as respondents approach their mid-30s. Many of the issues and experiences relevant for high school seniors and young adults become less central, and new issues and experiences emerge. Accordingly, after the sixth scheduled follow-up for each graduating class, the follow-up procedures shift in two important ways: First, we shift to a five-year interval between follow-ups (modal ages of 35, 40, and 45; we are proposing to continue this schedule, adding an age-50 survey). Second, the questionnaire content is different from the earlier follow-ups, with many (mostly nondrug) items eliminated, and some new, more extensive measures of key events and experiences that mark the movement beyond young adulthood added. In particular, we wanted to capture a broader array of adulthood experiences (e.g., concerning family relations and parenting practices) and drug behavior and attitudes (e.g., drug abuse and dependency, views on adolescent drug use). Also, a single questionnaire form is used instead of six forms.

As detailed below, there are numerous benefits of continuing to follow the MTF respondents as they enter new segments of the life span, and these follow-ups at ages 35, 40, 45, and now 50 are intended as a reduced-cost and reduced-burden strategy for realizing these benefits. The age-35 survey was first implemented in 1993–1994,

beginning with the 1976 senior-year cohort, and has continued annually with the subsequent senior-year cohorts. The age-40 survey (started in 1998) and the age-45 survey (started in 2003) also began with the 1976 senior-year cohort. In addition, we are proposing to initiate an annual age-50 survey, starting in 2008 with the 1976 senior-year cohort.

These follow-ups extend the age spectrum across which we can differentiate age, period, and cohort effects (Objective 4) and, in particular, over which we can examine life-course development (Objective 6). The fact that members of these older panels have become the parents of the generation of adolescents and young adults now being surveyed in the study makes them a valuable source of information on parental attitudes and behaviors, as well as on generational change. Although we do not have data matching parents with their own children, the monitoring of drug use and related behaviors and attitudes among adjacent generations provides additional important opportunities for describing and explaining aggregate change (Objective 5), and ultimately for understanding and addressing societal drug epidemics (cf. Johnston, 1991a).

We conceptualized the mid-30s as an important posttransitional period, a point at which the large majority of individuals have established their occupational and familial paths. Over the past decade, there has been an increase in conceptualization and research concerning middle adulthood (e.g., see the edited volumes by Brim, Ryff, & Kessler, 2004; Whitbourne & Willis, 2006; and Willis & Reid, 1999, for overviews of research issues and findings regarding middle adulthood), in part because of increased interest in development across the whole life span, and in part because longitudinal projects such as ours have continued on, following respondents beyond young adulthood. The significance of moving beyond young adulthood rests in part on the individual's increased investments in the "status quo" and in the younger generation. According to Erikson's (1963) life-span theory of psychosocial development, after the identity and intimacy quests of adolescence and young adulthood comes the generativity quest of early to middle adulthood. Generativity, which can be defined as "a configuration of psychosocial features constellated around the goal of providing for the next generation" (McAdams, de St. Aubin, & Logan, 1993, p. 221), can take many forms, including parenting efforts as well as occupationally and community relevant ones (e.g., Peterson & Stewart, 1993). There is evidence to suggest that feelings of, and efforts toward, generativity increase after young adulthood (e.g., McAdams et al., 1993; Ryff & Heincke, 1983), and the individual and societal significance of increased orientation toward generativity during adulthood is clear.

The study of social roles and role transitions is integral to the recently established field of midlife scholarship (Whitbourne & Willis, 2006). Important transitions that typically occur during midlife include "empty nest" or the postparental stage, retirement, and becoming a caregiver to aging parents. These and other midlife transitions have been variously conceptualized as sources of stress, feelings of loss, and also as eagerly anticipated movements into new stages of life. Although the emotional resonance of such transitions varies across individuals, such processes present opportunities for important change, including change in substance use. It is useful to contrast these middle adulthood transitions with those that help define early adulthood, particularly marriage, parenthood,

and full-time work: Each of these early adulthood transitions constitutes increases in responsibilities and decreases in personal freedoms (if only in terms of “free time”), and thus it is not too surprising that they typically correspond with decreases in substance use (e.g., Bachman et al., 2002; Bachman, Wadsworth, O’Malley, Johnston, et al., 1997). In contrast, some (but not all) of the middle adulthood transitions just described relate to decreases in responsibilities and increases in personal freedoms. As we discuss under Objective 6b, while the available research generally shows that substance use decreases with age across the life course, it remains the case that resurgences in drug use are possible as adulthood responsibilities are reduced, especially for the baby-boom generation (with extensive drug-using experience in their youth) now progressing through middle adulthood. It is also possible that substance use may increase as a coping mechanism to deal with stress caused by these life changes. Thus, as the MTF respondents work their way through the unique and consequential experiences of middle adulthood, we believe it is a critical time to conduct an in-depth examination of (a) the impact of middle adulthood roles and experiences on changes in drug use, and (b) the consequences of earlier substance use on these roles and experiences, as well as on adulthood health and substance use, abuse, and dependence.

The surveys at ages 35, 40, 45, and 50 provide additional and important vantage points from which to examine the relationship of transitions in social contexts and roles to changes in drug use (adding to Objective 6b discussed below). For example, while we have found that the impact of parenthood by itself does not have a large unique impact on drug use during young adulthood (Bachman, Wadsworth, O’Malley, Johnston, et al., 1997; Bachman, Wadsworth, O’Malley, Schulenberg, & Johnston, 1997), we may find that this conclusion is qualified when the respondents’ children approach and enter adolescence. In particular, in facing the specter of their own children’s potential drug use, those respondents still using illicit (and licit) drugs may well decide to quit or alter their use patterns. In contrast, because well-being and marital satisfaction among parents may decline somewhat as their children make the transition into adolescence (e.g., Silverberg & Steinberg, 1990; Steinberg & Silverberg, 1987), the parents’ coping capacities may become strained, and we may see increases in substance use among parents (including alcohol use and perhaps the inappropriate use of prescription drugs). Furthermore, concerning the intergenerational transmission of substance use behaviors and attitudes, it is informative to consider how disapproval of teenage substance use may vary among parents as a function of the age of their children. Indeed, we have found that disapproval of teenage substance use is higher among parents whose oldest child is 10 to 17 compared with parents whose oldest child is 9 or younger (Merline, Schulenberg, & O’Malley, 2001).

We have been examining the effects of adults’ previous drug use on their views on adolescent drug use, which has important implications for the intergenerational transmission of drug use (e.g., Bailey, Hill, Oesterle, & Hawkins, 2006). Furthermore, we have been examining the extent to which this effect is mediated through parenting practices (Merline et al., 2002; Schulenberg & Maggs, 2001; Schulenberg, Merline, O’Malley, Bachman, & Johnston, in preparation). There is a wealth of literature concerning the impact of parenting practices on adolescent substance use, indicating that parental monitoring and nurturance correspond with lower adolescent substance use (e.g.,

Ary et al., 1999; Biglan, Duncan, Ary, & Smolkowski, 1995; Blackson & Tarter, 1994; Brook et al., 1990; Brook, Kessler, & Cohen, 1999; Carvajal, Hanson, Downing, Coyle, & Pederson, 2004; Dishion & McMahon, 1998; Dodge et al., 2006; Hill, Hawkins, Catalano, Abbott, & Guo, 2005; Johnson & Pandina, 1991; Kumpfer & Turner, 1990; Oetting & Donnermeyer, 1998; Peterson, Hawkins, Abbott, & Catalano, 1994; Pilgrim et al., 2006; Schulenberg, 1996; Simons-Morton, 2004; Tucker, Ellickson, & Klein, 2003). Although we do not collect data from the adult respondents' children, we do gather data from the adults about their parenting practices and their perceptions of the behaviors and attitudes of their adolescents, which in turn can be examined as consequences of the adults' previous and current drug use (cf. Bailey et al., 2006; Brook, Whiteman, Balka, & Cohen, 1995; Duncan, Duncan, Hops, & Stoolmiller, 1995; Kandel, 1990). These sorts of research questions are ideally suited to latent growth and growth mixture models, in which we will be able to examine the unique impact of initial (adolescent) level of drug use as well as the unique impact of the pattern of drug use during young adulthood on middle adulthood outcomes.

Similarly, although our previous research indicates that early occupational transitions may not have a strong relationship with changes in drug use during young adulthood, we may find that, as individuals move into more responsible positions and become more invested in their careers, they decide they have too much to lose and thus cease their use of illicit drugs rather than risk discovery. For example, while we have not yet determined the extent to which it reflects selection or socialization effects, we have found that respondents occupying professional positions (at age 35) are less likely to smoke, drink heavily, use marijuana or use cocaine (Merline, O'Malley, Schulenberg, Johnston, & Bachman, submitted). Conversely, the pressures of higher level occupations, for some, may well contribute to increased substance use, and a similar case can be made for the effects of role overload (e.g., increased work pressure *and* increased family obligations from older and younger generations) on substance use. In analyses thus far, we have found that use of psychoactive substances—in particular marijuana, cocaine, and heavy drinking of alcohol—tends to move in a parallel or similar fashion. For example, all three measures showed increases after high school, and later declines (secular trends complicate the picture, but there appear to be clear developmental patterns as well). If in fact there are pressures that tend to produce increases in substance use, and pressures to avoid use of illicit drugs, then we may see a divergence between use of alcohol (or prescription psychotherapeutic drugs), on the one hand, and illicit drugs such as marijuana or cocaine, on the other.

While middle adulthood is not typically viewed as a prime period in the life span for illicit drug abuse, it must be remembered that this view is based on previous cohorts who do not have a history of extensive drug use in their youth. Some of the respondents in the cohorts now entering middle adulthood and facing the unique pressures associated with this period, as well as beginning to experience what is commonly referred to as the "midlife crisis," may find themselves reverting to past strategies (including drug use) to cope with pressure. Given the degree to which some illicit drug use was normative among the MTF cohorts now approaching age 50, we believe that applying the role transition theories discussed above to illicit drug use would be advantageous. In doing so, it will be of particular importance to consider each individual's history of substance use,

and the kind of longitudinal data found in MTF is uniquely capable of testing the application of midlife theories to illicit drug use. Further, the longitudinal design will allow us to determine whether increases in substance use following a role exit vary according to whether an individual's use decreased when entering that role. We plan to examine these and other issues concerning the relations between changes in drug use and social roles and environments during early and middle adulthood, using a variety of analytic techniques to exploit the panel data more fully (e.g., structural equation modeling with latent variables to examine predictive models and causal links, latent growth and growth mixture modeling to examine the course and patterns of change over time). In addition, in the middle adulthood surveys, we gather new information about the respondents' own views about why they stopped or reduced their drug use (contributing to Objective 1k), as well as about drug dependence (in accordance with Objective 8), thus permitting additional strategies for understanding how and why drug use changes during adulthood.

With regard to consequences of drug use, the inclusion of the surveys at ages 35, 40, 45, and 50 provides us with additional "endpoints" from which to consider the potential consequences of adolescent and young adult drug use (strengthening our efforts regarding Objective 7). Not only does this permit us to consider possible "sleeper effects" (i.e., it may take many years and/or the unique experiences of entering middle adulthood for the effects of earlier drug use on health and well-being to become manifest), but the surveys at ages 35, 40, 45, and 50 will also permit us to examine a wider range of longer term social and health consequences. For example, when investigating consequences of adolescent and young adult substance use, the outcomes of interest are often fairly short term in nature (e.g., school grades or dropping out, car accidents caused by intoxicated driving); in contrast, middle adulthood provides us with an opportunity to view the *cumulative* effects of substance use on physical health (e.g., self-reported heart disease and high blood pressure). Recent research has shown that neurological development continues well into late adolescence and early adulthood (e.g., Giedd et al, 1999; Thompson et al., 2000). Because most of this development occurs in the frontal cortex, the development of executive functions like impulse control, planning, and reasoning is particularly vulnerable to the effects of environmental insults during this time. Studies indicate deficits in attention and working memory among adolescent users of marijuana (Jacobsen, Mencl, Westerveld, & Pugh, 2004), and that early onset of cannabis use can produce cognitive deficits that remain even after desistance from use (Pope et al., 2003). After a period of prolonged abstinence, the cognitive deficits produced by earlier recreational use may not be noticeable during early adulthood, but during midlife, when cognitive capabilities become increasingly heterogeneous (Willis & Schaie, 2006), the cognitive deficits caused by young adult drug use may become more apparent. Illicit drugs may continue to have deleterious effects, even following cessation of use. According to recent research, enduring cellular changes occur when drug users move from recreational use toward addiction. The changes in gene expression in the prefrontal cortex associated with use of addictive drugs remain, and even increase following discontinuation of drug use (Kalivas & Volkow, 2005), resulting in lifelong persistence of craving and proclivity towards relapse. Although these ideas apply primarily to addicted individuals, evidence suggests these changes begin during times of recreational use and therefore may apply to individuals who never reach the stage of addiction.

Furthermore, in addition to gathering information on drug *abuse* (which we also obtain in the young adult follow-up surveys), we gather some information regarding drug *dependence*, which will allow us to examine this as a consequence of earlier drug use (contributing to Objectives 7 and 8). Continuing to collect data into midlife will provide us with the opportunity to examine factors that differentiate individuals with early-onset and late-onset drug abuse and dependence. It will also allow us to make use of growth mixture modeling to determine whether the various trajectories of substance use result in different midlife outcomes (Schulenberg, Merline, & O'Malley, 2005).

Epidemiological evidence demonstrates that while minor alcohol problems make their first appearance between ages 18 and 25, major alcohol problems begin to appear between ages 25 and 33 (Schuckit, 1995), and alcohol-related problems occur at later ages for moderate and severe alcoholics (Bucholz et al., 1996). Because there is typically an interval of time between the onset of alcohol use and illicit drug use, it is likely that the problems resulting from illicit drug use follow closely behind those resulting from alcohol use. Therefore, the consequences of adolescent illicit drug use may not become apparent until age 30 and beyond.

Also, given the expanded focus on marital history and parenting practices, we expect to examine these as consequences of earlier drug use. More details about our recent efforts on examining the long-term consequences of adolescent and young adult drug use on middle adulthood functioning and adjustment are provided later when we discuss Objective 7.

Objective 4: To attempt to distinguish among three basic types of change in drug use and related factors at the aggregate level: age, period, and cohort.

This is one of Monitoring the Future's more important objectives in its own right, because the pursuit of a number of the other objectives in this study is influenced in important ways by the accomplishment of this objective. Distinguishing among the three types of change is useful not only in terms of general description and understanding, but also in terms of guiding the scientific search for potential causes (Glenn, 1981a; Schaie, 1994). If a secular trend or period effect is identified, the causes are likely to be broad societal forces occurring contemporaneously. If cohort effects are found, the causes are likely to be events that primarily affect certain cohorts at a particular stage in the life course. Because a cohort effect may be measured some time after the historical events that affected particular cohorts have passed, a search for the historical forces responsible for the observed change must extend to earlier time periods in the life course of the cohort(s). If age effects are found consistently across a number of cohorts, then they likely reflect maturational effects as the result of contemporaneous experiences associated with the developmental period through which respondents are passing, largely because such experiences (e.g., marriage, parenthood, employment) tend to occur for all cohorts at roughly the same age.

If a change is misidentified as to whether it reflects a period, age, or cohort effect, then the search for causes and appropriate interventions is likely to focus on the wrong class of variables, and quite possibly on the wrong historical period. Therefore,

distinguishing among age, period, and cohort effects with considerable accuracy has significance not only for the causal examinations that we conduct, but also for those conducted by other researchers.

In one of NIDA's earliest research monographs, in a discussion about gaps and future directions in drug epidemiology, William McGlothlin stated, "measures of trends, collected in a standard fashion and reported on a regular basis, are one of the most important aspects of drug epidemiology" (1975, p. 255). He also indicated that for broader epidemiological work, "the longitudinal study is essential" (p. 256). But, as a number of investigators have indicated, simple longitudinal studies are not adequate for the demanding task of understanding change in drug use. In 1965, Schaie wrote, "the conventional longitudinal and cross-sectional methods for the study of developmental problems can lead to comparable results only when there are no . . . cultural changes in relation to the variables studied Research strategies are required, therefore, which will permit the unconfounding of the components of developmental change" (p. 106).

In 1972 (two years before MTF was launched), in a similar vein, Baltes and Nesselrode wrote, "Present cultural change . . . appears so rapid and pervasive that results from particular cross-sectional or longitudinal studies are threatened with obsolescence before they can be marketed to the scientific consumer" (p. 244). Speaking of their own findings about cultural change and personality development based on one of the few multicohort designs in the literature, they went on to say, "In our judgment, the study presents convincing evidence that cohort differences play a major role in the development of adolescent personality The present results suggest that the average standing of adolescents on personality dimensions is less dependent on their chronological age than upon the time (cultural moment) at which they are measured" (pp. 253–254).

The cohort-sequential design—that is, one in which "longitudinal sequences for two or more cohorts are examined simultaneously" (Schaie, 1965, p. 97)—has the potential for addressing all of the needs stated above. It quantifies trends by taking measurements in a standard fashion and on a repeated, regular basis; it provides longitudinal studies of multiple cohorts; and it provides the database from which regular maturational changes, period effects (changes observed in all cohorts and ages), and cohort-specific changes can begin to be disentangled. These efforts at disentangling can be applied not only to observed changes in drug use, but also to changes in attitudes, beliefs, and other variables (such as delinquency), and even relationships with other variables (such as delinquency or an unconventional orientation).

Attempts to distinguish among age, period, and cohort effects are usually difficult, and often controversial, because of the inherent confounding among the three "independent" variables. Because any two of the three variables defines the third, there are only two statistically independent effects possible, even though conceptually there are three potentially different factors operating (Schaie, 1994). The analytic methodology is consequently complex. However, it is sometimes possible to discern rather clearly what is happening by inspection of the data (Weinkam & Sterling, 1991). The era from the mid-1960s to the present has been an exceptionally turbulent time in the nation's history with

regard to drug use; as a result, there have been substantial secular trends observed for nearly all drugs. For some years, the secular trends were discernible from the parallel trend lines for multiple age groups over certain historical periods, as are displayed in a number of figures in our annual NIDA-published monographs (Johnston, O'Malley, et al., 2006d, and earlier volumes in that series). Similarly, cohort effects may be fairly obvious from such graphs, as has been true in the case of cigarettes over much of the life of the study, and was also true for marijuana use in the period from about 1992 to 1996.

In the 1990s, we reported cohort effects for most of the illicit drugs for the first time during the life of the study (an exception was that daily marijuana use had exhibited a cohort effect early in the study), as the use of many of these drugs began to rise sharply among adolescents but not among young adults or older adults (Johnston, O'Malley, et al., 2006d). It is clear that something had changed in the culture that was uniquely affecting young people during that historical period, and we discuss under the next objective what some of our hypotheses have been to explain this unusual development.

Sometimes it is necessary to conduct more rigorous kinds of analyses in order to distinguish and quantify the various types of change that may be going on simultaneously. In the 25-year period between 1965 and 1990, there were a number of publications discussing various ways to analyze cohort-sequential data of the kind that Monitoring the Future has been collecting (Adam, 1978; Buss, 1973, 1975; Converse, 1977; Costa & McCrae, 1982; Ferrara, 1990; Fienberg & Mason, 1979; Glenn, 1977, 1981a, 1981b; Labouvie, 1975; Maddox & Wiley, 1976; Mason & Fienberg, 1985; Mason, Mason, Winsborough, & Poole, 1973; Menard, 1992; Osmond & Gardner, 1989; Palmore, 1978; Pullum, 1978; Rodgers, 1982a, 1982b; Schaie, 1965, 1984; Smith, Mason, & Fienberg, 1982; Williams, 1991). Additional efforts were made after 1990, and all of the various techniques were reviewed and compared by Robertson, Gandini, and Boyle (1999). Each technique required some kind of identifying constraints in order to estimate the age, period, and cohort effects simultaneously. We believe that most researchers in this difficult area would agree that cohort analysis is a useful, perhaps necessary, first step, but that a full understanding of the dynamics of change requires the introduction of additional variables to the analysis (Glenn, 2005; Johnson & Gerstein, 2000; Kandel, Griesler, Lee, Davies, & Schaffsan, 2001).

Our own first effort at formally differentiating age, period, and cohort effects was published in the *American Journal of Public Health* in 1984, and an updated effort was published in the same journal in 1988 (O'Malley, Bachman, & Johnston, 1984, 1988). The analyses displayed an impressive variety of change patterns observed among the different drugs in the relatively short interval between 1976 and 1988. Several kinds of *period* effects were evident. Marijuana use increased through 1979, decreasing thereafter. Cocaine use increased through 1980, was constant until 1986, and then declined. Alcohol use declined (monthly prevalence and occasions of heavy drinking).

Increases with *age* in the early years after high school were seen for all measures of cigarette use. The different patterns indicated that there was not much increase in the proportion who were active smokers in the years after high school, but that among those who smoked, a higher proportion became frequent smokers. Alcohol use and annual

prevalence of cocaine increased linearly with age through age 21 and declined thereafter. A measure of occasions of heavy drinking showed a similar increase through age 21, but declined thereafter. Annual and monthly marijuana prevalence followed a similar pattern, peaking at age 21 or 22 and declining thereafter.

Clear *cohort* effects (in this case, high school class cohort) appeared for cigarette use, with successive classes smoking less at all levels, though there may be an important slowing occurring. There may also be small cohort effects for daily marijuana use and daily alcohol use (both measures of use seemed to be declining with successive classes).

We expect to continue these efforts at differentiating among age, period, and cohort effects, but we also are engaged in continuing efforts to understand the causal processes underlying observed changes. As we indicated earlier:

The documentation of these various effects by use of a cohort-sequential design is but one step in the scientific process. It provides a more refined description of a phenomenon, by separating observed changes into several qualitatively different component parts. The next step is the explanation of those component parts, and this requires an analysis of all the causal factors for which year, age, and class are proxies Having a good understanding as to which type of effect accounts for observed change should greatly enhance our ability to focus on the appropriate classes of explanatory variables (O'Malley et al., 1984, pg. 688).

In the more than two decades since the above-quoted statement was written, we have undertaken a wide range of analyses focusing on explanatory variables, as summarized especially in Objectives 5 and 6 below. Our use of the cohort-sequential design to differentiate age, period, and cohort effects has figured importantly in many of those analyses.

Objective 5: To attempt to explain, at the aggregate level of analysis, secular trends and lasting cohort differences in drug use, emphasizing changes in cultural influences, attitudes, beliefs, value orientations, price, and availability as possible explanatory factors.

As indicated in Objective 4, the documentation of any of the three types of change is a first step. The more scientifically interesting enterprise is to determine what factors have been responsible for effecting each type of change identified. The three basic types of change involve different dynamics, and one would expect quite different causal factors to be operating to produce these various types of change.

In terms of explaining aggregate change, the study has contributed to the knowledge base in a number of ways. In examining change over time, we have attempted to distinguish between historical or secular change (common to most age groups), age-associated change (common to most cohorts), and lasting differences between and among cohorts (observable across age). As we discussed earlier, a correct distinction among these alternatives is key to the development of an understanding of *when the change*

occurred and the *types of explanatory variables* likely to account for the change. The study has found and reported all three types of change across the various drugs under study, and has offered and demonstrated explanatory factors for each of the three types of change (e.g., Bachman et al., 2002; Bachman, Wadsworth, O'Malley, Johnston, et al., 1997; Johnston, O'Malley, et al., 2006c and earlier volumes in the same series; O'Malley et al., 1984, 1988; Schulenberg et al., 2000).

In particular, the findings that secular trends in drug use over the past 30 years can be explained by demand-side factors (such as attitudes, beliefs, and peer norms) and not by supply-side factors (such as perceived availability) have policy implications of the broadest order. The fact that cigarette smoking shows strong and lasting cohort-related differences, beginning by early adolescence, has proven critical to policy considerations with regard to that behavior. (A number of other findings from the study regarding smoking have also proven critical to policy considerations.)

Although supply-side factors could not explain secular trends as well as demand-side factors, that does not mean that supply factors are not important. Price is likely to be one important factor in determining use of drugs, and MTF data were instrumental in providing some empirical support for the role of price in affecting use of marijuana (Pacula et al., 2001). A problem with attempting to assess the role of price in determining use is that there are no good measures of price. Moreover, the potency (or purity) of substances like marijuana, cocaine, and heroin have changed substantially over the last 30 years, and these changes should be taken into account in assessing the real price, or price per "high," although adequate measurement of these factors is often lacking. Accessibility of substances is also likely to be an important factor in determining use. Although changes in accessibility, or perceived availability, of marijuana and cocaine did not appear to explain much of the change in use of those drugs, it may be that increased efforts at restricting access to tobacco for young adolescents will have some salutary effect, perhaps as much from the symbolism of that action as the actual interruption of accessibility. Changed availability was likely an important factor in the decline in use of LSD observed after 2000. The Drug Enforcement Administration shut down a major LSD-producing laboratory in late 2000, and that seemed to disrupt supply sufficiently to affect use.

One particular change that we were able to identify as being a primarily secular trend (and not a cohort or age effect) was the change between 1979 and about 1990 in marijuana use. In the case of marijuana use, and in the more specific case of daily marijuana use, we concluded that much of the explanation was due to related attitudes, specifically, perceived risk of harm of regular marijuana use and personal disapproval of regular marijuana use. We arrived at this interpretation after evidence of their temporal covariation cumulated (Johnston, 1982, 1985; Johnston, O'Malley, & Bachman, 1984; Johnston et al., 1991a), and after careful consideration of various other possibilities, as detailed in Bachman, Johnston, O'Malley, and Humphrey (1986).

A similar secular trend occurred with respect to cocaine use in the latter half of the 1980s—a decline that occurred in multiple age groups in the same time interval. Again, we concluded that much of the explanation was due to perceived risk of harm, this

time the risk associated with cocaine use, even occasional use. We documented the bases for the conclusion in some detail in Bachman, Johnston, and O'Malley (1990a), and Johnston (1991a) pointed out that the changed belief translated into changed behavior only when the belief was relevant to the type of behavior in which the respondents were likely to engage (i.e., experimental or occasional use of cocaine). This finding is quite consistent with the Health Belief Model.

Another change occurred in cigarette smoking: there appeared to be a clear cohort effect, at least through the class of 1986, wherein each successive class smoked at lower rates at each grade level than the preceding class. We attributed the effect, in large part, to the addictive properties of cigarette smoking. If, for whatever reasons, a given age cohort achieved a different rate of smoking at a given age compared to earlier age cohorts, that difference would persist. The question of what caused a different rate to occur is one that is clearly of great scientific interest; the identification of the effect as a cohort effect helps suggest what kinds of variables should be examined. In this specific case, the reduction in advertising of cigarettes on television and radio, which occurred in 1971, could be implicated. Earlier cohorts (the senior classes of 1975 to 1977, born in 1957 to 1959) were exposed to explicit modeling of smoking behaviors in advertising when they were at the impressionable ages of 10 to 13. Later cohorts might have been less inclined to initiate smoking because there was less explicit modeling of the behavior. Such a process would be expected to generate a cohort effect, if one assumes that the behavior will persevere, once initiated. More recent cohorts (through the mid- to late 1980s) showed rather little decline. The great increase in advertising in the print media and various forms of promotion since the mid-1970s has been suggested by us as one possible reason for the lack of further decline in smoking (Johnston, 1985) and for the subsequent increases in smoking after 1991 (Johnston, O'Malley, et al., 2006c, and earlier volumes). Whatever the factors, the identification of a clear cohort effect improves the chances of making proper scientific inferences about the operative causal factors, in part because it guides the search for relevant factors to an earlier historical period rather than the period that might be considered if a secular trend were assumed.

During the early and mid-1990s, marijuana use increased, particularly among young Americans. We attribute this increase to a cohort effect because the increase was seen primarily among adolescents rather than among young adults. In fact, the study showed that the turnaround started first among 8th graders (in 1991). This unusual overall pattern of change strongly suggested that the educating and socializing influences that reached earlier cohorts were not reaching more recent cohorts of children. MTF documented that the perceived risk of various drugs declined during the mid- and late 1990s at each grade level. These findings led to an expansion of our theoretical approach by positing "generational forgetting" of the dangers of drugs. We believe that generational forgetting can be a predictable and important cause of a relapse phase in an epidemic. (Generational forgetting simply means that young people at a given time do not know or appreciate the consequences of drug use to the extent that their predecessors did—that such knowledge has not been maintained across cohorts. Presumably the younger cohorts did not have some experiences or opportunities for learning about the dangers of drugs as they aged that their predecessors did.)

In interpreting the increases in use, we offered a number of explanatory hypotheses (usually with some substantiating evidence):

- (1) There was less chance for vicarious learning from observing the consequences suffered by users, because there were so many fewer users in recent years.
- (2) Young people in recent years heard many fewer cautions about drug use (national news coverage of the issue dropped over 90% between 1989 and 1994; advertisement placements by the Partnership for a Drug-Free America [PDFFA] dropped by about 25% over the same interval; and federal funding for Drug-Free Schools and Communities declined by 40–50% between 1992 and 1995, after adjustments for inflation).
- (3) Parents from the drug generation were discussing drugs less with their children (surveys conducted for the PDFFA provided these data), perhaps because they felt hypocritical telling their children not to do what they themselves did.
- (4) There was some “reglamorizing” of drugs (data collected by the PDFFA indicate there had been a rise in prodrug lyrics and modeling by rock stars, and unpublished data from the MTF study showed that teens *perceived* a large and growing use of illicit drugs among key role-model groups—particularly rock musicians).
- (5) The rise in the number of teens smoking cigarettes may have contributed to the rise in the number using marijuana, because these two behaviors are strongly and sequentially associated.

If these interpretations are correct, the implications for prevention are dramatic. Because the informal sources of learning are diminished after a major downturn in use, compounded by society dropping its attention to the issue, the need for planned and systematic teaching about the consequences of drug use becomes greater if a newer and more naive generation of young people is to be spared its own epidemic. Put a different way, after each period of substantial decline, the seeds of a new epidemic are sown (absent any planned intervention), because the hazards of drugs are forgotten; and after each expansion of an epidemic, the seeds of the next decline are sown because the hazards will once again become visible. In continuing the MTF study, specifically the integrated cohort-sequential design, we will maintain in place a social observatory from which we will be able to examine this hypothesis with regard to other drugs and new historical eras.

The third kind of effect is developmental, which deals with individual changes as opposed to aggregate group changes. Developmental effects will be discussed later, primarily under Objective 6.

Objective 6: To examine at the individual level of analysis the natural history of drug use and related factors from early adolescence through middle adulthood, and to attempt to explain age and social role effects on the initiation, maintenance, and cessation of drug use.

General developmental theoretical orientation. In addressing this and related etiological objectives, we draw extensively from advances in human developmental theory in life-span psychology and life-course sociology over the past few decades. Although there is not one unified, agreed-upon developmental theory, there has been growing consensus about the need to consider the dynamic interplay between active individuals and active social contexts in conceptualizations and studies of human development (Baltes, Lindenberger, & Stausinger, 2006; Bronfenbrenner & Morris, 2006; Cairns, 2000; Cicchetti, 2006; Elder & Shanahan, 2006; Lerner, 2006; Sameroff, 2000). Furthermore, while the points of entry into the study of human development are typically different for life-course and life-span studies (e.g., social structure and roles versus intraindividual phenomena, respectively), reflecting their respective origins in sociology and psychology, the two converge more than they diverge on such key issues as dynamic person–context interactions, cultural and historical embeddedness, multidirectional change, and lifelong development (e.g., Lerner, 2006; Settersten, 2003). More generally, the concern with these issues reflects a developmental science perspective (e.g., Cairns & Cairns, 2006; Cairns, Elder, & Costello, 1996; Magnusson & Stattin, 2006), a broad framework that emphasizes holistic considerations of developing individuals in changing contexts, and advocates that the study of development is best advanced by interdisciplinary efforts.

The perspective that guides much of our etiologic work is consistent with the broad interdisciplinary developmental science framework that emphasizes multidimensional and multidirectional developmental change across the life course, characterized by successive and dynamic mutual selection and accommodation of individuals and their contexts (Baltes, 1987; Baltes et al., 2006; Elder, 1996; Elder & Shanahan, 2006; Lerner, 1982, 2006; Sameroff, 1987). Humans are considered to play a strong active role in their own development, and social and physical environments are viewed as also playing strong active roles (Brandtstädter & Lerner, 1999; Bronfenbrenner & Morris, 2006; Caspi, Lynam, Moffitt, & Silva, 1993; Lerner, 1982, 2006; Scarr & McCartney, 1983; Sameroff, 2000). Through a process of niche selection, individuals select contexts and activities from differing ranges of options based on personal characteristics, beliefs, interests, and competencies. Selected ecological niches then afford various opportunities (Bronfenbrenner & Morris, 2006; Lerner, 2006; Nurmi, 2004; Scarr & McCartney, 1983). This progressive accommodation suggests the qualities of coherence and continuity that appear to describe much of human development. But consistent with an emphasis on dynamic person–context interactions and multidirectional change, development is not necessarily expected to exhibit a smooth and progressive function, and early experiences may not always have strong or lasting effects (e.g., Cairns, 2000; Cicchetti, 2006; Lewis, 1999; Loeber & Stouthamer-Loeber, 1998). Thus, both continuity and discontinuity are anticipated across the life course.

Our emphasis on the conditions and mechanisms of continuity and discontinuity is informed by essential themes that have emerged from life-course and life-span scholarship, specifically the notion of behavioral trajectories across life, and how various developmental transitions relate to those trajectories, including how transitions can serve as turning points (Baltes et al., 2006; Elder & Shanahan, 2006; Graber & Brooks-Gunn, 1996; Laub & Sampson, 1993; Pickles & Hill, 2006; Rutter, 1996; Settersten, 2003). In addition, we draw from broader life-course developmental themes about interindividual (and inter- and intracohort) variation in life-course trajectories and social-role transitional experiences, the interplay of distal and proximal experiences and events, linked lives, and the cultural and historical embeddedness of the life course (Elder & Shanahan, 2006; Settersten, 2003; Shanahan, 2000). In recent work, we have also drawn from a developmental psychopathology framework that highlights resilience, the functionality of deviance and difficulties, and the heterogeneity in course, causes, and consequences of difficulties (equifinality and multifinality) (e.g., Cicchetti, 2006; Cicchetti & Rogosch, 2002; Graber, 2004; Masten, 2001; Pickles & Hill, 2006; Sameroff, 2000). Additional discussion of the broad developmental science framework that guides much of our etiologic work can be found in some of our recent conceptual and review articles and chapters (e.g., Schulenberg, 2006; Schulenberg & Maggs, 2002; Schulenberg, Maggs, et al., 2003; Schulenberg, Sameroff, & Cicchetti, 2004; Schulenberg & Zarrett, 2006).

The conceptualization and study of the developmental course of drug use. A major component of MTF is description and explanation of the developmental course of drug use from adolescence through young adulthood and into middle adulthood. As just discussed, our approach is conceptually and methodologically informed by relevant epidemiological, etiological, developmental psychopathology, and life-course and life-span developmental literatures, a combination that reflects a commonly advocated interdisciplinary perspective in the relevant substance use theoretical and empirical work (e.g., Brook et al., 1990; Brook, Adams, Balka, & Johnson, 2002; Brook, Balka, Rosen, Brook, & Adams, 2005; Brown & Tapert, 2004; Burton, Johnson, Ritter, & Clayton, 1996; Catalano & Hawkins, 1996; Catalano et al., 2005; Chassin, Hussong, et al., 2004; Chassin et al., 2003; Clayton, 1992; Collins & Ellickson, 2004; Costello & Angold, 2006; Fromme, 2006; Glantz & Hartel, 1999; Glantz & Leshner, 2000; Grant, Harford, & Grigson, 1988; Hawkins, Van Horn, & Arthur, 2004; Hartka & Fillmore, 1989; Hu, Davies, & Kandel, 2006; Jessor et al., 2006; Kandel, 1998; Kellam & Rebok, 1992; Pandina, Labouvie, & White, 1984; Pandina & Johnson, 1999, 2005; Richardson, Newcomb, Myers, & Coombs, 2002; Schulenberg & Maggs, 2002; Schulenberg, Maggs, & Hurrelmann, 1997b; Schulenberg, Maggs, Steinman, et al., 2001; Sloboda, 2005; Tucker, Ellickson, Orlando, & Klein, 2006; Warner & White, 2003; White, Pandina, & Chen, 2002; Wiesner & Windle, 2006; Windle, 1988; Windle & Davies, 1999; Zucker, 1989, 1994, 2006). That is, within the opportunities and constraints of the ongoing Monitoring the Future project, we focus on stability and change in drug use and related factors from adolescence through middle adulthood, and on the developmentally and contextually linked causes and correlates of initiation, maintenance, cessation, and abstinence.

Much theory development and longitudinal research over the past few decades has been devoted to understanding the course of drug use during adolescence and young

adulthood as well as to determining the risk factors for, and protective factors against, such drug use. See, for example, edited books by Galanter (2005), Glantz and Hartel (1999), Glantz and Pickens (1992), Jessor (1998), Kandel (2002), Kaplan (1995), and Sloboda (2005), and review and theoretical articles by Brook and Brook (1996); Brown and Tapert (2004); Catalano et al. (2005); Chassin, Hussong, et al. (2004); Clayton (1992); Dodge et al. (2006); Hawkins, Catalano, and Miller (1992); Hops et al. (2000); Maggs and Schulenberg (2005); Mayes and Suchman (2006); O'Malley et al. (2004); Pandina and Johnson (2005); Petraitis et al. (1995); Schulenberg and Maggs (2002); Schulenberg, Maggs, Steinman, et al. (2001); Szapocznik and Coatsworth (1999); Weinberg, Rahdert, Collier, and Glantz (1998); and Zucker (2006). The particular importance of these and related topics to the health and well-being of the nation's young people, as well as the conceptual and analytic complexities of the issues involved, underscore the necessity for continuing such etiological efforts. MTF contributes uniquely and significantly to these efforts. In particular, the combination of the cohort-sequential design (which permits the separation of age effects from cohort-specific and historical ones) along with large national samples makes for a close-to-ideal method for describing and interpreting typical long-term developmental change in drug use, in addition to atypical patterns of change. The size of the follow-up samples, particularly when the lack of cohort and secular trend effects permits concatenation across the panels, also allows for consideration of change in important subgroups as well as some focus on heavy users (contributing to Objective 8). The long-term multiwave panels spanning adolescence through middle adulthood provide an important vantage point for delineating how the various developmental transitions across the life course influence changes in drug use (see also Objective 3).

Although the study of developmental change in drug use is one of the most exciting features of the Monitoring the Future project, we recognize that the study of developmental change is perhaps the most complex and unwieldy of endeavors within the social-behavioral sciences (e.g., Cronbach & Furby, 1970; Hertzog & Nesselroade, 2003; Nesselroade, 1992; Nesselroade & Baltes, 1979; Nesselroade & Ghisletta, 2000; Schulenberg et al., 2003). At the same time, the cohort-sequential longitudinal design of the project remains the state-of-the-art design for studying change and decomposing the various causes of change. Several analytic advances over the past decade or so (as represented in, e.g., Arminger, Clogg, & Sobel, 1995; Bergman, von Eye, & Magnusson, 2006; Bollen & Curran, 2006; Bryant, Windle, & West, 1997; Collins, 2006; Collins & Horn, 1991; Collins & Sayer, 2001; Duncan, Duncan, & Strycker, 2006; Gottman, 1995; Marcoulides & Schumacker, 1996; Muthén & Muthén, 2000; Raudenbush & Bryk, 2002; Rose, Chassin, Presson, & Sherman, 2000; Singer & Willett, 2003; von Eye, 1990) have facilitated our approach to studying change.

The MTF multicohort national panels. The longitudinal feature of the MTF research design has been a central part of much of our recent analyses and writing, and will continue to be central in the future. There are now longitudinal data on 30 panels from the classes of 1976 through 2005 followed into 2006. These panels have been maintained to age 31–32 with the annual data collections (i.e., seven biennial follow-up surveys—note that beginning in 2002, we stopped the biennial young adult surveys at ages 29–30, i.e., through six biennial follow-up surveys), and to ages 35, 40, 45, and 50

(proposed) with half-decade data collections using middle adulthood surveys. New panels will be added for each future graduating class participating in the study. In addition, we continue the annual national cross-sectional surveys of 8th and 10th graders (began in 1991), and these combined with the annual surveys of 12th graders permit a cross-sectional examination of age differences in the correlates of drug use across the adolescent period. Furthermore, we followed random subsamples of three cohorts of initial 8th graders (in 1991–1993) into young adulthood (through age 24), and these national panels permit a longitudinal consideration of risk and protective factors from middle adolescence into young adulthood. The long-term aspect of the panels is one of the most important features of the longitudinal component of MTF, allowing the longer term investigation of both the etiology and consequences of drug use. As discussed below, there are several other noteworthy features of the MTF panel data.

These data comprise a rare and valuable resource, namely, longitudinal data on drug use and related factors among broadly representative national and multicohort samples of adolescents and adults. Most of the other earlier longitudinal samples either have not been national in scope or have been less broadly representative; for example, the Youth in Transition series on the class of 1969 and the O'Donnell et al. (1976), Burton et al. (1996), and Robins' (1978) studies were all national, but contained only males. An excellent study of the epidemiology and etiology of delinquent behavior and drug use by Elliott et al. (1985, 1989) covered comparatively fewer birth cohorts (seven) and fewer cases (about 1,725). Over the past few decades, there have been a large number of scientifically valuable longitudinal studies concerning drug use; very few of these, however, have been national in scope. There are exceptions, including the National Longitudinal Survey of Youth (<http://www.bls.gov/nls/>) and the National Longitudinal Study of Adolescent Health (Add Health, <http://www.cpc.unc.edu/addhealth>). While excellent studies, neither is focused primarily on drug use, and more importantly, neither uses a cohort-sequential design. (Because so many new longitudinal studies were launched over the past decade, and because there are many others not known as “drug studies” but which nonetheless include longitudinal data on substance use like the two studies mentioned above, the relevant studies are too numerous to list in any sort of comprehensive way here; such studies are illustrated throughout this occasional paper, especially within the current section on Objective 6.)

Of course, many of the aims of longitudinal studies do not require nationally representative samples, and in the relevant literature, there are many excellent illustrations of the power of longitudinal research involving more regional studies. Kandel (1975), for example, identified and described a modal pattern of stages in the unfolding of drug-using behavior among American adolescents. While based on a sample of two adjacent birth cohorts (10th and 11th graders in 1971) from a single state (New York), the findings are likely to be valid for most American youth over the last few decades. She has extended the longitudinal span of the study through young adulthood and into middle adulthood, providing considerable information on the patterns of drug use from adolescence through adulthood (e.g., Chen & Kandel, 1995; Kandel, 1988; Kandel et al., 1990, 1992; Kandel & Chen, 2000; Kandel & Logan, 1984; Kandel, Simcha-Fagan, & Davies, 1986; Kandel & Yamaguchi, 1993, 1999; Yamaguchi & Kandel, 1984a, 1984b). Treating illicit drug use as part of a larger constellation of

problem behaviors, along with such other behaviors as delinquency and early sexual experience, Jessor and Jessor (1977, 1978, 1984) have demonstrated through longitudinal analysis how illicit drug use among adolescents is part of a sequential pattern of problem behaviors. Their ongoing longitudinal research has continued to investigate the structure and predictors of problem behavior through adolescence into young adulthood (e.g., Donovan & Jessor, 1985; Donovan, Jessor, & Costa, 1999; Jessor et al., 2006; Jessor, Donovan, & Costa, 1991, 1996). Again, although most of this research has been based on a sample of a few cohorts of young people in one state (Colorado), these findings seem likely to hold more generally. Using the Rutgers Health and Human Development Project sample drawn in New Jersey, Labouvie, Bates, and Pandina (1997) showed that illicit drug use and heavier alcohol use are, regardless of age of onset, adolescence-limited phenomena for most individuals. Additional research from this group has extended these findings in terms of describing and explaining the longitudinal course of licit and illicit drugs (e.g., Labouvie & White, 2002; White, Bates, & Buyske, 2001; White et al., 2002, 2005). Again, although based on only a few cohorts in one state, these findings are likely to hold more generally.

Thus, these and other regionally based longitudinal studies have made and will continue to make major and complementary contributions to our understanding of developmental changes in drug use during adolescence and young adulthood. There remain, however, certain distinct advantages to having at least some longitudinal studies based on large nationally representative samples. One advantage is the possibility to examine variation on several potentially relevant factors, such as region of the country, urbanicity, social class, ethnic background, and so on. If such variables have main effects (which most of them do in relation to drug use) or interaction effects, these would be missed in analyses of a sample in which they do not vary. As suggested by our broad-based conceptual framework discussed above and in Part 1, this emphasis on “social address” variables is a critical feature in the attempt to gain a more contextually sensitive (and more realistic, we believe) understanding of the developmental course of drug use (e.g., Biglan, 1995; Brook, Gordon, Brook, & Brook, 1989; Chassin, Hussong, et al., 2004; Hawkins et al., 2004; Pandina et al., 1984; Schulenberg & Maggs, 2002; Szapocznik & Coatsworth, 1999).

Another advantage of a longitudinal study of a broad population base is the possibility to draw a comparable sample from a comparable population at a later time, permitting comparison of the longitudinal patterns and relationships observed in the earlier cohort with those in the later one. Without the ability to replicate the population from which a representative sample is drawn, it is not possible to determine whether observed changes are due to differences in the populations studied at the two points in time, to real changes in maturational trends and relationships, or to both. For example, because Youth in Transition was based on a representative national sample of a male cohort, we are able to compare longitudinal findings from it with those from males in the Monitoring the Future project. Had either of these studies been a purposive or convenience sample, however, such comparisons would be far more difficult—perhaps impossible—to interpret reliably. Of course, this capability has also been a critical feature of our nationally representative college samples over the years, and will continue to be so as the demographics of the college population continue to change.

The importance of studying cohort differences has been highlighted recently by research on emerging adulthood. Arnett (1998, 2000, 2004; Arnett & Tanner, 2006) conceptualizes emerging adulthood as a relatively new period of the life span between ages 18 and 25 (though sometimes extending through the 20s), which is characterized in part by demographic changes in young people's transition experiences. Cohort-sequential longitudinal samples allow consideration of such historic shifts in experiences across the life span. For example, given the marriage effect that we and others have found (e.g., Bachman, Wadsworth, O'Malley, Johnston, et al., 1997; Bachman et al., 2002; Leonard & Homish, 2005), an important question is the extent to which this effect remains in place as the age at first marriage continues to increase (Schulenberg & Zarrett, 2006).

Still another advantage of large, national, cohort-sequential longitudinal samples is that they permit panel analyses of some subgroups which comprise fairly small fractions of the population (e.g., daily marijuana users)—both because of the large samples, and because we can concatenate across a number of cohorts to increase sample size. Of course, this would be easiest when there are no secular trends taking place in the drug under study; however, it is also possible for analyses to include adjustments for such secular trends. By focusing on important subgroups of drug users in our national sample, say frequent binge drinkers or daily marijuana users, we are in a position to offer important data regarding the overall and subgroup-specific epidemiology and etiology of drug use. That is, we can determine (a) the proportional size of the given subgroup, and (b) whether the causes and consequences of drug use in that group vary vis-à-vis the population at large (cf. Schulenberg, O'Malley, Bachman, Wadsworth, & Johnston, 1996; Schulenberg, Wadsworth, O'Malley, Bachman, & Johnston, 1996; Schulenberg, Maggs, Steinman, et al., 2001; Schulenberg, Merline, Johnston, et al., 2005). In fact, we have oversampled active drug users in high school for inclusion in the follow-up samples from the beginning, including current daily marijuana users.

In addition to the other benefits of having several cohorts represented (as discussed under Objectives 4 and 5), having panel data on several cohorts readily permits cross-validation (again, in the absence of secular trends), increasing the generalizability of the identified developmental patterns and trends. This cross-validation capacity proved important in our recent emphasis on social role and environmental effects on drug use during the transition to young adulthood (Bachman, Wadsworth, O'Malley, Johnston, et al., 1997; Bachman, Wadsworth, O'Malley, Schulenberg, et al., 1997; Bachman et al., 2002, in press). In particular, as discussed further below, we were able to offer strong conclusions regarding the impacts of engagement, marriage, and divorce, as well as school success and difficulties, on changes in drug use. Sometimes, however, not all developmental patterns cross-validate, and to the extent that these reflect systematic cohort effects, then we are able to offer data on changes in developmental patterns as a result of social change. For example, in examining developmental patterns of drug use and well-being during the first few years out of high school, we found shifts over the past decade to suggest that the transition to young adulthood has become more difficult (Schulenberg et al., 2000).

The Monitoring the Future project is broad, not only in terms of population and cohorts, but also in terms of drug-related substantive domains, a breadth that corresponds

to our multifaceted conceptual framework discussed in Part 1. While we tend to refer to drug use measures as the dependent variables in our analyses, as discussed under Objective 1, many other factors are proposed for examination in MTF, including attitudes about use, beliefs about the harmfulness of drugs, exposure, availability, peer attitudes, reasons for use, social contexts of use, and the social connotations of use. Whether or not one uses different drugs, and the intensity of one's use, depends to some extent on how supportive one's psychosocial context is toward drug use (e.g., the number and types of parties one attends, perceived norms of friends). What has not received much attention until recently (e.g., Bachman et al., 2002), however, is how the elements of the psychosocial context of drug use may change during adolescence and into young adulthood and beyond (cf. Fromme, 2006; Kandel et al., 1990; Newcomb & Bentler, 1988; Schulenberg & Maggs, 2002). Because of the broad content of the instrument package, we can examine longitudinally the developmental changes in numerous relevant contextual and psychological variables, and relate such changes to changes in drug use.

The importance of having this array of variables present over time can be illustrated in relation to the classic issue of cessation of drug use. O'Donnell et al. (1976, p. 69) advanced lack of peer support as at least a partial explanation for why some men discontinue their use of illicit drugs, an explanation consistent with other findings (e.g., Johnson & Kaplan, 1990; Oetting & Beauvais, 1987). The notion is that some individuals were willing to experiment with drugs as long as some of their friends were using, but, as fewer of their friends were using, there was less support for their own use. Ultimately they discontinued use, suggesting that a change in exposure to friends' use of drugs leads to a change in drug use. (Of course, the reciprocal causation, or a combination of both, is equally tenable.) Nevertheless, changes in a number of other variables could also lead to changes in drug use; for example, changes in attitudes and beliefs, or changes in availability of drugs. It is thus valuable to be able to study, longitudinally, all these factors as well as drug use itself, and the breadth of content contained in these instruments allows for this kind of study. Changes in these factors, associated with entering different types of environments and role statuses, can be examined as possible explanations for associated changes in actual use. Indeed, after our intensive analysis effort to examine changes in drug use as related to social role changes during young adulthood (Bachman, Wadsworth, O'Malley, Johnston, et al., 1997; Bachman, Wadsworth, O'Malley, Schulenberg, et al., 1997), we then examined more closely the explanatory processes by focusing on changes in a wide variety of person and contextual characteristics during the transition to young adulthood (Bachman et al., 2002). In a recent effort, we examined selection and socialization mechanisms involved with substance use and fraternity and sorority membership among college students; we found that movement into and out of fraternities/sororities was associated with increases and decreases, respectively, in substance use (McCabe et al., 2005).

Approaches to understanding individual-level change and stability in drug use. Methodologically, there have been many advances in the analysis of developmental change over the past two decades (e.g., Bergman, et al., 2006; Bollen & Curran, 2006; Bryant et al., 1997; Collins, 2006; Collins & Horn, 1991; Collins & Sayer, 2001; Duncan, et al., 2006; Gottman, 1995; Muthén & Muthén, 2000; Nagin, 2005; Raudenbush & Bryk, 2002; Rose et al., 2000; Singer & Willett, 2003), and these advances will continue to

inform our analytic approaches to addressing the etiologic objectives of MTF. Indeed, there are many options available for analyzing multilevel effects and individual-level change, and we will continue to use multipronged approaches, taking care to match the appropriate strategy with the given research questions, and to compare alternative strategies when advantageous for addressing our objectives (e.g., Schulenberg & Maggs, 2001; Schulenberg, Wadsworth, et al., 1996). One key ongoing issue will be the consideration of missing data (e.g., Allison, 2003; Graham, Hofer, Donaldson, MacKinnon, & Schafer, 1997; Graham, Hofer, & Piccinin, 1994; Hedeker & Rose, 2000; Schafer, 2001; Schafer & Graham, 2002). We have used, and will continue to use, a variety of approaches. We have utilized multiple imputation programs including NORM (Schafer, 1997), IVEWARE (Raghunathan, Solenberger, & VanHoewyk, 2000), and SAS Procedure MI. We also utilize state-of-the-art versions of EQS and *Mplus*, which have incorporated missing data procedures in their current editions (EM-ML in the former, FIML in the latter).

Three additional points about our approach to understanding change and stability at the individual level over time are noted here. *First*, the difficulties and complexities of panel analyses are more than offset, we believe, by the richness and importance of detail gained. To illustrate, both cross-sectional and longitudinal data would likely provide similar evidence that the prevalence of drug use increases during adolescence and peaks during the transition to young adulthood. Nevertheless, the cross-sectional data would not permit a consideration of the stability of individual differences. For example, without longitudinal assessment, we do not know whether an individual who uses more cocaine than his or her peers during adolescence continues to use comparatively more cocaine during and after the transition. Indeed, with only cross-sectional prevalence rates, it is not possible to determine whether the peak that occurs during young adulthood represents: (a) a generalized, relative increase and subsequent decrease in drug use for many individuals, with individual differences remaining very stable during and after the transition (e.g., those who used drugs more than their peers continued to do so); (b) a blending of several change patterns, with individual differences being unstable during and after the transition; or (c) a combination of the two patterns, with individual differences being unstable during but stable after the transition. Each of these patterns has quite different implications regarding the epidemiology and prevention of drug use. Only with longitudinal data can they be examined. Indeed, for both binge drinking and marijuana use, we have found that Pattern “b” just described best represents the panel data during young adulthood (Schulenberg, O’Malley, Bachman, Wadsworth, & Johnston, 1996; Schulenberg, Maggs, Long, et al., 2001; Schulenberg, Merline, Johnston, et al., 2005; Jackson, Sher, & Schulenberg, 2005).

Second, because stability and change over time can be viewed in a variety of ways, several approaches to analyses are needed to understand the natural history of drug use. As alluded to above, a consideration of both mean-level change over time, as well as the stability of individual differences over time, provides important and distinct information. The advantages of a multivariate approach over time are numerous. In particular, a multivariate approach permits consideration of structural relations within and across time, and especially the use of structural equation modeling (SEM) techniques (EQS, LISREL, *Mplus*). We have used these techniques extensively to consider, for

example, causal (or at least temporal) relations between educational success and substance use (Bachman et al., in press; Bachman, Schulenberg, et al., 1990; Bryant, Schulenberg, Bachman, O'Malley, & Johnston, 2000; Schulenberg et al., 1994) and part-time work and substance use (Safron, Schulenberg, & Bachman, 2001). (For other SEM examples, including longitudinal and cross-sectional ones, see Olmstead, Guy, O'Malley, & Bentler, 1991; O'Malley & Bachman, 1983; O'Malley, Bachman, & Johnston, 1983; Osgood et al., 1988, 1996; Pilgrim et al., 2006). We will continue to use SEM techniques in future analyses of cross-sectional and longitudinal data.

Although SEM techniques are well suited for developing and testing models of causal patterns (or at least temporal precedence) with longitudinal quasiexperimental data, it is important not to overlook their power in simply *describing* what occurs in relationships among variables over time. Particularly with the inclusion of the 8th and 10th graders, structural equation modeling techniques can be useful in describing the underlying structural changes among constellations of variables (e.g., perceptions of drug-related norms) that may occur over time. For example, drawing from Werner's (1957) orthogenetic principle (i.e., "whenever development occurs, it proceeds from a state of relative lack of differentiation to a state of increasing differentiation, articulation, and hierarchic integration" [p. 126]), it may be the case that there is little differentiation among perceptions of different drugs at 8th grade, and that these perceptions become more differentiated (and hierarchically integrated) over time. Similarly, as we have noted elsewhere, components of deviance appear to become differentiated during the transition to young adulthood (Osgood et al., 1988; see also Newcomb & Bentler, 1988; Newcomb & McGee, 1991). Confirmatory factor analysis techniques are ideally suited to test this possible developmental progression (cf. Baltes & Nesselroade, 1973; Schulenberg, Shimizu, Vondracek, & Hostetler, 1988).

Although we have traditionally taken a "variable-centered" approach to understanding change over time, there are some advantages to complementing this with a "pattern-centered" or "person-centered" approach (e.g., Bergman et al., 2006; Magnusson, 1988; Magnusson & Bergman, 1988; von Eye, 1990), as has become common in the relevant drug use literature (e.g., Chassin, Presson, Sherman, & Edwards, 1991; Chassin, Pitts, & Prost, 2002; Colder et al., 2001; Ellickson, Marino, & Collins, 2004; Flory, Lynam, Milich, Leukefeld, & Clayton, 2004; Hill, White, Chung, Hawkins, & Catalano, 2000; Labouvie, Pandina, & Johnson, 1991; Muthén & Muthén, 2000; Nagin, 1999; Oesterle et al., 2004; Orlando, Tucker, Ellickson, & Klein, 2005; White et al., 2002; Windle & Wiesner, 2004). One way to do this, as discussed further under Objective 6b, involves developing typologies of developmental trajectories (or dynamic typologies, as described by Huizinga, 1995), which provide, for example, a way to examine change simultaneously in the dependent and independent variables, something that can be fairly cumbersome with traditional variable-centered approaches. We have considered this pattern approach in analyses concerning, for example, marijuana use and binge drinking during the transition to young adulthood (Schulenberg, Maggs, Long, et al., 2001; Schulenberg, Merline, Johnston, et al., 2005; Schulenberg, O'Malley, et al., 1996; Schulenberg, Wadsworth, et al., 1996). In our ongoing efforts, this approach will be useful in efficiently tracking, for example, the developmental trajectories of frequent and heavy illicit drug users and polydrug users over time.

In addition, pattern-centered analyses can be used to identify groups of individuals who are similar to each other within time on a set of variables. This can be done with either continuous variables (using cluster analysis, see Bergman, Magnusson, & El-Khoury, 2003; Ensminger & Juon, 1998) or categorical variables (using latent class analysis, see e.g., Lanza & Collins, 2006; Lanza, Flaherty, & Collins, 2003). We have used cluster analysis in recent analyses (e.g., Messersmith & Schulenberg, 2005), and will continue to use this approach, extending it over time (e.g., Bergman et al., 2006). Building on latent class analysis, latent transition analysis, in which covariates are used to predict a transition from one latent class to another longitudinally, is a very useful way to examine issues of change over time (e.g., Hyatt & Collins, 2000), particularly in terms of drug use sequencing (e.g., Collins, 2002), and we intend to use this technique in our planned analyses of drug use onset, sequencing, duration, and desistence.

Another way to examine differential change patterns, as well as to examine change simultaneously in dependent and independent variables, is represented by the latent growth curve modeling (LGCM) approach (e.g., Bollen & Curran, 2006; McArdle, 1988; Meredith & Tisak, 1990; Muthén, 1991; for recent illustrations see, e.g., Curran, 2000; Curran, Harford, & Muthén, 1996; Del Boca, Darkes, Greenbaum, & Goldman, 2004; Duncan & Duncan, 1994, 1995, 1996; Duncan et al., 2006; Muthén & Muthén, 2000; Stoolmiller, Duncan, Bank, & Patterson, 1993; White et al., 2005; Wills, Yaeger, & Sandy, 2003; Windle, 2005). Briefly, in this approach, the shapes of change over multiple waves (e.g., linear, quadratic, cubic) are conceptualized as latent variables, and individual differences in these shapes can be predicted with other time-varying and static constructs; likewise the latent growth curves (say in marijuana use over eight waves) can be used to predict consequences, with the implication being that it is not so much initial level of marijuana use that contributes to negative consequences, but rather the pattern of marijuana use over time (see Objectives 3 and 7). We have used this LGCM approach recently to examine, for example, spousal effects on the course of drug use (Merline et al., submitted); the consequences of the course of substance use on subsequent substance use disorders (Schulenberg, Merline, & O'Malley, 2005; Zucker et al., 2006); and correlated slopes among substance use, problem behaviors, and other difficulties during the transition to adulthood (Schulenberg, Jager, & O'Malley, 2006).

The recent applied extension of LGCM, known as growth curve mixture modeling (e.g., Muthén, 2001; Muthén & Muthén, 2000; for recent illustrations see, e.g., Chassin et al., 2002; Hix-Small, Duncan, Duncan, & Okut, 2004; Orlando et al., 2005; Stanton, Flay, Colder, & Mehta, 2004; White et al., 2001; Wiesner & Windle, 2004), permits the consideration of different categories of change patterns over time (allowing for within-category random effects) and is thus useful for determining the different types of change patterns (an empirical counterpoint to the more conceptual pattern-centered approach described above). In a recent set of growth mixture modeling analyses, MTF panel data were used to examine the comorbidity of cigarette and alcohol (Jackson, Sher, & Schulenberg, 2005) and alcohol and marijuana use (Jackson, Sher, & Schulenberg, submitted). We have also been conducting growth mixture modeling analyses to determine patterns of change in marijuana and other drug use during young adulthood as a function of adolescent risk and protective factors, and we look forward to continuing to utilize this technique. We recognize, of course, that LGCM is just one of the approaches

under the broader category of random effects models (e.g., Bauer, Preacher, & Gil, 2006; Laird & Ware, 1982; Raudenbush, 2001) that take into account intraindividual change over time. Another related approach is hierarchical linear modeling (HLM) (e.g., Bryk & Raudenbush, 1992; Raudenbush & Bryk, 2002; Raudenbush, Bryk, Cheong, & Congdon, 2000; Raudenbush & Chan, 1993), and we look forward to continuing to apply appropriate random effects models to the MTF panel data.

The *third* and final point that is equally relevant to the use of variable- and pattern-centered approaches is the superiority of multiple waves of data. Although it certainly increases the complexity of the analyses, employing more than two waves of panel data is necessary for addressing many questions (but certainly not all or even most questions) concerning change and stability over time in general (e.g., Rogosa, 1979) and the natural history of drug use during adolescence and early and middle adulthood in particular (Schulenberg et al., 2003). In addition, having more than two waves of data may facilitate the examination of the processes that underscore causal relationships over time as illustrated in our work (e.g., Bachman et al., in press) and that of others (e.g., Newcomb & McGee, 1991). Furthermore, three or more waves are particularly useful when attempting to delineate age-specific patterns vis-à-vis secular trends and cohort effects (e.g., see O'Malley et al., 1988), and to examine the causes and effects of age of drug use initiation and cessation (cf. Rutter, 1988).

Risk and protective factors. Before discussing the subobjectives concerning change in drug use during the secondary school and post-high school years, it is useful to briefly consider our emphasis on the specification of multiple risk and protective factors in understanding the etiology of drug use during adolescence and young adulthood, a perspective that follows from our conceptual framework summarized above and earlier in Part 1. Recent extensions of this work combine an understanding of the natural history of drug use, a wealth of available contextual as well as drug use variables, and new approaches to longitudinal data analyses. As discussed above, in a series of chapters and articles, we have put forth a developmental-contextual conceptual framework that emphasizes the key features and advantages of a developmental perspective on substance use etiology and prevention during adolescence and young adulthood. Using MTF (and other) data, we illustrated the importance of examining substance use in relation to developmental tasks and transitions, as well as individual trajectories of substance use and related factors over time (Maggs & Schulenberg, 2005; Schulenberg & Maggs, 2001, 2002; Schulenberg, Maggs, Long, et al., 2001; Schulenberg, Maggs, et al., 2003; Schulenberg, Maggs, Steinman, et al., 2001; Schulenberg, O'Malley, et al., 2000; Schulenberg & Zarrett, 2006). Some common themes across these papers include an emphasis on multidirectional change (e.g., diverging and converging trajectories of substance use over time); concern with more interactive and time-varying relations among risk factors and substance use; an understanding of how major developmental transitions (and major changes in social roles and contexts) relate to changes in health risks; and an emphasis on alternative analytic strategies that permit description and explanation of individual trajectories of substance use and related factors using multiwave panel data. This evolving framework, which has drawn heavily on earlier MTF analyses, has been useful in many of the recent and new MTF empirical papers.

The focus on risk and protective factors, a focus drawn largely from the epidemiology and developmental psychopathology literatures (e.g., Anthony & Cohler, 1987; Bowie, Ensminger, & Robertson, 2006; Catalano et al., 1996; Cicchetti, 1999, 2006; Cicchetti & Rogosch, 2002; Clark & Cornelius, 2004; Costello & Angold, 2006; Dodge et al., 2006; Garmezy, 1985, 1988; Glantz, 1992; Glantz & Hartel, 1999; Glantz & Leshner, 2000; Kellam & Rebok, 1992; Mayes & Suchman, 2006; Rolf, Masten, Cicchetti, Nuechterlein, & Weintraub, 1990; Rutter, 1979, 1988, 1990; Sloboda, 2005) has become of increasing interest to those conducting research on adolescent drug use (e.g., Barnes, Welte, Hoffman & Dintcheff, 2005; Blackson & Tarter, 1994; Brook et al., 1990; Brook et al., 2005; Brook, Whiteman, Finch, & Cohen, 1995; Bry, McKeon, & Pandina, 1982; Chassin et al., 2002; Chassin, Hussong, et al., 2004; Clayton, 1992; Clayton, Leukefeld, Donohew, & Bardo, 1995; Costa et al., 2005; Curran & Chassin, 1996; Dielman, Schulenberg, & Weinberg, 1993; Felix-Ortiz, Villatoro Velázquez, Medina-Mora, Newcomb, 2001; Fromme, 2006; Glantz & Leshner, 2000; Glantz & Pickens, 1992; Hansen & O'Malley, 1996; Hawkins, Catalano, & Miller, 1992; Hawkins et al., 2004; Jessor et al., 2006; Kaplan & Johnson, 2001; Kogan, Luo, Murry & Brody, 2005; Kumpfer & Turner, 1990; McCabe et al., 2005; Newcomb, 1992, 1997; Newcomb & Bentler, 1986a; Oetting, 1992; Pilgrim et al., 2006; Rhodes & Jason, 1990; Schulenberg et al., 1994; Schulenberg, O'Malley, et al., 1996; Schulenberg, Merline, Johnston, et al., 2005; Sher, Walitzer, Wood, & Brent, 1991; Tucker et al., 2003; Warner & White, 2003; Weinberg et al., 1998; Wills et al., 2004; Windle & Wiesner, 2004; Windle & Windle, 2005; Zucker, 1989, 1994). Risk and protective factors refer to those elements in the individual, the social context, and the interaction between the individual and the social context, that alter the likelihood of drug use and related behaviors (e.g., Brook et al., 1990; Costa et al., 2005; Dielman et al., 1993; Glantz, 1992; Hawkins et al., 2004; Sameroff, 2006; Sameroff, Peck, & Eccles, 2004). Given specific constellations of risk and protective factors, it would be possible to characterize individuals as vulnerable to (i.e., at risk for) or resilient to drug use.

Clearly, the focus on both risk and protective factors is important. Although many protective factors (e.g., good school performance) may appear to be simply the opposite of risk factors (e.g., poor school performance), suggesting a redundancy in terminology and conceptualization, such is not necessarily the case (e.g., Clayton, 1992; Hawkins, Catalano, & Miller, 1992; Maggs & Schulenberg, 2005; Rutter, 1990; Schulenberg & Maggs, 2002; Schulenberg, Maggs, Steinman, et al., 2001). To illustrate, although few would argue that avoiding long-distance running is a risk factor for cigarette use, long-distance running may well be viewed as a protective factor against cigarette smoking. Risk and protective factors can also be viewed as operating differently within an interactive framework (e.g., Brook et al., 1990; Brook, Nomura, et al., 1989; Brook, Whiteman, Finch, et al., 1995; Rutter, 1990; Sameroff, 2006; Szapocznik & Coastworth, 1999). For example, some protective factors against illicit drug use (e.g., self-efficacy) may operate regardless of whether certain risk factors are present, whereas others (e.g., teacher or coach serving as a strong role model) may operate only (or may be more powerful) in the presence of specific risk factors (e.g., father absence). Indeed, as we found in regard to risk factors for increased binge drinking during the transition to young adulthood, some risk factors (e.g., low self-efficacy) appear unconditional, whereas others (e.g., low conventionality) depend on one's initial level of drinking (Schulenberg,

Wadsworth, et al., 1996). In addition, as Brook et al. (1990) effectively demonstrate, viewing risk and protective factors over time permits consideration of how early risk factors can be ameliorated by later protective factors.

Also, consistent with our conceptual framework discussed in Part 1 and above in this subsection, a risk and protective factor perspective engenders a broader, more complex, more realistic, and ultimately more useful perspective on the etiology of drug use (Clayton, 1992; Schulenberg & Maggs, 2002; Schulenberg, Maggs, Steinman, et al., 2001). For example, by focusing on a multitude of risk and protective factors, it becomes much easier to acknowledge that the causes of drug use are multiple and not necessarily always additive or overlapping (e.g., Brook et al., 1990; Bry et al., 1982; Hawkins et al., 2004; Hawkins, Catalano, & Miller, 1992; Newcomb, 1992; Weinberg et al., 1998). Indeed, having only a few risk factors for drug use may not make an individual vulnerable to drug use (Clayton, 1992; Newcomb et al., 1986); likewise, a complete lack of risk factors may not make an individual resilient against drug use—it would leave one untested and thus may actually make one vulnerable if and when later risk factors appear (Rutter, 1990; Schulenberg, Maggs, Steinman, et al., 2001). By focusing on protective factors, more emphasis is placed on understanding why some individuals do *not* use drugs (see, e.g., Baumrind & Moselle, 1985; Dielman et al., 1993; Perry & Jessor, 1983), an emphasis that is certainly important in guiding prevention and asset-building efforts (Lerner, 2001).

Finally, in terms of examining risk and protective factors from a developmental perspective, we have found it useful to focus on the health risks and opportunities engendered by the several developmental transitions that occur from adolescence through adulthood (Schulenberg & Maggs, 2002; Schulenberg, Maggs, Steinman, et al., 2001). That is, in addition to a focus on individual, contextual, and interactional risk and protective factors, it is also important to view developmental or “ecological” transitions (cf. Bronfenbrenner, 1979) as increasing or decreasing one’s vulnerability to drug use (Szapocznik & Coastworth, 1999). In particular, various developmental transitions (e.g., school transitions, romantic involvement transitions, cognitive and self-image transitions) can be viewed as composites of risk and/or protective factors (e.g., Graber & Brooks-Gunn, 1996; Schulenberg & Maggs, 2002; Schulenberg, Maggs, & Hurrelmann, 1997a). For example, the transition to junior high school could contribute to increased drug use for a variety of reasons, including: (a) the transition increases stress levels and overwhelms coping capacities, (b) the transition decreases the match between individual needs and contextual affordances, (c) the transition increases exposure to a wider and older range of peers, and/or (d) the transition is accompanied by changing norms regarding the appropriateness of drug use; in contrast, other transitions (e.g., into marriage) work in a protective fashion by, for example, increasing the match between individual desires and contextual affordances and/or decreasing norms about excessive drug use (Schulenberg et al., 1997a). This focus on developmental transitions as increasing and decreasing one’s vulnerability to drug use corresponds closely with our findings regarding social role transitions during the transition to young adulthood (e.g., Bachman et al., 2002; Bachman, Wadsworth, O’Malley, Johnston, et al., 1997; Bachman, Wadsworth, O’Malley, Schulenberg, et al., 1997).

Objective 6a: To assess during the *secondary school* years the impact of individual characteristics (e.g., values, beliefs, lifestyles, and other behaviors such as delinquency, school performance, and religiosity) and social contexts (e.g., part-time work, sports and other extracurricular activities, activities outside of school, peer groups) on drug use and related factors, with particular emphasis on the specification of risk and protective factors.

The Monitoring the Future project has had a synergistic emphasis on understanding both the epidemiology and etiology of drug use during adolescence and young adulthood. Efforts to understand the etiology of drug use are greatly enhanced by cross-sectional and longitudinal data from the 8th- and 10th-grade students. (As we discussed previously, national 8th- and 10th-grade surveys began in 1991, and random subsamples of the 1991–1993 eighth graders have been followed into young adulthood.) In particular, these national cross-sectional and panel data sets based on adolescents will help to provide answers to questions concerning: (a) causal influences during adolescence, (b) distinctions between causes/correlates of drug use and initiation versus drug use maintenance, (c) distinctions between causes of experimentation with drug use versus more long-term involvement with drug use, (d) variations in the causes, correlates, and consequences of drug use as a function of age of initiation, and (e) sequencing of drug use. In short, we will be able to understand adolescent drug use within the broader context of adolescent development (and more generally life-span development), a perspective that we and others believe is essential (e.g., Baumrind & Moselle, 1985; Brook et al., 1990; Catalano et al., 2005; Chassin, 1984; Chassin, Hussong, et al., 2004; Clayton et al., 1995; Hawkins, Catalano, & Miller, 1992; Hawkins et al., 2004; Kandel, 1985; Kaplan & Johnson, 2001; Labouvie et al., 1991; Newcomb & Bentler, 1988; Pandina & Johnson, 1999, 2005; Petraitis et al., 1995; Schulenberg, 2006; Schulenberg & Maggs, 2002; Schulenberg, Maggs, & O'Malley, 2003; Schulenberg, Maggs, Steinman, et al., 2001; Szapocznik & Coatsworth, 1999; Windle & Davies, 1999; Zucker, 2006).

The understanding of the antecedents and etiology of drug use during adolescence has commanded much conceptual and empirical attention, especially over the past decade or so. The enormous literature base on this subject is certainly too large for any attempt at a comprehensive review here. Less than three decades ago, Kandel (1978b) was able to encompass as chapters in a single volume the then limited number of longitudinal studies. Since that time, the number of relevant longitudinal studies has expanded dramatically (many of which are discussed and cited throughout this paper). The various studies have established or confirmed the importance for the prediction of drug use during adolescence of a considerable array of demographic and family background characteristics, attitudes, other personality characteristics, earlier problem behaviors and academic difficulties, peer behaviors, and various other characteristics of the social context. In deciding upon the substantive foci of the 8th- and 10th-grade surveys, we have drawn extensively from the many important advances that have occurred in this relevant literature (as well as from our findings regarding salient predictors of drug use based on high school seniors and young adults); at the same time, with the unique strengths of the MTF national cross-sectional and longitudinal components, we are hopeful that our findings can help advance this literature.

In the discussion of Objective 1, we looked at several individual and social environmental characteristics (and the relevant literature concerning each) that will continue to serve a dual role in consideration of both the epidemiology and etiology of drug use. Because of the desirability of surveying the 8th and 10th graders with a shorter instrument, not every social indicator is included in these adolescent samples. Of those considered in Objective 1, the following are included in our analyses to determine their part in the etiology of, and abstention from, drug use during adolescence: (a) perceived risk of different levels of use of various drugs, (b) personal disapproval of different levels of use of various drugs, (c) perceptions (social connotations) concerning cigarette smokers, (d) exposure to peer drug use (including felt peer pressure to use), (e) availability of various drugs, (f) social and physical contexts of drug use, and (g) reasons for not using marijuana. In addition, the sequencing of drug use, both prior to the 8th grade (using retrospective data concerning grade at first use) and during high school (using the prospective longitudinal data), is also considered. There are several other individual and social environmental characteristics that are included in the adolescent data, and thus can be included in our analyses to specify the risk and protective factors of drug use. Next, we briefly consider a few of these characteristics.

Educational commitment and success. One of the more powerful domains of influence on adolescent drug use is educational commitment and success. Because of this, we included a wide range of relevant items in the 8th- and 10th-grade base year and follow-up surveys, such as grades, school track, college plans, hours spent on homework, school enjoyment, truancy, expulsion and suspension, grade retention, trips to the principal's office, difficulties in completing assignments, and dropping out of school. With the 1991–1993 eighth-grade panels, we are in a position to examine how educational success and failure, including dropping out, relate to drug use; indeed, as we discuss further below, this topic is the subject of our most recent book (Bachman et al., in press).

Decades of research indicate that students who are successful in school and committed to continuing their education are less likely to be involved in deviant or health-compromising behaviors. In particular, the evidence is clear that these students are less likely to be users of cigarettes, alcohol, or illicit drugs during high school (e.g., Bachman, O'Malley, & Johnston, 1978; Bachman et al., in press; Barnes & Welte, 1986; Brook, Nomura, et al., 1989; Bryant et al., 2000; Bryant, Schulenberg, O'Malley, Bachman, & Johnston, 2003; Carvajal et al., 2004; Chassin, 1984; Clayton, 1992; Donovan & Jessor, 1985; Duncan et al., 1998; Eggert & Herting, 1993; Ellickson, Tucker, Klein & Saner, 2004; Fergusson, Horwood & Beauvais, 2003; Galambos & Silbereisen, 1987; Hawkins, Catalano, & Miller, 1992; Hundleby, 1985; Johnston, 1973; Kandel, 1980; Kaplan, 1985; Kasen, Cohen, & Brook, 1998; Newcomb & Bentler, 1986a; Perkins & Borden, 2003; Schulenberg et al., 1994; Simons-Morton, 2004; Tucker et al., 2003; White et al., 2002; Windle, Mun, & Windle, 2005; Zimmerman & Schmeelk-Cone, 2003). The interconnections between substance use and educational indicators such as grade point average (GPA), perceived school success, college plans, and truancy are complex and have been subject to a variety of causal interpretations.

The evidence indicates that school difficulties precede substance use, at least temporally, if not also causally (e.g., Bachman et al., in press; Brunswick & Messeri, 1984; Bryant et al., 2000, 2003; Ellickson, Tucker, et al., 2004; Engel, Nordlohne, Hurrelmann, & Holler, 1987; Gerber & Newman, 1989; Johnston, 1973; Kandel, 1980; Kaplan, 1985; Safron et al., 2001). In particular, we (Bryant et al., 2000) developed and tested competing conceptual models concerning the causal relations among school misbehavior, academic achievement, and cigarette use during middle adolescence. Using the MTF 8th-grade panel data, we found through a series of structural equation models that the predominant direction of influence was from school experiences to substance use: school misbehavior and low academic achievement contributed directly and indirectly to increased cigarette use over time. These findings, which were robust across gender and ethnicity, suggest the importance of early substance use prevention efforts focused on reducing school misbehavior and academic failure. We have extended these findings in our recent book as described below (Bachman et al., in press).

Among several of the explanations offered for this phenomenon of substance use being influenced by school- and academic-related factors, one common conceptualization is that substance use emerges as a response, either directly or indirectly via association with substance-using peers, to the frustrations of poor school performance (e.g., Chassin, Mann, & Sher, 1988; The Consortium on the School-Based Promotion of Social Competence, 1994; Johnston, 1973; Kandel, 1980; Kaplan, 1985; Kaplan & Johnson, 2001; Labouvie, 1986; Silbereisen & Noack, 1988). Another common conceptualization is that both poor school performance and subsequent substance use reflect a more general pattern of behavior that may signal difficulties in psychosocial functioning and adjustment (Hurrelmann, 1990), including unconventionality (Donovan & Jessor, 1985; Huba & Bentler, 1982; Jessor, Turbin, & Costa, 1998), lack of institutional bonding (e.g., Elliott et al., 1989; Hawkins, Lishner, Jenson, & Catalano, 1987; Hirschi, 1969), or dissatisfaction with perceived future opportunities (e.g., Brunswick & Messeri, 1984; Engel et al., 1987). Consistent with these two general conceptualizations is the notion that school success serves to protect the adolescent against substance use, perhaps through increasing self-esteem or reinforcing school bonding (e.g., Hawkins et al., 1987; Hawkins, Catalano, & Miller, 1992; Hundleby, 1985). A third common conceptualization, which makes reference to “precocious development,” is that non-college-bound adolescents may be anticipating an earlier entrance into adulthood roles, and using drugs and alcohol may be viewed as facilitating this process (e.g., Bachman & Schulenberg, 1993; Bachman et al., in press; Newcomb & Bentler, 1988; Silbereisen & Noack, 1988).

There is some evidence, of course, indicating that substance use may also contribute to school difficulties (e.g., Brook, Nomura, & Cohen, 1989; Ellickson, Tucker et al., 2004; Ellickson, Tucker, & Klein, 2001; Galambos & Silbereisen, 1987; Newcomb et al., 2002) as well as dropping out of high school (e.g., Friedman, Bransfield, & Kreisher, 1994; Krohn, Thornberry, Collins-Hall, & Lizotte, 1995; Mensch & Kandel, 1988a; Newcomb & Bentler, 1986a), and suggesting that substance use may contribute to decrements in motivation or academic functioning (cf. Baumrind & Moselle, 1985). Some of our research suggests that substance use and educational commitment/success

influence each other in a negative reciprocal fashion over time during adolescence, each serving to reinforce the other (Safron et al., 2001).

Our most recent book (Bachman et al., in press) set out to disentangle some of these competing explanations for the education–drug use connections. Monitoring the Future’s panel data collection from those who were 8th graders in 1991, 1992, and 1993 provided at least four advantages for addressing the gaps in the relevant literature: (a) it began tracking students before dropping out occurred, facilitating the consideration of causal relationships; (b) it obtained multiple waves of data, making it possible to consider causal links over time; (c) it oversampled 8th graders who were likely to become dropouts, ensuring a sufficiently large sample; and (d) because of the oversampling of poor school performers, it provided a panel comparison group of those who did not drop out, but nonetheless had poor grades and other hallmarks of inadequate school bonding, permitting more accurate estimation of the causes and consequences of dropping out versus doing poorly in school. The book employed multiple analysis methods, including bivariate descriptive tables and figures, multiple regression analysis, multiple classification analysis, and structural equation modeling. The structural equation analysis began with a fairly extensive modeling of the academic attainment process, first taking account of exogenous factors (race/ethnicity, family background, parental involvement) as well as early educational setbacks (grade retention, suspension, or expulsion), then adding grades, college plans, later educational setbacks, and dropping out, using data from modal ages 14, 16, and 18 to predict academic attainment (years completed) by age 22. The academic attainment model was then expanded, first to include measures of general delinquency at ages 14, 16, and 18, and then further to include use of substances (cigarettes, alcohol, marijuana, and cocaine) at ages 14, 16, and 18. The key findings from the book are: (a) educational successes and failures evident by age 14, along with their prior causes, show a considerable influence on delinquent behaviors in general and on substance use in particular, whereas (b) any impacts of substance use on subsequent educational outcomes are much more limited. The impacts of educational experiences are strongest and longest lasting for cigarette use, most notably among dropouts, reflecting the fact that once smoking is firmly established it is among the most difficult forms of substance use to stop. Alcohol use, by way of contrast, is negatively linked to educational success at age 14, but actually positively linked during the college years—reflecting college living environment effects that essentially disappear by the later 20s (as illustrated by brief analyses of data from 12th-grade panels included in the new book, and documented in detail in our earlier book, Bachman, Wadsworth, O’Malley, Johnston, et al., 1997).

Finally, in terms of school-related risk and protective factors, it is important to consider possible interactive effects, particularly in terms of how school risk and protective factors interrelate. Bryant, Schulenberg, O’Malley, Bachman, and Johnston (2003) considered how early school experiences influenced the course of substance use from ages 14 through 20. Based on growth curve analysis using hierarchical linear modeling (HLM) with four waves from the MTF 8th-grade panel data, we found that school misbehavior and peer encouragement of misbehavior at age 14 were positively associated with initial substance use and increased substance use over time; school bonding, school interest, school effort, academic achievement, and parental help with

school were negatively associated. Of particular importance, positive school attitudes were protective factors for those adolescents with low academic achievement.

Parents and peers. Parents represent a powerful source of influence on adolescent drug use. In considering the many ways in which parents influence adolescent drug use and problem behaviors in general (e.g., Barnes et al., 2005; Baumrind, 1985; Brook, Balka, & Whiteman, 1999; Brook, Nomura, et al., 1989; Brook, Whiteman, Balka, et al., 1995; Collins & Laursen, 2004; Dishion & McMahon, 1998; Dodge et al., 2006; Duncan, Duncan, & Hops, 1996; Duncan et al., 2006; Fromme, 2006; Guo, Hill, et al., 2002; Hawkins et al., 1986; Hawkins, Catalano, Morrison, et al., 1992; Hyatt & Collins, 2000; Jessor et al., 2006; Kandel, 1980; Murray & Perry, 1985; Oetting & Donnermeyer, 1998; Simons et al., 1988; Simons-Morton, 2004; Tucker et al., 2003; White et al., 1986; Wills et al., 2004; Wu & Kandel, 1995), the most important protective factors appear to be parental monitoring and nurturance (e.g., Ary et al., 1999; Barnes, Farrell, & Banerjee, 1994; Biglan et al., 1995; Blackson & Tarter, 1994; Brook et al., 1990; Chassin et al., 2005; Fromme, 2006; Hill et al., 2005; Johnson & Pandina, 1991; Kumpfer & Turner, 1990; Schulenberg, 1996; Steinberg, 1987; White, Johnson & Buyske, 2000), as well as parent–adolescent communication and concordance regarding norms and values (e.g., Baumrind, 1987; Chassin et al., 2005; Dielman, 1994; Kandel, 1980; Peterson et al., 1994; Turner, Irwin, & Millstein, 1991).

While positive parenting practices are viewed as strong protective factors against substance use during adolescence, key questions remain about the moderators and mediators of parenting effects on substance use. Using MTF cross-sectional 8th- and 10th-grade data, Pilgrim et al. (2006) examined the mediating effect of school and peer factors on the parental involvement–substance use link, and the moderating effect of gender and ethnicity on these relations. Structural equation modeling analyses revealed that school success and peer involvement were partial mediators of parental involvement and risk taking on drug use. Multigroup analyses showed much similarity across gender and ethnic subgroups in these relations.

Peers also represent very powerful sources of influence on adolescent drug use (for reviews, see e.g., Chassin, Hussong, et al., 2004; Clayton, 1992; Clayton et al., 1995; Dodge et al., 2006; Ellickson, Bird, Orlando, Klein, & McCaffrey, 2003; Hawkins, Catalano, & Miller, 1992; Kandel, 1985; Oetting, 1992; Weinberg et al., 1998), sometimes competing against the protective force of parents (e.g., Brook et al., 1990; Duncan, Duncan, & Hops, 1994; Silbereisen, Petersen, Albrecht, & Kracke, 1989), and other times working in conjunction with parental influences to increase or decrease the adolescent’s vulnerability to drug use (e.g., Biglan et al., 1995; Brown et al., 1997; Dishion et al., 1995; Wills et al., 2004). In fact, early and middle adolescence is when parents and peers begin to “trade places” in terms of their influence on individuals (e.g., Bailey & Hubbard, 1990; Collins & Laursen, 2004; Ellickson, Marino, et al., 2004; Steinberg & Silverberg, 1986).

With respect to the influence of peers, one theoretical position is that unstructured socializing with peers in the absence of authority figures engenders opportunities for deviant behavior. The presence of peers makes deviant acts, including drug use, easier

and more rewarding; the absence of authority figures reduces the potential for social control; and the lack of structure leaves time available for deviant behavior. This “routine activities” perspective guided analyses of five waves of data from the MTF sample (Osgood et al., 1996). Results showed that participation in routine activities (e.g., riding in a car for fun, spending evenings out for fun, visiting with friends, going to parties) was strongly associated with delinquent behavior, heavy drinking, marijuana use, and use of other illicit drugs (see also Safron et al., 2001). Further, participation in routine activities accounted for a substantial portion of the association of these deviant behaviors with age, gender, and socioeconomic status.

Several items in our 8th-, 10th-, and 12th-grade surveys permit us: (a) to address a variety of topics relevant to parental influences, peer influences, and the interaction of parental and peer influences on adolescent drug use; and (b) importantly, to determine whether parental and peer influences vary as a function of historical time (i.e., secular trends or cohort effects).

Rebellious and delinquent behavior. Other robust covariates of drug use during adolescence include rebellious and delinquent behavior. There is a large amount of literature on the relationship between drug use and delinquent, antisocial, and criminal behavior (for reviews and conceptual overviews, see e.g., Clayton, 1981; Clayton & Tuchfeld, 1982; Elliott, 1993; Hawkins, Catalano, & Miller, 1992; Jessor, 1998; Kaplan, 1995; Kaplan & Johnson, 2001; Kellam, Rebok, Wison, & Mayer, 1994; Loeber, 1990; Newcomb & Locke, 2005; Patterson, DeBaryshe, & Ramsey, 1989; Weinberg et al., 1998; Zucker, 1994). Several longitudinal investigations (to name just a few: Bailey et al., 2006; Brook, Whiteman, & Finch, 1992; Brook, Whiteman, Balka, et al., 1995; Brook et al., 2005; Dishion et al., 1995; Donovan & Jessor, 1985; Donovan, Jessor, & Costa, 1988; Elliott et al., 1985, 1989; Guo, Chung, et al., 2002; Huba & Bentler, 1982; Johnson & Pandina, 1991; Johnston, 1973; Johnston, O’Malley, & Eveland, 1978; Kandel, Simcha-Fagan, et al., 1986; Kaplan et al., 1986; Mason & Windle, 2002; White et al., 1986; Wiesner & Windle, 2006; Windle et al., 2005; Windle, 1990) have confirmed the association between drug use and delinquent or criminal behavior. Analysis of the MTF young adulthood longitudinal panels demonstrated that this relationship is best conceived as reflecting an underlying propensity toward deviance, as a number of others have argued, rather than as reflecting some causal paths either from drug use to delinquent behavior, or vice versa (Osgood et al., 1988). In some of our earlier work reporting on two different national cohorts of males (Johnston & O’Malley, 1978; Johnston et al., 1978), we found that an index of illicit drug use (as well as each illicit drug taken individually) was positively correlated with self-report indexes of theft and vandalism and of interpersonal aggression, the latter index showing a considerably stronger relationship. Based on our analyses of the time sequences involved, we concluded that the delinquency was not caused by the drug use, but rather that the drug use was likely an age-related expression of a tendency toward deviance, a conclusion that matches our most recent analyses of this and other longitudinal relationships (Bachman et al., in press). Jessor and Jessor (1977, 1978) have made a similar point in their longitudinal work with high school and college students, but others have questioned whether there might in fact be some causal connection (e.g., Clayton, 1981), and still others question this common etiology explanation (e.g., Elliott, 1993; White, 1991). Analyses of the MTF

adolescent panel data will continue to shed some light on these issues of causal relationships, building upon the relevant and long-term panel studies of adolescents and young adults listed earlier, on whom both drug use and delinquency measures exist (Schulenberg, Jager, et al., 2006; Schulenberg & Zarrett, 2006).

Selected personality characteristics. Decades of research, including some of our own research, have documented the importance of personality influences on drug use during adolescence and young adulthood. Consistent with the relevant literature, we consider personality characteristics in broad terms, and include personality and behavioral attributes (e.g., Block, Block, & Keyes, 1988; Brook, Whiteman, Gordon, & Cohen, 1986; Chassin, Hussong, et al., 2004; Mayes & Suchman, 2006). Several personality domains have consistently been found to relate to alcohol and other drug use: (a) antisociality/alienation (e.g., Block et al., 1988; Brook, Cohen, Whiteman, & Gordon, 1992; Crocker et al., 2005; Jessor & Jessor, 1977), (b) low conventionality (e.g., Brook, Brook, Arencibia-Mireles, Richter, & Whiteman, 2001; Chassin et al., 1991; Jessor et al., 1991; Kogan et al., 2005; Newcomb & Bentler, 1988), (c) low personal control orientation (e.g., Chassin, Flora, & King, 2004; Jessor et al., 1991; Newcomb & Harlow, 1986; Sadava & Thompson, 1986; Schulenberg, Merline, Johnston, et al., 2005; Schulenberg, O'Malley, et al., 1996; Vangsness, Bry, & Labouvie, 2005), and (d) risk taking and sensation seeking (e.g., Baskin-Sommers & Sommers, 2006; Bates & Labouvie, 1995; Baumrind, 1987; Chassin, 1984; Crawford, Pentz, Chou, Li, & Dwyer, 2003; Donohew et al., 1991; Kelly et al., 2005; Martin & Robbins, 1995; Newcomb & McGee, 1991; Pilgrim et al., 2006; Wills, Vaccaro, & McNamara, 1994; Windle, 1994). Evidence regarding the link between self-esteem and substance use is equivocal (e.g., Kaplan, 1985; Labouvie & McGee, 1986; Newcomb & Bentler, 1986b; Schulenberg, Bryant, et al., 2004), and limited evidence suggests an inverse relationship between identity (e.g., relating to purpose in life) and substance use (e.g., Newcomb & Harlow, 1986). One individual-level characteristic that has not received much attention, but still may hold promise in terms of understanding the etiology of drug use during adolescence, is future orientation. As part of the normative developmental processes and tasks (e.g., increased capacity for hypothetical thinking, contextual presses), thoughts and plans about the future become more salient during middle and late adolescence (e.g., Lewin, 1939; Nurmi, 1991, 2004), and a lack of future orientation (for whatever reasons, ranging from lack of perceived opportunities to lack of interest) may have some impact on, and in turn be influenced by, drug use during adolescence (e.g., Brunswick & Messeri, 1984; Engel et al., 1987). Our adolescent panels include data on each of these potentially important individual characteristics, and although some may not prove robust in main effects models, consistent with our above discussion on risk and protective factors, they may prove robust in some interactive models.

Part-time work. A final domain of potential influence on adolescent drug use that we will discuss here is part-time work. Part-time work during adolescence had long been viewed as a panacea, curing everything from the limitations of formal schooling to the difficulties in the transition to young adulthood (e.g., National Commission on Youth, 1980; Staff, Mortimer, & Uggen, 2004). Over the past decade or so, there have been several important challenges to this positive view of part-time work, most notably a series of studies (some of which were longitudinal) conducted by Greenberger and Steinberg

and their colleagues (e.g., Greenberger & Steinberg, 1986; Steinberg & Dornbusch, 1991; Steinberg, Fegley, & Dornbusch, 1993; Steinberg, Greenberger, Garduque, Ruggiero, & Vaux, 1982), in which work intensity (i.e., number of hours worked per week) was found to contribute to an increase in drug use (see also, e.g., Largie, Field, Hernandez-Reif, Sanders, & Diego, 2001). Other researchers, most notably Mortimer and colleagues (e.g., Finch, Mortimer, & Ryu, 1997; Leventhal, Graber, & Brooks-Gunn, 2001; Mortimer, Finch, Shanahan, & Ryu, 1990; Mortimer & Staff, 2004), have questioned the causal direction between long hours and drug use (see also, e.g., Breslin & Adlaf, 2005; Johnson, 2004; Staff & Uggen, 2003). In general, although our findings from the senior year samples have shown a positive relationship between work intensity and drug use (Bachman, Bare, & Frankie, 1986; Bachman, Johnston, & O'Malley, 1981b), our findings suggest that the part-time work intensity may be more a concomitant rather than a cause of drug use (Bachman & Schulenberg, 1993, 1999; Schulenberg & Bachman, 1993; see also Entwisle, Alexander, & Olson, 2000; Mortimer & Johnson, 1998). Using data from several cohorts of the MTF 8th, 10th, and 12th graders, Safron, Schulenberg, and Bachman (2001) found evidence supporting two mechanisms by which work intensity and substance use are related: (a) time trade-off (long hours at work interfere with time for more developmentally beneficial experiences, contributing to substance use as coping); and (b) precocious development (substance use and long hours of work are part of a constellation of behaviors in younger adolescents that are more normative for older adolescents). Additional analyses covering 8th- and 10th-grade students, as well as those in 12th grade, include a "wishing to work" measure introduced in some MTF questionnaire forms beginning in 1992 (Bachman, Safron, Sy, & Schulenberg, 2003). The analyses show that simply wishing to work long hours is correlated (positively) with substance use; moreover, among younger students (many of whom do not work while in school), the desires for long hours of work are more strongly linked with substance use than are actual hours of work. These findings, plus analyses in the latest book (Bachman et al., in press), suggest that most of the link between long hours of part-time work and substance use reflects prior causes, such as educational failure and disengagement. In other words, although working long hours while a student may contribute to problems, the desire and (later) decision to work such long hours can also be a symptom of pre-existing problems. We have recently begun a line of new analyses to try to address more fully the causal connections between part-time work and substance use (Staff, Osgood, Schulenberg, Bachman, & Messersmith, 2006).

Recent special topic analyses on risk and protective factors. A strength of the MTF design is that we can not only examine the relationship between risk and protective factors at a given time, but also consider the extent to which those relationships change over time. Building on earlier MTF analysis (Bachman, O'Malley, & Johnston, 1980), as well as other studies (e.g., Donovan et al., 1999), Brown, Schulenberg, Bachman, O'Malley, and Johnston (2001) examined whether risk and protective factors for substance use are consistent across historical time, based on analyses of MTF data from high school seniors from the classes of 1976 through 1997. The analyses showed a relatively high degree of consistency across time, as well as some consistency across four substances (cigarettes, alcohol, marijuana, and cocaine). Consistent negative correlates of substance use (i.e., protective factors) were religiosity and high grades; consistent positive correlates (i.e., risk factors) were truancy and frequent evenings out for fun and

recreation. There were some noteworthy inconsistencies, however, especially concerning college plans, parental education, region, and urbanicity, underscoring the need for continued consideration of how the relationships between risk factors and drug use are shifting historically. Many of these subgroup trends are now displayed graphically for all three grades in a Web-based occasional paper (Johnston, O'Malley, et al., 2006a).

In a related analysis, we focused on changes in daily smoking rates among high school seniors across two decades (1976–1995), and found that shifts were more likely to occur among seniors classified as “high risk” (based on such risk factors as GPA, truancy, evenings out, and religious commitment). This general “elasticity” in daily cigarette rates runs contrary to general wisdom and suggests that preventive efforts should not exclude the high-risk segment (An, O'Malley, Schulenberg, Bachman, & Johnson, 1999).

Finally, we have begun to pursue questions concerning resilience in terms of why some adolescents seemingly at risk for substance use do not engage in such use (Masten, 2001). We have started this line of analysis by examining adolescents who score high on sensation seeking and risk taking, but do not engage in substance use. Clearly, sensation seeking tends to be highly related to substance use (e.g., Arnett, 1992; Crawford et al., 2003; Jessor, 1992), but there are nonetheless so-called “off diagonals” (Schulenberg & Zarrett, 2006)—adolescents who enjoy taking risks but do not use drugs, as well as adolescents who do not enjoy taking risks but do use drugs. In our initial analyses, we have found that 10–20% of the 8th, 10th, and 12th graders defined as high risk takers were nondrug users (in the past year), and that this percentage decreases across the grade levels (Dworkin & Schulenberg, 2005). In future analyses, we will test for potential protective factors at work among this unique sample of nonusing risk takers, including religion, sports involvement, family processes, school achievement and involvement, as well as social context characteristics. With the large samples and consistency of measurement across the cohorts and grades, MTF is uniquely suited to study these kinds of small but significant segments of the population to determine the conditions and mechanisms involved when adolescents at risk for drug use are able to avoid drug use.

This overview of relevant issues, literature, and data concerning the etiology of drug use during adolescence is necessarily brief and selective. There are, of course, a number of other individual and social environmental characteristics included in the adolescent panel data that will be considered further in terms of their involvement in the etiology of adolescent drug use. These include several background characteristics (region, urbanicity, school size, race/ethnicity, parental education level, number of parents living in the home), peer climate in the school, extracurricular activities at school, involvement in organized activities outside of school, religiosity, frequency and type of social activities, driving and riding in cars (including when alcohol and drug use is involved), health-promoting activities, and a variety of attitudes concerning human nature, sex roles, and future parenthood.

Objective 6b: To assess during the *post-high school* years the impact of individual characteristics, changes in major social contexts (college, military service, civilian employment, homemaking, unemployment), as well as changes in roles (marriage, pregnancy, parenthood, divorce) on drug use and related variables.

There has been much emphasis lately on the importance of the transition period between adolescence and adulthood (e.g., Arnett, 2000, 2004; Arnett & Tanner, 2006; Settersten et al., 2005), and on the importance of understanding substance use etiology within a broader life-span framework of risk and resilience (e.g., Chassin, Hussong, et al., 2004; Cicchetti, 1999; Cicchetti & Rogosch, 2002; Glantz & Hartel, 1999; Schulenberg et al., 2003; Schulenberg & Zarrett, 2006; Windle & Davies, 1999; Windle & Windle, 2003). We plan to continue to merge these two streams and consider how substance use may relate (as a cause, correlate, and consequence) to difficulties in negotiating the transition to adulthood, providing some conceptual and methodological leadership to the study of this unique period of young adulthood. Schulenberg recently took the lead in initiating and editing a special issue of *Development & Psychopathology* regarding the transition to adulthood, focusing on how experiences during the transition relate to continuity and discontinuity in psychopathology, substance use, and related difficulties (Schulenberg, Sameroff, et al., 2004). In the recently edited *Handbook of the Life Course* (Mortimer & Shanahan, 2003), we provided a chapter illustrating connections between, and continuity and discontinuity across, adolescence and adulthood by focusing on the long-term consequences of substance use (Schulenberg et al., 2003). In addition, in a new APA-edited book on the rapidly growing emphasis on emerging adulthood (Arnett & Tanner, 2006), we provided a conceptual/review chapter on how transitional experiences relate to continuity and discontinuity in substance use, problem behavior, and mental health (highlighting MTF panel data) (Schulenberg & Zarrett, 2006). Finally, in another high-profile edited volume on the transition to adulthood (Settersten et al., 2005) sponsored by the MacArthur Foundation, we used MTF panel data to illustrate the diversity of life paths out of high school, and how they relate to the course of substance use and well-being (Schulenberg, O'Malley, et al., 2005).

Social role transitions and contexts during the transition to adulthood. A major and ongoing effort of the project has been to examine social role changes during the transition to young adulthood and how these changes relate to changes in drug use. In particular, we undertook this task in our 1997 book (Bachman, Wadsworth, O'Malley, Johnston, et al., 1997; see also Bachman, Wadsworth, O'Malley, Schulenberg, et al., 1997). Because the book is quite comprehensive, both in terms of its review of the relevant literature and in terms of the coverage of role transitions, we offer only a brief overview here. The roles and experiences of young adulthood are closely interrelated and often reflect long-standing differences in backgrounds, abilities, and aspirations. Such complexities were taken into account using multivariate analyses (detailed in an extensive appendix to the book), and we focused particularly on two distinct types of linkage between drug use and young adult experiences—differential *changes* and *stable* differences. For example, low rates of heavy drinking and illicit drug use among married respondents were linked directly to the transition to marriage, rather than reflecting long-standing differences. Similarly, we showed that women sharply decreased their alcohol and illicit drug use during pregnancy—and even their smoking to some degree. A very

different pattern was the low smoking rates of college students, which were shown to be a clear extension of pre-existing differences—the link between smoking and educational success is firmly in place by the end of high school. In sum, the analyses in this book were able to demonstrate that much of the age-related rise in use of cigarettes, alcohol, marijuana, and cocaine during the years following high school can be traced to the new freedoms experienced by young people moving out of their parents' homes; and the analyses also showed that the subsequent declines in drug use are attributable to the new conditions involved in marriage and parenthood.

In a sequel book (Bachman et al., 2002), we examined behaviors and attitudes that may mediate the associations between post-high school experiences and substance use. As with our earlier book, only key results from this book are summarized here. Some differences between college students and their age-mates can be attributed to college students' increased likelihood of going to parties; spending time informally with friends; and going to bars, taverns, and nightclubs. Going to college is also associated with modest shifts in views about heavy drinking and marijuana use. Whereas during high school the college-bound are more likely than average to perceive risks and to disapprove, a year or two later (after they became full-time college students) their risk and disapproval ratings are just about average. The effects of marriage on attitudes and behaviors may help to explain the associations between marriage and reduced substance use. The importance of religion increases somewhat among those who marry, and married respondents show larger increases in perceived risks and disapproval than respondents in any of the other living arrangement categories. Marriage is also associated with the largest declines in frequencies of (a) evenings out for fun and recreation; (b) attendance at parties and other social affairs; (c) getting together with friends informally; and (d) going to bars, taverns and nightclubs. Indeed, one reason that many young adults engage in these activities is to find a partner—a motivation that presumably subsides considerably after marriage. Married respondents are also less likely than average to have friends who get drunk or use illicit drugs. Pregnant women and men with pregnant spouses show increases in perceived risk and disapproval ratings. This suggests that increased concerns about health consequences underlie the reductions in substance use that occur among pregnant women and men with pregnant spouses.

To elaborate more on the “marriage effect,” a recent study (Merline et al., submitted) examined changes in substance use following marriage, and how those changes might be associated with spousal characteristics. The results of this study concurred with previous research (Leonard & Eiden, 1999; Leonard & Mudar, 2003; Yamaguchi & Kandel, 1993) in showing that some of the concordance between spouses is due to individuals choosing marital partners with similar patterns of drug use. This study also documented decreases in cigarette smoking, heavy drinking, and marijuana use that occur with marriage. For both women and men, reductions in substance use were associated with being partnered with someone who also decreased substance use. This research is important in showing that marital status differences in drug use cannot be attributed solely to differential selection into marriage by drug users and abstainers. It also demonstrates that marriage may not be beneficial in curbing drug use when individuals choose other drug users as their partners.

We have also focused specifically on the impact of military service on drug use behavior. Several early, large-scale surveys indicated that illicit drug use was clearly higher among those in military service (Bray, Marsden, & Peterson, 1991; Segal, 1977). Data from the Youth in Transition panel (Johnston, 1973) were consistent with that conclusion; and Robins (1974) reported very high levels of marijuana and heroin use among young men returning from Vietnam. In seemingly direct contradiction to those findings, O'Donnell et al. (1976) found virtually no difference between those who served in the military and those who did not in mean scores on an index of illicit drug use. However, O'Donnell's sample covered a ten-year age span corresponding roughly to the high school classes of 1962 through 1972. Closer inspection revealed that marijuana and heroin use figures for those who were in Vietnam during the last years of the war correspond rather well with those from the Robins study. In other words, there appears to have been a cohort difference even in the relative standing of those in military service versus those in civilian life, and the findings from one period are simply not generalizable to the other. Indeed, in an analysis of the senior year cohort of 1976, Johnson and Kaplan (1991) found little difference in terms of the rates of initiation of marijuana use and of escalation to daily marijuana use as a function of military status.

Analyses reported by Bachman, Wadsworth, O'Malley, Johnston, et al. (1997) indicated that military service was strongly associated with increased use of *licit* drugs, cigarettes and alcohol, and decreased use of *illicit* drugs. These effects were relatively independent of other effects associated with transitional changes (i.e., getting married, becoming a parent).

We continued to examine military service in Bachman et al. (2002) and found some explanation for the changes in alcohol use associated with military service. Those in military service at follow-up showed greater than average increases in evenings out in general, and in going to bars in particular. They also showed greater than average declines in their disapproval of having five or more drinks in a row once or twice each weekend, and they were more likely than average to report having friends who got drunk at least once a week. A more fine-grained analysis of links between military enlistment and drug use (Bachman, Freedman-Doan, O'Malley, Johnston, & Segal, 1999b) employed senior-year and first follow-up panel data to contrast male military enlistees with young men who entered college and those who were in full-time civilian employment (the numbers of women in our samples who enlisted were too small to permit these analyses). Five time intervals were compared (senior classes of 1976–1979, 1980–1983, 1984–1987, 1988–1991, 1992–1995), and important differences were found for various substances across time. Illicit drug use dropped sharply after the military introduced mandatory drug testing in 1980, although in senior year (i.e., prior to enlistment) those headed for military service were about average in their use of illicit drugs (marijuana and cocaine). This suggests that illicit use among high school seniors who later entered military service was not at a level of dependence that prevented their quitting use after enlistment. The findings for half-pack or more daily cigarette use were distinctly different. Prior to the institution of smoke-free basic training in 1989, military enlistees (like those who entered civilian employment, and in contrast to those who entered college) were above average in proportions of half-pack or more daily smoking; however, after 1989 the military was able to recruit fewer such regular smokers—

presumably because some individuals who otherwise would have preferred to enlist were too heavily dependent on cigarettes to manage an extended period of nonsmoking.

In another effort focusing specifically on the “launching period” following high school, Schulenberg, O’Malley, Bachman, and Johnston (2000) grouped respondents into nine different life paths based on their achievement and affiliative experiences immediately following high school (e.g., moved away from home, attended college full-time, remained single) and examined the course of substance use and well-being during the transition to young adulthood. Following high school, well-being tended to increase for all, with the exception of those who became single parents and those who remained at home and were neither a full-time worker nor student. In contrast, we found that drug use tended to increase most for those who left the parental home and remained single. Results were found to vary somewhat by cohort in a pattern suggesting that the transition to young adulthood has become somewhat more difficult for more recent cohorts. Building on these findings, Schulenberg, O’Malley, et al. (2005) examined the timing, sequencing, and covariation of various transitions in a panel sample of 4,071 MTF seniors followed to age 26 and found, for example, that a greater number of transitions was associated with higher well-being and lower substance use during the transition to adulthood. Findings concerning different configurations of transitions suggest that delaying the transitions into adulthood roles is associated with continued substance use. In an examination of how success in negotiating the developmental tasks of young adulthood (concerning education, work, romantic involvement, peer relations, citizenship, and financial independence) relate to well-being and substance use in a panel sample of 2,910 MTF seniors followed to age 26, Schulenberg, Bryant, et al. (2004) found that success in developmental tasks was associated with salutary trajectories of well-being and lower overall substance use. Of particular interest, drawing on the Selection-Optimization-Compensation hypothesis common in life-span development (e.g., Baltes, 1997), this paper showed that there was a compensatory effect among the various developmental tasks such that doing well in one (e.g., achievement-related tasks of education and work) compensated for “stalling” in another (e.g., affiliation-related tasks of romantic and peer involvement).

College students. A major continuing theme in MTF, both for epidemiological and etiological purposes, has been a focus on college students. One article in a special issue of the *Journal of Studies on Alcohol* devoted to college drinking and other substance use (O’Malley & Johnston, 2002) focused on MTF data on college student alcohol and drug use, including a comparison of MTF data with other sources of national samples of college students. There are two major advantages of the MTF design: one is that students are not clustered by institution, providing a much more efficient sample, and the second is that precollege data are available, making conclusions about effects of college attendance much firmer. Another article in the same issue (Schulenberg & Maggs, 2002) focused on developmental conceptual issues concerning how alcohol and other drug use relates to the transition into and experiences of college. It used MTF data to illustrate different developmental trajectories of binge drinking and how they related to college experiences. Building on previous MTF analyses that identified different trajectories of binge drinking (Schulenberg, Wadsworth, et al., 1996), evidence was presented to link more troublesome trajectories of binge drinking and other drug use with

fraternity and sorority membership, greater risk taking, and less conventionality among college students; at age 30, those whose binge drinking subsided after college were indistinguishable in terms of psychosocial functioning from those who were not binge drinkers in college, whereas the group that continued to drink heavily after college appeared to be functioning less well in all domains of life (Schulenberg, 2000; Schulenberg, Maggs, Long, et al., 2001). In a more specific examination of college fraternity and sorority experiences as related to substance use, McCabe et al. (2005) used MTF panel data to differentiate between selection effects (i.e., those who use more alcohol and other substances in high school select into fraternities and sororities) and socialization effects (i.e., those who join and live in fraternities and sororities are socialized into using more substances). We found evidence for both, with selection effects being stronger for males than for females. This article is also noteworthy because it showed elevated use of almost all substances among fraternity and sorority members, particularly those who were in residence; furthermore, when individuals left residential fraternities and sororities, their substance use decreased.

Educational success, difficulties, and expectations. We have conducted several other studies to examine the link between substance use and educational success during young adulthood. In one, we compared high school students' expectations for college graduation to their actual educational attainment when they were age 25 or 26, and examined correlates and predictors of met and unmet expectations (Messersmith & Schulenberg, submitted). Cigarette, marijuana, and alcohol use were negatively related to high school seniors' expectations to graduate from college. Logistic regressions showed that among high school seniors who expected to graduate from college, cigarette and marijuana use was related to lower odds of graduating from college by age 25 or 26. Interestingly, for this group, odds of graduating were higher for those who used alcohol at the end of high school. Among young adults who had not expected to graduate from college while in high school, neither cigarette nor alcohol use was related to differential odds of graduating from college, but those who did not use marijuana were more than twice as likely to graduate from college than their peers who did use marijuana.

We have also used growth curve modeling to relate educational factors and substance use during the course of the transition to adulthood. Specifically, we modeled the covariation of individuals' educational attainment expectations and their substance use over time (Messersmith & Schulenberg, 2006). As expected, we found that educational expectations did covary with cigarette, alcohol, and marijuana use over time. The model also suggested that the strength of the relations between substance use and educational expectations varied depending upon the nature of transitions encountered during early adulthood. For instance, the modeled effect of cigarette use on educational expectations was stronger among those who were single, while the effect of marijuana use was stronger for those who were not yet parents. Though correlational, this study provides a more nuanced view of the way transitions into new roles and responsibilities can alter relations between constructs.

Adolescent risk and protective factors for young adult drug use. In another series of analyses using the young adult panel data, we focused on adolescent risk and protective factors for changes in drug use during the transition. In a structural equation

modeling effort with panel data, we examined the impact of high school educational success on subsequent changes in drug use (Schulenberg et al., 1994). While we found that high school GPA remained a protective factor against substance use during the transition, college plans in senior year related to increased alcohol use during the transition. In contrast to a purely selection or socialization hypothesis, the findings support a differential socialization hypothesis in which (a) selection factors set the stage for differential entry into young adult roles and experiences, and (b) these roles and experiences then serve to shape changes in drug use over time (a finding consistent with what we found in Messersmith & Schulenberg, 2006, summarized above).

There has been some focus in the literature on adolescent personality risk factors for later drug use, and we find this an especially important focus given our emphasis on risk and protective factors and developmental transitions. In regard to the possible long-term robustness of risk factors in these personality domains, the evidence is strongest for low conventionality (e.g., Donovan, Jessor, & Jessor, 1983; Jessor et al., 1991; Jessor et al., 2006; Newcomb & Bentler, 1988; Stacy, Newcomb, & Bentler, 1991). Consistent with the notion that it is a central characteristic of deviance proneness (Jessor & Jessor, 1977), low conventionality in adolescence appears to make one vulnerable to increased drug use during the transition to young adulthood. Although there is little direct evidence regarding the domain of antisociality/alienation, the extensive literature on childhood aggressive and antisocial antecedents of adolescent substance use and deviancy (e.g., Block et al., 1988; Caspi, Lynam, Moffitt, & Silva, 1993; Dodge et al., 2006; Kellam, Simon, & Ensminger, 1983; Loeber, 1982) suggests that those high in this domain during adolescence are vulnerable to increased binge drinking during the transition; however, other evidence suggests that this personality domain may not have long-term predictive power across the transition (Zucker, 1994, 2006). Although the direct evidence for personal control orientation is limited and mixed (e.g., Chassin, Hussong, et al., 2004; Chassin et al., 1991; Jessor et al., 1991), the successful negotiation of the transition is partly dependent on adolescent planfulness and self-efficacy (e.g., Clausen, 1991; Nurmi, 1993, 2004; Werner & Smith, 1992), suggesting that to the extent that increased drug use reflects difficulties with the transition, low personal control orientation may be a robust predictor. Finally, although the limited evidence regarding the robustness of self-esteem and identity is equivocal (e.g., Jessor et al., 1991; Kaplan, 1985; Newcomb & Bentler, 1986a), those low in this domain toward the end of adolescence may well be more prone to difficulties with the transition (Erikson, 1968), including increased drug use. Analyses completed (Schulenberg, Merline, Johnston, et al., 2005) and in progress have focused on understanding risk factors for changes in marijuana use during the transition; and our use of the 8th-grade national panels followed into young adulthood will provide an important vantage point from which to better understand the link between developmental transitions and vulnerability to drug use.

We have started a line of research examining how problem behaviors and mental health difficulties move in concert (or not) with substance use during the transition to adulthood (Schulenberg, Jager, et al., 2006). As background, it is well documented that problem or risky behaviors tend to intercorrelate highly and positively during adolescence; and it is also well documented that substance use correlates positively with mental health difficulties, especially depressive affect, during adolescence. Most of the

relevant research, however, has been cross-sectional. Of the longitudinal studies, most tend to look at how time 1 indices (e.g., risk taking) relate to time 2 indices (e.g., substance use) without addressing whether the two indices are changing in unison over time. Especially during the transition from adolescence to adulthood, when many risky behaviors are changing (Schulenberg & Zarrett, 2006), an understanding of how the various behaviors do and do not change in unison provides a needed basis for explaining stability and change in risky behaviors (and more generally for seeing the uniqueness of this time of life). The purpose of this research is to examine interrelationships among risky behaviors initially (in high school) and over time during emerging adulthood, using MTF panel data. Across five waves of data, we are modeling latent growth curves of substance use, risk taking, antisocial behavior, and depressive affect. Because much of the experience of the transition to adulthood is conditioned on college attendance and gender, we focus on differences by full-time college status (at Wave 2) and gender. Preliminary findings show that the intercepts and slopes of the indices of substance use (marijuana use, binge drinking, cigarette use) are highly correlated, indicating that indeed these substances do travel together during emerging adulthood. However, among the other indices of risky behaviors, there were some surprises. For example, while the intercept of depressive affect is equally correlated with the intercepts of the three indices of substance use, the linear slope of depressive affect is more highly related to the slope of marijuana use than the slopes of the other substances (suggesting, for example, a self-medication effect). In addition, the intercepts and slopes of risk taking are highly correlated with the intercepts and slopes of substance use in the total sample, but for college males, the correlation between the risk taking and binge drinking slopes is not significant, suggesting that for this subgroup, binge drinking is not viewed as a risky behavior. Finally, risk taking and antisociality, while initially highly correlated (based on intercepts), became less correlated during the transition to adulthood (based on the slopes). Overall, the findings indicate that while risky behaviors tend to be highly interrelated during adolescence, the connection among risky behaviors becomes much more complex during the transition to adulthood. This complexity sets a necessary foundation for understanding the severity and longevity of problems, and distinguishing such problems from more experimental risk taking during the transition to adulthood.

Previous research has shown that patterns of part-time work during adolescence are related to substance use and other problem behaviors. Because work values are predictive of job choice and may be taken as proxies for occupational goals, we expected these motivational constructs to be related to substance use during late adolescence and young adulthood. Messersmith and Schulenberg (2005) investigated the connection between work values, substance use, other problem behaviors, and educational attainment using pattern-centered analyses. Using Sleipner 2.0 to examine clusters of individuals with similar patterns of work values during senior year of high school, we found that the clusters differed in their concurrent marijuana use, drinking, and binge drinking. Controlling for substance use during high school, clusters also differed in the amount they drank at age 25/26. In a follow-up analysis (Messersmith & Schulenberg, 2005), we examined clusters of work values during each follow-up survey of the 12th-grade MTF sample. After high school, clusters again differed in their alcohol use. In some cases, changing from one cluster to another was also related to differences in alcohol use.

Overall, these analyses are an additional step in explaining why there appear to be selection effects at play in the connection between part-time work and substance use.

Correlates of substance use and midlife. Our oldest cohorts have now entered middle adulthood (ages 35 through 45), and this has provided us the opportunity to consider the long-term consequences of earlier substance use (discussed when considering Objective 7) as well as the correlates and causes of midlife substance use. Merline et al. (2004) examined the prevalence of age-35 substance use, and considered the impact of demographic characteristics, adulthood experiences, and age-18 substance use. In general, the findings indicate that at the beginning of midlife, when adulthood family and societal responsibilities are central, substance use is still rather prevalent (e.g., 1 out of 10 custodial fathers was a current marijuana user), and is a function of adulthood roles and experiences, as well as of previous use. In addition, we have been examining how previous and concurrent substance use relates to parenting practices at middle adulthood. Merline et al. (2001) examined contemporaneous effects of substance use at age 35 on parenting practices and attitudes toward teenage use. Heavy drinking at age 35 was associated with less positive parenting. Parents who use any given substance are less likely than other parents to disapprove of their children using the same substance. Of particular interest, disapproval of teenage substance use was higher among parents whose oldest child is 10 to 17 than among parents whose oldest child is 9 or younger. Using latent curve analysis, Merline et al. (2004) extended these analyses showing how the course of substance use during late adolescence and early adulthood related to age-35 parenting practices.

While the analytic possibilities may seem overwhelming, it is useful to mention the range that exists. Obviously, we must of necessity be selective in the choice of variables used in each class of analysis, and we can mine only a limited proportion of the rich veins of findings that still await discovery in the database. That is one reason we archive and provide a variety of other means of access so that the data will be readily available for analysis by others. (The subject of sharing the data is discussed more fully under Objective 11.) The MTF data sets provide unique and valuable opportunities to understand the course, causes, and correlates of drug use from early adolescence through adulthood. We turn next to a consideration of the consequences of drug use.

Objective 7: To assess both the short- and longer term consequences of various types of drug use—particularly heavy use—on a number of outcomes in the domains of physical health, psychological well-being, status attainment, role performance, driving performance, deviant behavior, and social alienation.

The potential negative consequences of drug use for youth run a wide gamut including: health impairment; temporary or permanent impairment of cognitive functioning; development of emotional instability; violent or other delinquent behavior; psychomotor impairment while driving or in other potentially hazardous situations; delay of psychosocial maturation; reduction in motivation or performance in school or on the job; acquisition of a criminal record or involvement with criminals; serious impairment of interpersonal relationships; and possibly even death due to overdose, allergic reaction, or (with injection use) AIDS. Before considering some relevant research (ours and that of

others), we focus briefly on some of the problems inherent in the study of consequences, and on MTF design features that can help overcome such problems.

There has been a great deal of research on the effects of various types of illicit drug use on peoples' lives over the past few decades (e.g., Bentler, 1992; Brook, Balka, & Whiteman, 1999; Brook, Brook, Zhang, & Cohen, 2004; Brook & Newcomb, 1995; Brook, Richter, & Rubenstone, 2000; Brook, Richter, Whiteman, & Cohen, 1999; Brunswick, 1984; Friedman et al., 1994; Friedman, Granick, Bransfield, Kreisher, & Schwartz, 1996; Glantz, 1984; Guy, Smith, & Bentler, 1994; Institute of Medicine, 1982; Jessor et al., 1991; Johnson & Kaplan, 1990; Kandel, 1978a; Kandel, Davies, Karus, & Yamaguchi, 1986; Kandel & Yamaguchi, 1987; Newcomb & Bentler, 1988; Newcomb & Locke, 2005; Pandina, Labouvie, Johnson, & White, 1990; Perkins, 2002; Stein, Newcomb, & Bentler, 1987; Stein, Smith, Guy, & Bentler, 1993; Welte, Barnes, & Hoffman, 2004; White & Bates, 1993; Windle & Windle, 2005; Wood, Sher, & McGowan, 2000). Nevertheless, much remains to be learned, especially regarding long-term effects, and some of the answers are likely to be important in future prevention efforts.

Of the illicit drugs, marijuana received the most research attention during the 1970s and early 1980s, in part because this study documented how large a proportion of America's young people were becoming heavy users of the drug. Many of the results of that work have been summarized and reported to the Congress in the form of Marijuana and Health reports; NIDA published a series of monographs on marijuana research specifically (Braude & Ludford, 1984; Glantz, 1984; Petersen, 1980; Rapaka & Makriyannis, 1989), and more recently, a series of research notes (NIDA, 2003, 2005). An earlier comprehensive review was conducted by the Institute of Medicine (1982), which drew heavily on results from MTF. Of course, there is considerable research on the effects of other drugs as well; cocaine in particular has been the subject of intensive efforts since the early 1980s (Cregler, 1989; Czechowicz, 1988; Grabowski, 1984; Kozel & Adams, 1985; Miech, Chilcoat, & Harder, 2005; Schober & Schade, 1991; Tims & Leukefeld, 1994; Williams, Pacula, Chaloupka, & Wechsler, 2006). The specter of "crack babies" generated a spate of research on the effect of cocaine use by pregnant women in particular.

While much of the extant research has been concerned with cannabis and cocaine, many of the conceptual and methodological problems encountered are common to research on just about all drugs used outside a supervised medical regimen (Schulenberg et al., 2003). First, there are many different within-time and cross-time patterns of use to be found for almost any psychoactive drug. A number of people use it only once or twice, others sporadically, some chronically in small quantities, some chronically in large quantities, and so on. For any given drug, the potential consequences will surely vary across these different patterns of use, although heavy ongoing use is likely to engender the most severe consequences. Second, the time lag between the damaging behavior and the appearance of any evidence of damage can vary from minutes to decades (Brook et al., 2004; Hingson, Heeren, Zakocs, Kopstein, & Wechsler, 2002). In general, we can assume that the longer the lag, the more difficult the problem of discovering the link as the effects dissipate and other events and experiences contribute to health and well-being

in adulthood. But such is not necessarily the case, because some effects may amplify over time—that is, it may take time for some consequences to consolidate and become manifest in various aspects of individuals' lives (Schulenberg et al., 2003). Third, negative effects are usually not certain, but occur on a probabilistic basis; this is true for the connection between lung cancer and smoking, for example. Thus, the research necessary to discover connections may need to encompass long-term panel studies with a large number of heavy users, occasional users, and abstainers.

Consequences also vary as a function of individual characteristics and experiences. Negative consequences may occur only with particular kinds of people—pregnant women, those going through puberty, or the emotionally unstable, to take three disparate examples. The effects may be indirect and, therefore, difficult to recognize and to trace accurately to a source (Sher & Gotham, 1999). For instance, involvement with drugs is likely to affect friendship patterns, which in turn may affect the development of life goals and aspirations (Brook, Balka, et al., 1999). Or, a young person who is intoxicated much of the time may not participate in many other activities that ordinarily would have filled the same time—activities that might have advanced that young person's social skills, maturity, or knowledge in some area (Brook et al., 2002; Gotham, Sher, & Wood, 2003). Consequences may also be secondhand (Windle & Windle, 2005). For example, romantic partners of drug users may become victims of drug-related intimate violence (White et al., 2002); the likelihood of such victimization may be correlated with individual use as well (Mohler-Kuo, Dowdall, Koss, & Wechsler, 2004). Selection also constitutes an important challenge for research on substance use consequences—simply, young people who become involved with drugs tend to differ from the average on many important personal and environmental characteristics. It may be that negative outcomes superficially attributed to drug use are really due to these pre-existing differences. Finally, the use of each psychoactive drug tends to be positively correlated with the use of all other psychoactive drugs, which makes disentangling their effects—particularly their long-term effects—all the more difficult. Clearly, drug use consequences must be considered in light of the many potent biopsychosocial influences on development (Newcomb & Locke, 2005; Schulenberg et al., 2003). For all these reasons, research on the effects of using the various illicit drugs has been, and remains, particularly difficult.

The Monitoring the Future design is well suited for dealing with the assessment of a number of possible effects, particularly in light of some of the problems just mentioned. First, it is based on general population samples, which permits the assessment of a wide range of different usage patterns and gives it a higher probability of identifying user groups for whom use of the drug (say marijuana) is not highly confounded with the use of others. Additionally, the fact that the sample is nationally representative means most potentially confounding variables will vary enough that their effects can be estimated and statistically controlled. Given the great breadth of measurement in the study, there is at least a reasonable chance that important conditioning or control variables are included among the measured variables.

The samples are also relatively large, permitting the identification of more heavy users and more users of some of the drugs that are less prevalent than marijuana (cocaine,

for example)—a necessity for meaningful research, particularly given the probabilistic basis on which many effects are likely to occur. The fact that longitudinal panels are included in the design is critical, for obvious reasons. Further, the developmental period encompassed by the longitudinal panels beginning in 12th grade is a particularly good one, partly because many of the respondents will be at the starting or early stages of use, and also because they will be making a number of major life decisions in this interval (e.g., to enter or to leave college, military service, employment, marriage, parenthood, and so on) (Schulenberg & Maggs, 2002). Such decisions themselves may reflect psychosocial effects of drug involvement. The developmental period encompassed by the longitudinal panels beginning in 8th grade is even better, of course, because it starts earlier, at a point prior to initiation of illicit drug use in most cases. Some of these respondents will be making a critical decision—whether to drop out or stay in school—that may be particularly influenced by drug involvement.

The range of variables for which potential drug use effects can be examined in this study is quite large. Psychosocial variables comprise the great majority of variables for which we can examine potential effects. We can investigate the effects of a wide array of value and lifestyle orientations, including attitudes, values, and beliefs about education, work, family, leisure, religion, politics, social action, social change, and various social issues (see Objective 6). Assessments of social and political alienation and views about a number of specific social institutions are also included.

In the domain of affective states and other general personality characteristics, the potential exists to look at outcomes such as self-esteem, depression, internal and external locus of control, loneliness, risk-taking propensity, pessimism, satisfaction in a number of life domains, and overall happiness and life satisfaction. In some cases, these personality characteristics may also serve as control variables.

A particularly important set of outcomes deals with attainment of certain social statuses and performance in major life roles. In the educational sphere, available measures include college entrance, successful completion of college, academic performance, and satisfaction with school and college. In the work sphere, proportion of time gainfully employed, status of attained occupation, hourly pay rate, annual income, stability of employment, days missed from work, financial independence, and job satisfaction are measured. Concerning family roles, the study contains measures of marital status (including divorce or separation), number of children, and satisfaction with marriage. Respondents are also asked in a separate set of questions to assess how well *prepared* they feel they are to function effectively in the roles of spouse, parent, and worker, and also how well they feel they *actually will function* in those roles.

In the important domain of delinquency and rebelliousness, we include repeated measures of the frequency with which respondents commit a number of delinquent and criminal acts. While our own work (Johnston et al., 1978; Osgood et al., 1988) and that of others (e.g., Welte et al., 2004) does not indicate increased deviance as a result of illicit, nonaddictive drug use, the possibility remains that those findings may be subject to change as the drug scene changes. Indeed, the pattern and magnitude of consequences

could well vary by cohort as a function of cohort variation in substance use (Schulenberg et al., 2003).

While the study initially contained few direct measures of physiological outcomes, it did contain some measures that may be indirect indicators. For example, our measures include an index of somatic symptoms, which we have found to relate to an index of illicit drug use. There is also a measure of days missed from school (or work, in the post-high school questionnaires) due to illness. Respondents are also asked directly whether their illicit drug use has caused them any physical health problems. Since 1982, we have assessed a number of more direct measures of physical health or illness, having to do with symptoms of physical and mental illnesses, physician visits, and hospitalizations for injuries and other types of problems.

The connection between drug use and nearly all of the outcomes discussed earlier would have to be inferred statistically. It is also possible, of course, to ask the respondents to play a more active role by self-reporting any outcomes they perceive to result from their drug use. While this approach certainly has pitfalls, it has some advantages that complement the statistical inference approach. Therefore, a list of problems that might result from drug use is included in the measurement package. Respondents are asked to give their own assessment of whether each problem has resulted from their use of alcohol, marijuana, or other illicit drugs. Among the problems included are harmful effects on relationships with parents, spouse, friends, teachers, and supervisors; involvement with people who are a bad influence; lowered performance in school and/or job; lowered emotional stability; lowered interest in other activities; lowered energy level; lowered ability to think clearly; "other bad psychological effects"; unsafe driving; poor health; behavior which was later regretted; and, involvement with the police. An earlier analysis, looking only at daily marijuana users, suggests that they report a number of these adverse outcomes (Johnston, 1980).

In the questionnaires sent to respondents at modal ages of 35, 40, and 45, we ask a similar set of questions about their use of alcohol, marijuana, and other illicit drugs in the past five years. We also include some questions designed to assess abuse or dependence symptoms. These questions will likely be included in the proposed age-50 questionnaires, as well.

Some of the possible long-term consequences have been investigated empirically via other longitudinal studies (Bray, Zarkin, Ringwalt, & Qi, 2000; Brunswick, 1984; Chassin et al., 2002; Ellickson, Bui, Bell, & McGuigan, 1998; Galaif, Newcomb, & Carmona, 2001; Gotham et al., 2003; Guy et al., 1994; Jessor et al., 1991; Johnson & Kaplan, 1990; Kandel, 1978b; Kandel, Davies, et al., 1986; Kandel & Yamaguchi, 1987; Newcomb & Bentler, 1988; Oesterle et al., 2004; Pandina et al., 1990; Stein et al., 1993; Stein et al., 1987; Tucker et al., 2006; Vargas-Carmona, Newcomb, & Galaif, 2002; Warner & White, 2003; White & Bates, 1993; Wood et al., 2000). However, as noted by Johnson and Kaplan (1990, p. 278), the evidence concerning long-term consequences is mixed; now, a decade and a half after their commentary, there is still much to be learned about the consequences. Moreover, as Newcomb and Bentler (1988) noted, there has been rather limited theory development regarding the effect of adolescent drug use on

later life outcomes. They discuss some theories or hypotheses related to consequences of adolescent drug use; these theories are not mutually exclusive, and they have generally not been tested empirically. These include impaired functioning, developmental lag, consolidation of regressive coping, amotivational syndrome, psychosocial dysfunction, use leads to abuse, problem behavior theory, self-derogation, role compatibility theory, and precocious development. Some of these theories and hypotheses, such as those concerning self-derogation (Johnson & Kaplan, 1990), precocious development (Newcomb & Bentler, 1988), and role incompatibility (Brook, Richter, et al., 1999; D'Amico, Ellickson, Collins, Martino, & Klein, 2005; Dawson et al., 2006; Flora & Chassin, 2005; Liu & Kaplan, 2001) have had more empirical testing than others. Despite important progress in the almost two decades since Newcomb and Bentler's (1988) focus on drug use consequences, Jackson, Sher, and Park (2005) recently concluded that their remains a paucity of data on long-term effects of alcohol use during college. Even less is known about consequences of other substance use and about adolescents and young adults who do not attend college.

Our own first efforts at investigating possible long-term consequences of a range of drug use during high school were reported by O'Malley (1991). Those analyses, using multiple linear regression, made clear that high school drug use is significantly associated with outcomes nine to ten years past high school graduation. In particular, it appears that educational attainment is deleteriously affected by high school drug use. Illicit drug use (marijuana, cocaine, and an index of other illicit drug use) varied in the extent to which significant direct effects survived controls for high school lifestyle factors. In essence, it appears that the effect of drug use in reducing educational attainment has primarily manifested itself by the end of senior year of high school. Thus, students who become involved with illicit drugs in high school become (or already are) poor students, likely to be truants, and as a result, are less likely to further their education. Some deleterious effects of illicit drug use on occupational outcomes and marital behaviors also seem to be present, whereas rather few independent effects are seen for health outcomes and deviant behaviors, after controlling other factors. Alcohol and cigarette use also show the deleterious effects on educational attainment (though the effects are weakened substantially when lifestyle variables are controlled).

Additional analyses have incorporated later, post-high school drug use, to assess whether the effects of high school drug use are completely mediated through later drug use. These analyses have used structural equation modeling (Bentler, 1990) to take into account errors of measurement, and to permit the use of latent variables with multiple observed indicators. In general, the results are highly similar to the earlier linear regressions; most of the action of high school drug use is mediated through the lifestyle variables as measured near the end of high school.

Recent efforts have made extensive use of the 8th-grade panel data to examine the connections between adolescent substance use and educational successes and failures, both short-term and longer term. Bachman et al. (in press) examined the links between educational experiences and substance use from ages 14 through 22. This analysis first developed a model of academic attainment by age 22 (ranging from high school dropouts to college graduates), taking account of prior educational experiences as well as family

background and demographic factors. The model was then expanded to include delinquency and the use of substances (cigarettes, marijuana, cocaine, and alcohol). Possible causal connections were examined using multiple methods, including regression analysis, multiple classification analysis, and structural equation modeling. These analyses led to the conclusions that adolescent substance use is negatively correlated with academic attainment because: (a) both sets of behaviors share common prior causes, (b) educational successes protect against substance use while educational failures are risk factors, and (c) to a lesser extent, some substance use can impair educational success. Behind these broad conclusions are nuanced findings, differing from one substance to another and from one developmental period to another.

Other recent efforts have ranged from conceptual considerations regarding a more developmental view of understanding long-term consequences (Schulenberg et al., 2003) to empirical efforts with the panel data. In one publication, we examined the relationship of marijuana use by high school seniors to occupational attainment ten years later (Schuster et al., 2001). Analyses were conducted separately by gender, with and without controlling for other variables; we used the models for dependence of cross-classifications having ordered categories presented by Goodman (1983). Control variables, all measured when respondents were seniors, were academic performance, educational aspirations, and occupational aspirations. Results indicate that the influence of marijuana use on occupational attainment was considerably different for males and females. For males, the bivariate relationship between marijuana use and occupational attainment was depicted by a threshold model in which no or light marijuana use does not predict level of occupational attainment. Once a threshold level is passed (say three occasions of marijuana use in the last year), increasing marijuana use predicts linearly to decreasing success with respect to occupational attainment. This relationship between marijuana use and occupational attainment did not persist when control variables were entered, suggesting that marijuana use exerts its influence on occupational attainment by reducing school performance and lowering educational as well as occupational aspirations. For females, the bivariate relationship between marijuana use and occupational attainment was more complex, suggesting a range of possible negative and neutral relations.

Our oldest cohorts have now entered middle adulthood (ages 35 through 45), and this has provided us the opportunity to consider the long-term consequences of earlier substance use. Our more recent efforts at examining consequences of drug use have utilized latent growth methodology (Duncan et al., 2006; Muthén & Curran, 1997). Here we have utilized nine measurement occasions (12th grade, seven biennial follow-ups through age 32, and age 35) to consider the effect of trajectory of substance use on age-35 outcomes (Schulenberg et al., in preparation). Earlier attempts at latent growth methodology estimated three latent growth factors: intercept, linear slope, and a quadratic term (O'Malley & Schulenberg, 1997). Difficulties in interpreting the meaning of quadratic terms (in the presence of a linear slope) led us to shift to a "piece-wise" approach wherein the substance use is modeled as having two linear slopes (Li, Duncan, Duncan, & Hops, 2001): an initial positive slope (representing increased substance use after high school graduation) and a later negative slope (representing decreased substance use among most respondents as they mature). The outcome measures at age 35 include

measures of happiness, satisfaction with life roles, substance use problems and dependence indicators, and occupational status. Results show clear deleterious effects from the trajectory of substance use in the expected direction. For example, relatively high later slope (either increasing or decreasing less than average) of marijuana use predicts lower occupational success, and more problems and dependence symptoms associated especially with marijuana, but also with other illicit drugs and with alcohol. In a similar set of analyses, Schulenberg (2001, 2004; also Schulenberg, Merline, O'Malley, Bachman, & Johnston, in preparation) examined the impact of the level and course of substance use during adolescence and young adulthood (ages 18–32) on parenting practices and attitudes about teenage substance use measured at age 35. Using latent growth modeling analyses with eight waves of panel data ($N = 4,500$), it was found that both intercepts and linear slopes of marijuana use and heavy drinking were significant and powerful predictors of age-35 disapproval of teenage substance use, and less powerful but still significant predictors of age-35 positive parenting. These findings suggest both direct and indirect mechanisms concerning the intergenerational transmission of susceptibility to substance use. Another recent latent growth modeling effort involves the examination of how earlier substance use relates to later use and substance use disorders at middle adulthood; the findings clearly indicate that substance use at a single point of time (i.e., senior year of high school) is far less indicative of later use and abuse than is the course of substance use across the transition to adulthood (Schulenberg, Merline, & O'Malley, 2005; Zucker et al., 2006). These analyses are being extended to consider different trajectory groups of substance use over time (using growth mixture modeling) and examine the effects on substance use disorders through age 40 (Schulenberg et al., in preparation).

We will build upon and extend these recent analyses. Our ongoing efforts to understand consequences of drug use are facilitated by several features of the study design. One is that we have extended the age range to 45, and that is proposed to be further extended to age 50. This extension of the panel sample will increase the time span for which to consider long-term consequences; this is particularly important because it allows us to consider whether consequences become stronger as individuals reach middle age, a hypothesis consistent with the “fanning” or increased heterogeneity in mental and physical health trajectories that occurs across the life course (Schulenberg et al., 2003). Sufficient numbers of cohorts will have made it through the age-35 surveys to allow us to consider the extent to which consequences vary by cohort (more specifically by rates of initial substance use which varied considerably across the late 1970s and 1980s). We also have more in-depth indices of health difficulties as well as substance use disorders in the middle adulthood surveys, allowing us to examine a wider range of impairments potentially due to earlier and ongoing substance use. Finally, we have the three panels of 8th graders (1991–1993 cohorts) that have been followed through young adulthood, and these panels will enable us to continue our efforts to understand consequences earlier in the drug progression sequence.

Objective 8: To give special emphasis throughout to the more frequent or heavier users of the different drugs, i.e., individuals most likely to be characterized as “abusers.” (This objective crosscuts most of the previous objectives.)

The distinction between use and abuse has long been a cloudy one (e.g., Smart, 1974) and quite controversial, but most definitions of abuse are based on the notion of use that is detrimental to the users or to society. For example, in considering a comprehensive definition of substance abuse, Newcomb and Bentler (1989) state:

Adverse or negative consequences of use on self, others, or property, such as having deleterious health sequelae, impaired relationships, getting arrested, causing an accident, blacking out, or starting fights, indicate that use has progressed to abuse . . . (p. 243).

Accordingly, although some may argue from a moralistic or legal position that *any* use of an illicit drug by an adolescent or young adult constitutes abuse, an alternative position that defines abuse in terms of consequences would take account of the quantity and/or frequency of use. In any case, there is undoubtedly a consensus that heavy use, however defined, is worse for the user than light or occasional use.

In the MTF study, there is an ongoing and cross-cutting emphasis on the frequent and heavy use of licit and illicit drugs. This emphasis is evident throughout all of the previously discussed objectives (as well as in Objectives 9 and 10), and includes, for example, the monitoring of secular and developmental trends in frequent and heavy use, as well as the causes, correlates, and consequences of frequent and heavy use. In addition, a set of questions is included in the 12th-grade surveys regarding the respondent’s cumulative experience with daily marijuana use, the age of starting such use, and so on. (Results from these questions are routinely reported, as are a number of the other heavy or frequent use measures, in the study’s annual monographs, e.g., Johnston et al., in press). Furthermore, in the young adult follow-up surveys, there is some emphasis on measures of drug abuse as defined by negative consequences (e.g., whether one’s use is causing social or occupational difficulties). This emphasis is expanded in the age-35, age-40, and age-45 surveys (and proposed age-50 survey), in which we include extensive survey items regarding substance use disorders such as abuse and dependence. Thus, in addition to our ongoing consideration of frequent and heavy drug use, we will continue to include consideration of drug abuse and dependence in our ongoing efforts.

With the ongoing young adult surveys, the middle adulthood surveys, and the 8th-grade follow-up surveys (for 1991–1993 eighth-grade cohorts that we have followed through age 24), we are able to track the course and consequences of frequent and heavy use from middle adolescence through middle adulthood. In the extensive discussions of Objectives 1 and 6, it was suggested that by tracking individuals over time, the chronicity, abstinence, incidence, and remission of frequent and heavy drug use during adolescence and adulthood may be determined. By focusing on individuals over several points in time, various developmental trajectories (e.g., increasing, decreasing, quadratic trends) of frequent and heavy use can be identified, and then the antecedents, concomitants, and consequences of the various trajectory groups can be determined. This

strategy can either be a variable-centered approach in which the emphasis is on a normative developmental trajectory and individual differences in terms of deviations about the normative trajectory, or a person- or pattern-centered approach in which groups are formed based on common change patterns over time (e.g., Block, 1971; Cairns & Cairns, 1994; Cairns, Cairns, Rodkin, & Xie, 1998; Magnusson & Bergman, 1988; Magnusson & Stattin, 2006). The latter approach has been used with increasing frequency in the substance use literature to examine change and stability in frequent and heavy use of licit and illicit drugs (e.g., Chassin et al., 1991, 2002; Colder et al., 2001; Curran, 2000; Donovan et al., 1983; Ellickson, Marino, et al., 2004; Flory et al., 2004; Labouvie et al., 1991; Oesterle et al., 2004; White et al., 2002; Windle & Wiesner, 2004). As discussed previously under Objective 6, we used this strategy to identify the different trajectories of frequent binge drinking and frequent marijuana use from adolescence through young adulthood (Schulenberg, Maggs, Long, et al., 2001; Schulenberg, Merline, Johnston, et al., 2005; Schulenberg, O'Malley, et al., 1996; Schulenberg, Wadsworth, et al., 1996). An added feature of using this strategy with nationally representative data is that we are able to address the prevalence rates of the different trajectories (e.g., 4.6% were chronic frequent marijuana users from adolescence through young adulthood; Schulenberg, Merline, Johnston, et al., 2005). In addition to assisting in understanding the course of frequent and heavy use over time, this pattern-centered focus can also be important in specifying risk and protective factors. In particular, risk factors for chronic heavy drug users are not the same as the risk factors for those following other developmental trajectories of drug use (e.g., Bates & Labouvie, 1995; Duncan et al., 1996; Labouvie et al., 1991; Maggs & Schulenberg, 2005; Schulenberg, Maggs, Long, et al., 2001; Schulenberg, Merline, Johnston, et al., 2005; Schulenberg, Wadsworth, et al., 1996; Zucker, 2006).

Greater attention to frequent and heavier users is also important for understanding short-term and long-term consequences of drug use. As previously discussed under Objective 7, documenting consequences can be quite difficult, but it seems clear that heavier users are most at risk (e.g., Ellickson, Tucker, et al., 2004; Schulenberg, Merline, Johnston, et al., 2005; Windle & Weisner, 2004), and thus worthy of special attention. The large samples in MTF provide sufficient numbers of heavy users of most drugs to provide meaningful panel data on heavy users in the normal population, although we recognize that the most extreme cases—such as heroin or crack addicts—are unlikely to be covered, either because they never finished high school or because they failed to participate in the follow-up surveys.

As mentioned above, there is an ongoing emphasis on measures of drug *abuse* in the young adulthood surveys, and expanded coverage of substance abuse and dependence (together called substance use disorders) in the middle adulthood surveys. The middle adulthood substance use disorder survey items include an emphasis on alcohol, marijuana, and illicit drugs other than marijuana, and cover symptoms during the past five years. These items are consistent with how alcohol and other drug use disorders have been measured in other large scale surveys (e.g., Harford & Muthén, 2001; Muthén, 1996; Muthén, Grant, & Hasin, 1993) including the National Comorbidity Survey (e.g., Nelson, Heath, & Kessler, 1998), and can be used to reflect DSM 4-TR symptom counts for both abuse and dependence (e.g., Harford & Muthén, 2001). Based on DSM 4-TR

criteria, our current estimates for alcohol abuse and dependence, marijuana abuse and dependence, and other illicit drug abuse and dependence for age 35 are 17.5%, 5.0%, 3.4%, 1.7%, 2.4%, and 1.7%, respectively; the corresponding rates at age 40 are 12.9%, 4.5%, 2.1%, 1.1%, 1.8%, and 1.2%, respectively (Schulenberg et al., in preparation). These rates match well with those of other studies (just mentioned), and the drop in abuse and dependence between age 35 and 40 shown in our rates is consistent with other research on so-called “naturally occurring” recovery (e.g. Dawson et al., 2006). Our recent efforts with these data (and also with using alcohol and marijuana use disorders as continuous variables) focus on viewing abuse and dependence as consequences of earlier use and other characteristics and experiences (Merline & Schulenberg, in preparation; Schulenberg, Merline, & O’Malley, 2005; Schulenberg et al., in preparation; Zucker et al., 2006). We will continue these efforts, and also extend our analyses to examine the course of substance use disorders during middle adulthood and how substance use disorders relate to health and psychosocial difficulties.

We turn now to a brief discussion of individual drugs. In addition to the definitional problems of drug abuse as discussed above, there are problems associated with quantifying heavy illicit drug use. For example, in research on licit drugs such as alcohol, frequency and amount of use are most often combined to provide a measure of abuse (e.g., Cahalan & Room, 1974; see also Hilton & Clark, 1987). Another indication of alcohol abuse is heavy drinking, which is often defined as having five or more drinks in a row (sometimes called “binge drinking” and more recently “episodic heavy drinking” in the literature) (e.g., Blane, 1979; Chung, Martin, & Winters, 2005; Knupfer, 1989; Kusserow, 1991; Wechsler & Isaac, 1992). Unfortunately, illegal drugs as popularly consumed are not as amenable to an accurate quantitative measurement. There is no standard proof for marijuana or heroin as there is for alcohol, for example, nor traditional quantities (such as a shot or a 12-ounce can) for most illicit drugs as they are commonly used.

As one way of attempting to address this difficulty, questions about the duration and degree of intoxication on an average occasion of use have been included in the senior year and young adult surveys (as discussed earlier), although it is quite likely that a certain amount of noise is introduced by individual differences in subjective judgments or, for that matter, in actual reactions to a given dose of a drug. These measures provide some valuable broad distinctions among individuals (e.g., between someone who usually gets high for an hour versus someone who usually gets high for five or ten hours) (see, e.g., Johnston, 1980), and also some important comparisons across drugs (see, e.g., Johnston et al., 1991a, 1996, 2006c).

Some interesting hypotheses have been generated by the trend results for these variables (i.e., the degree and duration of highs) among high school seniors. For marijuana, there was a general downward trend between 1978 and 1983 in the degree of highs usually obtained, followed by an increase among more recent cohorts. In 1978, 73% of the users said they usually got “moderately high” or “very high”—a figure that dropped to 64% by 1983, increased to 71% in 1990, 70% in 1995, 71% in 2000, and stands at 73% in 2005. Similarly, there was a downward and then upward trend in the proportion of users saying they stayed high three or more hours (from 52% of the users in

1975 to 35% in 1983; this proportion increased to 39% in 1990, 45% in 1995, dropped back down to 39% in 2000, and was at 40% in 2005). These earlier downward trends were inconsistent with the evidence showing a dramatic increase in the THC content in marijuana over that decade, suggesting, as we argued elsewhere (Johnston, 1980; Johnston et al., 1991a), that not only were fewer high school students using marijuana, but those who were using seemed to be using less frequently and to be taking smaller amounts (and doses of the active ingredient) per occasion. That is, users titrated their intake to obtain particular levels of THC to achieve a certain (perhaps declining) level of high, and thus smoked less marijuana in terms of volume. The upward trends in the 1990s did not bode well in that young people were once again reporting getting higher and for a longer time per occasion, indicating that not only were they using marijuana more frequently, they were using more in terms of quantity (assuming some constancy in THC levels) (Johnston et al., 1996). More recently, however, we have begun to see some drop in these indicators (Johnston et al., 2001a, 2006c).

Particular emphasis is given to frequent users of marijuana because a significant segment of the youthful population has been involved with marijuana throughout the life of the study. Of course, the recent increases (followed by modest decreases) in marijuana use in young people add even more incentive to focus on frequent users of marijuana. MTF has long been credited with playing a central role in bringing the problem of frequent marijuana use to the attention of policy makers and the general public some years ago (e.g., Dupont, 1980), and it has contributed significantly to subsequent policy initiatives over the past several decades. This project is in an unusually good position to study large numbers of daily or near-daily users, both cross-sectionally and longitudinally, and will continue to give special emphasis to the phenomenon of daily use. Our annual monographs, in addition to containing a special section on respondents' histories of daily marijuana use, have documented important changes that have accompanied variations in that behavior—shifts in beliefs about the harmfulness of regular use and in personal disapproval of regular use (e.g., Johnston et al., 2001a, 2006c). These findings have had important implications for prevention, which have been elaborated in Bachman et al. (1988), Bachman, Johnston, and O'Malley (1990a), Bachman et al. (1996), and Johnston (1985, 1991a, 1991b).

Cigarette use, and in particular frequent cigarette use, has been a form of drug use included in the study since its inception, and routinely has been included in all of the annual reports on prevalence rates and trends. After the study's inception, NIDA added tobacco use as one of its mandated areas of research (Jarvik, Cullen, Gritz, Vogt, & West, 1977; Krasnegor, 1979a, 1979b). Because of the major health consequences of cigarette smoking, we have continued to give special emphasis to tobacco use, along with related attitudes and beliefs, among the nation's youth (e.g., Johnston, O'Malley, & Bachman, 1999, 2000a; Johnston, O'Malley, Bachman, & Schulenberg, 2005). MTF data on cigarette smoking have also been included in the final reports of the National Commission for Drug-Free Schools and the White House Conference for a Drug-Free America, and have been used several times in invited testimony before Congress on legislation aimed at reducing smoking among young people.

Our retrospective data concerning age at first use indicate that the majority of those who are daily smokers in the senior year began daily smoking between 8th and 10th grade, and our 8th- and 10th-grade surveys have provided additional important information concerning the etiology and correlates of heavy cigarette smoking (e.g., Wynn, Schulenberg, & O'Malley, 1996). By following the 1991–1993 eighth-grade panels through high school and into young adulthood, we were able to consider the etiology of heavy smoking in a causal framework (Bachman et al., in press). Furthermore, the addition of the age-35, age-40, age-45, and the proposed age-50 surveys provides us with the opportunity to continue to examine the longer term health consequences of early and ongoing heavy cigarette smoking.

In our analytic attempts to differentiate among age, period, and cohort effects in substance use, the one behavior that showed a clear cohort effect was cigarette smoking (O'Malley et al., 1988). We interpreted this as reflecting the persistence of the behavior—once started it is difficult to stop, and therefore any differences between cohorts or classes tend to be long lasting. We also have found cigarette smoking to be unique in another way. Use of other substances, including alcohol and marijuana, changed in the first few years after high school graduation as a function of post-high school transitions; substance use generally decreased among those getting married, increased among those who left the parental home but did not get married, and remained essentially unchanged among those who remained in the parental home. Cigarette use was the exception, with smoking rates not much influenced by the multiple social role transitions that follow shortly after high school. Again, we interpret this as reflecting the persistence of the behavior, and the difficulty of stopping smoking (Bachman et al., 1984, 2002; Bachman, Wadsworth, O'Malley, Schulenberg, et al., 1997; Schulenberg et al., 1994; Schulenberg, O'Malley, et al., 2005).

As we discussed earlier under Objective 6a, we focused on daily smoking rate changes among high school seniors across two decades (1976–1995), and found that shifts were more likely to occur among seniors classified as “high risk” (based on such risk factors as GPA, truancy, evenings out, and religious commitment) (An, et al., 1999). That is, most of the shifting in daily smoking rates over those two decades in the senior year population could be attributed to shifts in rates among adolescents particularly at risk for smoking (and substance use in general). This general “elasticity” in daily cigarette rates among young people at high risk for substance use suggests the importance of targeted interventions (in addition to general population interventions).

One figure that has continued to be highly disturbing throughout the life of the study is the proportion of high school seniors who report occasions of heavy—or binge—drinking: nearly three out of ten 2005 seniors (28% total, about 33% of males, 23% of females) reported having five or more drinks in a row on at least one occasion in the two weeks prior to the survey. Furthermore, fully 29% of all 2005 seniors said that most or all of their friends got drunk at least once a week. The picture is no less disturbing when we look at the rates of binge drinking among the nation's 8th and 10th graders: in 2005, they were about one in ten for 8th graders (just over 10% for both males and females) and over one in five for 10th graders (22% of males, 20% of females), indicating a rather sharp increase in binge drinking with age during high school, long before alcohol use is

even legal. Moreover, the frequency of binge drinking clearly increases during the first few years after high school. Ironically, the peak levels for this behavior seem to occur at or soon after age 21, when most young Americans first become able to purchase alcoholic beverages legally. (Cohort-sequential analyses make us more confident in interpreting the change as an age-related [and social context-related] phenomenon, rather than some period or cohort effect.)

A major reason for concern about heavy drinking is that it is often associated with driving. In order to assess the frequency of driving after drinking, in 1984 questions were added that asked how often the respondents had been driving after drinking and after having five or more drinks in a row. O'Malley and Johnston (1999) reported results from the surveys of 1984 through 1997. No less than 39% of 1984 high school senior males reported driving after drinking in just the two weeks prior to the survey; for females, the figure was 23%. Fully 25% of all senior males had been driving at least once after having five or more drinks in a row; an additional 11% of females had done so. There was a rather dramatic decline in these figures: in 1990, 24% of the males and 14% of the females drove after drinking, and 14% of the males and 6% of the females drove after having five or more drinks. However, there was little further improvement through most of the 1990s: by 1997, the corresponding rates were 22%, 16%, 16%, and 8%. Since then the rates have improved somewhat: in 2005, the corresponding rates were 15%, 10%, 11%, and 5%. Nonetheless, these figures remain disquieting; for example, few would take comfort in the fact that nationally *only* 1 in 14 (7%) high school seniors in the class of 2005 drove while impaired by alcohol—and likely legally drunk—at least once in the past two weeks. These figures also underscore the need to continue monitoring this area of problem behavior.

We will continue to focus on heavy users in our epidemiological and etiological analyses. With the inclusion of 8th-grade panel data (followed up to age 24), we are able to examine further the factors underlying the initiation of frequent and heavy substance use, and with the addition of the middle adulthood surveys, we are able to examine further the longer term health and social role consequences of earlier and ongoing frequent and heavy substance use and substance use disorders.

Objective 9: To continue to study drug use and drug-related attitudes and beliefs among a number of subgroups that historically have been underrepresented in drug abuse research. These subgroups include women, ethnic minorities, and young adults who do not attend college, as well as those in military service, civilian employment, or homemaking after high school. (This objective also crosscuts many of the others above.)

Gender. A good proportion of the early large-scale epidemiological studies in this field contained males only, including those by Johnston (1973), O'Donnell et al. (1976), Robins (1974), and a number of others. Beschner and Treasure (1979) made the point more strongly: "In the past, there has been pitifully little research about the extent and etiology of female—youth or adult—drug use." During the 1980s, many more studies focused on drug use and related problems specifically among women (e.g., Beschner, Reed, & Mondara, 1981; Clayton, Voss, Robbins, & Skinner, 1986; Fillmore, 1987;

Glynn, Pearson, & Sayers, 1983; Ray & Braude, 1986; Reed, Beschner, & Mondara, 1982; Robbins, 1989; Wilsnack, 1987).

In response to the relative paucity, the U.S. Public Health Service (PHS) (1985a, 1985b) established a Task Force on Women's Health Issues and published two reports that included various recommendations of the task force. Included in the list of recommendations were special efforts to initiate "Studies of the significant factors related to the onset, continuation, and cessation of smoking, drinking, and drug taking by women" (Ray & Braude, 1986, p. 8). Current PHS guidelines mandate adequate representation of females and ethnic minorities in NIH-funded research projects. All of the current major studies on drug use with adolescents and young adults cited in this paper include males and females and often present findings regarding possible gender differences.

Since its inception in 1975, MTF has surveyed both females and males, and has paid particular attention to gender differences in virtually all of its publications; with the inclusion of 8th and 10th graders in 1991, we have been able to play an even more significant role in understanding the onset of drug use among both genders.

Use of illicit drugs (including, for example, marijuana, LSD, cocaine, heroin, and inhalants) is generally higher among males than females, with the differences emerging with age, so that the differences are greater at 12th grade than at 8th grade (Johnston, 1993; Johnston et al., 2006c). Indeed, in terms of illicit drug use other than marijuana, lifetime use rates are higher for females than males at 8th and 10th grade, whereas the opposite is true at 12th grade; this pattern is particularly reflected in use of amphetamines and tranquilizers (Johnston et al., 2006c). Use of other drugs, such as marijuana and cocaine, tend to be higher among males than females especially at upper grade levels, and use of anabolic steroids is distinctly higher among males at all grade levels, with very few female students reporting use of anabolic steroids. Cigarette use is fairly similar between males and females, but smokeless tobacco use is distinctly higher among males. Alcohol use, particularly frequent use, is also distinctly higher among male students (Johnston et al., 2006c). These gender differences and similarities reflect current patterns, and in large part, have remained in place for the past 30 years; nonetheless, there have been some shifts in gender differences, highlighting the importance of continuing to examine gender differences, describing any historical trending in the differences, and then attempting to explain them. One noteworthy pattern, especially for marijuana use, is that during historical periods of high use, gender differences tend to be magnified, whereas during periods of lower use, gender differences are diminished; this pattern tends to hold for other subgroup differences as well (Johnston et al., 2006c).

It should be mentioned here that the MTF survey instrument contains a set of questions relevant to women's perceptions of obstacles and opportunities they may face as women, and other questions relevant to their own plans, preferences, and expectations regarding work, marriage, parenthood, child care, and housework. Thus, our study is able to examine females' answers on issues of particular relevance to women, which can be related to their attitudes and behaviors in the drug domain, in addition to comparing between males and females.

Given that life during adolescence and young adulthood (and beyond) is often structured and experienced differently by gender (Galambos, 2004), we understand the importance of examining similarities and differences across gender. Indeed, in our completed, ongoing, and planned analyses, we routinely examine and report gender differences and interactions (or the lack thereof). Below are some selected examples of such efforts.

Herzog, Bachman, Johnston, and O'Malley (1987) presented analyses designed to examine some differences in health-threatening behaviors between young men and women, and to explain those differences. We concluded that young men (high school seniors) were more likely than young women to engage in alcohol use, drug use, and risky driving, and to become injured by others. We tested a model that posited personal characteristics related to commitment to educational and religious institutions and to the role of genders in this society, and opportunity factors as explanatory factors for the gender differences. Multivariate analyses controlling these factors reduced or eliminated the gender difference in the health-threatening behaviors. Frequency of cigarette smoking, on the other hand, showed no gender difference bivariately, and multivariate controls actually "produced" a gender difference to the disadvantage of young women.

In Bachman, Wadsworth, O'Malley, Johnston, et al. (1997), we presented extensive analyses separately for men and women, highlighting the differences and similarities in terms of the impacts of roles and environments in young adulthood. We reported that most of the impacts were similar for men and women; one notable exception was that pregnancy had substantial impacts on the drug use of women, whereas among men the impacts of having a pregnant spouse are more limited. There were, of course, other important differences in terms of how many men versus women experienced the various roles and environments; for example, men were far more likely to enter military service, women were far more likely to become full-time homemakers.

In a second book (Bachman et al., 2002), we examined the extent to which the impacts of post-high school role statuses and the corresponding new freedoms and responsibilities were mediated through variables such as religiosity, social-recreational activities, and attitudes about drugs. We investigated the extent to which mediation effects were similar or different for men and women, using multigroup structural equation methods. We found that, for the most part, the effects were generally very similar; one significant difference that emerged was that marriage led to greater decreases in evenings out among men than it did among women.

In a third book (Bachman et al., in press), we again conducted analyses separately for males and females, examining the links between education and substance use. Again, we found that, for the most part, effects were generally very similar, albeit with a few exceptions.

In a recent structural equation modeling analysis, we explicitly investigated gender and ethnic differences in the impact of risk and protective factors on substance use among our nationally representative samples of 8th and 10th graders (Pilgrim et al., 2006). We examined the extent to which school success and time spent with friends

mediated the impact of parental involvement and risk taking on substance use, and the extent to which the direct and mediated effects were invariant across six gender (female, male) by ethnicity (African American, Hispanic American, and White) subgroups. We found that in terms of measurement (i.e., factor loadings for each construct), there were very few gender by ethnicity subgroup differences, indicating that the same constructs were measured in the same way across the subgroups. Building on this measurement equivalence, we were able to examine equivalence of path coefficients and found considerable invariance across the subgroups, with parenting involvement contributing negatively to drug use directly and indirectly through school success and time with friends for all subgroups. There were some notable exceptions: for example, at 8th grade, the indirect path through time with friends was stronger than average for White females, and the indirect path through school success was weaker than average for African-American females; and at 10th grade, the indirect path through school success was stronger than average for White males. This explicit focus on gender by ethnic subgroup similarities and differences is important in a number of ways, especially in terms of understanding the extent to which mechanisms vary (and do not vary) by gender.

Additional recent analyses have focused on gender differences and similarities in terms of how academic achievement, attitudes, and behaviors relate to the course of substance use during adolescence (Bryant et al., 2003), the effects of part-time work on adolescent substance use (Bachman et al., 2003; Safron et al., 2001), fraternity/sorority effects on the prevalence and course of drug and alcohol use among college students (McCabe et al., 2005), the prevalence and prediction of marijuana use trajectories during the transition to adulthood (Schulenberg, Merline, Johnston, et al., 2005), the comorbidity of alcohol and tobacco use during the transition to adulthood (Jackson, Sher, & Schulenberg, 2005), the relationship between well-being trajectories and successes and difficulties with negotiating the developmental tasks of young adulthood (including reduced substance use) (Schulenberg, Bryant, et al., 2004), the relationship of multiple transitions immediately following high school on the course of well-being and substance use (Schulenberg, O'Malley, et al., 2005), and the prevalence and correlates of substance use at age 35 (Merline et al., 2004). While we do find important gender differences in all of these analyses (especially in mean levels of variables), it is noteworthy that we also find considerable and typically more gender similarities (especially in relations among variables), a finding consistent with a recent meta-analysis of gender differences studies across a wide range of characteristics and experiences (Hyde, 2005). We will continue to examine gender differences and similarities in all of our work, and specifically attend to variables that show developmental and historical shifts in gender differences.

Racial/ethnic minorities. An important part of our epidemiological (Objective 9) and etiological (Objective 6a) research has been to examine the relationship between race/ethnicity and substance use (Bachman & Wallace, 1991; Bachman, Wallace, et al., 1991; Johnston, O'Malley, & Bachman, 2001b; Wallace, 1994, 1999a, 1999b; Wallace & Bachman, 1991, 1993, 1997; Wallace, Bachman, O'Malley, & Johnston, 1995; Wallace et al., 2002; Wallace, Bachman, et al., 2003; Wallace, Forman, et al., 1999; Wallace & Muroff, 2002). Some of the key questions that we have addressed are: Does the epidemiology of drug use vary significantly across ethnic and racial groups? Are there significant gender differences in drug use among racial and ethnic groups? To what

extent are racial/ethnic differences in drug use the result of racial/ethnic differences in sociodemographic and lifestyle factors? Are the risk factors that past research identified as important correlates of drug use among White youth also significant predictors of drug use among minority youth?

One paper (Wallace et al., 2002) used MTF data from White, African-American, Mexican-American, Cuban-American, Puerto Rican, Other Latin-American, Asian-American and American Indian youth to examine disparities and similarities in their drug use patterns and trends, from 1976 to 2000. This paper was one of the first national studies to disaggregate the nebulous “Hispanic” group into more meaningful ethnic categories (e.g., Mexican, Puerto Rican, Cuban). Also, this paper provided both the longest term and the most up-to-date data on trends in adolescent drug use among these many racial/ethnic subgroups.

In another paper, Wallace and Muroff (2002) examined the extent to which White and African-American adolescents are or are not differentially exposed and/or vulnerable to key risk factors for drug abuse that have been identified in past research. Although past research has examined, at least to some extent, the notion that African-American and White adolescents are differentially exposed to key risk factors for substance use, this is one of the first, and the largest study to examine not only differential exposure but also differential vulnerability as key explanatory factors for racial differences in adolescent drug use.

Combining the goals of Objective 9 and Objective 6a, we have specifically examined racial/ethnic differences in religiosity and its role as a protective factor against substance abuse. These efforts have resulted in various analyses in a book, an occasional paper, and a series of articles (Bachman et al., 2002; Wallace, Brown, Bachman, & LaViest, 2003a, 2003b; Wallace, Forman, Caldwell, & Willis, 2003; Wallace, Delva, et al., in press; Wallace, Yamaguchi, et al., in press). In one recent article, Wallace, Forman, et al. (2003) documented the patterns and trends in the social distribution of religion across different racial/ethnic groups. This study found that religious attendance and the importance that young people ascribe to religion are generally highest among African-American and Hispanic youth, younger students, girls, youth with more highly educated parents, rural youth, and Southern youth. Building upon the findings of this study, we examined racial/ethnic differences in the relationship between religiosity and substance use using data from 8th, 10th and 12th graders (Wallace, Delva, et al., in press). This study found that the majority of 10th graders, irrespective of racial or ethnic group, are at least somewhat religious, that a third or more might be considered very religious, and that African-American 10th graders are significantly more religious than White and Hispanic 10th graders. We further found that although religion “protects” all three groups of young people from substance use, the strength of the relationship is greater for White than for non-White youth. Delving further into race differences in religiosity as a key explanation for the consistent finding that African-American youth are less likely than White youth to use drugs, we found that race differences in abstinence were substantially reduced when race differences in religiosity were controlled (see Wallace, Brown, et al., 2003b). Somewhat unexpectedly, we also found that highly religious White youth were even

more likely than highly religious African-American youth to abstain from alcohol and marijuana use (Wallace, Brown, et al., 2003b).

In an effort to address the 30-year debate about if, when, and under what circumstances religiosity deters delinquent behavior like substance use, we used multilevel modeling data analytic techniques (i.e., HLM) and samples of public high schools ($N = 227$) and high school seniors ($N = 16,595$) to examine various unresolved issues in the ongoing debate, with a specific focus on the relationships between individual- and contextual-level (i.e., school) religiosity and adolescent's use of tobacco, alcohol, and marijuana (Wallace, Yamaguchi, et al., in press). The results indicate first, that the higher adolescents' level of religiosity, the less likely they were to be current tobacco users, to engage in binge drinking, or to have used marijuana in the past year; second, that as the level of religiosity in a school increased, adolescents' frequency of cigarette use, binge drinking, and marijuana use decreased; third, that the religiosity of the school influenced students' substance use, over and above their individual religiosity, but that this relationship existed only for marijuana; and fourth, that the strength of the relationship between individual-level religiosity and individual-level substance use varied depending upon the religiosity of the school context, such that adolescents who are highly religious and in highly religious contexts were less likely to engage in binge drinking or marijuana use than students who were equally religious but in less religious school contexts. Regarding race differences, we found that even after controls for individual- and school-level religiosity, African-American youth smoked and drank heavily less often than White youth. We also found that cigarette use and binge drinking were lower in predominantly African-American schools versus predominantly White schools.

As discussed above when considering gender differences, we also recently examined gender by ethnic subgroup differences in how risk and protective factors relate to substance use at grades 8 and 10 (Pilgrim et al., 2006). This study yielded a number of important findings concerning similarities and differences across African-American, Hispanic-American, and White students in terms of family, peer, school, and individual risk factors; the findings show that while the level of use (and related risk/protective factors) may vary across ethnicity (and gender), the underlying processes that link the risk/protective factors with substance use may be quite similar.

In our reporting of racial/ethnic differences, we have been concerned about possible differential validity of reporting by different race and ethnic groups, and have investigated whether differential validity of self-reports might account for observed differences. Fortunately, the data appear to show very convincingly that differential validity is not likely a major ingredient in the different usage rates that we have reported (Wallace & Bachman, 1997).

Young adults who do not attend college. As we noted earlier in the discussion of Objective 6, a major proportion of the studies of young adults of post-high school age have been about college students, who make up less than half of that age group. This focus on college students has occurred primarily because access and data collection can be accomplished much more cost efficiently for those in college than those in other major environments. The dearth of general knowledge about the lives of young adults who do

not attend college (i.e., “the forgotten half”) was noted as a national concern by the William T. Grant Foundation Commission on Work, Family, and Citizenship (1988).

Monitoring the Future has been able to contribute to our understanding of “the forgotten half,” because it contains a large and reasonably good sample of young adults who do not attend college. Because high school dropouts rarely attend college, our original design excluding dropouts produced noncollege samples that are less representative than the college samples. If approximately 50% of the high school graduates attend college, and if dropouts represent around 15% of the total age cohort, then dropouts would comprise one fourth to one third of the noncollege population (assuming very few dropouts attend college). Nevertheless, some very useful analyses have been, and will continue to be, accomplished with our noncollege samples, for reasons similar to those advanced earlier in discussion of the effect of missing dropouts from the base-year samples. In particular, the majority of the noncollege population is covered. Furthermore, observed relationships would be expected to be less affected than point estimates; for example, while the mean level of religiosity might differ, we would expect much less difference in any measures of association between religiosity and other variables. Finally, for our current samples of young adults, trends have remained valid because the relative proportion of dropouts has not changed (assuming that trends are not different for dropouts versus graduates). Because the proportions of males and females attending college have been changing, we have consistently presented data for the college samples separately for males and females (e.g., Johnston et al., 2006c). These changing proportions could lead to trends in drug use that may be somewhat misleading if the genders were not described separately. For the same reason, we report trends separately for males and females in the noncollege segment. Examining similarities and differences as a function of college student experience/college degree (alone and as it interacts with gender) has been an emphasis in our recent analyses of substance use as related to young adulthood experiences (e.g., Jackson, Sher & Schulenberg, 2005; Schulenberg, Bryant, & O’Malley, 2004; Schulenberg, Merline, Johnston, et al., 2005; Schulenberg, O’Malley, Bachman, & Johnston, 2005), as well as to middle adulthood experiences (e.g., Merline et al., 2004; Schulenberg, Merline, & O’Malley, 2005). This emphasis will be continued in our future analyses of those experiencing young and middle adulthood.

Military, civilian employment, and homemaking. We included in follow-up surveys members of the military and civilian populations and those who were homemakers. All of these groups were included in the analyses reported in two recent books (Bachman et al., 2002; Bachman, Wadsworth, O’Malley, Johnston, et al., 1997), and discussed under Objective 6, above. Another analysis (Bachman et al., 1999a, 1999b) focused on young adults who entered military service by modal ages 19 or 20 (first follow-up), and contrasted them with those who entered college or civilian employment. The overall analyses contrasted men and women; however, detailed analyses showing impacts of historical changes in military policies about drugs could be carried out only for men, because the samples of women enlistees were too small for these analyses. Among other findings, the detailed analyses showed two important “secular trends” traceable directly to the initiation of new armed forces policies: first, there were declines in the prevalence of marijuana use and cocaine use among enlistees after the introduction of routine drug testing (“socialization effects”); second, lower proportions of regular

smokers chose to enter the services once tobacco bans during basic training were initiated (a “selection effect”). These and various other analyses were supported, in large measure, by outside funding under grants to Jerald G. Bachman from the Army Research Institute and the Office of the Secretary of Defense.

Objective 10: To continue to make methodological, substantive, and policy-relevant contributions to the larger fields of social, behavioral, educational, and medical research dealing with drugs and/or youth.

The issues discussed in this objective are examples of the types of methodological contributions to the field that, to a degree, constitute a by-product of the extensive substantive work being done on the project. Under this broad objective, there are four varied subobjectives, listed and discussed separately below.

Objective 10a: To refine methodologies for the analysis and interpretation of self-report measures of drug use, including documenting the reliability and validity of such measures.

Reliability and stability. In the early years of the study the longitudinal component of Monitoring the Future allowed us to estimate the reliability and stability of self-reports of drug use in a national sample over relatively long periods of up to four years (O’Malley, Bachman, & Johnston, 1983). Heise (1969) showed that reliability (defined as the proportion of variance in the observed score that is due to the true score) and stability (defined as the correlation between two true scores measured at two different times) could be separated, given at least three different measurement points, if one is willing to assume that the reliability of the measuring instrument is equal at all three times. Wiley and Wiley (1970) suggested that another assumption, often more appropriate than constant reliability, was one of a constant amount of error variance. In both procedures, error scores are assumed uncorrelated over time. Using the LISREL computer program (Joreskog, 1979) to implement the Wiley and Wiley procedures, we obtained results indicating that the measures of current cigarette use, annual alcohol use, and annual marijuana use all had reliabilities of .84 or higher. An index of the use of illicit drugs other than marijuana was somewhat less reliably measured—though still sufficiently reliable for survey purposes—with estimates based on different samples ranging from .70 to .87. Estimated stabilities were quite high: the highest annual stability (that is, the estimated correlation between two true scores measured one year apart) was for current cigarette use, at .92 or .93. The other stability estimates were slightly lower, about .87 for 30-day use of alcohol, and .89 for annual alcohol use and annual and 30-day use of marijuana. The use of illicit drugs other than marijuana was less stable (though still quite stable), with annual use stability estimated at .85 and 30-day use stability estimated at .79. It turned out to make little difference whether one assumed equal reliabilities or equal error variances; estimated reliabilities and stabilities were very similar under the two assumptions.

More recent efforts have utilized data from senior year plus up to seven follow-ups every two years after graduation, for a total of eight measurement occasions, which allows one to make fewer assumptions (Bachman et al., 2002; Bachman, Wadsworth,

O'Malley, Johnston, et al., 1997). For these analyses, using the EQS program, we assume only that the error variances at the first two measurement occasions are equal, and that the error variances at the last two are equal. (The problem is that the “outside” error variances—that is, the first and last—are unidentified without some identifying assumptions.) No other equality assumptions were needed. Monthly cigarette use shows the highest average annual stability (.97), followed by annual marijuana use (.95), monthly alcohol use (.94), and heavy drinking in the last two weeks (.94). Annual cocaine use is somewhat less stable (.91). Stabilities across the eight measurement periods are higher than the earlier estimates; this is undoubtedly due to the greater volatility in drug use in the first few years after high school. In terms of reliability, the 30-day measure of cigarette use shows the highest value, with an average reliability of .86. Annual marijuana use is also highly reliably measured (.84). Monthly alcohol (.71) and annual cocaine use (.68) are somewhat lower, and heavy drinking during the prior two weeks is lowest (.64), as might be expected, given the short time frame. We also used similar procedures to estimate reliabilities of key measures in order to incorporate adjustments in estimating structural equation models of the links between educational success and substance use in panel samples of 8th graders (Bachman et al., in press).

A somewhat different look at reliability of drug use reporting was provided by Johnston & O'Malley (1997). These analyses of panel data from young adults investigated the extent to which respondents were consistent in their self-reported lifetime prevalence of drug use over multiple measurements. Overall, recanting rates were found to be modest for the illegal drugs but less so for the psychotherapeutic drugs. In general, differences in recanting rates among subgroups were not large. Among the largest were: (a) the rates for African Americans recanting earlier reported marijuana and cocaine use (but not the use of three other drugs), and (b) rates for those young adults who are in the military, police, or firefighting occupations.

We believe that these findings advance the state of knowledge about the use of self-report instruments in this field, as well as about the relatively high degree of stability that is found in drug use patterns from the late teens and through the early 30s.

Validity. One concern raised has been whether respondents can accurately report about their substance use over longer time intervals (Radosevich, Lanza-Kaduce, Akers, & Krohn 1979). We conducted a careful comparison of drug use rates as reported for the last 30 days compared to the last 12 months (Bachman & O'Malley, 1981), and discovered a rather interesting and important discrepancy. Specifically, either the annual frequencies are too low, the monthly frequencies are too high, or both. In analyzing the discrepancy, which is fairly large and quite consistent across different drugs, we considered four possible explanations: forgetting, telescoping (remembering events as occurring more recently in time than they actually did), developmental trend (more drug use later in a year as a function of age), and “senioritis” (more drug use in the late stages of the senior year as part of the “rites of passage”). The most appropriate conclusion from these analyses seems to be that simple forgetting probably accounts for most of the discrepancy. This implies that the frequency of drug use during the past year, and probably also lifetime, are in many cases systematically underestimated.

We also investigated three other possibilities related to the 30-day versus 12-month discrepancy. If, for example, some respondents are especially likely to forget or to repress some amount of their drug use over the course of the preceding year, then certain patterns of relationships among various discrepancy ratios should be evident: (1) discrepancy ratios for a given drug should show some degree of positive correlation across time; that is, they should exhibit stability; (2) within a particular time interval, discrepancy ratios for one drug should correlate with discrepancy ratios for other drugs; (3) discrepancy ratios should be correlated with other individual characteristics such as reading or verbal ability. We examined base-year and follow-up data for several different classes for various longitudinal intervals. To summarize the findings briefly, there was no evidence of systematic cross-time longitudinal associations in discrepancy ratios for the various drugs, but there was considerable within-time association among drugs. The discrepancy ratios were not related to stable individual characteristics.

We conclude from these various analyses that the underestimation of 12-month use is not a serious problem for this study for several reasons. First, it is quite likely that a respondent will remember having used a particular drug at least once, even though the number of times beyond one or two may be less clearly recalled; therefore, there should be little recall error in period prevalence estimates. Further, there is no reason to suppose that the pattern of inconsistency will change from one year to another, and therefore analyses of trends will likely be valid since the biases will be fairly constant from one year to the next. Finally, the tendency to be inconsistent, and presumably to underreport annual use, is not strongly associated with any of a broad array of individual characteristics (Bachman & O'Malley, 1981; O'Malley et al., 1983).

There are various other types of evidence bearing on the validity of self-report data and such data dealing specifically with substance use, which are summarized in chapter 3 of the annual volumes of epidemiological results (e.g., Johnston et al., 2006c). The reader is referred to that source for a discussion of the evidence.

One particular question regarding the validity of drug surveys is whether there are racial or ethnic differences in the tendency to report drug use validly (Mensch & Kandel, 1988b). Wallace and Bachman (1993) provided a series of analyses that investigated whether minority students underreported their drug use. These analyses indicate that, although caution should be used when reporting and interpreting racial differences in school-based survey responses, particularly when such differences are relatively small, the large racial and ethnic subgroup differences in self-reported drug use found in the MTF data are likely to be valid and reliable. A chapter by Wallace et al. (1995) further discussed issues about the validity of self-report data in student-based studies with minority populations. These analyses utilized data from the 8th-, 10th-, and 12th-grade surveys, and the analyses again supported the general validity of such data. That chapter points out that some of the differences in drug use between White and Hispanic high school seniors can be explained by the higher dropout rates among Hispanic youth, but none of the several hypotheses investigated seemed to account for the different rates of use between White and African-American youth.

A number of the techniques used to test for reliability and validity of the Monitoring the Future data have now been extended to data gathered in several European countries, using an instrument modeled after ours (Johnston, Driessen, & Kokkevi, 1994). The results of this work, sponsored by the Council of Europe, suggest that there is considerable evidence of reliability and validity in these instruments, even when applied to a range of different cultures. The generality of reliability and validity clearly facilitates international comparisons.

Representativeness. One issue relating to the representativeness of the MTF sample—an issue that is of concern to many other researchers as well—is the effect of absentees. Kandel (1975), Josephson and Rosen (1978), and Johnston, O’Malley, and Bachman (1996) have shown absenteeism is correlated with drug use. We examined the effect of differential weighting of data to adjust for the rate of absenteeism, and we concluded that the adjustment had minimal effects on prevalence and trend estimates and thus was not worth the cost and difficulty of differential weighting (Johnston & O’Malley, 1985).

Objective 10b: To continue to provide measures for, and to stimulate the comparability of measurement in, drug research at the local, state, national, and international levels; and to provide national norms for comparison purposes.

The meteoric rise in drug use in the United States during the late 1960s and early 1970s was closely followed by a similar rise in survey studies of young people—many in specific schools and colleges (Berg & Broecker, 1972). These many surveys were conducted using an almost equal number of research instruments, often resulting in use of poor or unworkable instruments and frustrated attempts to compare or integrate findings across studies. In 1974, NIDA and the Special Action Office on Drug Abuse Prevention gave official recognition to this problem by establishing a committee of research scientists to recommend some standardized measurement techniques and terms. The committee developed recommendations (Elinson & Nurco, 1975), and subsequently, the *Drug Abuse Instrument Handbook* was developed (Nehemkis, Macari, & Lettieri, 1976). A second NIDA committee was later created to review the standardization of interview measures (Rittenhouse, 1978).

The first committee and the subsequent handbook recommended certain standard characteristics for drug use measures (Kandel, 1978a, pp. 28–30) that would be compatible both with certain earlier studies and with the MTF series. A third committee met to develop a handbook devoted to helping investigators interested in assessing marijuana use consequences (Huba, Bentler, & Newcomb, 1981); it adopted a number of MTF measures, and MTF also adopted some of the new measures developed by the committee.

Since that time, we have made an active effort to stimulate the use of compatible measures by other researchers in this country and abroad. This has been done both by offering the use of MTF measures in other studies for which they would be appropriate, and by suggesting the incorporation of compatible distinctions in measures developed for different formats.

To date we have made various parts of our measurement package available to all who have expressed an interest in using them. In this country, a number of sizable surveys have made use of portions of the instrumentation. The National Household Survey of Drug Abuse (Substance Abuse and Mental Health Services Administration, 1999), the adolescent smoking segment of the National Health and Nutrition Examination Survey (National Center for Health Statistics), an AMA-sponsored survey of medical students (Baldwin, Hughes, Conard, Storr, & Sheehan, 1991), the Centers for Disease Control's Youth Risk Behavior Surveillance study, and a survey of college student athletes by the National Collegiate Athletic Association (Anderson, Albrecht, McKeag, Hough, & McGrew, 1991) are some of the national efforts that have used Monitoring the Future items. At a minimum,¹⁰ state-wide surveys in Colorado, Connecticut, Indiana, Massachusetts, Michigan, Minnesota, Nebraska, New Jersey, New Mexico, New York, and Oregon have utilized portions of our instrumentation. In addition, use of our questionnaires has been requested by many American investigators conducting their own surveys or evaluations.

On the international level, model instruments have been developed with our participation by both the World Health Organization (WHO) (Smart, 1980) and the United Nations Division of Narcotic Drugs (UNDND) (1980). The WHO instrument, a self-administered questionnaire, was developed and applied to purposive school samples in seven countries. It was then revised and has been disseminated as a model for investigators in other countries wishing to conduct school-based studies. While simplified for use with populations in developing, as well as developed countries, it has a basic structure (in the distinctions among drug classes, in time intervals for prevalence measurement, and in frequency distinctions) that will generate data comparable to data from MTF. It also contains a number of optional segments on attitudes, availability, and so on, which are based directly on MTF measures. Another WHO instrument, which is similarly compatible, was also developed.

A model interview schedule for drug use surveys in developing countries was developed by Johnston under United Nations sponsorship (United Nations Division of Narcotic Drugs, 1980). It was designed to be compatible with the WHO instruments, the Monitoring the Future instruments, and portions of the NIDA Household Survey instruments.

A multicountry school drug use survey study, mentioned briefly in Objective 10a, has been conducted under the auspices of the Council of Europe. Johnston served as coordinating investigator, and the instrument package consisted almost entirely of MTF instrumentation (Johnston et al., 1994). A critical outgrowth of that activity was a 26-country coordinated school survey in 1995 of nationally representative samples of students, mostly in Europe, using an instrument based largely on the pilot study instrument just mentioned. (Johnston served as a consultant in the design, instrumentation, and reporting of the 26-country study.) The work, which was sponsored

¹⁰We are not always aware of the extent to which some use is made of the Monitoring the Future instrumentation.

by the Swedish government in collaboration with the Council of Europe (Hibbell & Andersson, personal communication, 1996), was repeated in 1999, with 30 European countries participating (Hibell et al., 2000), and in 2003 with 35 countries participating (Hibell et al., 2004). MTF data were included in all three volumes for comparison purposes. Thus, this effort, which helps to put the situation in the U.S. into a much broader perspective, constitutes a major expansion of the field of drug epidemiology at the world level.

Monitoring the Future is also contributing to the advancement of epidemiological work at the international level, and specifically to the standardization of instrumentation, through Johnston's participation in the development of a new manual entitled *Guide to Drug Abuse Epidemiology* published by the World Health Organization (WHO) as an international guide. He contributed two chapters (Johnston, 2000a, 2000b), and many MTF variables and measures are included as models.

We have also provided copies of our instruments to a number of Canadian, Australian, African, Asian, and European investigators at their request; and the instruments have been adopted in a number of national assessments overseas.

We consider these to be major steps toward the standardization of measurement in the field. We expect that MTF can continue to play an important role in this effort, not only by making its instrumentation available, but by providing up-to-date national norms against which the results of studies on more local or specialized populations can be compared. Such comparisons may well contribute to improved understanding of the role that various cultural and social factors play in the etiology of drug use.

Objective 10c: To continue to conduct research of policy importance, particularly the evaluation of “natural experiments,” that can build upon the main study with great economies in cost and time; and to facilitate the use of MTF data for policy studies by and with external collaborators, who often combine MTF data with other relevant data sets.

Because we have accumulated large numbers of respondents in nationally representative samples, there is now a rich resource that can be used to address many research and policy issues not encompassed in the current design. We discuss below several types of research potentials that are provided by the existence of the MTF project.

Evaluating natural experiments. One important example to date has been our ability to address the question of the behavioral impact of marijuana decriminalization. Having before and after data in a number of “control,” as well as “experimental,” states allowed us to address in a prospective fashion the question of impact under a separate grant from the National Institute on Drug Abuse (Johnston, O'Malley, & Bachman, 1981). Had the main study not been in place, it is doubtful that there would have been sufficient time to mount a comparable effort; but, even if there had been time, the cost would have been far greater.

A second example of an evaluation of a natural experiment also relates to evaluating a change in the legal status of use of a drug, in this case, alcohol. A number of states lowered the minimum age for purchase of alcohol in the early and mid-1970s. Following increases in the rate of driving accidents after drinking by young people, several states raised their minimum drinking ages in the late 1970s and early 1980s; and, by 1987, national legislation had prompted all other states with a minimum drinking age less than 21 to raise that minimum to 21. Thus, because we had before and after data in a number of states, we were in a position to evaluate the likely effect of these law changes. The National Institute on Alcohol Abuse and Alcoholism provided funds to perform such an evaluation, and the results were reported by O'Malley and Wagenaar (1991). A later similar effort evaluated the effects of changes by many states in the blood alcohol concentration levels that determined "driving under the influence" status (Wagenaar, O'Malley, & LaFond, 2001). More recently, the efforts of state coalitions to reduce underage drinking were evaluated (Wagenaar, Erickson, Harwood, & O'Malley, 2006). (In these cases, additional funding was provided by the Robert Wood Johnson Foundation.)

Because the legal status of drug use (including alcohol and cigarette availability) remains in a state of flux, it seems likely that other natural experiments will be taking place. Cigarette smoking is being regulated in a variety of ways, including the proposed removal of machine-dispensed cigarettes, which may make cigarettes less available to youngsters. Taxation of alcohol and tobacco products is another example of policy decisions that could influence use of those substances. Several efforts have already utilized MTF data to evaluate the effects of prices on cigarette use among adolescents (Chaloupka & Pacula, 1998, 1999; Gruber & Zinman, 2001; Tauras, O'Malley, & Johnston, 2001). As such events occur, the Monitoring the Future data series can be used to assess their effects on young people. In some cases this may mean gathering some supplementary data, as in the study of marijuana decriminalization; but in other cases existing data may suffice.

Evaluating planned experiments. While natural experiments provide one type of experimental manipulation that may be assessed using the existing monitoring system, planned experiments provide another—that is, true experiments planned with the evaluation system and control groups in mind. For example, educational and persuasion efforts aimed at reducing the abuse of drugs might be introduced in selected experimental schools (if conducted through the school) or regions (if conducted through the media). The existing national series could be used to provide control data on use, attitudes, beliefs, and so on, while presumably supplementary data collections could be made in those areas where the experimental intervention was introduced. We have argued elsewhere (Johnston, 1977) that planned experimentation with carefully thought-out evaluation provides the most promising route for the advancement of intervention techniques in the drug abuse field. We are prepared to contribute to the process by making intervention and comparison data available to others and, if necessary, by proposing to conduct supplementary data collections or analyses ourselves. One such effort is now underway, in fact, involving a supplementary sample of about 50 schools in which Botvin's Life Skills Training (LST) is in the process of being adopted. Under funding from the Robert Wood Johnson Foundation, we are attempting to evaluate the

effectiveness of this program as it diffuses throughout the country. We will be assessing the changes in levels of various types of substance use among 8th graders in the schools adopting this program, and comparing them to the changes observed in the MTF schools not adopting that program. The results could have significant implications for schools and the prevention field.

One planned intervention, which generally was not implemented within an experimental design, is the massive national effort by the Partnership for a Drug-Free America (PDFA) to discourage drug use via the media. The Monitoring the Future study has contributed trend data on use, as well as attitudes, and has done much to establish the importance of certain attitudes and beliefs. In addition, a number of questions were added to the study to secure the respondents' assessment of the qualities and impact of this advertising campaign, and the results have been encouraging (Johnston, 1999). Results have been shared over the years with PDFA and ONDCP, and presented in testimony before Congress (Johnston, 1999). The ONDCP Director used MTF data to make several points in his comments on the effectiveness of the recent National Youth Anti-Drug Media Campaign; for example "Further, according to MTF, teens are increasingly likely to disapprove of trying marijuana, and these higher rates of disapproval are associated with lower rates of current use, especially among 10th graders, the core target audience of the Campaign." Thus the study has been of acknowledged value to this important undertaking, even though it has not provided an experimental design.

Extended study of select subgroups. Rather than focusing on a representative cross-section of a graduating class, there may be occasions where extended study of a highly select subgroup is desired. For example, we responded affirmatively when one investigator in the field asked our assistance in selecting a sample of monozygotic twins. While his research was never launched, the potential was there. Of course, continued study of the groups selected is not without its potential problems. Certainly their explicit consent to participate in a different research undertaking would be required.

Other research potentials. MTF, by virtue of its sampling frames and new and ongoing panels, represents a rich resource that has been and will continue to be used to investigate key policy issues concerning important subpopulations. Some of these efforts may be within the domain of substance use (e.g., see Johnston, O'Malley, & Davis-Sacks, 1983; Johnston, O'Malley, & Harrison, 1989); some focus on other issues (e.g., see Bachman, Segal, Freedman-Doan, & O'Malley, 1998; Herzog & Bachman, 1982; Rodgers & Bachman, 1988).

Objective 10d: To continue to provide measures of progress toward the accomplishment of various national goals, including the National Education Goals, the National Health Goals, the President's National Drug Control Strategy, the DHHS reports on child well-being, the Surgeon General's Reports on Smoking, and the Surgeon General's Reports on Adolescent Violence.

Monitoring the Future has been used as a data source for measuring the accomplishment of various national goals included in the White House's annual National Strategy on Drug Abuse, DHHS's Health Objectives for the Year 2000 and subsequently

the Year 2010, and the National Education Goals Panel's Objectives for the Year 2000. In addition, the final report of the National Commission on Drug-Free Schools (1990) relied heavily on results from Monitoring the Future; and the annual Sourcebook of Criminal Justice Statistics, which tracks crime and victimization in the country, contains a substantial amount of data from the study in its annual reports. Among the government's Health Objectives for the Year 2000 and now 2010 were a number of dimensions for which MTF was the source of information. Similarly, the National Education Goals relied primarily on data from the Monitoring the Future project to measure, at the national level, the accomplishment of the seventh of the eight educational goals: "Safe, disciplined, and drug- and alcohol-free schools."¹¹ We believe this constitutes formal recognition of the importance of the study's many indicators to the monitoring of the well-being of the young people in America.

Objective 11: To continue to facilitate the use of the MTF databases by others—including investigators in a variety of substantive and disciplinary fields—while adequately protecting the confidentiality of the study's many respondents.

We believe it desirable to make the data, as well as the instrumentation from this study, readily available to the larger field of scholars. There are several reasons for this view. First, on issues having the social importance of some of the ones we have been addressing, we believe it important for others to be able to check and perhaps at times challenge, our conclusions by conducting their own analyses. Second, the complex design of the study, combined with its great breadth of substance, means that a data resource results that is far too rich for a single set of investigators to exploit completely. We believe that many investigators within and outside of the drug field will have questions to ask of the data that we will not be able to pursue ourselves; indeed, many already have.

Throughout the life of the study, we have made the secondary school data available primarily through two mechanisms, a national data archive and our data resource volumes. The 8th-, 10th-, and 12th-grade cross-sectional data sets from the Monitoring the Future study are provided on an annual basis to the Substance Abuse and Mental Health Data Archive (SAMHDA; <http://www.icpsr.umich.edu/SAMHDA/>), which is a part of the Inter-university Consortium for Political and Social Research (ICPSR) and is located at the Institute for Social Research in Ann Arbor. SAMHDA, in turn, processes these data sets and makes them available in a standard format on the World Wide Web to anyone who requests them. SAMHDA currently provides access to 293 different MTF cross-sectional data sets. SAMHDA also makes available a Web-based data analysis capability for a number of MTF data sets that contain key multiform "core" variables (<http://www.icpsr.umich.edu/SAMHDA/sda.html>). As of this writing, the MTF files are generating nearly 100,000 downloads per year by external users, indicating a very high level of utilization by the field. There are also about 28,000 accesses per year to the archive's direct Data Analysis System. ICPSR is particularly well

¹¹We worked extensively with the National Education Goals Panel in the formulation of measures for this objective, including the development of some new measures on weapons at school, feeling safe at school, and disruptions in class—all of which were added to MTF to assist the work of the Panel. Unfortunately, this Panel was phased out of existence in 2002.

suited for these archival activities, because it has established dissemination capabilities with some 500 colleges and universities throughout the nation and the world, and is the world's largest social science data archive.

Another medium for dissemination of information to other researchers and policy makers is our series of annual reference volumes containing summary statistics from the surveys of 12th graders. Thirty-one (1975–2005) of these have been published as of this writing. They contain percentagized univariate and bivariate distributions for all variables measured on each year's senior class—nearly 2,000 variables in all. Bivariate statistics for subgroups defined by gender, race, region of the country, college plans, and a composite index of drug use are included routinely. Trends across time for all seniors, or for any of these subgroups, can be determined by using the reference volumes for two or more years in combination. A special cross-time question index allows the reader to quickly determine in what years a question was asked, and where it was located in the questionnaires. In addition to serving as reference works in their own right, we believe they can serve to stimulate and facilitate use of the archived data. Not only can the volumes create interest by calling attention to the existence of particular variables, and perhaps to some intriguing preliminary findings, but they can also serve as codebooks for the user of the public data sets and provide a standard set of univariate and bivariate statistics on all analytical variables. Further, they can provide national norms for any investigator using some of our measures to survey particular populations of special interest.

Three other publication series are also worth brief mention in this regard—our own annual volumes of detailed results on the various drugs, published by NIDA (Johnston et al., 2006c). Quite a bit of statistical material is published elsewhere that is taken from the information in this series, including, for example, *Trends in the Well-Being of America's Children and Youth*, (Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services, 2003); and the *Sourcebook of Criminal Justice Statistics*, published by the Department of Justice (Bureau of Justice Statistics, 2003). The latter, an important sourcebook series in the criminology field, regularly carries a sizable section (now roughly 40 pages) of data in trend tables derived from our annual volumes.

In addition to these public data resources, we have also made other data available to individual researchers on request. Because of major concerns about protecting the confidentiality of our many respondents, we concluded that it constituted an unreasonable risk (and thus a breach of our assurances to respondents) to place the study's panel data into public access archives. We believe that there would be a very real potential for someone to break confidentiality through the "pattern identification" of individuals using the extensive panel information, and that, because these files contain a considerable amount of highly sensitive data, it would present too great a challenge or opportunity for someone to misuse them. (An important implication of our design, which involves the inclusion of whole schools at a given grade level, is that a large number of people know that any given individual participated in this study. To illustrate the risk, we have had at least one request for data on a respondent from a spouse in a divorce proceeding.)

However, we recognize the desirability of providing analytic access to the panel data to other investigators, and we have used a number of different mechanisms to do so. The most important mechanism was to add to the project staff a data analyst (who has Master's degrees in statistics and mathematics) who is available to outside users to run analyses on the panel data or to provide a summary data set, for example, a covariance matrix. (This arrangement, implemented in 1994, is analogous in many ways to what the MTF investigators themselves do to carry out analyses.) At the specification of the outside investigator, the analyst conducts analyses on an actual-cost basis and provides the results in an appropriate form to the investigator. While this process may be more cumbersome than having a public-use panel data set, we concluded that it was the most forthcoming arrangement we could justify and still meet our obligation to our respondents, as well as to their parents and their schools, to protect their identities. Recently, our local Institutional Review Board conducted a routine review of our respondent protection procedures, including our data-sharing policies; their conclusion was that our strict data-sharing policies are necessary and appropriate in terms of protecting respondent confidentiality.

We have also instituted a Remote Analysis System (RAS), available through the Internet. An outside investigator can conduct analyses on a "dummy" data set, and then provide the analysis commands (using SAS, SPSS, SUDAAN, etc.) to the MTF staff, who run the specified analyses on the actual data. Collaboration with one of the MTF investigators is another mechanism that has been used on occasion, and it is also possible for an investigator to come on site and work with an analyst on the study staff to carry out specified runs.

In sum, we have used, and will continue to use, a variety of mechanisms to provide data for others to utilize, and we believe we have been successful both in preserving and protecting the confidentiality of our respondents, and in accommodating the needs and wishes of other researchers who require access to data that cannot be made publicly available.

REFERENCES

- Adam, J. (1978). Sequential strategies and the separation of age, cohort, and time-of-measurement contributions to developmental data. *Psychological Bulletin*, 85, 1309–1316.
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.
- Akers, R. L., & Cochran, J. K. (1985). Adolescent marijuana use—A test of three theories of deviant behavior. *Deviant Behavior*, 6, 323–346.
- Allison, P. (2003). Missing data techniques for structural equation modeling. *Journal of Abnormal Psychology*, 112, 545–557.
- Alzado, L. (1991, July 8). I'm sick and I'm scared. *Sports Illustrated*, 75(2), 20–25.
- An, L. C., O'Malley, P. M., Schulenberg, J., Bachman, J. G., & Johnston, L. D. (1999). Change at high risk: The fall and rise of cigarette use among American high school seniors. *American Journal of Public Health*, 89, 699–705.
- Anderson, W. A., Albrecht, R. R., McKeag, D. B., Hough, D. O., & McGrew, C. A. (1991). A national survey of alcohol and drug use by college athletes. *The Physician and Sportsmedicine*, 19, 91–104.
- Anthony, E. J., & Cohler, B. J. (1987). *The invulnerable child*. New York: Guilford Press.
- Arminger, G., Clogg, C. C., & Sobel, M. E. (Eds.). (1995). *Handbook of statistical modeling for the social and behavioral sciences*. New York: Plenum Press.
- Arnett, J. J. (1992). Reckless behavior in adolescence: A developmental perspective. *Developmental Review*, 12, 339–373.
- Arnett, J. J. (1998). Learning to stand alone: The contemporary American transition to adulthood in cultural and historical context. *Human Development*, 41, 295–315.
- Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist*, 55, 469–480.
- Arnett, J. J. (2004). *Emerging adulthood: The winding road from the late teens through the twenties*. New York: Oxford University Press.
- Arnett, J. J., & Tanner, J. L. (Eds.). (2006). *Emerging adults in America: Coming of age in the 21st century*. Washington, DC: American Psychological Association.
- Ary, D. V., Duncan, T. E., Biglan, A., Metzler, C. W., Noell, J. W., & Smolkowski, K. (1999). Development of adolescent problem behavior. *Journal of Abnormal Child Psychology*, 27(2), 141–150.
- Bachman, J. G., Bare, D. E., & Frankie, E. I. (1986). *Correlates of employment among high school seniors* (Monitoring the Future Occasional Paper No. 20). Ann Arbor, MI: Institute for Social Research.
- Bachman, J. G., Freedman-Doan, P., O'Malley, P. M., Johnston, L. D., & Segal, D. R. (1999a). Changing patterns of drug use among US military recruits before and after enlistment. *American Journal of Public Health*, 89, 672–677.
- Bachman, J. G., Freedman-Doan, P., O'Malley, P. M., Johnston, L. D., & Segal, D. R. (1999b). *Comparing drug-using behaviors among high school graduates entering military service, college, and civilian employment* (Monitoring the Future Occasional Paper No. 42). Ann Arbor, MI: Institute for Social Research.

- Bachman, J. G., Johnston, L. D., & O'Malley, P. M. (1981a). *Monitoring the Future: Questionnaire responses from the nation's high school seniors, 1980*. Ann Arbor, MI: Institute for Social Research.
- Bachman, J. G., Johnston, L. D., & O'Malley, P. M. (1981b). Smoking, drinking, and drug use among American high school students: Correlates and trends, 1975–1979. *American Journal of Public Health, 71*, 59–69.
- Bachman, J. G., Johnston, L. D., & O'Malley, P. M. (1985). *Monitoring the Future: Questionnaire responses from the nation's high school seniors, 1984*. Ann Arbor, MI: Institute for Social Research.
- Bachman, J. G., Johnston, L. D., & O'Malley, P. M. (1989). *Monitoring the Future: Questionnaire responses from the nation's high school seniors, 1989*. Ann Arbor, MI: Institute for Social Research.
- Bachman, J. G., Johnston, L. D., & O'Malley, P. M. (1990a). Explaining the recent decline in cocaine use among young adults: Further evidence that perceived risks and disapproval lead to reduced drug use. *Journal of Health and Social Behavior, 31*, 173–184. Also abstracted in *Yearbook of Psychiatry and Applied Mental Health* (1992). Chicago, IL: Mosby-Year Book, Inc.
- Bachman, J. G., Johnston, L. D., & O'Malley, P. M. (1990b). *Linking trends in cocaine use to perceived risks, disapproval, and lifestyle factors: An analysis of high school seniors, 1976–1988* (Monitoring the Future Occasional Paper No. 29). Ann Arbor, MI: Institute for Social Research.
- Bachman, J. G., Johnston, L. D., & O'Malley, P. M. (1991a). How changes in drug use are linked to perceived risks and disapproval: Evidence from national studies that youth and young adults respond to information about the consequences of drug use. In R. L. Donohew, H. Sypher, & W. Bukoski (Eds.), *Persuasive communication and drug abuse prevention* (pp. 133–156). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Bachman, J. G., Johnston, L. D., & O'Malley, P. M. (1991b). *Monitoring the Future: Questionnaire responses from the nation's high school seniors, 1988*. Ann Arbor, MI: Institute for Social Research.
- Bachman, J. G., Johnston, L. D., & O'Malley, P. M. (1998). Explaining the recent increases in students' marijuana use: The impacts of perceived risks and disapproval from 1976 through 1996. *American Journal of Public Health, 88*, 887–892.
- Bachman, J. G., Johnston, L. D., O'Malley, P. M., & Humphrey, R. H. (1986). *Changes in marijuana use linked to changes in perceived risks and disapproval* (Monitoring the Future Occasional Paper No. 19). Ann Arbor, MI: Institute for Social Research.
- Bachman, J. G., Johnston, L. D., O'Malley, P. M., & Humphrey, R. H. (1988). Explaining the recent decline in marijuana use: Differentiating the effects of perceived risks, disapproval, and general lifestyle factors. *Journal of Health and Social Behavior, 29*, 92–112.
- Bachman, J. G., Johnston, L. D., O'Malley, P. M., & Schulenberg, J. E. (1996). Transitions in alcohol and other drug use and abuse during late adolescence and young adulthood. In J. A. Graber, J. Brooks-Gunn, & A. C. Petersen (Eds.), *Transitions through adolescence: Interpersonal domains and contexts*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Bachman, J. G., Johnston, L. D., O'Malley, P. M., & Schulenberg, J. E. (2006). *The Monitoring the Future project after thirty-two years: Design and procedures* (Monitoring the Future Occasional Paper No. 64). Ann Arbor, MI: Institute for Social Research.

- Bachman, J. G., Kahn, R. L., Mednick, M. T., Davidson, T. N., & Johnston, L. D. (1967). *Youth in Transition: Vol. 1. Blueprint for a longitudinal study of adolescent boys*. Ann Arbor, MI: Institute for Social Research.
- Bachman, J. G., & O'Malley, P. M. (1981). When four months equal a year: Inconsistencies in students' reports of drug use. *Public Opinion Quarterly*, *45*, 536–548.
- Bachman, J. G., O'Malley, P. M., & Johnston, J. (1978). *Youth in Transition: Vol. 6. Adolescence to adulthood—A study of change and stability in the lives of young men*. Ann Arbor, MI: Institute for Social Research.
- Bachman, J. G., O'Malley, P. M., & Johnston, L. D. (1980). *Correlates of drug use: Part 1. Selected measures of background, recent experiences, and lifestyle orientations* (Monitoring the Future Occasional Paper No. 8). Ann Arbor, MI: Institute for Social Research.
- Bachman, J. G., O'Malley, P. M., & Johnston, L. D. (1984). Drug use among young adults: The impacts of role status and social environments. *Journal of Personality and Social Psychology*, *47*, 629–645.
- Bachman, J. G., O'Malley, P. M., & Johnston, L. D. (1986). *Change and consistency in the correlates of drug use among high school seniors: 1976–1986* (Monitoring the Future Occasional Paper No. 21). Ann Arbor, MI: Institute for Social Research.
- Bachman, J. G., O'Malley, P. M., Schulenberg, J. E., Johnston, L. D., Bryant, A. L., & Merline, A. C. (2002). *The decline of substance use in young adulthood: Changes in social activities, roles, and beliefs*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Bachman, J. G., O'Malley, P. M., Schulenberg, J. E., Johnston, L. D., Freedman-Doan, P., & Messersmith, E. E. (in press). *The education–drug use connection: How successes and failures in school relate to adolescent smoking, drinking, drug use, and delinquency*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Bachman, J. G., Safron, D. J., Sy, S. R., & Schulenberg, J. E. (2003). Wishing to work: New perspectives on how adolescents' part-time work intensity is linked to educational disengagement, substance use, and other problem behaviours. *International Journal of Behavioral Development*, *27*(4), 301–315.
- Bachman, J. G., & Schulenberg, J. E. (1993). How part-time work intensity relates to drug use, problem behavior, time use, and satisfaction among high school seniors: Are these consequences, or merely correlates? *Developmental Psychology*, *29*, 220–235.
- Bachman, J. G., Schulenberg, J. E., O'Malley, P. M., & Johnston, L. D. (1990, March). *Short-term and longer-term effects of educational commitment and success on the use of cigarettes, alcohol, and illicit drugs*. Paper presented at the Biennial Meetings of the Society for Research on Adolescence, Atlanta, GA.
- Bachman, J. G., Segal, D. R., Freedman-Doan, P., & O'Malley, P. M. (1998). Does enlistment propensity predict accession? High school seniors' plans and subsequent behavior. *Armed Forces and Society*, *25*(1), 59–80.
- Bachman, J. G., Wadsworth, K. N., O'Malley, P. M., Johnston, L. D., & Schulenberg, J. E. (1997). *Smoking, drinking, and drug use in young adulthood: The impact of new freedoms and new responsibilities*. Mahwah, NJ: Lawrence Erlbaum Associates.

- Bachman, J. G., Wadsworth, K. N., O'Malley, P. M., Schulenberg, J. E., & Johnston, L. D. (1997). Marriage, divorce, and parenthood during the transition to young adulthood: Impacts on drug use and abuse. In J. E. Schulenberg, J. Maggs, & K. Hurrelmann (Eds.), *Health risks and developmental transitions during adolescence*. New York: Cambridge University Press.
- Bachman, J. G., & Wallace, J. M., Jr. (1991). The 'drug problem' among adolescents: Getting beyond the stereotypes. *Ethnicity & Disease, 1*, 85–97.
- Bachman, J. G., Wallace, J. M., Jr., O'Malley, P. M., Johnston, L. D., Kurth, C. L., & Neighbors, H. W. (1991). Racial/ethnic differences in smoking, drinking, and illicit drug use among American high school seniors, 1976–1989. *American Journal of Public Health, 81*, 372–377.
- Bailey, J. A., Hill, K. G., Oesterle, S., & Hawkins, J. D. (2006). Linking substance use and problem behavior across three generations. *Journal of Abnormal and Child Psychology, 34*, 273–292.
- Bailey, S. L., & Hubbard, R. L. (1990). Developmental variation in the context of marijuana initiation among adolescents. *Journal of Health and Social Behavior, 31*, 58–70.
- Baldwin, D. C., Jr., Hughes, P. H., Conard, S. E., Storr, C. L., & Sheehan, D. V. (1991). Substance use among senior medical students: A survey of 23 medical schools. *Journal of the American Medical Association, 265*, 2074–2078.
- Baltes, P. B. (1987). Theoretical propositions of life-span developmental psychology: On the dynamics between growth and decline. *Developmental Psychology, 23*, 611–626.
- Baltes, P. B. (1997). On the incomplete architecture of human ontogeny: Selection, optimization and compensation as foundation of developmental theory. *American Psychologist, 52*, 366–380.
- Baltes, P. B., Lindenberger, U., & Stausinger, U. M. (2006). Life-span theory in developmental psychology. In R. M. Lerner (Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (6th ed., pp. 569–664). Hoboken, NJ: Wiley.
- Baltes, P. B., & Nesselroade, J. R. (1972). Cultural change and adolescent personality development: An application of longitudinal sequences. *Developmental Psychology, 7*, 244–256.
- Baltes, P. B., & Nesselroade, J. R. (1973). The developmental analysis of individual differences on multiple measures. In J. R. Nesselroade & H. W. Reese (Eds.), *Life-span developmental psychology: Methodological issues* (pp. 219–251). New York: Academic Press.
- Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice-Hall.
- Barnes, G. M., Farrell, M. P., & Banerjee, S. (1994). Family influences on alcohol abuse and other problem behaviors among Black and White adolescents in a general population sample. *Journal of Research on Adolescence, 4*, 183–201.
- Barnes, G. M., & Welte, J. W. (1986). Patterns and predictors of alcohol use among 7th–twelfth grade students in New York State. *Journal of Studies on Alcohol, 47*, 53–62.
- Barnes, G. M., Welte, J. W., Hoffman, J. H., Dintcheff, B. A. (2005). Shared predictors of youthful gambling, substance use, and delinquency. *Psychology of Addictive Behaviors, 19*(2), 165–174.
- Barnes, H. E., & Becker, H. P. (1952). *Social thought from lore to science* (2nd ed.). Washington, DC: Harren Press.

- Baskin-Sommers, A., & Sommers, I. (2006). The co-occurrence of substance use and high-risk behaviors. *Journal of Adolescent Health, 38*, 609–611.
- Bates, M. E., & Labouvie, E. W. (1995). Personality-environment constellations and alcohol use: A process-oriented study of intraindividual change during adolescence. *Psychology of Addictive Behaviors, 9*(1), 23–35.
- Bauer, D. J., Preacher, K. J., & Gil, K. M. (2006). Conceptualizing and testing random indirect effects and moderated mediation in multilevel models: New procedures and recommendations. *Psychological Methods, 11*, 142–163.
- Bauman, K. E. (1980). *Predicting adolescent drug use: Utility structure and marijuana*. New York: Praeger.
- Baumrind, D. (1985). Familial antecedents of adolescent drug use: A developmental perspective. In C. L. Jones & R. J. Battjes (Eds.), *Etiology of drug abuse: Implications for prevention* (NIDA Research Monograph No. 56). Rockville, MD: National Institute on Drug Abuse.
- Baumrind, D. (1987). A developmental perspective on adolescent risk taking in contemporary America. In C. E. Irwin, Jr. (Ed.), *Adolescent social behavior and health. New directions for child development, No. 37*. San Francisco, CA: Jossey-Bass Inc.
- Baumrind, D., & Moselle, K. A. (1985). A developmental perspective on adolescent drug use. *Advances in Alcohol and Substance Use, 5*, 41–67.
- Bentler, P. M. (1990). *EQS: Structural equations program manual*. Los Angeles: BMDP Statistical Software.
- Bentler, P. M. (1992). Etiologies and consequences of adolescent drug use: Implications for prevention. *Journal of Addictive Diseases, 11*, 47–61.
- Berg, D. F., & Broecker, L. P. (1972). *Illicit use of dangerous drugs in the United States: A compilation of studies, surveys, and polls*. Washington, DC: U.S. Government Printing Office.
- Bergman, L. R., Magnusson, D., & El-Khoury, B. M. (2003). Studying individual development in an interindividual context: A person-oriented approach. In D. Magnusson (Series Ed.), *Paths through life*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Bergman, L. R., von Eye, A., & Magnusson, D. (2006). Person-oriented research strategies in developmental psychopathology. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology: Vol. 1. Theory and method* (2nd ed., pp. 850–888). Hoboken, NJ: Wiley.
- Beschner, G. M., Reed, B. G., & Mondara, J. (Eds.). (1981). *Treatment services for drug dependent women* (Vol. 1) (DHHS Publication No. (ADM) 81-1177). Rockville, MD: National Institute on Drug Abuse.
- Beschner, G. M., & Treasure, K. G. (1979). Female adolescent drug use. In G. Beschner & A. Friedman (Eds.) *Youth drug abuse*. Lexington, MA: Lexington.
- Biddle, B. J., Bank, B. J., & Marlin, M. M. (1980a). Parental and peer influence on adolescents. *Social Forces, 58*, 1057–1079.
- Biddle, B. J., Bank, B. J., & Marlin, M. M. (1980b). Social determinants of adolescent drinking: What they think, what they do and what I think and do. *Journal of Studies on Alcohol, 41*, 215–241.
- Biglan, A. (1995). Choosing a paradigm to guide prevention research and practice. *Drugs & Society, 8*(3–4), 149–160.
- Biglan, A., Duncan, T. E., Ary, D. V., & Smolkowski, K. (1995). Peer and parental influences on adolescent tobacco use. *Journal of Behavioral Medicine, 18*(4), 315–330.

- Biglan, A., Glasgow, R. E., & Singer, G. (1990). The need for a science of larger social units: A contextual approach. *Behavior Therapy, 21*, 195–215.
- Biglan, A., Mrazek, P. J., Carnine, D., & Flay, B. R. (2003). The integration of research and practice in the prevention of youth problem behaviors [Special issue]. *American Psychologist, 58*(6–7), 433–440.
- Black, G. S. (1991). Changing attitudes toward drug use: The effects of advertising. In L. Donohew, H. E. Sypher, & W. J. Bukowski (Eds.), *Persuasive communication and drug abuse prevention* (pp. 157–191). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Blackson, T. C., & Tarter, R. E. (1994). Individual, family, and peer affiliation factors predisposing to early-age onset of alcohol and drug use. *Alcoholism: Clinical & Experimental Research, 18*(4), 813–821.
- Blane, H. T. (1979). Middle aged alcoholics and young drinkers. In H. T. Blane & M. E. Chafetz (Eds.), *Youth, alcohol and social policy* (pp. 5–38). New York: Plenum.
- Block, J. (1971). *Lives through time*. Berkeley, CA: Bancroft Books, Inc.
- Block, J., Block, J. H., & Keyes, S. (1988). Longitudinally foretelling drug usage in adolescence: Early childhood personality and environmental precursors. *Child Development, 59*(2), 337–355.
- Blum, R. H. (1970). *Students and drugs; College and high school observations* (The Jossey-Bass Behavioral Science Series). San Francisco: Jossey-Bass.
- Bogart, L. M., Collins, R. L., Ellickson, P. L., Martino, S. C., & Klein, D. J. (2005). Effects of early and later marriage on women’s alcohol use in young adulthood: A prospective analysis. *Journal of Studies on Alcohol, 66*, 729–737.
- Bollen, K. A., & Curran, P. J. (2006). *Latent curve models: A structural equation approach*. Hoboken, NJ: Wiley.
- Botvin, G. J., Baker, E., Dusenbury, L., Tortu, S., & Botvin, E. M. (1990). Preventing adolescent drug abuse through a multimodal cognitive-behavioral approach: Results of a 3 year study. *Journal of Consulting and Clinical Psychology, 58*, 437–446.
- Bowie, J. V., Ensminger, M. E., & Robertson, J. A. (2006). Alcohol-use problems in young black adults: Effects of religiosity, social resources, and mental health. *Journal of Studies on Alcohol, 67*(1), 44–53.
- Brandtstädter, J., & Lerner, R. M. (Eds.). (1999). *Action and self-development: Theory and research through the life span*. Thousand Oaks: Sage Publications.
- Braude, M. C., & Ludford, J. P. (1984). *Marijuana effects on the endocrine and reproductive systems* (NIDA Research Monograph No. 44). Rockville, MD: National Institute on Drug Abuse.
- Bray, J., Zarkin, G., Ringwalt, C., & Qi, J. (2000). The relationship between marijuana initiation and dropping out of high school. *Health Economics, 9*, 9–18.
- Bray, R. M., Marsden, M. E., & Peterson, M. R. (1991). Standardized comparisons of the use of alcohol, drugs, and cigarettes among military personnel and civilians. *American Journal of Public Health, 81*, 865–869.
- Breslin, F. C., & Adlaf, E. M. (2005). Part-time work and adolescent heavy episodic drinking: The influence of family and community context. *Journal of Studies of Alcohol, 66*, 784–794.
- Brim, O. G., Ryff, C. D., & Kessler, R. C. (2004). *How healthy are we? A national study of well-being at midlife*. Chicago, IL: University of Chicago Press.

- Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge, MA: Harvard University Press.
- Bronfenbrenner, U. (2005). Lewinian space and ecological substance (1977). In U. Bronfenbrenner (Ed.), *Making human beings human: Bioecological perspectives on human development* (pp.41–49). Thousand Oaks, CA: Sage Publications.
- Bronfenbrenner, U., & Morris, P. A. (2006). The bioecological model of human development. In R. M. Lerner (Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (6th ed., pp. 793–827). Hoboken, NJ: Wiley.
- Brook, J. S., Adams, R. E., Balka, E. B., & Johnson, E. (2002). Early adolescent marijuana use: Risks for the transition to young adulthood. *Psychological Medicine*, *32*, 79–91.
- Brook, J. S., Balka, E. B., Rosen, Z., Brook, D. W., & Adams, R. (2005). Tobacco use in adolescence: Longitudinal links to later problem behavior among African American and Puerto Rican urban young adults. *Journal of Genetic Psychology*, *166*, 133–151.
- Brook, J. S., Balka, E. B., & Whiteman, M. (1999). The risks for late adolescence of early adolescent marijuana use. *American Journal of Public Health*, *89*, 1549–1554.
- Brook, J. S., & Brook, D. W. (1996). Risk and protective factors for drug use: Etiological considerations. In C. McCoy, L. Metsch, & J. Inciardi (Eds.), *Intervening with drug-involved youth* (pp. 23–44). Thousand Oaks, CA: Sage Publications.
- Brook, J. S., Brook, D. W., Arencibia-Mireles, O., Richter, L., & Whiteman, M. (2001). Risk factors for adolescent marijuana use across cultures and across time. *Journal of Genetic Psychology*, *162*, 357–374.
- Brook, J. S., Brook, D. W., Gordon, A. S., Whiteman, M., & Cohen, P. (1990). The psychosocial etiology of adolescent drug use: A family interactional approach. *Genetic, Social, and General Psychology Monographs*, *116*(2), 111–267.
- Brook, J. S., Brook, D. W., Zhang, C., & Cohen, P. (2004). Tobacco use and health in young adulthood. *Journal of Genetic Psychology*, *165*(3), 310–323.
- Brook, J. S., Cohen, P., Whiteman, M., & Gordon, A. S. (1992). Psychosocial risk factors in the transition from moderate to heavy use or abuse of drugs. In M. Glantz & R. Pickens (Eds.), *Vulnerability to Drug Abuse* (pp. 359–388). Washington, DC: American Psychological Association.
- Brook, J. S., Gordon, A. S., Brook, A., & Brook, D. W. (1989). The consequences of marijuana use on intrapersonal and interpersonal functioning in Black and White adolescents. *Genetic, Social, and General Psychology Monographs*, *115*, 349–369.
- Brook, J. S., Kessler, R. C., & Cohen, P. (1999). The onset of marijuana use from preadolescence and early adolescence to young adulthood [Special issue]. *Development & Psychopathology*, *11*(4), 901–914.
- Brook, J. S., & Newcomb, M. D. (1995). Childhood aggression and unconventionality: Impact on later academic achievement, drug use, and workforce involvement. *Journal of Genetic Psychology*, *156*(4), 393–410.
- Brook, J. S., Nomura, C., & Cohen, P. (1989). A network of influences on adolescent drug involvement: Neighborhood, school, peer, and family. *Genetic, Social, and General Psychology Monographs*, *115*, 123–145.
- Brook, J. S., Richter, L., & Rubenstone, E. (2000). Consequences of adolescent drug use on psychiatric disorders in early adulthood. *Annals of Medicine*, *32*, 401–407.

- Brook, J. S., Richter, L., Whiteman, M., & Cohen, P. (1999). Consequences of adolescent marijuana use: Incompatibility with the assumption of adult roles. *Genetic, Social, & General Psychology Monographs*, *125*, 193–207.
- Brook, J. S., Whiteman, M. M., Balka, E. B., & Cohen, P. (1995). Parent drug use, parent personality, and parenting. *Journal of Genetic Psychology*, *156*(2), 137–151.
- Brook, J. S., Whiteman, M. M., & Finch, S. (1992). Childhood aggression, adolescent delinquency, and drug use: A longitudinal study. *Journal of Genetic Psychology*, *153*(4), 369–383.
- Brook, J. S., Whiteman, M. M., Finch, S., & Cohen, P. (1995). Aggression, intrapsychic distress, and drug use: Antecedent and intervening processes. *Journal of the American Academy of Child & Adolescent Psychiatry*, *34*(8), 1076–1084.
- Brook, J. S., Whiteman, M., Gordon, A. S., & Cohen, P. (1986). Dynamics of childhood and adolescent personality traits and adolescent drug use. *Developmental Psychology*, *22*, 403–414.
- Brown, B. B. (2004). Adolescents' relationships with peers. In R. M. Lerner & L. D. Steinberg (Eds.), *Handbook of adolescent psychology* (2nd ed., pp. 363–394). Hoboken, NJ: Wiley.
- Brown, B. B., Dolcini, M. M., & Leventhal, A. (1997). Transformations in peer relationships at adolescence: Implications for health-related behavior. In J. E. Schulenberg, J. Maggs, & K. Hurrelmann (Eds.), *Health risks and developmental transitions during adolescence*. New York: Cambridge University Press.
- Brown, S. A., & Tapert, S. F. (2004). Adolescence and the trajectory of alcohol use: Basic to clinical studies. In R. E. Dahl & L. P. Spear (Eds.), *Adolescent brain development: Vulnerabilities and opportunities*, Volume 1021 of the *Annals of the New York Academy of Sciences* (pp. 234–244). New York: New York Academy of Sciences.
- Brown, T. N., Schulenberg, J., Bachman, J. G., O'Malley, P. M., & Johnston, L. D. (2001). Are risk and protective factors for substance use consistent across historical time?: National data from the high school classes of 1976 through 1997. *Prevention Science*, *2*(1), 29–43.
- Brunswick, A. F. (1984). Health consequences of drug use: A longitudinal study of urban black youth. In S. A. Mednick, M. Harway, & K. M. Finello (Eds.) *Handbook of longitudinal research: Vol. 2. Teenage and adult cohorts* (pp. 290–314). New York: Praeger.
- Brunswick, A. F., & Messeri, P. A. (1984). Gender differences in the processes leading to cigarette smoking. *Journal of Psychosocial Oncology*, *2*, 49–69.
- Bry, H., McKeon, P., & Pandina, R. J. (1982). Extent of drug use as a function of the number of risk factors. *Journal of Abnormal Psychology*, *91*, 273–279.
- Bryant, A. L., Schulenberg, J. E., Bachman, J. G., O'Malley, P. M., & Johnston, L. D. (2000). Understanding the links among school misbehavior, academic achievement, and cigarette use: A national panel study of adolescents. *Prevention Science*, *1*, 71–87.
- Bryant, A. L., Schulenberg, J. E., O'Malley, P. M., Bachman, J. G., & Johnston, L. D. (2003). How academic achievement, attitudes, and behaviors relate to the course of substance use during adolescence: A six-year multi-wave national longitudinal study. *Journal of Research on Adolescence*, *13*, 361–397.
- Bryant, K., Windle, M., & West, S. (Eds.). (1997). *The science of prevention: Methodological advances from alcohol and substance abuse research*. Washington, DC: American Psychological Association.
- Bryk, A. S., & Raudenbush, S. W. (1992). *Hierarchical linear models: Applications and data analysis methods*. Newbury Park, CA: Sage Publications.

- Bucholz, K. K., Heath, A. C., Reich, T., Hesselbrock, V. M., Kramer, J. R., Nurnberger, J. I., Jr., et al. (1996). Can we subtype alcoholism? A latent class analysis of data from relatives of alcoholics in a multi-center family study of alcoholism. *Alcohol, Clinical and Experimental Research*, 20(8), 1462–1471.
- Bukoski, W. J. (1991). A definition of drug abuse prevention research. In L. Donohew, H. E. Sypher, & W. J. Bukowski (Eds.), *Persuasive communication and drug abuse prevention* (pp. 3–19). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Bureau of Justice Statistics. (2003). *Sourcebook of criminal justice statistics* (31st ed.). Retrieved October 15, 2006, from <http://www.albany.edu/sourcebook>
- Burton, R. P. D., Johnson, R. J., Ritter, C., & Clayton, R. R. (1996). The effects of role socialization on the initiation of cocaine use: An event history analysis from adolescence into middle adulthood. *Journal of Health and Social Behavior*, 37, 75–90.
- Buss, A. R. (1973). An extension of developmental models that separate ontogenetic changes and cohort differences. *Psychological Bulletin*, 80, 466–479.
- Buss, A. R. (1975). More on the age x cohort developmental model: Reply to Labouvie. *Psychological Bulletin*, 82, 170–173.
- Cahalan, D., & Room, R. (1974). *Problem drinking among American men* (Monograph No. 7). New Brunswick, NJ: Rutgers Center of Alcohol Studies.
- Cairns, R. B. (2000). Developmental science: Three audacious implications. In L. R. Bergman, R. B. Cairns, L.-G. Nilsson, & L. Nystedt (Eds.), *Developmental science and the holistic approach* (pp. 49–62). Mahwah, NJ: Lawrence Erlbaum Associates.
- Cairns, R. B., & Cairns, B. D. (1994). *Lifelines and risks: Pathways of youth in our time*. New York: Cambridge University Press.
- Cairns, R. B., & Cairns, B. D. (2006). The making of developmental psychology. In R. M. Lerner (Ed.), *Handbook of child psychology: Volume 1. Theoretical models of human development* (6th ed., pp. 89–164). Hoboken, NJ: Wiley.
- Cairns, R. B., Cairns, B. D., Rodkin, P., & Xie, H. (1998). New directions in developmental research: Models and methods. In R. Jessor (Ed.), *New perspectives on adolescent risk behavior* (pp. 13–40). New York: Cambridge University Press.
- Cairns, R. B., Elder, G. H., Jr., & Costello, E. J. (Eds.). (1996). *Developmental science*. New York: Cambridge University Press.
- Carvajal, S. C., Hanson, C., Downing, R. A., Coyle, K. K., & Pederson, L. L. (2004). Theory-based determinants of youth smoking: A multiple influence approach. *Journal of Applied Social Psychology*, 34(1), 59–84.
- Caspi, A., Lynam, D., Moffitt, T. E., & Silva, P. A. (1993). Unraveling girls' delinquency: Biological, dispositional, and contextual contributions to adolescent misbehavior. *Developmental Psychology*, 29, 19–30.
- Catalano, R. F., & Hawkins, J. D. (1996). The social development model: A theory of antisocial behavior. In J. D. Hawkins (Ed.), *Delinquency and crime: Current theories* (pp. 149–197). New York: Cambridge University Press.
- Catalano, R. F., Kosterman, R., Hawkins, J. D., & Newcomb, M. D. (1996). Modeling the etiology of adolescent substance use: A test of the social development model. *Journal of Drug Issues*, 26(2), 429–455.

- Catalano, R. F., Park, J., Harachi, T. W., Haggerty, K. P., Abbott, R. D., & Hawkins, J. D. (2005). Mediating the effects of poverty, gender, individual characteristics, and external constraints on antisocial behavior: A test of the social development model and implications for life-course theory. In D. P. Farrington (Ed.), *Advances in criminological theory: Vol. 14. Integrated developmental and life-course theories of offending* (pp. 93–123). New Brunswick, NJ: Transaction Books.
- Cattell, R. B. (1966). Psychological theory and scientific method. In R. B. Cattell (Ed.), *Handbook of multivariate experimental psychology*. Chicago: Rand McNally.
- Centers for Disease Control and Prevention (CDC). (2001). Prevalence of risk behaviors for HIV infection among adults—United States, 1997. *Morbidity and Mortality Weekly Report*, 50(14), 262–265.
- Centers for Disease Control and Prevention (CDC). (2005a). *HIV/AIDS Surveillance Report, 2004* (Vol. 16). Atlanta, GA: Author.
- Centers for Disease Control and Prevention (CDC). (2005b). Trends in HIV/AIDS Diagnoses—33 states, 2001–2004. *Morbidity and Mortality Weekly Report*, 54(45), 1149–1153.
- Centers for Disease Control and Prevention (CDC). (2006). Cases of HIV infection and AIDS in the United States, by race/ethnicity, 2000–2004. *HIV/AIDS Surveillance Supplemental Report*, 12(1).
- Chaloupka, F. J., & Pacula, R. L. (1998). *An examination of gender and race differences in youth smoking responsiveness to price and tobacco control policies* (NBER Working Paper No. 6541). Cambridge, MA: National Bureau of Economic Research.
- Chaloupka, F. J., & Pacula, R. L. (1999). Sex and race differences in young people's responsiveness to price and tobacco control policies. *Tobacco Control*, 8(4), 373–377.
- Chassin, L. (1984). Adolescent substance use and abuse. *Advances in Child Behavioral Analysis and Therapy*, 3, 99–152.
- Chassin, L., Flora, D. B., & King, K. M. (2004). Trajectories of alcohol and drug use and dependence from adolescence to adulthood: The effects of familial alcoholism and personality. *Journal of Abnormal Psychology*, 113, 483–498.
- Chassin, L., Hussong, A., Barrera, M., Molina, B. S. G., Trim, R., & Ritter, J. (2004). Adolescent substance use. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology* (2nd ed., pp. 665–696). Hoboken, NJ: Wiley.
- Chassin, L., Mann, L. M., & Sher, K. J. (1988). Self-awareness theory, family history of alcoholism, and adolescent alcohol involvement. *Journal of Abnormal Psychology*, 97, 206–217.
- Chassin, L., Pitts, S. C., & Prost, J. (2002). Binge drinking trajectories from adolescence to emerging adulthood in a high-risk sample: Predictors and substance abuse outcomes. *Journal of Consulting and Clinical Psychology*, 70, 67–78.
- Chassin, L., Presson, C. C., Rose, J., Sherman, S. J., Davis, M. J., & Gonzalez, J. L. (2005). Parenting style and smoking-specific parenting practices as predictors of adolescent smoking onset. *Journal of Pediatric Psychology*, 30(4), 334–344.
- Chassin, L., Presson, C. C., & Sherman, S. J. (1989). “Constructive” vs. “destructive” deviance in adolescent health-related behaviors. *Journal of Youth and Adolescence*, 18, 245–262.
- Chassin, L., Presson, C. C., Sherman, S. J., & Edwards, D. A. (1991). Four pathways to young-adult smoking status: Adolescent social-psychological antecedents in a Midwestern community sample. *Health Psychology*, 10, 409–418.

- Chassin, L., Ritter, J., Trim, R. S., & King, K. M. (2003). Adolescent substance use disorders. In E. J. Mash & R. A. Barkley (Eds.), *Child psychopathology* (2nd ed., pp. 199–230). New York: Guilford.
- Chen, K., & Kandel, D. B. (1995). The natural history of drug use in a general population sample from adolescence to the mid-thirties. *American Journal of Public Health, 85*, 41–47.
- Chilcoat, H. D., & Anthony, J. C. (1996). Impact of parent monitoring on initiation of drug use through late childhood. *Journal of the American Academy of Child & Adolescent Psychiatry, 35*(1), 91–100.
- Chung, T., Martin, C. S., & Winters, K. C. (2005). Diagnosis, course, and assessment of alcohol abuse and dependence in adolescents. In M. Galanter (Ed.), *Recent developments in alcoholism: Volume 17. Alcohol problems in adolescents and young adults* (pp. 5–27). New York: Kluwer Academic/Plenum Publ.
- Cicchetti, D. (1999). A developmental psychopathology perspective on drug abuse. In M. D. Glantz & C. R. Hartel (Eds.), *Drug abuse: Origins & interventions* (pp. 97–117). Washington, DC: American Psychological Association.
- Cicchetti, D. (2006). Development and psychopathology. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology: Volume 1. Theory and method* (2nd ed., pp. 1–23). Hoboken, NJ: Wiley.
- Cicchetti, D., & Rogosch, F. A. (2002). A developmental psychopathology perspective on adolescence. *Journal of Consulting and Clinical Psychology, 70*(1), 6–20.
- Clark, D. B., & Cornelius, J. (2004). Childhood psychopathology and adolescent cigarette smoking: A prospective survival analysis in children at high risk for substance use disorders. *Addictive Behaviors, 29*, 837–841.
- Clasen, D. R., & Brown, B. B. (1985). The multidimensionality of peer pressure in adolescence. *Journal of Youth and Adolescence, 14*, 451–468.
- Clausen, J. A. (1991). Adolescent competence and the shaping of the life course. *American Journal of Sociology, 96*, 805–842.
- Clayton, R. R. (1981). The delinquency and drug use relationship among adolescents: A critical review. In D. J. Lettieri & J. P. Ludford (Eds.), *Drug abuse and the American adolescent*. (pp. 82–103) (NIDA Research Monograph No. 38). Rockville, MD: National Institute on Drug Abuse.
- Clayton, R. R. (1992). Transitions in drug use: Risk and protective factors. In M. D. Glantz & R. W. Pickens (Eds.), *Vulnerability to drug abuse* (pp. 15–52). Washington, DC: American Psychological Association.
- Clayton, R. R., Leukefeld, C. G., Donohew, L., & Bardo, M. (1995). Risk and protective factors: A brief review. *Drugs & Society, 8*(3–4), 7–14.
- Clayton, R. R., & Tuchfeld, B. S. (1982). The drug-crime debate: Obstacles to understanding the relationship. *Journal of Drug Issues, 12*, 153–166.
- Clayton, R. R., & Voss, H. L. (1981). *Young men and drugs in Manhattan: A causal analysis*. (NIDA Research Monograph No. 39). Rockville, MD: National Institute on Drug Abuse.
- Clayton, R. R., Voss, H. L., Robbins, C., & Skinner, W. F. (1986). Gender differences in drug use: An epidemiological perspective. In B. A. Ray & M. C. Braude (Eds.), *Women and drugs: A new era for research* (pp. 80–99) (NIDA Research Monograph No. 65). Rockville MD: National Institute on Drug Abuse.

- Colder, C., Mehta, P., Balanda, K., Campbell, R., Mayhew, K., Stanton, W., et al. (2001). Identifying trajectories of adolescent smoking: An application of latent growth mixture modeling. *Health Psychology, 20*, 127–135.
- Collins, L. M. (2002). Using latent transition analysis to examine the gateway hypothesis. In D. B. Kandel (Ed.), *Stages and pathways of drug involvement: Examining the gateway hypothesis* (pp. 254–269). New York: Cambridge University Press.
- Collins, L. M. (2006). Analysis of longitudinal data: The integration of theoretical model, temporal design, and statistical model. *Annual Review of Psychology, 57*, 505–528.
- Collins, L. M., Graham, J. W., Rousculp, S. S., Fidler, P. L., Pan, J., & Hansen, W. B. (1994). Latent transition analysis and how it can address prevention research questions. In L. M. Collins & L. A. Seitz (Eds.), *Advances in data analysis for prevention intervention research* (pp. 81–111) (NIDA Research Monograph No. 142, NIH Pub. No. 94-3599). Rockville MD: National Institute on Drug Abuse.
- Collins, L. M., & Horn, J. L. (Eds.). (1991). *Best methods for the analysis of change*. Washington, DC: American Psychological Association.
- Collins, L. M., & Sayer, A. G. (Eds.). (2001). *New methods for the analysis of change*. Washington, DC: American Psychological Association.
- Collins, R. L., & Ellickson, P. L. (2004). Integrating four theories of adolescent smoking. *Substance Use and Misuse, 39*, 179–209.
- Collins, R. L., Ellickson, P. L., & Bell, R. (1998). Simultaneous polydrug use among teens: Prevalence and predictors. *Journal of Substance Abuse, 10*(3), 233–253.
- Collins, W. A., & Laursen, B. (2004). Parent-adolescent relationships and influences. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology* (2nd ed., pp. 331–361). Hoboken, NJ: Wiley.
- The Consortium on the School-Based Promotion of Social Competence (1994). The school-based promotion of social competence: Theory, research, practice, and policy. In R. J. Haggerty, L. R. Sherrod, N. Garmezy, & M. Rutter (Eds.), *Stress, risk, and resilience in children and adolescents: Processes, mechanisms, and interventions* (pp. 268–316). New York: Cambridge University Press.
- Converse, P. E. (1977). *Dynamics of party support: Cohort-analyzing party identification*. Beverly Hills: Sage Publications.
- Costa, F. M., Jessor, R., Turbin, M. S., Dong, Q., Zhang, H., & Wang, C. (2005). The role of social contexts in adolescence: Context protection and context risk in the United States and China. *Applied Developmental Science, 9*, 67–85.
- Costa, P. T., & McCrae, R. R. (1982). An approach to the attribution of aging, period, and cohort effects. *Psychological Bulletin, 92*, 238–250.
- Costello, E. J., & Angold, A. (2006). Developmental epidemiology. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology: Volume 1. Theory and method* (2nd ed., pp. 41–74). Hoboken, NJ: Wiley.
- Crawford, A. M., Pentz, M. A., Chou, C.-P., Li, C., & Dwyer, J. H. (2003). Parallel developmental trajectories of sensation seeking and regular substance use in adolescents. *Psychology of Addictive Behaviors, 17*, 179–192.
- Cregler, L. L. (1989). Adverse health consequences of cocaine abuse. *Journal of the National Medical Association, 81*, 27–38.

- Crocker, A. G., Muesser, K. T., Drake, R. E., Clark, R. E., McHugo, G. J., Ackerson, T. H., et al. (2005). Antisocial personality, psychopathy, and violence in persons with dual disorders: A longitudinal analysis. *Criminal Justice and Behavior*, *32*, 452–476.
- Crockett, L., Losoff, M., & Petersen, A. C. (1984). Perceptions of the peer group and friendship in early adolescence. *Journal of Early Adolescence*, *4*, 155–181.
- Cronbach, L. J., & Furby, L. (1970). How should we measure “change”—Or should we? *Psychological Bulletin*, *74*, 68–80.
- Csikszentmihalyi, M., & Larson, R. (1984). *Being adolescent: Conflict and growth in the teenage years*. New York: Basic Books.
- Curran, P. J. (2000). A latent curve framework for the study of developmental trajectories in adolescent substance use. In J. S. Rose, L. Chassin, C. C. Presson, & S. J. Sherman (Eds.), *Multivariate applications in substance use research: New methods for new questions* (pp. 1–42). Mahwah, NJ: Lawrence Erlbaum Associates.
- Curran, P. J., & Chassin, L. (1996). A longitudinal study of parenting as a protective factor for children of alcoholics. *Journal of Studies on Alcohol*, *57*, 305–313.
- Curran, P. J., Harford, T. C., & Muthén, B. O. (1996). The relation between heavy alcohol use and bar patronage: A latent growth model. *Journal of Studies on Alcohol*, *57*, 410–418.
- Czechowicz, D. (1988). Adolescent alcohol and drug abuse and its consequences: An overview. *American Journal of Drug and Alcohol Abuse*, *14*, 189–197.
- D’Amico, E. J., Ellickson, P. L., Collins, R. L., Martino, S., & Klein, D. J. (2005). Processes linking adolescent problems to substance-use problems in late young adulthood. *Journal of Studies on Alcohol*, *66*(6), 766–775.
- Dawson, D. A., Grant, B. F., Stinson, F. S., & Chou, P. S. (2006). Maturing out of alcohol dependence: The impact of transitional life events. *Journal of Studies on Alcohol*, *67*, 195–203.
- Del Boca, F. K., Darkes, J., Greenbaum, P. E., & Goldman, M. S. (2004). Up close and personal: Temporal variability in the drinking of individual college students during their first year. *Journal of Consulting and Clinical Psychology*, *72*(2), 155–164.
- Dent, C. W., Grube, J. W., & Biglan, A. (2005). Community level alcohol availability and enforcement of possession laws as predictors of youth drinking. *Preventive Medicine*, *40*, 355–362.
- Deutsch, M. (1968). Field theory in social psychology. In G. Lindzey & E. Aronson (Eds.), *The handbook of social psychology* (2nd ed., Vol. 1). Reading, MA: Addison-Wesley.
- Dielman, T. E. (1994). School-based research on the prevention of adolescent alcohol use and misuse: Methodological issues and advances. *Journal of Research on Adolescence*, *4*, 271–293.
- Dielman, T. E., Shop, J. T., Butchart, A. T., Campanelli, P. C., & Caspar, R. A. (1989). A covariance structure model test of antecedents of adolescent alcohol misuse and a prevention effort. *Journal of Drug Education*, *19*(4), 337–361.
- Dielman, T. E., Schulenberg, J. E., & Weinberg, N. Z. (1993). Resilience among young adolescents: Implications for the prevention of alcohol and other drug misuse. Unpublished manuscript, University of Michigan.
- Dishion, T. J., Capaldi, D., Spracklen, K. M., & Li, F. Z. (1995). Peer ecology of male-adolescent drug-use [Special issue: Developmental processes in peer relations and psychopathology]. *Development & Psychopathology*, *7*(4), 803–824.

- Dishion, T. J., & McMahon, R. J. (1998). Parental monitoring and the prevention of child and adolescent problem behavior: A conceptual and empirical formulation. *Clinical Child & Family Psychology Review, 1*(1), 61–75.
- Dishion, T. J., & Owen, L. D. (2002). A longitudinal analysis of friendships and substance use: Bidirectional influence from adolescence to adulthood. *Developmental Psychology, 38*, 480–491.
- Dodge, K. A., Malone, P. S., Lansford, J. E., Miller-Johnson, S., Pettit, G. S., & Bates, J. E. (2006). Toward a dynamic developmental model of the role of parents and peers in early onset substance use. In A. Clarke-Stewart & J. Dunn (Eds.), *Families count: Effects on child and adolescent development* (pp. 104–131). New York: Cambridge University Press.
- Domestic Council Drug Abuse Task Force. (1975). White paper on drug abuse: Report to the President from the Domestic Council Drug Abuse Task Force. Washington, DC: U.S. Government Printing Office.
- Donohew, L., Lorch, E., & Palmgreen, P. (1991). Sensation seeking and targeting of televised anti-drug PSAs. In R. L. Donohew, H. E. Sypher, & W. J. Bukowski (Eds.), *Persuasive communication and drug abuse prevention* (pp. 209–226). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Donovan, J. E. (1996). Problem-behavior theory and the explanation of adolescent marijuana use. *Journal of Drug Issues, 26*(2), 379–404.
- Donovan, J. E., & Jessor, R. (1983). Problem drinking and the dimension of involvement with drugs: A Guttman scalogram analysis of adolescent drug use. *American Journal of Public Health, 73*, 543–552.
- Donovan, J. E., & Jessor, R. (1985). Structure of problem behavior in adolescence and young adulthood. *Journal of Consulting and Clinical Psychology, 53*, 890–904.
- Donovan, J. E., Jessor, R., & Costa, F. M. (1988). Syndrome of problem behavior in adolescence: A replication. *Journal of Consulting and Clinical Psychology, 56*(5), 762–765.
- Donovan, J. E., Jessor, R., & Costa, F. M. (1991). Adolescent health behavior and conventionality-unconventionality: An extension of problem-behavior theory. *Health Psychology, 10*, 52–61.
- Donovan, J. E., Jessor, R., & Costa, F. M. (1999). Adolescent problem drinking: Stability of psychosocial and behavioral correlates across a generation. *Journal of Studies on Alcohol, 60*(3), 352–361.
- Donovan, J. E., Jessor, R., & Jessor, S. L. (1983). Problem drinking in adolescence and young adulthood: A follow-up study. *Journal of Studies on Alcohol, 44*, 109–137.
- Duncan, O. D. (1969). *Toward social reporting: Next steps*. New York: Russell Sage Foundation.
- Duncan, S. C., & Duncan, T. E. (1994). Modeling incomplete longitudinal substance use data using latent variable growth curve methodology. *Multivariate Behavioral Research, 29*, 313–338.
- Duncan, S. C., & Duncan, T. E. (1996). A multivariate latent growth curve analysis of adolescent substance abuse. *Structural Equation Modeling, 3*, 323–347.
- Duncan, S. C., Duncan, T. E., Biglan, A., & Ary, D. (1998). Contributions of the social context to the development of adolescent substance use: A multivariate latent growth modeling approach. *Drug and Alcohol Dependence, 50*, 57–71.

- Duncan, S. C., Duncan, T. E., & Strycker, L. A. (2006). Alcohol use from ages 9 to 16: A cohort-sequential latent growth model. *Drug and Alcohol Dependence*, *81*(1), 71–81.
- Duncan, T. E., & Duncan, S. C. (1995). Modeling the processes of development via latent variable growth curve methodology. *Structural Equation Modeling*, *2*, 187–213.
- Duncan, T. E., Duncan, S. C., & Hops, H. (1994). The effects of family cohesiveness and peer encouragement on the development of adolescent alcohol use: A cohort-sequential approach to the analysis of longitudinal data. *Journal of Studies on Alcohol*, *55*(5), 588–599.
- Duncan, T. E., Duncan, S. C., & Hops, H. (1996). The role of parents and older siblings in predicting adolescent substance use: Modeling development via structural equation latent growth methodology. *Journal of Family Psychology*, *10*(2), 158–172.
- Duncan, T. E., Duncan, S. C., Hops, H., & Stoolmiller, M. (1995). An analysis of the relationship between parent and adolescent marijuana use via generalized estimating equation methodology. *Multivariate Behavioral Research*, *30*(3), 317–339.
- Duncan, T. E., Tildesley, E., Duncan, S. C., & Hops, H. (1995). The consistency of family and peer influences on the development of substance use in adolescence. *Addiction*, *90*(12), 1647–1660.
- Dupont, R. (1980, September 19). Comments made at the first annual meeting of the National Alcohol and Drug Coalition, Washington, DC.
- Durbin, D. L., Darling, N., Steinberg, L., & Brown, B. (1993). Parenting style and peer group membership among European-American adolescents. *Journal of Research on Adolescence*, *3*, 87–100.
- Dworkin, J., & Schulenberg, J. E. (2005). *Positive risk-taking during adolescence: Risk-taking without substance abuse*. Paper presented at the Biennial Meeting of the Society for Research on Child Development, Atlanta, GA.
- Eggert, L. L., & Herting, J. R. (1993). Drug involvement among potential dropouts and “typical” youth. *Journal of Drug Education*, *23*(1), 31–55.
- Elder, G. H., Jr. (1996). Human lives in changing societies: Life course and developmental insights. In R. B. Cairns, G. H. Elder, Jr., & E. J. Costello (Eds.), *Developmental science* (pp. 31–62). New York: Cambridge University Press.
- Elder, G. H., Jr., & Shanahan, M. J. (2006). The life course and human development. In R. M. Lerner (Ed.), *Handbook of child psychology: Volume 1. Theoretical models of human development* (6th ed., pp. 665–712). Hoboken, NJ: Wiley.
- Elinson, J., & Nurco, D. (Eds.). (1975). *Operational definitions in socio-behavioral drug use research* (NIDA Research Monograph No. 2). Washington, DC: U.S. Government Printing Office.
- Elkind, D. (1985). Egocentrism redux. *Developmental Review*, *5*, 218–226.
- Ellickson, P. L., Bird, C. E., Orlando, M., Klein, D. J., & McCaffrey, D. F. (2003). Social context and adolescent health behavior: Does school-level smoking prevalence affect students’ subsequent smoking behavior? *Journal of Health and Social Behavior*, *44*, 525–535.
- Ellickson, P. L., Bui, K., Bell, R., & McGuigan, K. (1998). Does early drug use increase the risk of dropping out of high school? *Journal of Drug Issues*, *28*, 357–380.
- Ellickson, P. L., Marino, S. C., & Collins, R. L. (2004). Marijuana use from adolescence to young adulthood: Multiple developmental trajectories and their associated outcomes. *Health Psychology*, *23*, 299–307.

- Ellickson, P. L., Tucker, J. S., & Klein, D. J. (2001). High-risk behaviors associated with early smoking: Results from a 5-year follow-up. *Journal of Adolescent Health, 28*, 465–473.
- Ellickson, P. L., Tucker, J. S., Klein, D. J., & Saner, H. (2004). Antecedents and outcomes of marijuana use initiation during adolescence. *Preventive Medicine, 39*(5), 976–984.
- Elliott, D. (1993). Health-enhancing and health-compromising lifestyles. In S. G. Millstein, A. C. Petersen, & E. O. Nightingale (Eds.), *Promoting the health of adolescents: New directions for the twenty-first century* (pp. 119–145). New York: Oxford University Press.
- Elliott, D. S., Huizinga, D., & Ageton, S. S. (1985). *Explaining delinquency and drug use*. Beverly Hills: Sage Publications.
- Elliott, D. S., Huizinga, D., & Menard, S. (1989). *Multiple problem youth: Delinquency, substance use, and mental health problems*. New York: Springer-Verlag.
- Emery, S., Wakefield, M. A., Terry-McElrath, Y., Saffer, H., Szczyepka, G., O'Malley, P. M., Johnston, L. D., Chaloupka, F. J., & Flay, B. (2005). Televised state-sponsored anti-tobacco advertising and youth smoking beliefs and behavior in the United States, 1999–2000. *Archives of Pediatrics & Adolescent Medicine, 159*, 639–645.
- Engel, U., Nordlohne, E., Hurrelmann, K., & Holler, B. (1987). Educational career and substance use in adolescence. *European Journal of Psychology and Education, 2*, 365–374.
- Ennett, S. T., & Bauman, K. E. (1994). The contribution of influence and selection to adolescent peer group homogeneity: The case of adolescent cigarette smoking. *Journal of Personality & Social Psychology, 67*, 653–663.
- Ensminger, M. E., & Juon, H. S. (1998). Transition to adulthood among high-risk youth. In R. Jessor (Ed.), *New perspectives on adolescent risk behavior* (pp. 365–391). New York: Cambridge University Press.
- Entwisle, D. R., Alexander, K. L., & Olson, L. S. (2000). Early work histories of urban youth. *American Sociological Review, 65*, 279–297.
- Erikson, E. H. (1963). *Childhood and society*. New York: Norton.
- Erikson, E. H. (1968). *Identity, youth, and crisis*. New York: Norton.
- Félix-Ortiz, M., Villatoro Velázquez, J. A., Medina-Mora, M. E., & Newcomb, M. D. (2001). Adolescent drug use in Mexico and among Mexican American adolescents in the United States: Environmental influences and individual characteristics. *Cultural Diversity & Ethnic Minority Psychology, 7*(1), 27–46.
- Fergusson, D. M., Horwood, L. J., & Beautrais, A. L. (2003). Cannabis and educational achievement. *Addiction, 98*, 1681–1692.
- Ferrara, K. F. (1990). A comparison of cohort analytic methods. *Journal of Gerontology, 45*, S220–S227.
- Fienberg, S. E., & Mason, W. M. (1979). Identification and estimation of age-period-cohort models in the analysis of discrete archival data. In K. Schuessler (Ed.), *Sociological methodology 1979*. San Francisco: Jossey-Bass.
- Fillmore, K. M. (1987). Women's drinking across the adult life course as compared to men's. *British Journal of Addiction, 82*, 801–811.
- Finch, M. D., Mortimer, J. T., & Ryu, S. (1997). Transition into part-time work: Health risks and opportunities. In J. E. Schulenberg, J. Maggs, & K. Hurrelmann (Eds.), *Health risks and developmental transitions during adolescence*. New York: Cambridge University Press.

- Flay, B. R., & Petraitis, J. (1994). The theory of triadic influence: A new theory of health behavior with implications for preventive interventions. In G. Albrecht (Ed.), *Advances in medical sociology: Vol. 4. A reconsideration of health behavior change models* (pp. 19–44). Greenwich, CT: JAI Press.
- Flora, D. B., & Chassin, L. (2005). Changes in drug use during young adulthood: The effects of parent alcoholism and transition into marriage. *Psychology of Addictive Behaviors, 19*, 352–362.
- Flory, K., Lynam, D., Milich, R., Leukefeld, C., & Clayton, R. (2004). Early adolescent through young adult alcohol and marijuana use trajectories: Early predictors, young adult outcomes, and predictive utility. *Development and Psychopathology, 16*, 193–213.
- Friedman, A. S., Bransfield, S., & Kreisher, C. (1994). Early teenage substance use as a predictor of educational-vocational failure. *American Journal on Addictions, 3*, 325–336.
- Friedman, A. S., Granick, S., Bransfield, S., Kreisher, C., & Schwartz, A. (1996). The consequences of drug use/abuse for vocational career: A longitudinal study of a male urban African-American sample. *American Journal of Drug & Alcohol Abuse, 22*, 57–73.
- Fromme, K. (2006). Parenting and other influences on the alcohol use and emotional adjustment of children, adolescents, and emerging adults. *Psychology of Addictive Behaviors, 20*, 138–139.
- Galaif, E. R., Newcomb, M. D., & Carmona, J. V. (2001). Prospective relationships between drug problems and work adjustment in a community sample of adults. *Journal of Applied Psychology, 86*(2), 337–350.
- Galambos, N. L. (2004). Gender and gender role development in adolescence. In R. M. Lerner & L. D. Steinberg (Eds.), *Handbook of adolescence* (2nd ed., pp. 233–262). Hoboken, NJ: Wiley.
- Galambos, N. L., & Silbereisen, R. K. (1987). Substance use in West German youth: A longitudinal study of adolescents' use of alcohol and tobacco. *Journal of Adolescent Research, 2*, 161–174.
- Galanter, M. (Ed.). (2005). *Recent developments in alcoholism: Vol. 17. Alcohol problems in adolescents and young adults*. New York: Kluwer Academic/Plenum Publ.
- Garnezy, N. (1985). Stress-resistant children: The search for protective factors. In J. E. Stevenson (Ed.), *Recent research in developmental psychopathology*. Oxford: Pergamon Press.
- Garnezy, N. (1988). Longitudinal strategies, causal reasoning and risk research: A commentary. In M. Rutter (Ed.), *Studies of psychosocial risk: The power of longitudinal data*. Cambridge: Cambridge University Press.
- Gerber, R. W., & Newman, I. M. (1989). Predicting future smoking of adolescent experimental smokers. *Journal of Youth and Adolescence, 18*, 191–201.
- Giedd, J. N., Blumenthal, J., Jeffries, N. O., Castellanos, F. X., Liu, H., Zijdenbos, A., et al. (1999). Brain development during childhood and adolescence: A longitudinal MRI study. *Nature Neuroscience, 2*(10), 861–863.
- Gilbert, M. J., & Alcocer, A. M. (1988). Alcohol use and Hispanic youth: An overview. *Journal of Drug Issues, 18*, 33–48.
- Glantz, M. D. (Ed.). (1984). *Correlates and consequences of marijuana use* (Research Issues 34). Rockville, MD: National Institute on Drug Abuse.

- Glantz, M. (1992). A developmental psychopathology model of drug abuse vulnerability. In M. Glantz & R. Pickens (Eds.), *Vulnerability to drug abuse* (pp. 389–418). Washington, DC: American Psychological Association.
- Glantz, M. D., & Hartel, C. R. (Eds.). (1999). *Drug abuse: Origins and interventions*. Washington, DC: American Psychological Association.
- Glantz, M. D., & Leshner, A. I. (2000). Drug abuse and developmental psychopathology. *Development & Psychopathology*, *12*(4), 795–814.
- Glantz, M., & Pickens, R. (Eds.). (1992). *Vulnerability to drug abuse*. Washington, DC: American Psychological Association.
- Glenn, N. D. (1977). *Cohort analysis with survey sample data*. Beverly Hills: Sage Publications.
- Glenn, N. D. (1981a). Age, birth cohorts, and drinking: An illustration of the hazards of inferring effects from cohort data. *Journal of Gerontology*, *36*, 362–369.
- Glenn, N. D. (1981b). The utility and logic of cohort analysis. *The Journal of Applied Behavioral Science*, *17*, 247–257.
- Glenn, N. (2005). *Cohort analysis* (2nd ed.). Beverly Hills, CA: Sage Publications.
- Glynn, T. J., Pearson, H. W., & Sayers, M. (Eds.). (1983). *Women and drugs* (Research Issues 31). Rockville, MD: National Institute on Drug Abuse.
- Goldman, M. S., Del Boca, F. K., & Darkes, J. (1999). Alcohol expectancy theory: The application of cognitive neuroscience. In K.E. Leonard & H. T. Blane (Eds.), *Psychological theories of drinking and alcoholism* (pp. 203–246). New York: Guilford Press.
- Goldstein, J. W. (1975). Assessing the interpersonal determinants of adolescent drug use. In D. J. Lettieri (Ed.), *Predicting adolescent drug abuse: A review of issues, methods and correlates* (NIDA Research Issues No. 2). Washington, DC: U.S. Government Printing Office.
- Golub, A., & Johnson, B. (2001). Variation in youthful risks of progression from alcohol and tobacco to marijuana and to hard drugs across generations. *American Journal of Public Health*, *91*(2), 225–232.
- Goodman, L. A. (1983). The analysis of dependence in cross-classifications having ordered categories using log-linear models for frequencies and log-linear models for odds. *Biometrics*, *39*, 149–160.
- Gotham, H. J., Sher, K. J., & Wood, P. K. (2003). Alcohol involvement and developmental task completion during young adulthood. *Journal of Studies on Alcohol*, *64*(1), 32–42.
- Gottman, J. M. (Ed.). (1995). *The analysis of change*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Graber, J. A. (2004). Internalizing problems during adolescence. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology* (pp. 587–626). Hoboken, NJ: Wiley.
- Graber, J. A., & Brooks-Gunn, J. (1996). Transitions and turning points: Navigating the passage from childhood through adolescence. *Developmental Psychology*, *32*, 768–776.
- Grabowski, J. (Ed.). (1984). *Cocaine: Pharmacology, effects, and treatment of abuse* (NIDA Research Monograph No. 50). Rockville, MD: National Institute on Drug Abuse.
- Graham, J. W., Collins, L. M., Wugalter, S. E., Chung, N. K., & Hansen, W. B. (1991). Modeling transitions in latent stage-sequential processes: A substance use prevention example. *Journal of Consulting and Clinical Psychology*, *59*, 48–57.

- Graham, J. W., Hofer, S. M., Donaldson, S. I., MacKinnon, D. P., & Schafer, J. L. (1997). Analysis with missing data in prevention research. In K. Bryant, M. Windle, & S. West (Eds.), *The science of prevention: Methodological advances from alcohol and substance abuse research* (pp. 325–366). Washington, DC: American Psychological Association.
- Graham, J. W., Hofer, S. M., & Piccinin, A. M. (1994). Analysis with missing data in prevention research. In L. M. Collins & L. A. Seitz (Eds.), *Advances in data analysis for prevention intervention research* (pp. 13–63) (NIDA Research Monograph No. 142, NIH Pub. No. 94-3599). Rockville, MD: National Institute on Drug Abuse.
- Grant, B. F., Harford, T. C., & Grigson, M. B. (1988). Stability of alcohol consumption among youth: A national longitudinal survey. *Journal of Studies on Alcohol*, *49*, 253–260.
- Greenbaum, P. E., Del Boca, F. K., Darkes, J., Wang, C.-P., & Goldman, M. S. (2005). Variation in the drinking trajectories of freshmen college students. *Journal of Consulting and Clinical Psychology*, *73*(2), 229–238.
- Greenberger, E., & Steinberg, L. (1986). *When teenagers work: The psychological and social costs of adolescent employment*. New York: Basic Books.
- Grossman, M., Chaloupka, F. J., & Brown, C. C. (1996a, January). *The demand for cocaine by young adults: A rational addiction approach*. Paper presented at the Pacific Rim Allied Economic Organization Conference, coordinated by the Western Economic Association International, Hong Kong.
- Grossman, M., Chaloupka, F. J., & Brown, C. C. (1996b). *The demand for marijuana by young adults: A rational addiction approach*. Working Paper, April 1996.
- Gruber, J., & Zinman, J. (2001). Youth smoking in the United States: Evidence and implications. In J. Gruber (Ed.), *Risky behavior among youths: An economic analysis* (pp. 69–120). Chicago: University of Chicago Press.
- Guo, J., Chung, I.-J., Hill, K. G., Hawkins, J. D., Catalano, R. F., & Abbott, R. D. (2002). Developmental relationships between adolescent substance use and risky sexual behavior in young adulthood. *Journal of Adolescent Health*, *31*, 354–362.
- Guo, J., Hill, K. G., Hawkins, J. D., Catalano, R. F., & Abbott, R. D. (2002). A developmental analysis of sociodemographic, family, and peer effects on adolescent illicit drug initiation. *Journal of the American Academy of Child and Adolescent Psychiatry*, *41*, 838–845.
- Guy, S. M., Smith, G. M., & Bentler, P. M. (1994). Consequences of adolescent drug use and personality factors on adult drug use. *Journal of Drug Education*, *24*, 109–132.
- Hansen, W. B., & O'Malley, P. M. (1996). Drug use. In R. J. DiClemente, W. B. Hansen, & L. E. Ponton (Eds.), *Handbook of adolescent health risk behavior* (pp. 161–192). New York: Plenum Press.
- Harford, T. C., & Grant, B. F. (1987). Psychosocial factors in adolescent drinking contexts. *Journal of Studies on Alcohol*, *48*, 551–557.
- Harford, T. C., & Muthén, B. O. (2001). The dimensionality of alcohol abuse and dependence: A multivariate analysis of DSM-IV symptom items in the National Longitudinal Survey of Youth. *Journal of Studies on Alcohol*, *62*, 150–157.
- Hartka, E., & Fillmore, K. M. (1989). Cross-cultural and cross-temporal explanations of drinking behavior: Contributions from epidemiology, life-span developmental psychology, and the sociology of aging. *British Journal of Addiction*, *84*, 1409–1417.

- Hawkins, J. D., Catalano, R. F., & Miller, J. Y. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. *Psychological Bulletin*, *112*, 64–105.
- Hawkins, J. D., Catalano, R. F., Morrison, D. M., O'Donnell, J., Abbott, R. D., & Day, L. E. (1992). The Seattle Social Developmental Project: Effects of the first four years on protective factors and problem behaviors. In J. McCord & R. Tremblay (Eds.), *The prevention of antisocial behavior in children* (pp. 139–161). New York: Guilford.
- Hawkins, J. D., Lishner, D. M., Catalano, R. F., & Howard, M. O. (1986). Childhood predictors of adolescent substance abuse: Toward an empirically grounded theory. In S. Ezekoye, K. Kumpfer, & W. Bukoski (Eds.), *Childhood and chemical abuse: Prevention and intervention*. New York: The Haworth Press.
- Hawkins, J. D., Lishner, D. M., Jenson, J. M., & Catalano, R. F. (1987). Delinquents and drugs: What the evidence suggests about prevention and treatment programming. In *Youth at high risk for substance abuse* (pp. 81–131). Rockville, MD: National Institute on Drug Abuse.
- Hawkins, J. D., Van Horn, M. L., & Arthur, M. W. (2004). Community variation in risk and protective factors of substance use outcomes. *Prevention Science*, *5*, 213–220.
- Hays, R. D., Stacy, A. W., Widaman, K. F., DiMatteo, M. R., & Downey, R. (1986). Multistage path models of adolescent alcohol and drug use: A reanalysis. *Journal of Drug Issues*, *16*(3), 357–369.
- Hays, R. D., Widaman, K. F., DiMatteo, M. R., & Stacy, A. W. (1987). Structural-equation models of current drug use: Are appropriate models so simple(x)? *Journal of Personality and Social Psychology*, *52*(1), 134–144.
- Hedeker, D., & Rose, J. S. (2000). The natural history of smoking: A pattern-mixture random-effects regression model. In J. S. Rose, L. Chassin, C. C. Presson, & S. J. Sherman (Eds.), *Multivariate applications in substance use research* (pp. 79–112). Mahwah, NJ: Lawrence Erlbaum Associates.
- Heise, D. R. (1969). Separating reliability and stability in test-retest correlation. *American Sociological Review*, *34*, 93–101.
- Herting, J. R., Eggert, L. L., & Thompson, E. A. (1996). A multidimensional model of adolescent drug involvement. *Journal of Research on Adolescence*, *6*(3), 325–361.
- Hertzog, C., & Nesselroade, J. R. (2003). Assessing psychological change in adulthood: An overview of methodological issues. *Psychology and Aging*, *18*, 639–657.
- Herzog, A. R., & Bachman, J. G. (1982). *Sex role attitudes among high school seniors: Views about work and family roles*. Ann Arbor, MI: Institute for Social Research.
- Herzog, A. R., Bachman, J. G., Johnston, L. D., & O'Malley, P. M. (1987). *Sex differences in adolescents' health-threatening behaviors: What accounts for them?* (Monitoring the Future Occasional Paper No. 23). Ann Arbor, MI: Institute for Social Research.
- Hesselbrock, V. M., O'Brien, J., Weinstein, M., & Carter-Menendez, N. (1987). Reasons for drinking and alcohol use in young adults at high risk and at low risk for alcoholism. *British Journal of Addiction*, *82*, 1335–1339.
- Hibell, B., Andersson, B., Ahlstrom, S., Balakireva, O., Bjarnasson, T., Kokkevi, A., et al. (2000). *The 1999 ESPAD Report: Alcohol and other drug use among students in 30 European countries*. Stockholm, Sweden: The Swedish Council for Information on Alcohol and Other Drugs.

- Hibell, B., Andersson, B., Bjarnason, T., Ahlström, S., Balakireva, O., Kokkevi, A., et al. (2004). *The ESPAD Report 2003: Alcohol and other drug use among students in 35 European countries*. Stockholm, Sweden: The Swedish Council for Information on Alcohol and Other Drugs.
- Hill, K. G., Hawkins, J. D., Catalano, R. F., Abbott, R. D., & Guo, J. (2005). Family influences on the risk of daily smoking initiation. *Journal of Adolescent Health, 37*, 202–210.
- Hill, K. G., White, H. R., Chung, I.-J., Hawkins, J. D., & Catalano, R. F. (2000). Early adult outcomes of adolescent binge drinking: Person- and variable-centered analyses of binge drinking trajectories. *Alcoholism: Clinical and Experimental Research, 24*, 892–901.
- Hilton, M. E., & Clark, W. B. (1987). Changes in American drinking patterns and problems, 1967–1984. *Journal of Studied on Alcohol, 48*, 515–522.
- Hingson, R. W., Heeren, T., Zakocs, R. C., Kopstein, A., & Wechsler, H. (2002). Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18–24. *Journal of Studies on Alcohol, 63*(2), 136–144.
- Hirschi, T. (1969). *Causes of delinquency*. Berkeley: University of California Press.
- Hix-Small, H., Duncan, T. E., Duncan, S. C., & Okut, H. (2004). Multivariate associative finite growth mixture modeling approach examining adolescent alcohol and marijuana use. *Journal of Psychopathology and Behavioral Assessment, 26*(4), 255–270.
- Hops, H., Andrews, J. A., Duncan, S. C., Duncan, T. E., & Tildesley, E. (2000). Adolescent drug use development: A social interactional and contextual perspective. In A. J. Sameroff, M. Lewis, & S. M. Miller (Eds.), *Handbook of developmental psychopathology* (pp. 589–605). New York: Kluwer Academic/Plenum Publishers.
- Hu, M.-C., Davies, M., & Kandel, D. B. (2006). Epidemiology and correlates of daily smoking and nicotine dependence among young adults in the United States. *American Journal of Public Health, 96*, 299–308.
- Huba, G. J., & Bentler, P. M. (1982). A developmental theory of drug use: Derivation and assessment of a causal modeling approach. In P. B. Baltes & O. G. Brim, Jr. (Eds.), *Life-span development and behavior* (Vol. 4, pp. 147–203). New York: Academic Press.
- Huba, G. J., & Bentler, P. M. (1983). Causal models of the development of law abidance and its relationship to psychosocial factors and drug use. In W. S. Laufer & J. M. Day (Eds.), *Personality theory, moral development, and criminal behavior* (pp. 165–214). Lexington, MA: Lexington Books.
- Huba, G. J., Bentler, P. M., & Newcomb, M. D. (Eds.). (1981). *Assessing marijuana consequences: Selected questionnaire items* (NIDA Research Issues No. 28). Rockville, MD: National Institute on Drug Abuse.
- Huba, G. J., Wingard, J. A., & Bentler, P. M. (1981). A comparison of two latent variable causal models for adolescent drug use. *Journal of Personality and Social Psychology, 40*, 180–193.
- Huizinga, D. (1995). Developmental sequences in delinquency: Dynamic typologies. In L. G. Crockett & A. C. Crouter (Eds.), *Pathways through adolescence: Individual development in relation to social contexts* (pp. 15–34). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Hundleby, J. D. (1985). Drug usage and outstanding performance among young adolescents. *Addictive Behaviors, 10*, 419–423.
- Hundleby, J. D. (1987). Adolescent drug use in a behavioral matrix: A confirmation and comparison of the sexes. *Addictive Behaviors, 12*, 103–112.

- Hurrelmann, K. (1990). Health promotion for adolescents: Preventive and corrective strategies against problem behavior. *Journal of Adolescence*, *13*, 231–250.
- Hyatt, S. L., & Collins, L. M. (2000). Using latent transition analysis to examine the relationship between perceived parental permissiveness and the onset of substance use. In J. S. Rose, L. Chassin, C. C. Presson, & S. J. Sherman (Eds.), *Multivariate applications in substance use research: New methods for new questions* (pp. 259–288). Mahwah, NJ: LEA.
- Hyde, J. S. (2005). The gender similarities hypothesis. *American Psychologist*, *60*, 581–592.
- Institute of Medicine (1982). *Marijuana and health*. Washington, DC: National Academy Press.
- Jackson, K. M., Sher, K. J., & Park, A. (2005). Drinking among college students. In M. Galanter (Ed.), *Recent developments in alcoholism: Volume 17. Alcohol problems in adolescents and young adults. Epidemiology neurobiology prevention treatment* (pp. 85–117). New York: Kluwer Academic/Plenum.
- Jackson, K. M., Sher, K. J., & Schulenberg, J. E. (2005). Conjoint developmental trajectories of young adult alcohol and tobacco use. *Journal of Abnormal Psychology*, *114*, 612–626.
- Jackson, K. M., Sher, K. J., & Schulenberg, J. E. (2006). *Conjoint developmental trajectories of young adult substance use*. Manuscript submitted for publication.
- Jacobsen, L. K., Mencl, W. E., Westerveld, M., & Pugh, K. R. (2004). Impact of cannabis use on brain function in adolescents. *Annals New York Academy of Sciences*, *1021*, 384–390.
- Jarvik, M. E., Cullen, J. W., Gritz, E. R., Vogt, T. M., & West, L. J. (1977). *Research on smoking behavior* (NIDA Research Monograph No. 17). Rockville, MD: National Institute on Drug Abuse.
- Jessor, R. (1985). Bridging etiology and prevention in drug abuse research. In C. L. Jones & R. J. Battjes (Eds.), *The etiology of drug abuse: Implications for prevention* (pp. 257–268) (NIDA Research Monograph No. 56). Rockville, MD: National Institute on Drug Abuse.
- Jessor, R. (1992). Risk behavior in adolescence: A psychosocial framework for understanding and action. *Developmental Review*, *12*, 374–390.
- Jessor, R. (Ed.). (1998). *New perspectives on adolescent risk behavior*. New York: Cambridge University Press.
- Jessor, R., Costa, F. M., Krueger, P. M., & Turbin, M. S. (2006). A developmental study of heavy episodic drinking among college students: The role of psychosocial and behavioral protective and risk factors. *Journal of Studies on Alcohol*, *67*, 86–94.
- Jessor, R., Donovan, J. E., & Costa, F. M. (1991). *Beyond adolescence: Problem behavior and young adult development*. New York: Cambridge University Press.
- Jessor, R., Donovan, J. E., & Costa, F. M. (1996). Personality, perceived life changes, and adolescent behavior. In K. Hurrelmann & S. F. Hamilton (Eds.), *Social problems and social contexts in adolescence: Perspectives across boundaries* (pp. 219–233). Hawthorne, NY: Aldine de Gruyter.
- Jessor, R., & Jessor, S. L. (1977). *Problem behavior and psychological development: A longitudinal study of youth*. New York: Academic Press.
- Jessor, R., & Jessor, S. L. (1978). Theory testing in longitudinal research on marijuana use. In D. B. Kandel (Ed.), *Longitudinal research on drug use: Empirical findings and methodological issues*. Washington, DC: Hemisphere Publishing.
- Jessor, R., & Jessor, S. L. (1984). Adolescence to young adulthood. In S. A. Mednick, M. Harway, & K. M. Finello (Eds.), *Handbook of longitudinal research: Vol. 2. Teenage and adult cohorts* (pp. 34–61). New York: Praeger.

- Jessor, R., Jessor, S. L., & Finney, J. (1973). A social psychology of marijuana use: Longitudinal studies of high school and college youth. *Journal of Personality and Social Psychology*, 26, 1–15.
- Jessor, R., Turbin, M. S., & Costa, F. M. (1998). Protective factors in adolescent health behavior. *Journal of Personality and Social Psychology*, 75, 788–800.
- Johanson, C. E. (1984). Assessment of the dependence potential of cocaine in animals. In J. Grabowski (Ed.), *Cocaine: Pharmacology, effects, and treatment of abuse* (NIDA Research Monograph No. 50). Rockville, MD: National Institute on Drug Abuse.
- Johnson, E. O., & Schultz, L. (2005). Forward telescoping bias in reported age of onset: An example from cigarette smoking. *International Journal of Methods in Psychiatric Research*, 14(3), 119–129.
- Johnson, M. K. (2004). Further evidence on adolescent employment and substance use: Differences by race and ethnicity. *Journal of Health and Social Behavior*, 45, 187–197.
- Johnson, R. A., & Gerstein, D. R. (2000). Age, period, and cohort effects in marijuana and alcohol incidence: United States females and males, 1961–1990. *Substance Use & Misuse*, 35, 925–948.
- Johnson, R. J., & Kaplan, H. B. (1990). Stability of psychological symptoms: Drug use consequences and intervening processes. *Journal of Health and Social Behavior*, 31, 277–291.
- Johnson, R. J., & Kaplan, H. B. (1991). Developmental processes leading to marijuana use: Comparing civilians and the military. *Youth and Society*, 23, 3–30.
- Johnson, V., & Pandina, R. J. (1991). Effects of the family environment on adolescent substance use, delinquency, and coping styles. *American Journal of Drug & Alcohol Abuse*, 17(1), 71–88.
- Johnston, L. D. (1973). *Drugs and American youth*. Ann Arbor: Institute for Social Research.
- Johnston, L. D. (1975). Defining the term “polydrug use.” In J. Elinson & D. Nurco (Eds.), *Operational definitions in socio-behavioral drug use research* (NIDA Research Monograph No. 2). Washington, DC: U.S. Government Printing Office.
- Johnston, L. D. (1977). *Drug use among American youth: Selected findings and recommendations*. Washington, DC: White House Office of Drug Abuse Policy.
- Johnston, L. D. (1980, September 19). *The daily marijuana user*. Paper presented at the first annual meeting of the National Alcohol and Drug Coalition, Washington, DC.
- Johnston, L. D. (1982). A review and analysis of recent changes in marijuana use by American young people. In *Marijuana: The national impact on education* (pp. 8–13). New York: American Council on Marijuana.
- Johnston, L. D. (1985). The etiology and prevention of substance use: What can be learned from recent historical changes? In C. L. Jones & R. J. Battjes (Eds.), *The etiology of drug abuse: Implications for prevention* (pp. 155–177) (NIDA Research Monograph No. 56). Washington, DC: U.S. Government Printing Office.
- Johnston, L. D. (1991a). Contributions of drug epidemiology to the field of drug abuse prevention. In W. Bukoski (Ed.), *Drug abuse prevention research: Methodological issue*. (NIDA Research Monograph). Washington, DC: U.S. Government Printing Office.
- Johnston, L. D. (1991b). Toward a theory of drug epidemics. In L. Donohew, H. Syper, & W. Bukoski (Eds.), *Persuasive communication and drug abuse prevention*. Hillsdale, NJ: Lawrence Erlbaum Associates.

- Johnston, L. D. (1993). *Emerging gender differences during adolescence in smoking, drinking, and drug use*. Keynote address to the conference on Clinical Implications of Gender Differences in Adolescents and Young Adults, sponsored by Student Assistance Services Incorporated, White Plains, New York.
- Johnston, L. D. (1999, December 17). Statement read at a national press conference on the 1999 results on substance abuse from the Monitoring the Future study, made in conjunction with statements from the Secretary of the Department of Health and Human Services and the Director of the White House Office of National Drug Control Policy. Read at the Department of Health and Human Services, Washington, DC.
- Johnston, L. D. (2000a). General population surveys of drug abuse. In *Guide to drug abuse epidemiology* (pp. 125–170). Geneva: World Health Organization.
- Johnston, L. D. (2000b). Selecting variables and measures for drug surveys. In *Guide to drug abuse epidemiology* (pp. 171–203). Geneva: World Health Organization.
- Johnston, L. D., & Bachman, J. G. (1980). *Monitoring the Future: Questionnaire responses from the nation's high school seniors, 1975*. Ann Arbor, MI: Institute for Social Research.
- Johnston, L. D., Bachman, J. G., & O'Malley, P. M. (1977). *Drug use among American high school students, 1975–1977* (NIDA Research Monograph). Washington, DC: U.S. Government Printing Office.
- Johnston, L. D., Bachman, J. G., & O'Malley, P. M. (1979). *Drugs and the class of 1978: Behaviors, attitudes, and recent national trends* (DHEW Publication No. (ADM) 79-877). Washington, DC: U.S. Government Printing Office.
- Johnston, L. D., Bachman, J. G., & O'Malley, P. M. (1981). *Highlights from student drug use in America, 1975–1980* (DHHS Publication No. (ADM) 81-1066). Washington, DC: National Institute on Drug Abuse.
- Johnston, L. D., Bachman, J. G., & O'Malley, P. M. (2001). *Monitoring the Future: Questionnaire responses from the nation's high school seniors, 1997*. Ann Arbor, MI: Institute for Social Research.
- Johnston, L. D., Bachman, J. G., & O'Malley, P. M. (2006). *Monitoring the Future: Questionnaire responses from the nation's high school seniors, 2005*. Ann Arbor, MI: Institute for Social Research.
- Johnston, L. D., Driessen, F. M. H. M., & Kokkevi, A. (1994). *Report of a six country collaborative project on student surveys of drug use*. Strasbourg, France: Council of Europe.
- Johnston, L. D., & O'Malley, P. M. (1978, August). *A cross-cohort comparison of the drugs-delinquency connection*. Paper presented at the symposium on cohort studies under the sponsorship of the International Sociological Association, the American Society of Criminology, and the Scandinavian Research Council for Criminology, Stockholm, Sweden.
- Johnston, L. D., & O'Malley, P. M. (1985). Issues of validity and population coverage in student surveys of drug use. In B. A. Rouse, N. J. Kozel, & L. G. Richards (Eds.), *Self-report methods of estimating drug use: Meeting current challenges to validity* (NIDA Research Monograph No. 57). Washington, DC: National Institute on Drug Abuse.
- Johnston, L. D., & O'Malley, P. M. (1986). Why do the nation's students use drugs and alcohol? Self-reported reasons from nine national surveys. *Journal of Drug Issues*, 16, 29–66.

- Johnston, L. D., & O'Malley, P. M. (1997). The recanting of earlier-reported drug use by young adults. In L. Harrison & A. Hughes (Eds.), *The validity of self-reported drug use: Improving the accuracy of survey estimates* (pp. 59–80) (NIDA Research Monograph No. 167, NIH Publication No. 97-4147). Washington, DC: National Institute on Drug Abuse.
- Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (1981). *Marijuana decriminalization: The impact on youth 1975–1980* (Monitoring the Future Occasional Paper No. 13). Ann Arbor, MI: Institute for Social Research.
- Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (1984). *Highlights from drugs and American high school students: 1975–1983*. Washington, DC: National Institute on Drug Abuse.
- Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (1987, October). *Lifestyle orientations in late adolescence and patterns of substance abuse*. Paper presented at the Sixth Annual Scientific Symposia of the American College of Epidemiology, New Orleans, LA.
- Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (1989). *Drug use, drinking, and smoking: National survey results from high school, college, and young adult populations, 1975–1989*. Washington, DC: National Institute on Drug Abuse.
- Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (1991a). *Drug use among American high school seniors, college students and young adults, 1975–1990: Volume I. High school seniors* (DHHS Publication No. [ADM]91-1813). Rockville, MD: National Institute on Drug Abuse.
- Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (1991b). *Drug use among American high school seniors, college students and young adults, 1975–1990: Volume II. College students and young adults* (DHHS Publication No. [ADM]91-1835). Rockville, MD: National Institute on Drug Abuse.
- Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (1995). *National survey results on drug use from the Monitoring the Future study, 1975–1994: Volume I. Secondary school students* (DHHS Publication No. [NIH]95-4026). Rockville, MD: National Institute on Drug Abuse.
- Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (1996). *National survey results on drug use from the Monitoring the Future study, 1975–1995: Volume I. Secondary school students* (DHHS Publication No. [NIH]96-4139). Rockville, MD: National Institute on Drug Abuse.
- Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (1999, April 14). *Cigarette brands smoked by American teens: One brand predominates, three account for nearly all teen smoking*. National press release, University of Michigan News and Information Services, Ann Arbor, MI.
- Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (2000a, December 13). *Cigarette use and smokeless tobacco use decline substantially among teens*. National press release, University of Michigan News and Information Services, Ann Arbor, MI.
- Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (2001a). *Monitoring the Future national survey results on drug use, 1975–2000: Volume I. Secondary school students* (NIH Pub. No. 01-4924). Bethesda, MD: National Institute on Drug Abuse.
- Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (2001b). *Monitoring the Future national survey results on drug use, 1975–2000: Volume II. College students and adults ages 19–40* (NIH Pub. No. 01-4925). Bethesda, MD: National Institute on Drug Abuse.

- Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2005, December 19). *Decline in teen smoking appears to be nearing its end*. University of Michigan News and Information Services, Ann Arbor, MI. From The Monitoring the Future Web site: <http://www.monitoringthefuture.org/pressreleases/05cigpr.pdf>
- Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2006a). *Demographic subgroup trends for various licit and illicit drugs, 1975–2005* (Monitoring the Future Occasional Paper No. 63). Ann Arbor, MI: Institute for Social Research.
- Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2006b). *Monitoring the Future national results on adolescent drug use: Overview of key findings, 2005* (NIH Publication No. 06-5882). Bethesda, MD: National Institute on Drug Abuse.
- Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2006c). *Monitoring the Future national survey results on drug use, 1975–2005: Volume I. Secondary school students* (NIH Publication No. 06-5883). Bethesda, MD: National Institute on Drug Abuse.
- Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2006d). *Monitoring the Future national survey results on drug use, 1975–2005: Volume II. College students and adults ages 19–45* (NIH Publication No. 06-5884). Bethesda, MD: National Institute on Drug Abuse.
- Johnston, L. D., O'Malley, P. M., & Davis-Sacks, M. L. (1983). *A world-wide survey of seniors in the Department of Defense dependent schools: Drug use and related factors* (Monitoring the Future Occasional Paper No. 15). Ann Arbor, MI: Institute for Social Research.
- Johnston, L. D., O'Malley, P. M., & Eveland, L. K. (1978). Drugs and delinquency: A search for causal connections. In D. G. Kandel (Ed.), *Longitudinal research on drug use: Empirical findings and methodological issues*. Washington, DC: Hemisphere Publishing.
- Johnston, L. D., O'Malley, P. M., & Harrison, L. D. (1989). *The second worldwide survey of drug and alcohol use among students in the Department of Defense Dependents School System: 1982–1987* (Monitoring the Future Occasional Paper No. 31). Ann Arbor, MI: Institute for Social Research.
- Johnston, L. D., Terry-McElrath, Y. M., O'Malley, P. M., & Wakefield, M. (2005). Trends in recall and appraisal of anti-smoking advertising among American youth: Results from the Monitoring the Future surveys, 1997–2001. *Prevention Science*, 6, 1–19.
- Joreskog, K. G. (1979). Statistical estimation of structural models in longitudinal-developmental investigations. In J. Nesselroade & P. Baltes (Eds.), *Longitudinal research in the study of behavior and development* (pp. 303–352). New York: Academic.
- Josephson, E., & Rosen, M. A. (1978). Panel loss in a high school drug study. In D. B. Kandel (Ed.), *Longitudinal research on drug use: Empirical findings and methodological issues*. Washington, DC: Hemisphere Publishing.
- Kalivas, P. W., & Volkow, N. D. (2005). The neural basis of addiction: A pathology of motivation and choice. *American Journal of Psychiatry*, 162, 1403–1413.
- Kandel, D. B. (1974). Interpersonal influence on adolescent illegal drug use. In E. Josephson & E. E. Carroll (Eds.), *Drug use: Epidemiological and sociological approaches*. Washington, DC: Hemisphere Publishing.
- Kandel, D. B. (1975). Stages in adolescent involvement in drug use. *Science*, 190, 912–914.
- Kandel, D. B. (1978a). Homophily, selection, and socialization in adolescent friendships. *American Journal of Sociology*, 84, 427–436.

- Kandel, D. B. (Ed.). (1978b). *Longitudinal research on drug abuse: Empirical findings and methodological issues*. Washington, DC: Hemisphere Publishing.
- Kandel, D. B. (1980). Drug and drinking behavior among youth. *Annual Review of Sociology*, 6, 235–285.
- Kandel, D. B. (1982). Epidemiological and psychosocial perspectives on adolescent drug use. *Journal of the American Academy of Child Psychiatry*, 21, 328–347.
- Kandel, D. B. (1985). On processes of peer influences in adolescent drug use: A developmental perspective. *Advances in Alcohol and Substance Abuse*, 4, 139–163.
- Kandel, D. B. (1988). Issues of sequencing of adolescent drug use and other problem behaviors. *Drugs and Society*, 3, 55–76.
- Kandel, D. B. (1990). Parenting styles, drug use and children's adjustment in families of young adults. *Journal of Marriage and the Family*, 52, 183–196.
- Kandel, D. B. (1998). Persistent themes and new perspectives on adolescent substance use: A lifespan perspective. In R. Jessor (Ed.), *New perspectives on adolescent risk behavior* (pp. 43–89). New York: Cambridge University Press.
- Kandel, D. B. (Ed.). (2002). *Stages and pathways of drug involvement: Examining the gateway hypothesis*. New York: Cambridge University Press.
- Kandel, D. B., & Chen, K. (2000). Types of marijuana users by longitudinal course. *Journal of Studies on Alcohol*, 61(3), 367–378.
- Kandel, D. B., Davies, M., & Baydar, N. (1990). The creation of interpersonal contexts: Homophily in dyadic relationships in adolescence and young adulthood. In L. Robins & M. Rutter (Eds.), *Straight and devious pathways from childhood to adulthood* (pp. 221–241). Cambridge: Cambridge University Press.
- Kandel, D. B., Davies, M., Karus, D., & Yamaguchi, K. (1986). The consequences in young adulthood of adolescent drug involvement: An overview. *Archives of General Psychiatry*, 43, 746–754.
- Kandel, D. B., Griesler, P. C., Lee, G., Davies, M., & Schaffsan, C. (2001). *Parental influences on adolescent marijuana use and the baby boom generation: Findings from the 1976–1996 National Household Surveys on Drug Abuse* (Office of Applied Studies, Analytic Series A-13, DHHS No. [SMA]01-3531). Rockville, MD: Substance Abuse and Mental Health Service Administration.
- Kandel, D. B., Kessler, R. C., & Margulies, R. Z. (1978). Antecedents of adolescent initiation into stages of drug use: A developmental analysis. In D. B. Kandel (Ed.), *Longitudinal research on drug use: Empirical findings and methodological issues*. Washington, DC: Hemisphere Publishing.
- Kandel, D. B., & Logan, J. A. (1984). Patterns of drug use from adolescence to young adulthood: I. Periods of risk for initiation, continued use, and discontinuation. *American Journal of Public Health*, 74, 660–666.
- Kandel, D. B., Simcha-Fagan, O., & Davies, M. (1986). Risk factors for delinquency and illicit drug use from adolescence to young adulthood. *Journal of Drug Issues*, 16, 67–90.
- Kandel, D. B., & Yamaguchi, K. (1987). Job mobility and drug use. *American Journal of Sociology*, 92, 836–878.
- Kandel, D. B., & Yamaguchi, K. (1993). From beer to crack: Developmental patterns of drug involvement. *American Journal of Public Health*, 83, 851–855.

- Kandel, D. B., & Yamaguchi, K. (1999). Developmental stages of involvement in substance use. In R. E. Tarter, R. T. Amerman, & P. J. Ott (Eds.), *Sourcebook on substance abuse: Etiology, epidemiology, assessment, and treatment* (pp. 50–74). Needham Heights, MA: Allyn & Bacon.
- Kandel, D. B., Yamaguchi, K., & Chen, K. (1992). Stages of progression in drug involvement from adolescence to adulthood: Further evidence for the gateway theory. *Journal of Studies on Alcohol*, *53*, 447–457.
- Kaplan, H. B. (1980). Self-esteem and self-derogation theory of drug abuse. In D. J. Lettieri, M. Sayers, & H. W. Pearson (Eds.), *Theories on drug abuse: Selected contemporary perspectives* (NIDA Research Monograph No. 30). Rockville, MD: National Institute on Drug Abuse.
- Kaplan, H. B. (1985). Testing a general theory of drug abuse and other deviant adaptations. *Journal of Drug Issues*, *15*, 477–492.
- Kaplan, H. B. (Ed.). (1995). *Drugs, crime, and other deviant adaptations: Longitudinal studies*. New York: Plenum Press.
- Kaplan, H. B., & Johnson, R. J. (2001). *Social deviance: Testing a general theory*. New York: Kluwer Academic/Plenum Publishers.
- Kaplan, H. B., Johnson, R. J., & Bailey, C. A. (1987). Deviant peers and deviant behavior: Further elaboration of a model. *Social Psychology Quarterly*, *50*, 277–284.
- Kaplan, H. B., Johnson, R. J., & Bailey, C. A. (1988). Explaining adolescent drug use: An elaboration strategy for structural equation modeling. *Psychiatry*, *51*, 142–163.
- Kaplan, H. B., Martin, S. S., Johnson, R. J., & Robbins, C. A. (1986). Escalation of marijuana use: Application of a general theory of deviant behavior. *Journal of Health and Social Behavior*, *27*, 44–61.
- Kaplan, H. B., Martin, S. S., & Robbins, C. A. (1982). Application of a general theory of deviant behavior: Self-derogation and adolescent drug use. *Journal of Health and Social Behavior*, *23*, 274–294.
- Kasen, S., Cohen, P., & Brook, J. S. (1998). Adolescent school experiences and dropout, adolescent pregnancy, and young adult deviant behavior. *Journal of Adolescent Research*, *13*, 49–72.
- Kellam, S. G., & Rebok, G. W. (1992). Building developmental and etiological theory through epidemiologically based preventive intervention trials. In J. McCord & R. E. Tremblay (Eds.), *Preventing antisocial behavior: Interventions from birth through adolescence* (pp. 162–195). New York: Guilford.
- Kellam, S. G., Rebok, G. W., Wison, R., & Mayer, L. S. (1994). The social field of the classroom: Context for the developmental epidemiological study of aggressive behavior. In R. K. Silbereisen & E. Todt (Eds.), *Adolescence in context: The interplay of family, school, peers, and work in adjustment* (pp. 390–408). New York: Springer-Verlag.
- Kellam, S. G., Simon, M. B., & Ensminger, M. E. (1983). Antecedents in first grade of teenage substance use and psychological well-being: A ten-year community-wide perspective study. In D. F. Ricks & B. S. Dohrenwend (Eds.), *Origins of psychopathology* (pp. 17–42). Cambridge: Cambridge University Press.
- Kelly, T. M., Donovan, J. E., Cornelius, J. R., Bukstein, O. G., Delbridge, T. R., & Kinnane, J. M. (2005). Alcohol use disorder symptoms and risk-taking behavior as predictors of alcohol-related medical events among young adults treated in emergency departments. *Addictive Behaviors*, *30*, 1674–1689.

- Knupfer, G. (1989). The prevalence in various social groups of eight different drinking patterns, from abstaining to frequent drunkenness: Analysis of 10 U.S. surveys combined. *British Journal of Addiction*, *84*, 1305–1318.
- Kogan, S. M., Luo, Z., Murry, V. M., & Brody, G. H. (2005). Risk and protective factors for substance use among African American high school dropouts. *Psychology of Addictive Behaviors*, *19*, 382–391.
- Kozel, N. J., & Adams, E. H. (Eds.). (1985). *Cocaine use in America: Epidemiologic and clinical perspectives* (NIDA Research Monograph No. 61). Washington, DC: National Institute on Drug Abuse.
- Krasnegor, N. A. (Ed.). (1979a). *The behavioral aspects of smoking* (NIDA Research Monograph No. 26). Rockville, MD: National Institute on Drug Abuse.
- Krasnegor, N. A. (Ed.). (1979b). *Cigarette smoking as a dependence process* (NIDA Research Monograph No. 23). Rockville, MD: National Institute on Drug Abuse.
- Krohn, M. D., Thornberry, T. P., Collins-Hall, L., & Lizotte, A. J. (1995). Family relationships, school dropout, and delinquent behavior. In H. B. Kaplan (Ed.), *Drugs, crime, and other deviant adaptations: Longitudinal studies* (pp. 163–183). New York: Plenum.
- Kumar, R., O'Malley, P. M., Johnston, L. D., Schulenberg, J. E., & Bachman, J. G. (2002). Effect of school-level norms on student substance use. *Prevention Science*, *3*, 105–124.
- Kumpfer, K. L., & Turner, C. W. (1990). The social ecology model of adolescent substance abuse: Implications for prevention. *International Journal of the Addictions*, *25*(4-A), 435–463.
- Kusserow, R. P. (1991). *Youth and alcohol: A national survey—Drinking habits, access, attitudes, and knowledge*. Rockville, MD: Department of Health and Human Services.
- Labouvie, E. W. (1975). An extension of developmental models: Reply to Buss. *Psychological Bulletin*, *82*, 165–169.
- Labouvie, E. W. (1986). The coping function of adolescent alcohol and drug use. In R. K. Silbereisen, K. Eyferth, & G. Rudinger (Eds.), *Development as action in context: Problem behavior and normal youth development* (pp. 229–239). Berlin: Springer-Verlag.
- Labouvie, E. W., Bates, M. E., & Pandina, R. J. (1997). Age of first use: Its reliability and predictive utility. *Journal of Studies on Alcohol*, *58*, 638–643.
- Labouvie, E. W., & McGee, C. R. (1986). Relation of personality to alcohol and drug use in adolescence. *Journal of Consulting and Clinical Psychology*, *54*, 289–293.
- Labouvie, E. W., Pandina, R. J., & Johnson, V. (1991). Developmental trajectories of substance use in adolescence: Differences and predictors. *International Journal of Behavioral Development*, *14*, 305–328.
- Labouvie, E. W., & White, H. R. (2002). Drug sequences, age of onset, and use trajectories as predictors of drug abuse/dependence in young adulthood. In D. B. Kandel (Ed.), *Stages and pathways of drug involvement: Examining the gateway hypothesis* (pp. 19–41). New York: Cambridge University Press.
- Laird, N. M., & Ware, H. (1982). Random-effects models for longitudinal data. *Biometrics*, *38*, 963–974.
- Lanza, S. T., & Collins, L. M. (2006). A mixture model of discontinuous development in heavy drinking from ages 18 to 30: The role of college enrollment. *Journal of Studies on Alcohol*, *67*, 552–561.

- Lanza, S. T., Flaherty, B. P., & Collins, L. M. (2003). Latent class and latent transition analysis. In J. A. Schinka & W. F. Velicer (Eds.), *Handbook of psychology: Research methods in psychology* (Vol. 2, pp. 663–685). Hoboken, NJ: Wiley.
- Largie, S., Field, T., Hernandez-Reif, M., Sanders, C. E., & Diego, M. (2001). Employment during adolescence is associated with depression, inferior relationships, lower grades, and smoking. *Adolescence, 36*, 395–401.
- Laub, J. H., & Sampson, R. J. (1993). Turning points in the life course: Why change matters to the study of crime. *Criminology, 31*, 301–325.
- Leonard, K. E., & Eiden, R. D. (1999). Husband's and wife's drinking: Unilateral or bilateral influences among newlyweds in a general population sample. *Journal of Studies on Alcohol, Supplement No. 13*, 130–138.
- Leonard, K. E., & Mudar, P. (2003). Peer and partner drinking and the transition to marriage: A longitudinal examination of selection and influence processes. *Psychology of Addictive Behaviors, 17*, 115–125.
- Leonard, K. E., & Homish, G. G. (2005). Changes in marijuana use over the transition into marriage. *Journal of Drug Issues, 35*, 409–430.
- Lerner, R. M. (1982). Children and adolescents as products of their own development. *Developmental Review, 2*, 342–370.
- Lerner, R. M. (2001). Promoting promotion in the development of prevention science. *Applied Developmental Science, 5*(4), 254–257.
- Lerner, R. M. (2006). Developmental science, developmental systems, and contemporary theories of human development. In R. M. Lerner (Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (6th ed., pp. 1–17). Hoboken, NJ: Wiley.
- Lettieri, D. J., Sayers, M., & Pearson, H. W. (Eds.). (1980). *Theories on drug abuse: Selected contemporary perspectives* (NIDA Research Monograph No. 30). Rockville, MD: National Institute on Drug Abuse.
- Leventhal, T., Graber, J. A., & Brooks-Gunn, J. (2001). Adolescent transitions to young adulthood: Antecedents, correlates, and consequences of adolescent employment. *Journal of Research on Adolescence, 11*, 297–323.
- Lewin, K. (1939). The field theory approach to adolescence. *American Journal of Sociology, 44*, 868–897.
- Lewis, M. (1999). Contextualism and the issue of continuity. *Infant Behavior & Development, 22*, 431–444.
- Li, F., Duncan, T., Duncan, S., & Hops, H. (2001). Piecewise growth mixture modeling of adolescent alcohol use data. *Structural Equation Modeling, 8*, 175–204.
- Liu, X., & Kaplan, H. B. (2001). Role strain and illicit drug use: The moderating influence of commitment to conventional values. *Journal of Drug Issues, 31*(4), 833–856.
- Loeber, R. (1982). The stability of antisocial and delinquent child behavior: A review. *Child Development, 53*, 1431–1446.
- Loeber, R. (1990). Development and risk factors of juvenile antisocial behavior and delinquency. *Clinical Psychology Review, 10*, 1–41.
- Loeber, R., & Stouthamer-Loeber, M. (1998). Development of juvenile aggression and violence: Some common misconceptions and controversies. *American Psychologist, 53*, 242–259.
- Loewenstein, G., & Furstenberg, F. (1991). Is teenage sexual behavior rational? *Journal of Applied Social Psychology, 21*, 957–986.

- Lonczak, H. S., Huang, B., Catalano, R. F., Hawkins, J. D., Hill, K. G., Abbott, R. D., et al. (2001). The social predictors of adolescent alcohol misuse: A test of the Social Development Model [Special issue]. *Journal of Studies on Alcohol*, 62(6), 179–189.
- Lu, K. H. (1974). The indexing and analysis of drug indulgence. *International Journal of the Addictions*, 9, 785–804.
- Maddox, G. L., & Wiley, J. (1976). Scope, concepts and methods in the study of aging. In R. H. Binstock & E. Shanas (Eds.), *Handbook of aging and the social sciences*. New York: Van Nostrand Reinhold.
- Maggs, J. L., & Lee, C. M. (2005). What do you expect? Alcohol expectancies and consequences. In M. Fearnow-Kenney, D. L. Wyrick, & W. B. Hansen (Eds.), *Alcohol use and harm prevention: A resource for college students*. Greensboro, NC: Tanglewood Research.
- Maggs, J. L., & Schulenberg, J. E. (1998). Reasons to drink and not to drink: Altering trajectories of drinking through an alcohol misuse prevention program. *Applied Developmental Science*, 2, 48–60.
- Maggs, J. L., & Schulenberg, J. E. (2005). Trajectories of alcohol use during the transition to adulthood. *Alcohol Research and Health*, 28, 195–211.
- Magnusson, D. (1988). *Individual development from an interactional perspective: A longitudinal study* (Vol. 1). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Magnusson, D., & Bergman, L. R. (1988). Individual and variable-based approaches to longitudinal research on early risk factors. In M. Rutter (Ed.), *Studies of psychosocial risk: The power of longitudinal data*. New York: Cambridge University Press.
- Magnusson, D., & Stattin, H. (2006). The person in context: A holistic-interactionist approach. In R. M. Lerner (Ed.), *Handbook of child psychology: Volume 1. Theoretical models of human development* (6th ed., pp. 400–464). Hoboken, NJ: Wiley.
- Marcos, A. C., Bahr, S. J., & Johnson, R. E. (1986). Test of a bonding/association theory of adolescent drug use. *Social Forces*, 65, 135–161.
- Marcoulides, G. A., & Schumacker, R. E. (Eds.). (1996). *Advanced structural equation modeling: Issues and techniques*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Martin, M. J., & Pritchard, M. E. (1991). Factors associated with alcohol use in later adolescence. *Journal of Studies on Alcohol*, 52, 5–9.
- Martin, S. S., & Robbins, C. A. (1995). Personality, social control, and drug use in early adolescence. In H. B. Kaplan (Ed.), *Drugs, crime, and other deviant adaptations: Longitudinal studies* (pp. 145–161). New York: Plenum.
- Mason, K. O., Mason, W. M., Winsborough, H. H., & Poole, W. K. (1973). Some methodological issues in cohort analysis of archival data. *American Sociological Review*, 38, 242–258.
- Mason, W. M., & Fienberg, S. E. (1985). *Cohort analysis in social research: Beyond the identification problem*. New York: Springer-Verlage.
- Mason, W. A. & Windle, M. (2002). Reciprocal relations between adolescent substance use and delinquency: A longitudinal latent variable analysis. *Journal of Abnormal Psychology*, 111, 63–76.
- Massey, J. L., & Krohn, M. D. (1986). A longitudinal examination of an integrated social process model of deviant behavior. *Social Forces*, 65, 106–134.
- Masten, A. S. (2001). Ordinary magic: Resilience processes in development. *American Psychologist*, 56, 227–238.

- Mayes, L. C., & Suchman, N. E. (2006). Developmental pathways to substance abuse. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology: Volume 3. Risk, disorder, and adaptation* (2nd ed., pp. 599–619). Hoboken, NJ: Wiley.
- McAdams, D. P., de St. Aubin, E., & Logan, R. L. (1993). Generativity among young, midlife, and older adults. *Psychology & Aging*, 8, 221–230.
- McArdle, J. J. (1988). Dynamic but structural equation modeling of repeated measures data. In J. R. Nesselroade & R. B. Cattell (Eds.), *Handbook of multivariate experimental psychology* (2nd ed., pp. 561–614). New York: Plenum Press.
- McCabe, S. E., Schulenberg, J. E., Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Kloska, D. D. (2005). Selection and socialization effects of fraternities and sororities on U.S. college student substance use: A multi-cohort national longitudinal study. *Addiction*, 100, 512–524.
- McGlothlin, W. (1975). Program gaps and future directions. In L. G. Richards & L. B. Blevens (Eds.), *The epidemiology of drug abuse: Current issues* (NIDA Research Monograph No. 10). Washington, DC: U.S. Government Printing Office.
- Menard, S. (1992). Demographic and theoretical variables in the age-period-cohort analysis of illegal behavior. *Journal of Research in Crime and Delinquency*, 29, 178–199.
- Mensch, B., & Kandel, D. B. (1988a). Dropping out of high school and drug involvement. *Sociology of Education*, 61, 95–113.
- Mensch, B., & Kandel, D. B. (1988b). Underreporting of substance use in a national youth cohort: Individual and interviewer effects. *Public Opinion Quarterly*, 52, 100–124.
- Meredith, W., & Tisak, J. (1990). Latent curve analysis. *Psychometrika*, 55, 107–122.
- Merline, A. C., O'Malley, P. M., Schulenberg, J. E., Bachman, J. G., & Johnston, L. D. (2004). Substance use among adults 35 years of age: Prevalence, adulthood predictors, and impact of adolescent substance use. *American Journal of Public Health*, 94, 96–102.
- Merline, A. C., O'Malley, P. M., Schulenberg, J. E., Johnston, L. D., & Bachman, J. G. (2006). *Substance use at age 35: National data on prevalence, adulthood predictors, and impact of substance use at age 18*. Manuscript submitted for publication.
- Merline, A. C., & Schulenberg, J. E. (2006). *Adolescent correlates of adult alcohol use and abuse: Stability and change of predictive value into midlife*. Manuscript in preparation.
- Merline, A. C., Schulenberg, J. E., Johnston, L. D., Rogala, S., O'Malley, P. M., & Bachman, J. G. (2002, April). *Parental attitudes toward teenage substance use: A national panel study*. Paper presented at 9th Biennial Meeting of the Society for Research on Adolescence, New Orleans, LA.
- Merline, A. C., Schulenberg, J. E., & O'Malley, P. M. (2001, June). *Parental substance use and parenting practices: A national panel study*. Poster presented at the 13th Annual Convention of the American Psychological Society, Toronto, Canada.
- Merton, R. K. (1957). *Social theory and social structure*. New York: Free Press.
- Messersmith, E. E., & Schulenberg, J. E. (2005, October). *Patterns of work values in emerging adults*. Poster presentation at the 4th Biennial Meeting of the Society for the Study of Human Development, Pacific Grove, CA.
- Messersmith, E. E., & Schulenberg, J. E. (2006, July). *Self-regulation of academic effort: How individuals change or maintain their educational goals during the transition to adulthood*. Paper presentation at the 4th International Biennial SELF Research Conference, Ann Arbor, Michigan.

- Messersmith, E. E., & Schulenberg, J. E. (2006). *Can we expect the unexpected? Predicting educational attainment when it differs from previous expectations*. Manuscript submitted for publication.
- Miech, R. A., Chilcoat, H., & Harder, V. S. (2005). The increase in the association of education and cocaine use over the 1980s and 1990s: Evidence for a 'historical period' effect. *Drug and Alcohol Dependence*, 79(3), 311–320.
- Mittelmark, M. B., Murray, D. M., Luepker, R. V., & Pechacek, T. F. (1982). Cigarette smoking among adolescents: Is the rate declining? *Preventive Medicine*, 11, 708–712.
- Mohler-Kuo, M., Dowdall, G. W., Koss, M. P., & Wechsler, H. (2004). Correlates of rape while intoxicated in a national sample of college women. *Journal of Studies on Alcohol*, 65(1), 37–45.
- Morris, M., Handcock, M., Miller, W., Ford, C., Schmitz, J., Hobbs, M., et al. (2006). Prevalence of HIV infection among young adults in the United States: Results from the Add Health Study. *American Journal of Public Health*, 96(6), 1091–1097.
- Mortimer, J. T., Finch, M. D., Shanahan, M., & Ryu, S. (1990, April). *Work experience, mental health, and behavioral adjustment in adolescence*. Paper presented at the 1990 Biennial Meetings of the Society for Research on Adolescence, Atlanta, GA.
- Mortimer, J. T., & Johnson, M. K. (1998). New perspectives on adolescent work and the transition to adulthood. In R. Jessor (Ed.), *New perspectives on adolescent risk behavior* (pp. 425–496). Cambridge, UK: Cambridge University Press.
- Mortimer, J. T., & Shanahan, M. J. (Eds.). (2003). *Handbook of the life course*. New York: Plenum Publishers.
- Mortimer, J. T., & Staff, J. (2004). Early work as a source of developmental discontinuity during the transition to adulthood. *Development and Psychopathology*, 16, 1047–1070.
- Mosbach, P., & Leventhal, H. (1988). Peer group identification and smoking: Implications for intervention. *Journal of Abnormal Psychology*, 97, 238–245.
- Murray, D. M., & Perry, C. L. (1985). The prevention of adolescent drug abuse: Implications of etiological, developmental, behavioral, and environmental models. In R. J. Battjes & C. L. Jones (Eds.), *Etiology of drug abuse: Implications for prevention* (pp. 236–256). Washington, DC: National Institute on Drug Abuse.
- Musto, D. F. (1991). Opium, cocaine and marijuana in American history. *Scientific American*, 265, 40–47.
- Muthén, B. O. (1991). Analysis of longitudinal data using latent variable models with varying parameters. In L. M. Collins & J. L. Horn (Eds.), *Best methods for the analysis of change: Recent advances, unanswered questions, future directions* (pp. 1–17). Washington, DC: American Psychological Association.
- Muthén, B. O. (1996). Psychometric evaluation of diagnostic criteria: Application to a two-dimensional model of alcohol abuse and dependence. *Drug and Alcohol Dependence*, 41, 101–112.
- Muthén, B. O. (2001). Second-generation structural equation modeling with a combination of categorical and continuous latent variables. In L. M. Collins and A. Sayer (Eds.), *New methods for the analysis of change* (pp. 289–322). Washington, DC: American Psychological Association.
- Muthén, B. O., & Curran, P. (1997). General longitudinal modeling of individual differences in experimental designs: A latent framework for analysis and power estimation. *Psychological Methods*, 2, 371–402.

- Muthén, B. O., Grant, B., & Hasin, D. (1993). The dimensionality of alcohol abuse and dependence: Factor analysis of DSM-III-R and proposed DSM-IV criteria in the 1988 National Health Interview Survey. *Addiction, 88*, 1079–1090.
- Muthén, B. O., & Muthén, L. K. (2000). The development of heavy drinking and alcohol-related problems from ages 18 to 37 in a U.S. national sample. *Journal of Studies on Alcohol, 61*, 290–300.
- Muthén, B. O., & Muthén, L. K. (2000). Integrating person-centered and variable-centered analyses: Growth mixture modeling with latent trajectory classes. *Alcoholism—Clinical and Experimental Research, 24*(6), 882–891.
- Nagin, D. S. (1999). Analyzing developmental trajectories: A semi-parametric, group-based approach. *Psychological Methods, 4*, 139–157.
- Nagin, D. S. (2005). *Group-based modeling of development*. Cambridge, MA: Harvard University Press.
- National Commission on Drug-Free Schools. (1990). *Toward a drug-free generation: A nation's responsibility*. Washington, DC: U.S. Department of Education.
- National Commission on Marijuana and Drug Abuse. (1972). *Marijuana: A signal of misunderstanding* (1st report). Washington, DC: U.S. Government Printing Office.
- National Commission on Youth. (1980). *The transition to adulthood: A bridge too long*. New York: Westview Press.
- National Institute on Alcohol Abuse and Alcoholism (NIAAA). (2002). *A call to action: Changing the culture of drinking at U.S. colleges* (NIH Pub. No. 02-5010). Bethesda, MD: Author.
- National Institute on Drug Abuse. (2003). *A collection of NIDA Notes: National Institute on Drug Abuse articles that address research on marijuana* (NIH Publication No. NN00058). Bethesda, MD: Author.
- National Institute on Drug Abuse. (2005). *NIDA research report—Marijuana abuse* (NIH Publication No. 05-385). Bethesda, MD: Author.
- Needle, R., Su, S., & Lavee, Y. (1989). A comparison of the empirical utility of three composite measures of adolescent overall drug involvement. *Addictive Behaviors, 14*(4), 429–441.
- Nehemkis, A., Macari, M. A., & Lettieri, D. J. (Eds.). (1976). *Drug abuse instrument handbook* (NIDA Research Issues No. 12). Washington, DC: U.S. Government Printing Office.
- Nelson, C. B., Heath, A. C., & Kessler, R. C. (1998). Temporal progression of alcohol dependence symptoms in the U.S. household population: Results from the National Comorbidity Survey. *Journal of Consulting and Clinical Psychology, 66*, 474–483.
- Nesselrode, J. R. (1992). Adult personality development: Issues in assessing constancy and change. In R. A. Zucker, A. I. Rabin, J. Aronoff, & S. Frank (Eds.), *Personality structure in the life course* (pp. 221–275). New York: Springer.
- Nesselrode, J., & Baltes, P. (Eds.). (1979). *Longitudinal research in the study of behavior and development*. New York: Academic.
- Nesselrode, J. R., & Ghisletta, P. (2000). Beyond static concepts in modeling behavior. In L. R. Bergman, R. B. Cairns, L. G. Nilsson, & L. Nystedt (Eds.), *Developmental science and the holistic approach* (pp. 121–135). Mahwah, NJ: Lawrence Erlbaum Associates.
- Newcomb, M. D. (1992). Understanding the multidimensional nature of drug use and abuse: The role of consumption, risk factors, and protective factors. In M. D. Glantz & R. W. Pickens (Eds.), *Vulnerability to drug abuse* (pp. 255–298). Washington, DC: American Psychological Association.

- Newcomb, M. D. (1997). Psychosocial predictors and consequences of drug use: A developmental perspective within a prospective study. *Journal of Addictive Diseases, 16*, 51–89.
- Newcomb, M. D., Abbott, R. D., Catalano, R. F., Hawkins, J. D., Battin-Pearson, S., & Hill, K. (2002). Mediational and deviance theories of late high school failure: Process roles of structural strains, academic competence, and general versus specific problem behavior. *Journal of Counseling Psychology, 49*, 172–186.
- Newcomb, M. D., & Bentler, P. M. (1986a). Drug use, educational aspirations, and work force involvement: The transition from adolescence to young adulthood. *American Journal of Community Psychology, 14*, 303–321.
- Newcomb, M. D., & Bentler, P. M. (1986b). Frequency and sequence of drug use: A longitudinal study from early adolescence to young adulthood. *Journal of Drug Education, 16*, 101–120.
- Newcomb, M. D., & Bentler, P. M. (1988). *Consequences of adolescent drug use: Impact on the lives of young adults*. Newbury Park, CA: Sage Publications.
- Newcomb, M. D., & Bentler, P. M. (1989). Substance use and abuse among children and teenagers. *American Psychologist, 44*, 242–248.
- Newcomb, M. D., & Earleywine, M. (1996). Intrapersonal contributors to drug use: The willing host. *American Behavioral Scientist, 39*(7), 823–837.
- Newcomb, M. D., Fahy, B., & Skager, R. (1990). Reasons to avoid drug use among teenagers: Associations with actual drug use and implications for prevention among different demographic groups. *Journal of Alcohol and Drug Education, 36*, 53–81.
- Newcomb, M. D., & Harlow, L. L. (1986). Life events and substance use among adolescents: Mediating effects of perceived loss of control and meaninglessness in life. *Journal of Personality and Social Psychology, 51*, 564–577.
- Newcomb, M. D., & Locke, T. (2005). Health, social, and psychosocial consequences of drug use and abuse. In Z. Sloboda (Ed.), *Epidemiology of drug abuse* (pp. 45–59). New York: Springer.
- Newcomb, M. D., Maddahian, E., & Bentler, P. M. (1986). Risk factors for drug use among adolescents: Concurrent and longitudinal analyses. *American Journal of Public Health, 76*, 525–531.
- Newcomb, M. D., & McGee, L. (1991). Influence of sensation seeking on general deviance and specific problem behaviors from adolescence to young adulthood. *Journal of Personality and Social Psychology, 61*(4), 614–628.
- Nucci, L., Guerra, N., & Lee, J. (1991). Adolescent judgments of the personal, prudential, and normative aspects of drug usage. *Developmental Psychology, 27*, 841–848.
- Nurmi, J. E. (1991). How do adolescents see their future? A review of the development of future orientation and planning. *Developmental Review, 11*, 1–59.
- Nurmi, J. E. (1993). Adolescent development in an age-graded context: The role of personal beliefs, goals, and strategies in the tackling of developmental tasks and standards. *International Journal of Behavioral Development, 16*, 169–189.
- Nurmi, J. E. (2004). Socialization and self-development: Channeling, selection, adjustment and reflection. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology* (6th ed.). Hoboken, NJ: Wiley.

- O'Donnell, J. A., Voss, H. L., Clayton, R. R., Slatin, G., & Room, R. G. W. (1976). *Young men and drugs—A nationwide survey* (NIDA Research Monograph No. 5). Washington, DC: U.S. Government Printing Office.
- Oesterle, S., Hill, K. G., Hawkins, J. D., Guo, J., Catalano, R. F., & Abbott, R. D. (2004). Adolescent heavy episodic drinking trajectories and health in young adulthood. *Journal of Studies on Alcohol*, *65*, 204–212.
- Oetting, E. R. (1992). Planning programs for prevention of deviant behavior: A psychosocial model. *Drugs & Society*, *6*(3–4), 313–344.
- Oetting, E. R., & Beauvais, F. (1987). Peer cluster theory, socialization characteristics, and adolescent drug use: A path analysis. *Journal of Counseling Psychology*, *34*, 205–213.
- Oetting, E. R., & Beauvais, F. (1990). Adolescent drug use: Findings of national and local surveys. *Journal of Consulting and Clinical Psychology*, *58*, 385–394.
- Oetting, E. R., & Donnermeyer, J. F. (1998). Primary socialization theory: The etiology of drug use and deviance. *Substance Use and Misuse*, *33*, 995–1026.
- Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services. (2003). *Trends in the well-being of America's children and youth, 2003*. Retrieved October 1, 2006 from <http://aspe.hhs.gov/hsp/03trends/index.htm>
- Olmstead, R. E., Guy, S. M., O'Malley, P. M., & Bentler, P. M. (1991). Longitudinal assessment of the relationship between self-esteem, fatalism, loneliness, and substance use. *Journal of Social Behavior and Personality*, *6*, 749–770.
- O'Malley, P. M. (1984). Cigarette smoking among high school seniors: Did the rate decline? *Preventive Medicine*, *13*, 421–426.
- O'Malley, P. M. (1991, August). *Post-high school consequences of high school drug use: A preliminary report*. A paper presented at a poster session at the 1991 Annual Convention of the American Psychological Association, San Francisco, CA.
- O'Malley, P. M., & Bachman, J. G. (1983). Self-esteem: Change and stability between ages 13 and 23. *Developmental Psychology*, *19*, 257–268.
- O'Malley, P. M., Bachman, J. G., & Johnston, L. D. (1983). Reliability and consistency in self-reports of drug use. *International Journal of the Addictions*, *18*, 805–824.
- O'Malley, P. M., Bachman, J. G., & Johnston, L. D. (1984). Period, age, and cohort effects on substance use among American youth. *American Journal of Public Health*, *74*, 682–688.
- O'Malley, P. M., Bachman, J. G., & Johnston, L. D. (1988). Period, age, and cohort effects on substance use among young Americans: A decade of change, 1976–1986. *American Journal of Public Health*, *78*, 1315–1321.
- O'Malley, P. M., Bachman, J. G., Johnston, L. D., & Schulenberg, J. E. (2004). Studying the transition from youth to adulthood: Impacts on substance use and abuse. In J. S. House, F. T. Juster, R. L. Kahn, H. Schuman, & E. Singer (Eds.), *Telescope on society: Survey research and social science at the University of Michigan and beyond* (pp. 305–329). Ann Arbor: University of Michigan Press.
- O'Malley, P. M., & Johnston, L. D. (1999). Drinking and driving among American high school seniors: 1984–1997. *American Journal of Public Health*, *89*, 678–684.
- O'Malley, P. M., & Johnston, L. D. (2002). Epidemiology of alcohol and other drug use among American college students. *Journal of Studies on Alcohol, Supplement 14*, 23–39.

- O'Malley, P. M., & Schulenberg, J. E. (1997). The individual trajectories of substance use: How alcohol and other drug use changes from adolescence through young adulthood. In J. E. Schulenberg & J. L. Maggs (Chairs), *Developmental Trajectories of Alcohol and Drug Use from Childhood Through Adulthood: Insights From Latent Growth Modeling*. Symposium conducted at the 1997 Biennial Meetings of the Society for Research in Child Development, Washington, DC.
- O'Malley, P. M., & Wagenaar, A. C. (1991). Effects of minimum drinking age laws on alcohol use, related behaviors, and traffic crash involvement among American youth: 1976–1987. *Journal of Studies on Alcohol*, *52*, 478–491.
- Orlando, M., Tucker, J. S., Ellickson, P. L., & Klein, D. J. (2005). Concurrent use of alcohol and cigarettes from adolescence to young adulthood: An examination of developmental trajectories and outcomes. *Substance Use and Misuse*, *40*, 1051–1069.
- Osgood, D. W., Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (1988). The generality of deviance in late adolescence and early adulthood. *American Sociological Review*, *53*, 81–93.
- Osgood, D. W., Wilson, J. K., O'Malley, P. M., Bachman, J. G., & Johnston, L. D. (1996). Routine activities and individual deviant behaviors. *American Sociological Review*, *61*, 635–655.
- Osmond, C., & Gardner, M. J. (1989). Age, period, and cohort models: Non-overlapping cohorts don't resolve the identification problem. *American Journal of Epidemiology*, *129*, 31–35.
- Pacula, R. L., Grossman, M., Chaloupka, F. J., O'Malley, P. M., Johnston, L. D., & Farrelly, M. C. (2001). Marijuana and youth. In J. Gruber (Ed.), *Risky behavior among youths: An economic analysis* (pp. 271–326). Chicago: The University of Chicago Press.
- Palmore, E. (1978). When can age, period, and cohort be separated? *Social Forces*, *57*, 282–285.
- Pandina, R. J., & Johnson, V. L. (1999). Why people use, abuse, and become dependent on drugs: Progress toward a heuristic model. In M. D. Glantz & C. R. Hartel (Eds.), *Drug abuse: Origins and interventions* (pp. 119–147). Washington, DC: American Psychological Association.
- Pandina, R. J., & Johnson, V. L. (2005). Lifespan development and drugs. In R. H. Coombs (Ed.), *Addiction counseling review: Preparing for comprehensive, certification, and licensing examinations* (pp. 105–127). Mahwah, NJ: Lawrence Erlbaum Associates.
- Pandina, R. J., Labouvie, E. W., Johnson, V., & White, H. R. (1990). Relationship between alcohol and marijuana use and competence in adolescence. *Journal of Health and Social Policy*, *1*, 89–108.
- Pandina, R. J., Labouvie, E. W., & White, H. R. (1984). Potential contributions of the life span developmental approach to the study of adolescent alcohol and drug use. *Journal of Drug Issues*, *14*, 253–270.
- Patterson, G. R., DeBaryshe, B. D., & Ramsey, E. (1989). A developmental perspective on antisocial behavior. *American Psychologist*, *44*(2), 329–335.
- Pentz, M. A., Dwyer, J. H., MacKinnon, D. P., Flay, B. R., Hansen, W. B., Wang, E. Y. I., et al. (1989). A multi-community trial for primary prevention of adolescent drug abuse: Effects on drug use prevalence. *Journal of the American Medical Association*, *261*, 3259–3266.
- Perkins, D. F., & Borden, L. M. (2003). Positive behaviors, problem behaviors, and resiliency in adolescence. In I. B. Weiner (Series Ed.) & R. M. Lerner, M. A. Easterbrooks, & J. Mistry (Eds.), *Handbook of psychology: Vol. 6. Developmental psychology* (pp. 373–394). New York: Wiley.

- Perkins, H. W. (2002). Surveying the damage: A review of research on consequences of alcohol misuse in college populations. *Journal of Studies on Alcohol, Supplement No. 14*, 91–100.
- Perkins, H. W., & Berkowitz, A. D. (1986). Perceiving the community norms of alcohol use among students: Some research implications for campus alcohol education programming. *International Journal of the Addictions, 21*, 961–976.
- Perry, C. L., & Jessor, R. (1983). Doing the cube: Preventing drug abuse through adolescent health promotion. In T. J. Glynn, C. G. Leukefeld, & J. P. Ludford (Eds.), *Preventing adolescent drug abuse: Intervention strategies* (NIDA Research Monograph No. 47). Washington, DC: National Institute on Drug Abuse.
- Petersen, A. C., & Ebata, A. (1987). Developmental transitions and adolescent problem behavior: Implications for prevention and intervention. In K. Hurrelmann, F. Kaufmann, & F. Losel (Eds.), *Social intervention: Potential and constraints* (pp. 167–184). Berlin: Walter de Gruyter.
- Petersen, R. C. (1980). *Marijuana research findings: 1980* (NIDA Research Monograph No. 31). Rockville, MD: National Institute on Drug Abuse.
- Peterson, B. E., & Stewart, A. J. (1993). Generativity and social motives in young adults. *Journal of Personality & Social Psychology, 65*, 186–198
- Peterson, P. L., Hawkins, J. D., Abbott, R. D., & Catalano, R. F. (1994). Disentangling the effects of parental drinking, family management, and parental alcohol norms on current drinking by Black and White adolescents. *Journal of Research on Adolescence, 4*(2), 203–227.
- Petratis, J., Flay, B. R., & Miller, T. Q. (1995). Reviewing theories of adolescent substance use: Organizing pieces in the puzzle. *Psychological Bulletin, 117*, 67–86.
- Petty, R. E., Baker, S. M., & Gleicher, F. (1991). Attitudes and drug abuse prevention: Implications of the elaboration likelihood model of persuasion. In L. Donohew, H. E. Sypher, & W. J. Bukowski (Eds.), *Persuasive communication and drug abuse prevention* (pp. 71–90). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Pickles, A., & Hill, J. (2006). Developmental pathways. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology: Vol. 1. Theory and method* (2nd ed., pp. 211–242). Hoboken, NJ: Wiley.
- Pilgrim, C. C., Schulenberg, J. E., O'Malley, P. M., Bachman, J. G., & Johnston, L. D. (2006). Mediators and moderators of parental involvement on substance use: A national study of adolescents. *Prevention Science, 7*(1), 75–89.
- Pope, H. G., Gruber, A. J., Hudson, J. I., Cohane, G., Huestis, M. A., & Yurgelun-Todd, D. (2003). Early-onset cannabis use and cognitive deficits: What is the nature of the association? *Drug and Alcohol Dependence, 69*, 303–310.
- Pullum, T. W. (1978). Parametrizing age, period, and cohort effects: An application to U.S. delinquency rates. In K. F. Schuessler (Ed.), *Sociological methodology*. San Francisco: Jossey-Bass.
- Radosevich, M., Lanza-Kaduce, L., Akers, R. L., & Krohn, M. D. (1979). The sociology of adolescent drug and drinking behavior: A review of the state of the field: Part 1. *Deviant Behavior, 1*(1), 15–35.
- Radosevich, M., Lanza-Kaduce, L., Akers, R. L., & Krohn, M. D. (1980). The sociology of adolescent drug and drinking behavior: A review of the state of the field: Part 2. *Deviant Behavior, 1*(2), 145–169.

- Raghunathan, T. E., Solenberger, P. W., & VanHoewyk, J. (2000). *IVEware: Imputation and variance estimation software*. Ann Arbor, MI: Institute for Social Research.
- Rapaka, R. S., & Makriyannis, A. (Eds.). (1989). *Structure-activity relationships of the cannabinoids* (NIDA Research Monograph No. 79). Rockville, MD: National Institute on Drug Abuse.
- Raudenbush, S. W. (2001). Toward a coherent framework for comparing trajectories of individual change. In L. M. Collins & A. G. Sayer (Eds.), *New methods for the analysis of change* (pp. 35–64). Washington, DC: American Psychological Association.
- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks, CA: Sage Publications.
- Raudenbush, S. W., Bryk, A., Cheong, Y., & Congdon, R. (2000). *HLM 5: Hierarchical linear and nonlinear modeling*. Lincolnwood, IL: Scientific Software International.
- Raudenbush, S. W., & Chan, W. (1993). Application of hierarchical linear model to the study of adolescent deviance in an overlapping cohort design. *Journal of Consulting and Clinical Psychology, 61*, 941–951.
- Ray, B., & Braude, M. C. (Eds.). (1986). *Women and drugs: A new era for research*. (NIDA Research Monograph No. 65, DHHS Publication No. [ADM]86-1447). Rockville, MD: National Institute on Drug Abuse.
- Reed, B. G., Beschner, G. M., & Mondara, J. (Eds.). (1982). *Treatment services for drug dependent women* (Vol. 1) (DHHS Publication No [ADM]82-1219). Rockville, MD: National Institute on Drug Abuse.
- Rengel, M., Gavin, L., Reed, C., Fowler, M., & Lee, L. (2006). Epidemiology of HIV and AIDS among adolescents and young adults in the United States. *Journal of Adolescent Health, 39*, 156–163.
- Rhoades, B. L., & Maggs, J. L. (in press). Do academic and social goals predict planned alcohol use among college-bound high school graduates? *Journal of Youth and Adolescence*.
- Rhodes, J. E., & Jason, L. A. (1990). A social stress model of substance use. *Journal of Consulting and Clinical Psychology, 58*, 395–401.
- Richardson, M. A., Newcomb, M. D., Myers, H. F., & Coombs, R. H. (2002). Psychosocial predictors of recent drug use among Anglo and Hispanic children and adolescents. *Journal of Child and Adolescent Substance Abuse, 12*, 47–76.
- Rittenhouse, J. D. (Ed.). (1978). *Comparability in survey research on drugs*. Rockville, MD: National Institute on Drug Abuse.
- Robbins, C. (1989). Sex differences in psychosocial consequences of alcohol and drug abuse. *Journal of Health & Social Behavior, 30*, 117–130.
- Robertson, C., Gandini, S., & Boyle, P. (1999). Age-period-cohort models: A comparative study of available methodologies. *Journal of Clinical Epidemiology, 52*, 569–583.
- Robin, S. S., & Johnson, E. O. (1996). Attitude and peer cross pressure: Adolescent drug and alcohol use. *Journal of Drug Education, 26*(1), 69–99.
- Robins, L. N. (1974). *The Vietnam drug user returns* (Special Action Office Monograph, Series A, No. 2). Washington, DC: Executive Office of the President (Special Action Office for Drug Abuse Prevention).
- Robins, L. N. (1978). The interaction of setting and predisposition in explaining novel behavior: Drug initiations before, in, and after Vietnam. In D. B. Kandel (Ed.), *Longitudinal research on drug use: Empirical findings and methodological issues*. Washington, DC: Hemisphere Publishing.

- Rodgers, W. L. (1982a). Estimable functions of age, period, and cohort effects. *American Sociological Review*, 47, 774–787.
- Rodgers, W. L. (1982b). Reply to comments by Smith, Mason, & Fienberg. *American Sociological Review*, 47, 793–796.
- Rodgers, W. L., & Bachman, J. G. (1988). *The subjective well-being of young adults*. Ann Arbor, MI: Institute for Social Research.
- Rogosa, D. (1979). Causal models in longitudinal research: Rationale, formulation, and interpretation. In J. R. Nesselroade & P. B. Baltes (Eds.), *Longitudinal research in the study of behavior and development* (pp. 263–302). New York: Academic Press.
- Rolf, J., Masten, A. S., Cicchetti, D., Nuechterlein, K. H., & Weintraub, S. (Eds.). (1990). *Risk and protective factors in the development of psychopathology*. Cambridge: Cambridge University Press.
- Rooney, J. F. (1982). The influence of informal control sources upon adolescent alcohol use and problems. *American Journal of Drug and Alcohol Abuse*, 9, 233–245.
- Rose, J. S., Chassin, L., Presson, C. C., & Sherman, S. J. (Eds.). (2000). *Multivariate applications in substance use research*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education Monographs*, 2, 328–335.
- Rutter, M. E. (1979). Protective factors in children's responses to stress and disadvantage. In M. W. Kent & J. E. Rolf (Eds.), *Primary prevention in psychopathology: Vol 3. Social competence in children* (pp. 49–74). Hanover, NH: University Press of New England.
- Rutter, M. E. (1988). Longitudinal data in the study of causal processes: Some uses and some pitfalls. In M. E. Rutter (Ed.), *Studies of psychosocial risk: The power of longitudinal data* (pp. 1–28). Cambridge: Cambridge University Press.
- Rutter, M. E. (1990). Psychosocial resilience and protective mechanisms. In J. Rolf, A. S. Masten, D. Cicchetti, K. H. Nuechterlein, & S. Weintraub (Eds.), *Risk and protective factors in the development of psychopathology* (pp. 181–214). Cambridge: Cambridge University Press.
- Rutter, M. (1996). Transitions and turning points in developmental psychopathology: As applied to the age span between childhood and mid-adulthood. *International Journal of Behavioral Development*, 19, 603–626.
- Ryff, C. D., & Heinicke, S. G. (1983). Subjective organization of personality in adulthood and aging. *Journal of Personality & Social Psychology*, 44(4), 807–816.
- Sadava, S. W., & Thompson, M. M. (1986). Loneliness, social drinking, and vulnerability to alcohol problems. *Canadian Journal of Behavioral Science*, 18, 133–139.
- Safron, D. J., Schulenberg, J. E., & Bachman, J. G. (2001). Part-time work and hurried adolescence: The links among work intensity, social activities, health behaviors, and substance use. *Journal of Health and Social Behavior*, 42, 425–449.
- Sameroff, A. J. (1987). The social context of development. In N. Eisenberg (Ed.), *Contemporary topics in developmental psychology* (pp. 273–291). New York: Wiley.
- Sameroff, A. J. (2000). Developmental systems and psychopathology. *Development and Psychopathology*, 12, 297–312.
- Sameroff, A. (2006). Identifying risk and protective factors for healthy child development. In A. Clarke-Stewart & J. Dunn (Eds.), *Families count: Effects on child and adolescent development* (pp. 53–76). New York: Cambridge University Press.

- Sameroff, A., Peck, S. C., & Eccles, J. S. (2004). Changing ecological determinants of conduct problems from early adolescence to early adulthood. *Development and Psychopathology*, *16*, 873–896.
- Sarbin, T. R., & Allen, V. L. (1968). Role theory. In G. Lindzey & E. Aronson (Eds.), *The handbook of social psychology* (2nd ed., Vol. 1). Reading, MA: Addison-Wesley.
- Scarr, S., & McCartney, K. (1983). How people make their own environments: A theory of genotype-environment effects. *Child Development*, *54*, 424–435.
- Schafer, J. L. (1997). *Analysis of incomplete multivariate data*. London: Chapman & Hall.
- Schafer, J. L. (2001). Multiple imputation with PAN. In L. M. Collins & A. G. Sayer (Eds.), *New methods for the analysis of change* (pp. 357–377). Washington, DC: American Psychological Association.
- Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, *7*(2), 147–177.
- Schaie, K. W. (1965). A general model for the study of developmental problems. *Psychological Bulletin*, *64*, 92–107.
- Schaie, K. W. (1984). Historical time and cohort effects. In K. A. McCluskey & H. W. Reese (Eds.), *Life-span developmental psychology: Historical and generational effects* (pp. 1–15). New York: Academic Press.
- Schaie, K. W. (1994). Developmental designs revisited. In S. H. Cohen & H. W. Reese (Eds.), *Life-span developmental psychology: Methodological contributions* (pp. 45–64). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Schober, S., & Schade, C. (Eds.). (1991). *The epidemiology of cocaine use and abuse* (NIDA Research Monograph No. 110). Washington, DC: National Institute on Drug Abuse.
- Schuckit, M. A. (1995). *Drug and alcohol abuse: A clinical guide to diagnosis and treatment*. New York: Plenum Medical Book Co.
- Schulenberg, J. E. (1996, June). Cross-sectional v. longitudinal examinations of individual, parent, and peer influences on alcohol misuse during adolescence: Time for the pain? In R. Zucker (Chair), *Longitudinal research on alcohol problems: The flow of risk, problems and disorder over time*. Symposium conducted at the 1996 Joint Scientific Meeting of Research Society on Alcoholism and the International Society for Biomedical Research on Alcoholism, Washington, DC.
- Schulenberg, J. (2000, March/April). College students get drunk, so what? National panel data on binge drinking trajectories before, during and after college. In J.L. Maggs & J. Schulenberg (Chairs), *Taking a developmental perspective on college drinking*. Symposium conducted at the 2000 Biennial Meetings of the Society for Research on Adolescence, Chicago, IL.
- Schulenberg, J. E. (2001, June). On the importance of using changing rather than static predictors: The consequences of substance use during adolescence and young adulthood on subsequent parenting practices and attitudes. Paper presented in invited symposium, *Young Adulthood Consequences of Adolescent Risk-Taking* (Chair, M. Lynne Cooper), 2001 Conference of the American Psychological Society, Toronto, Canada.
- Schulenberg, J. E. (2004, March). Dynamic versus static analyses of multi-wave data: Conceptual and methodological issues. Paper presented in invited symposium, *Understanding Adolescence Over Time: Why We Need Multiwave Data and Dynamic Analyses* (Chair, John Schulenberg), 10th Biennial Meeting of the Society for Research on Adolescence, Baltimore, MD.

- Schulenberg, J. E. (2006). Understanding the multiple contexts of adolescent risky behavior and positive development: Advances and future directions. *Applied Developmental Science, 10*, 107–113.
- Schulenberg, J. E., & Bachman, J. G. (1993, March). Long hours on the job? Not so bad for some adolescents in some types of jobs: The quality of work and substance use, affect, and stress. In J. Mortimer & J. E. Schulenberg (Chairs), *Adolescent work and development in context: New evidence from urban, rural, and national data*. Symposium conducted at the 1993 Biennial Meetings of the Society for Research on Child Development, New Orleans, LA.
- Schulenberg, J. E., Bachman, J. G., O'Malley, P. M., & Johnston, L. D. (1994). High school educational success and subsequent substance use: A panel analysis following adolescents into young adulthood. *Journal of Health and Social Behavior, 35*, 45–62.
- Schulenberg, J. E., Bryant, A. L., Bachman, J. G., O'Malley, P. M., & Johnston, L. D. (1999, April). Transitional floundering among well-functioning adolescents: National panel data spanning the transition to young adulthood. In J. E. Schulenberg & A. Bryant (Chairs), *Falling apart and getting it together: Discontinuity in health and well-being during the transition to young adulthood*. Symposium conducted at the 1999 Biennial Meetings of the Society for Research in Child Development, Albuquerque, NM.
- Schulenberg, J. E., Bryant, A. L., & O'Malley, P. M. (2004). Taking hold of some kind of life: How developmental tasks relate to trajectories of well-being during the transition to adulthood. *Development and Psychopathology, 16*, 1119–1140.
- Schulenberg, J. E., Jager, J., & O'Malley, P. M. (2006, March). Substance use, antisocial behavior, and depressive affect: Their changing interrelations during the transition to adulthood. In J. E. Schulenberg & J. L. Maggs (Chairs), *Traveling together: Conceptual and methodological issues in the understanding of how risk behaviors co-vary over time*. Symposium conducted at the 2006 Biennial Meeting of the Society for Research on Adolescence, San Francisco, CA.
- Schulenberg, J. E., & Maggs, J. L. (2001). Moving targets: Modeling developmental trajectories of adolescent alcohol misuse, individual and peer risk factors, and intervention effects. *Applied Developmental Science, 5*(4), 237–253.
- Schulenberg, J. E., & Maggs, J. L. (2002). A developmental perspective on alcohol use and heavy drinking during adolescence and the transition to young adulthood. *Journal of Studies on Alcohol, Supplement 14*, 54–70.
- Schulenberg, J. E., Maggs, J. L., & Hurrelmann, K. (Eds.). (1997a). *Health risks and developmental transitions during adolescence*. New York: Cambridge University Press.
- Schulenberg, J. E., Maggs, J. L., & Hurrelmann, K. (1997b). Negotiating developmental transitions during adolescence and young adulthood: Health risks and opportunities. In J. E. Schulenberg, J. L. Maggs, & K. Hurrelmann (Eds.), *Health risks and developmental transitions during adolescence*. New York: Cambridge University Press.
- Schulenberg, J. E., Maggs, J. L., Long, S. W., Sher, K. J., Gotham, H. J., Baer, J. S., et al. (2001). The problem of college drinking: Insights from a developmental perspective. *Alcoholism, Clinical and Experimental Research, 25*, 473–477.
- Schulenberg, J. E., Maggs, J. L., & O'Malley, P. M. (2003). How and why the understanding of developmental continuity and discontinuity is important: The sample case of long-term consequences of adolescent substance use. In J. T. Mortimer & M. J. Shanahan (Eds.), *Handbook of the life course* (pp. 413–436). New York: Plenum Publishers.

- Schulenberg, J. E., Maggs, J. L., Steinman, K., & Zucker, R. A. (2001). Development matters: Taking the long view on substance abuse etiology and intervention during adolescence. In P. M. Monti, S. M. Colby, & T. A. O’Leary (Eds.), *Adolescents, alcohol, and substance abuse: Reaching teens through brief intervention* (pp. 19–57). New York: Guilford Press.
- Schulenberg, J. E., Merline, A. C., Johnston, L. D., O’Malley, P. M., Bachman, J. G., & Laetz, V. B. (2005). Trajectories of marijuana use during the transition to adulthood: The big picture based on national panel data. *Journal of Drug Issues, 35*, 255–279.
- Schulenberg, J. E., Merline, A. C., & O’Malley, P. M. (2005, June). Maturing out or partying on: National prospective data on how the course of heavy drinking during late adolescence relates to difficulties with alcohol and other drugs in middle adulthood. In R. Zucker (Chair), *Predicting risky drinking outcomes longitudinally: What kind of advance notice can we get?* Symposium conducted at the 28th Annual Scientific Meeting of the Research Society on Alcoholism, Santa Barbara, CA.
- Schulenberg, J. E., Merline, A. C., O’Malley, P. M., Bachman, J. G., & Johnston, L. D. (2006). *How substance use during adolescence and young adulthood relates to substance use disorders at middle adulthood*. Manuscript in preparation.
- Schulenberg, J. E., O’Malley, P. M., Bachman, J. G., & Johnston, L. D. (2000). Spread your wings and fly: The course of well-being and substance use during the transition to young adulthood. In L. J. Crockett & R. K. Silbereisen (Eds.), *Negotiating adolescence in times of social change*. New York: Cambridge University Press.
- Schulenberg, J. E., O’Malley, P. M., Bachman, J. G., & Johnston, L. D. (2005). Early adult transitions and their relation to well-being and substance use. In R. A. Settersten, Jr., F. F. Furstenberg, Jr., & R. G. Rumbaut (Eds.), *On the frontier of adulthood: Theory, research, and public policy* (MacArthur network edited volume, pp. 417–453). Chicago: University of Chicago Press.
- Schulenberg, J. E., O’Malley, P. M., Bachman, J. G., Wadsworth, K. N., & Johnston, L. D. (1996). Getting drunk and growing up: Trajectories of frequent binge drinking during the transition to young adulthood. *Journal of Studies on Alcohol, 57*, 289–304.
- Schulenberg, J. E., Sameroff, A. J., & Cicchetti, D. (2004). The transition to adulthood as a critical juncture in the course of psychopathology and mental health [Editorial]. *Development and Psychopathology, 16*, 799–806.
- Schulenberg, J. E., Shimizu, K., Vondracek, F. W., & Hostetler, M. (1988). Factorial invariance of career indecision dimensions across junior high and high school males and females. *Journal of Vocational Behavior, 33*, 63–81.
- Schulenberg, J. E., Wadsworth, K. N., O’Malley, P. M., Bachman, J. G., & Johnston, L. D. (1996). Adolescent risk factors for binge drinking during the transition to young adulthood: Variable- and pattern-centered approaches to change. *Developmental Psychology, 32*, 659–674.
- Schulenberg, J. E., & Zarrett, N. R. (2006). Mental health during emerging adulthood: Continuity and discontinuity in courses, causes, and functions. In J. J. Arnett & J. L. Tanner (Eds.), *Emerging adults in America: Coming of age in the 21st century* (pp. 135–172). Washington, DC: American Psychological Association.
- Schuster, C., O’Malley, P. M., Bachman, J. G., Johnston, L. D., & Schulenberg, J. E. (2001). Adolescent marijuana use and adult occupational attainment: A longitudinal study from age 18 to 28. *Substance Use & Misuse, 36*(8), 997–1014.

- Segal, D. R. (1977). Illicit drug use in the U.S. Army. *Sociological Symposium*, 18, 66–83.
- Settersten, R. A., Jr. (2003). *Invitation to the life course: Toward new understandings of later life*. Amityville, NY: Baywood Publishing Co., Inc.
- Settersten, R. A., Jr., Furstenberg, F. F., Jr., & Rumbaut, R. G. (Eds.). (2005). *On the frontier of adulthood: Theory, research, and public policy*. Chicago: University of Chicago Press.
- Shanahan, M. J. (2000). Pathways to adulthood in changing societies: Variability and mechanisms in life course perspective. *Annual Review of Sociology*, 26, 667–692.
- Sheffield, F. D., Darkes, J., Del Boca, F. K., & Goldman, M. S. (2005). Binge drinking and alcohol-related problems among community college students: Implications for prevention policy. *Journal of American College Health*, 54(3), 137–141.
- Sher, K. J., & Gotham, H. J. (1999). Pathological alcohol involvement: A developmental disorder of young adulthood [Special issue]. *Development and Psychopathology*, 11(4), 933–956.
- Sher, K. J., Grekin, E. R., & Williams, N. A. (2005). The development of alcohol use disorders. *Annual Review of Clinical Psychology*, 1(1), 493–523.
- Sher, K. J., Walitzer, K. S., Wood, P. K., & Brent, E. E. (1991). Characteristics of children of alcoholics: Putative risk factors, substance use and abuse, and psychopathology. *Journal of Abnormal Psychology*, 100, 427–448.
- Sieving, R. E., Perry, C. L., & Williams, C. L. (2000). Do friendships change behaviors, or do behaviors change friendships? Examining paths of influence in young adolescents' alcohol use. *Journal of Adolescent Health*, 26(1), 27–35.
- Silbereisen, R. K., & Noack, P. (1988). On the constructive role of problem behavior in adolescence. In N. Bolger, A. Caspi, G. Downey, & M. Moorehouse (Eds.), *Person in context: Developmental processes* (pp. 152–180). Cambridge: Cambridge University Press.
- Silbereisen, R. K., Petersen, A. C., Albrecht, H. T., & Kracke, B. (1989). Maturation timing and the development of problem behavior: Longitudinal studies in adolescence. *Journal of Early Adolescence*, 9, 247–268.
- Silverberg, S. B., & Steinberg, L. (1990). Psychological well-being of parents with early adolescent children. *Developmental Psychology*, 26(4), 658–666.
- Simons, R. L., Conger, R. D., & Whitbeck, L. B. (1988). A multistage social learning model of the influences of family and peers upon adolescent substance abuse. *Journal of Drug Issues*, 18, 293–315.
- Simons-Morton, B. (2004). Prospective association of peer influence, school engagement, drinking expectancies, and parent expectations with drinking initiation among sixth graders. *Addictive Behaviors*, 29, 299–309.
- Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York: Oxford University Press.
- Single, E., Kandel, D., & Faust, R. (1974). Patterns of multiple drug use in high school. *Journal of Health and Social Behavior*, 15, 344–357.
- Sloboda, Z. (Ed.). (2005). *Epidemiology of drug abuse*. New York: Springer.
- Slutske, W. S., Hunt-Carter, E. E., Nabors-Oberg, R. E., Sher, K. J., Bucholz, K. K., Madden, P. A. F., et al. (2004). Do college students drink more than their non-college-attending peers? Evidence from a population-based longitudinal female twin study. *Journal of Abnormal Psychology*, 113(4), 530–540.

- Smart, R. G. (1974). Addiction, dependency, abuse, or use: Which are we studying with epidemiology? In E. Josephson & E. E. Carroll (Eds.), *Drug use: Epidemiological and sociological approaches*. New York: Wiley.
- Smart, R. G. (1980). An availability-proneness theory of illicit drug abuse. In D. J. Lettieri, M. Sayers, & H. W. Pearson (Eds.), *Theories on drug abuse: Selected contemporary perspectives* (NIDA Research Monograph No. 30). Rockville, MD: National Institute on Drug Abuse.
- Smith, H. L., Mason, W. M., & Fienberg, S. E. (1982). More chimeras of the age-period-cohort accounting framework: Comments on Rodgers. *American Sociological Review*, *47*, 787–793.
- Stacy, A. W., Newcomb, M. D., & Bentler, P. M. (1991). Personality, problem drinking, and drunk driving: Mediating, moderating, and direct-effect models. *Journal of Personality and Social Psychology*, *60*, 795–811.
- Staff, J., Mortimer, J. T., & Uggen, C. (2004). Work and leisure in adolescence. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology* (pp. 429–450). Hoboken, NJ: Wiley.
- Staff, J., Osgood, D. W., Schulenberg, J. E., Bachman, J. G., & Messersmith, E. E. (2006, November). *Paid work and delinquency in adolescence*. Paper presented at the meeting of the American Society of Criminology (ASC), Los Angeles, CA.
- Staff, J., & Uggen, C. (2003). The fruits of good work: Early work experiences and adolescent deviance. *Journal of Research in Crime and Delinquency*, *40*, 263–290.
- Stanton, W. R., Flay, B. R., Colder, C. R., & Mehta, P. (2004). Identifying and predicting adolescent smokers' developmental trajectories. *Nicotine & Tobacco Research*, *6*(5), 843–852.
- Stein, J. A., Newcomb, M. D., & Bentler, P. M. (1987). An 8-year study of multiple influences on drug use and drug use consequences. *Journal of Personality and Social Psychology*, *53*, 1094–1105.
- Stein, J. A., Smith, G. M., Guy, S. M., & Bentler, P. M. (1993). Consequences of adolescent drug use on young adult job behavior and job satisfaction. *Journal of Applied Psychology*, *78*, 463–474.
- Steinberg, L. D. (1987). Familial factors in delinquency: A developmental perspective. *Journal of Adolescent Research*, *2*, 255–268.
- Steinberg, L. D., & Dornbusch, S. M. (1991). Negative correlates of part-time employment during adolescence: Replication and elaboration. *Developmental Psychology*, *27*, 304–313.
- Steinberg, L. D., Fegley, S., & Dornbusch, S. M. (1993). Negative impact of part-time work on adolescent adjustment: Evidence from a longitudinal study. *Developmental Psychology*, *29*, 171–180.
- Steinberg, L. D., Greenberger, E., Garduque, L., Ruggiero, M., & Vaus, A. (1982). Effects of working on adolescent development. *Developmental Psychology*, *18*, 385–395.
- Steinberg, L. D., & Silverberg, S. (1986). The vicissitudes of autonomy in early adolescence. *Child Development*, *57*, 841–851.
- Steinberg, L. D., & Silverberg, S. B. (1987). Influences on marital satisfaction during the middle stages of the family life cycle. *Journal of Marriage & the Family*, *49*(4), 751–760.
- Stephens, R. C. (1985). The sociocultural view of heroin use: Toward a role-theoretic model. *Journal of Drug Issues*, *15*, 433–446.

- Stoolmiller, M., Duncan, T., Bank, L., & Patterson, G. R. (1993). Some problems and solutions in the study of change: Significant patterns in client resistance. *Journal of Consulting and Clinical Psychology, 61*, 920–928.
- Substance Abuse and Mental Health Services Administration (SAMHSA). (1999). *Full report: 1999 National Household Survey on Drug Abuse*. Rockville, MD: Author.
- Szapocznik, J., & Coatsworth, J. D. (1999). An ecodevelopmental framework for organizing the influences on drug abuse: A developmental model of risk and protection. In M. D. Glantz & C. R. Hartel (Eds.), *Drug abuse: Origins and interventions* (pp. 331–366). Washington, DC: American Psychological Association.
- Tarter, R. E. (2002). Etiology of adolescent substance abuse: A developmental perspective. *American Journal on Addictions, 11*(3), 171–191.
- Tarter, R. E., & Mezzich, A. C. (1992). Ontogeny of substance abuse: Perspectives and findings. In M. D. Glantz & R. W. Pickens (Eds.), *Vulnerability to drug abuse* (pp. 149–179). Washington, DC: American Psychological Association.
- Tauras, J. A., Chaloupka, F. J., Farrelly, M. C., Giovino, G. A., Wakefield, M., Johnston, L. D., et al. (2005). State tobacco control spending and youth smoking. *American Journal of Public Health, 95*, 338–344.
- Tauras, J. A., O'Malley, P. M., & Johnston, L. D. (2001). *Effects of price and access laws on teenage smoking initiation: A national longitudinal analysis* (NBER Working Paper No. 8331). Cambridge, MA: National Bureau of Economic Research.
- Terry-McElrath, Y. M., O'Malley, P. M., & Johnston, L. D. (2006). *Reasons for drug use among American youth: Consumption level, gender, and race/ethnicity*. Manuscript in preparation.
- Thompson, P. M., Giedd, J. N., Woods, R. P., MacDonald, D., Evans, A. C., & Toga, A. W. (2000). Growth patterns in the developing brain detected by using continuum mechanical tensor maps. *Nature, 404*(6774), 190–193.
- Tims, F. M., & Leukefeld, C. G. (Eds.). (1994). *Cocaine treatment: Research and clinical perspectives* (NIDA Research Monograph No. 135). Rockville, MD: National Institute on Drug Abuse.
- Tucker, J. S., Ellickson, P. L., & Klein, D. J. (2003). Predictors of the transition to regular smoking during adolescence and young adulthood. *Journal of Adolescent Health, 32*, 314–324.
- Tucker, J. S., Ellickson, P. L., Orlando, M., & Klein, D. J. (2006). Cigarette smoking from adolescence to young adulthood: Women's developmental trajectories and associated outcomes. *Women's Health Issues, 16*, 30–37.
- Turner, R. A., Irwin, C. E., Jr., & Millstein, S. G. (1991). Family structure, family processes, and experimenting with substances during adolescence. *Journal of Research on Adolescence, 1*(1), 93–106.
- Uebersax, J. S. (1994). Latent class analysis of substance abuse patterns. In L. M. Collins & L. A. Seitz (Eds.), *Advances in data analysis for prevention intervention research* (pp. 64–80) (NIDA Research Monograph No. 142, NIH Pub No. 94-3599). Rockville, MD: National Institute on Drug Abuse.
- United Nations Division of Narcotic Drugs. (1980). *Manual on drug abuse assessment: Part 2. The use of population surveys*. Geneva, Switzerland.
- U.S. Department of Education. (1986). *What works: Schools without drugs*. Washington, DC: Author.

- U.S. Public Health Service (USPHS). (1964). *Smoking and health. Report of the advisory committee to the Surgeon General of the Public Health Service* (PHS Publication No. 1103). U.S. Department of Health, Education, and Welfare, Public Health Service, Centers for Disease Control.
- U.S. Public Health Service. (1985a). Women's health: Report of the Public Health Service Task Force on Women's Health Issues (Vol. 1). *Supplement to Public Health Reports, 100*, 73–106.
- U.S. Public Health Service. (1985b). Women's health: Report of the Public Health Service Task Force on Women's Health Issues (Vol. 2) (DHHS Publication No. [PHS]85-50206). Rockville, MD: Author.
- Vangsness, L., Bry, B. H., & Labouvie, E. W. (2005). Impulsivity, negative expectancies, and marijuana use: A test of the acquired preparedness model. *Addictive Behaviors, 30*, 1071–1076.
- Vargas-Carmona, J., Newcomb, M. D., & Galaif, E. R. (2002). The prospective relations between drug problems and intimacy in a community sample of adults. *Journal of Social & Clinical Psychology, 21*(2), 129–156.
- von Eye, A. (Ed.). (1990). *Statistical methods in longitudinal research* (Vols. 1–2). Boston: Academic Press.
- Wagenaar, A. C., Erickson, D. J., Harwood, E. M., & O'Malley, P. M. (2006). Effects of state coalitions to reduce underage drinking: A national evaluation. *American Journal of Preventive Medicine, 31*(4), 307–315.
- Wagenaar, A. C., O'Malley, P. M., & LaFond, C. (2001). Lowered legal blood alcohol limits for young drivers: Effects on drinking, driving, and driving-after-drinking behaviors in 30 states. *American Journal of Public Health, 91*, 801–804.
- Wallace, J. M., Jr. (1994). Race differences in adolescent drug use: Recent findings from national samples. *African-American Research Perspectives, 1*, 31–35.
- Wallace, J. M., Jr. (1999a). Explaining race differences in adolescent and young adult drug use: The role of racialized social systems. *Drugs and Society, 14*(1/2), 21–36.
- Wallace, J. M., Jr. (1999b). Race, risk and resilience: The social ecology of addiction in America's Black and Hispanic communities. *Pediatrics, 103*(5), 1122–1127.
- Wallace, J. M., Jr., & Bachman, J. G. (1991). Explaining racial/ethnic differences in adolescent drug use: The impact of background and lifestyle. *Social Problems, 38*, 333–357.
- Wallace, J. M., Jr., & Bachman, J. G. (1993). Validity of self-reports in student-based studies on minority populations: Issues and concerns. In M. De La Rosa & J. L. Andrados (Eds.), *Drug abuse among minority youth: Advances in research and methodology* (pp. 167–200) (NIDA Research Monograph No. 130). Rockville, MD: National Institute on Drug Abuse.
- Wallace, J. M., Jr., & Bachman, J. G. (1997). Issues and concerns on the validity of self-reports in student-based studies on minority populations. *Substance Use & Misuse, 32*(12&13), 1949–1950.
- Wallace, J. M., Jr., Bachman, J. G., O'Malley, P. M., & Johnston, L. D. (1995). Racial/ethnic differences in adolescent drug use: Exploring possible explanations. In G. Botwin, S. Schinke, & M. Orlandi (Eds.), *Drug abuse prevention with multi-ethnic youth* (pp. 59–80). Thousand Oaks, CA: Sage Publications.

- Wallace, J. M., Jr., Bachman, J. G., O'Malley, P. M., Johnston, L. D., Schulenberg, J. E., & Cooper, S. M. (2002). Tobacco, alcohol, and illicit drug use: Racial and ethnic differences among US high school seniors, 1976–2000. *Public Health Reports*, 117(3), S67–S75.
- Wallace, J. M., Jr., Bachman, J. G., O'Malley, P. M., Schulenberg, J. E., Cooper, S. M., & Johnston, L. D. (2003). Gender and ethnic differences in smoking, drinking, and illicit drug use among American 8th, 10th and 12th grade students, 1976–2000. *Addiction*, 98, 225–234.
- Wallace, J. M., Jr., Brown, T. N., Bachman, J. G., & LaVeist, T. A. (2003a). The influence of race and religion on abstinence from alcohol, cigarettes and marijuana among adolescents. *Journal of Studies on Alcohol*, 64, 843–848.
- Wallace, J. M., Jr., Brown, T. N., Bachman, J. G., & LaViest, T. A. (2003b). *Religion, race and abstinence from drug use among American adolescents* (Monitoring the Future Occasional Paper No. 58). Ann Arbor, MI: Institute for Social Research.
- Wallace, J. M., Jr., Delva, J., O'Malley, P. M., Bachman, J. G., Johnston, L. D., Schulenberg, J. E., et al. (in press). Race/ethnicity, religiosity and adolescent alcohol, cigarette, and marijuana use. *Journal of Health and Social Policy*.
- Wallace, J. M., Jr., Forman, T. A., Caldwell, C. H., & Willis, D. S. (2003). Religion and U.S. secondary school students: Current patterns, recent trends, and sociodemographic correlates. *Youth & Society*, 35, 98–125.
- Wallace, J. M., Jr., Forman, T. A., Guthrie, B. J., Bachman, J. G., O'Malley, P. M., & Johnston, L. D. (1999). The epidemiology of tobacco, alcohol, and other drug use among black youth. *Journal of Studies on Alcohol*, 60(6), 800–809.
- Wallace, J. M., Jr., & Muroff, J. R. (2002). Preventing substance abuse among African American children and youth: Race differences in risk factor exposure and vulnerability. *Journal of Primary Prevention*, 22, 235–261.
- Wallace, J. M., Jr., Yamaguchi, R., Bachman, J. G., O'Malley, P. M., Schulenberg, J. E., & Johnston, L. D. (in press). Religiosity and adolescent substance use: The role of individual and contextual influences. *Social Problems*.
- Warner, L. A., & White, H. R. (2003). Longitudinal effects of age at onset and first drinking situations on problem drinking. *Substance Use and Misuse*, 38(14), 1983–2016.
- Wechsler, H., & Isaac, N. (1992). “Binge” drinkers at Massachusetts colleges: Prevalence, drinking style, time trends, and associated problems. *The Journal of the American Medical Association*, 267, 2929–2931.
- Weinberg, N. Z., Rahdert, E., Coliver, J. D., & Glantz, M. D. (1998). Adolescent substance abuse: A review of the past 10 years. *Journal of the American Academy of Child & Adolescent Psychiatry*, 37(3), 252–261.
- Weinkam, J. J., & Sterling, T. D. (1991). A graphical approach to the interpretation of age-period-cohort data. *Epidemiology*, 2, 133–137
- Welte, J. W., & Barnes, G. M. (1985). Alcohol: The gateway to other drug use among secondary-school students. *Journal of Youth and Adolescence*, 14, 487–498.
- Welte, J. W., Barnes, G. M., & Hoffman, J. H. (2004). Gambling, substance use, and other problem behaviors among youth: A test of general deviance models. *Journal of Criminal Justice*, 32(4), 297–306.

- Welte, J. W., Barnes, G. M., Hoffman, J. H., & Dintcheff, B. A. (1999). Trends in adolescent alcohol and other substance use: Relationships to trends in peer, parent, and school influences. *Substance Use & Misuse, 34*(10), 1427–1449.
- Werner, E. E., & Smith, R. S. (1992). *Overcoming the odds: High risk children from birth to adulthood*. Ithaca, NY: Cornell University Press.
- Werner, H. (1957). The concept of development from a comparative and organismic point of view. In D. B. Harris (Ed.), *The concept of development* (pp. 125–148). Minneapolis: University of Minnesota Press.
- Whitbourne, S. K., & Willis, S. L. (Eds.). (2006). *The baby boomers grow up: Contemporary perspectives on midlife*. Mahwah, NJ: Lawrence Erlbaum Associates.
- White, H. R. (1991). Marijuana use and delinquency: A test of the “independent cause” hypothesis. *Journal of Drug Issues, 21*(2), 231–256.
- White, H. R., & Bates, M. E. (1993). Self-attributed consequences of cocaine use. *International Journal of the Addictions, 28*, 187–209.
- White, H., Bates, M. E., & Buyske, S. (2001). Adolescence-limited versus persistent delinquency: Extending Moffitt’s hypothesis into adulthood. *Journal of Abnormal Psychology, 110*(4), 600–609.
- White, H. R., & Jackson, K. (2004). Social and psychological influences on emerging adult drinking behavior. *Alcohol Research & Health, 28*(4), 182–190.
- White, H. R., Johnson, V., & Buyske, S. (2000). Parental modeling and parenting behavior effects on offspring alcohol and cigarette use—A growth curve analysis. *Journal of Substance Abuse, 12*(3), 287–310.
- White, H. R., Johnson, V., & Horwitz, A. (1986). An application of three deviance theories to adolescence substance use. *International Journal of the Addictions, 21*, 347–366.
- White, H. R., Labouvie, E. W., & Papadaratsakis, V. (2005). Changes in substance use during the transition to adulthood: A comparison of college students and their noncollege age peers [Special issue]. *Journal of Drug Issues, 35*(2), 281–306.
- White, H. R., Pandina, R. J., & Chen, P.-H. (2002). Developmental trajectories of cigarette use from early adolescence into young adulthood. *Drug and Alcohol Dependence, 65*, 167–178.
- Wiesner, M., & Windle, M. (2004). Assessing covariates of adolescent delinquency trajectories: A latent growth mixture modeling approach. *Journal of Youth and Adolescence, 33*, 431–442.
- Wiesner, M., & Windle, M. (2006). Young adult substance use and depression as a consequence of delinquency trajectories during middle adolescence. *Journal of Research on Adolescence, 16*, 239–264.
- Wiley, D. E., & Wiley, J. A. (1970). The estimation of measurement error in panel data. *American Sociological Review, 36*, 112–117.
- Wilks, J., Callan, V. J., & Austin, D. A. (1989). Parent, peer and personal determinants of adolescent drinking. *British Journal of Addiction, 84*, 619–630.
- William T. Grant Foundation Commission on Work, Family, and Citizenship. (1988). *The forgotten half: Pathways to success for America’s youth and young families*. Washington DC: Author.
- Williams, J. D. (1991). Age, cohort, and period in life-span research: A three-way analysis with logically missing cells. *Multivariate Behavioral Research, 26*, 631–654.

- Williams, J., Pacula, R. L., Chaloupka, F. J., & Wechsler, H. (2006). College students' use of cocaine. *Substance Use & Misuse, 41*(4), 489–509.
- Willis, S. L., & Reid, J. D. (Eds.). (1999). *Life in the middle: Psychological and social development in middle age*. San Diego, CA: Academic Press.
- Willis, S. L., & Schaie, K. W. (2006). Cognitive functioning in the baby boomers: Longitudinal and cohort effects. In S. K. Whitbourne & S. L. Willis (Eds.), *The baby boomers grow up: Contemporary perspectives on midlife* (pp. 205–234). Mahwah, NJ: Lawrence Erlbaum Associates.
- Wills, T. A., Resko, J. A., Ainette, M. G., & Mendoza, D. (2004). Role of parent support and peer support in adolescent substance use: A test of mediated effects. *Psychology of Addictive Behaviors, 18*, 122–134.
- Wills, T., Vaccaro, D., & McNamara, G. (1994). Novelty seeking, risk taking, and related constructs as predictors of adolescent substance use: An application of Cloninger's theory. *Journal of Substance Abuse, 6*, 1–20.
- Wills, T. A., Yaeger, A. M., & Sandy, J. M. (2003). Buffering effect of religiosity for adolescent substance use. *Psychology of Addictive Behaviors, 17*(1), 24–31.
- Wilsnack, S. C. (1987). Drinking and drinking problems in women: A U.S. longitudinal survey and some implications for prevention. In T. Loberg, W. R. Miller, P. E. Nathan, & G. A. Marlatt (Eds.), *Addictive behaviors: Prevention and early intervention* (pp. 1–39). Amsterdam, Netherlands: Swets and Zeitlinger.
- Windle, M. (1988). Critique: Are those adolescent to early adulthood drinking patterns so discontinuous? A response to Temple and Fillmore. *International Journal of the Addictions, 23*, 907–912.
- Windle, M. (1990). A longitudinal study of antisocial behaviors in early adolescence as predictors of late adolescent substance use: Gender and ethnic group differences. *Journal of Abnormal Psychology, 99*(1), 86–91.
- Windle, M. (1994). Substance use, risky behaviors, and victimization among a US national adolescent sample. *Addiction, 89*(2), 175–182.
- Windle, M. (2005). Retrospective use of alcohol and other substances by college students: Psychometric properties of a new measure. *Addictive Behaviors, 30*, 337–342.
- Windle, M., Barnes, G. M., & Welte, J. (1989). Causal models of adolescent substance use: An examination of gender differences using distribution-free estimators. *Journal of Personality and Social Psychology, 56*, 132–142.
- Windle, M., & Davies, P. T. (1999). Developmental theory and research. In K. E. Leonard & H. T. Blane (Eds.), *Psychological theories of drinking and alcoholism* (pp. 164–202). New York: Guilford Press.
- Windle, M., Miller-Tutzauer, C., Barnes, G. M., & Welte, J. (1991). Adolescent perceptions of help-seeking resources for substance abuse. *Child Development, 62*, 179–189.
- Windle, M., Mun, E. Y., & Windle, R. C. (2005). Adolescent-to-young adulthood heavy drinking trajectories and their prospective predictors. *Journal of Studies on Alcohol, 66*, 313–322.
- Windle, M., & Wiesner, M. (2004). Trajectories of marijuana use from adolescence to young adulthood: Predictors and outcomes. *Development and Psychopathology, 16*, 1007–1027.
- Windle, M., & Windle, R. C. (2003). Alcohol and other substance use and abuse. In G. R. Adams & M. D. Berzonsky (Eds.), *Handbook of adolescence* (pp. 450–469). Malden, MA: Blackwell.

- Windle, M., & Windle, R. C. (2005). Alcohol consumption and its consequences among adolescents and young adults. In M. Galanter (Ed.), *Alcohol problems in adolescents and young adults: Epidemiology, neurobiology, prevention, and treatment* (pp. 67–83). New York: Kluwer Academic/Plenum.
- Wood, M. D., Sher, K. J., & McGowan, A. K. (2000). Collegiate alcohol involvement and role attainment in early adulthood: Findings from a prospective high-risk study. *Journal of Studies on Alcohol*, *61*(2), 278–289.
- Wu, P., & Kandel, D. B. (1995). The roles of mothers and fathers in intergenerational behavioral transmission: The case of smoking and delinquency. In H. B. Kaplan (Ed.), *Drugs, crime, and other deviant adaptations: Longitudinal studies* (pp. 49–81). New York: Plenum Press.
- Wynn, S. L., Schulenberg, J. E., & O'Malley, P. M. (1996). *The impact of parenting practices and conventionality on adolescent cigarette use*. Presentation submitted for review for the 1997 Biennial Meetings of the Society for Research on Child Development, Washington, DC.
- Yamaguchi, K., & Kandel, D. B. (1984a). Patterns of drug use from adolescence to young adulthood: II. Sequences of progression. *American Journal of Public Health*, *74*, 668–672.
- Yamaguchi, K., & Kandel, D. B. (1984b). Patterns of drug use from adolescence to young adulthood: III. Predictors of progression. *American Journal of Public Health*, *74*, 673–681.
- Yamaguchi, K., & Kandel, D. B. (1993). The influence of spouses' behavior and marital dissolution on marijuana use: Causation or selection. *Journal of Marriage and the Family*, *59*, 22–36.
- Yamaguchi, K., & Kandel, D. B. (2002). Log linear sequence analyses: Gender and racial/ethnic differences in drug use progression. In D. B. Kandel (Ed.), *Stages and pathways of drug involvement: Examining the gateway hypothesis* (pp. 187–222). New York, Cambridge University Press.
- Yesalis, C. (1991). Anabolic steroids, nonmedical use by adolescents. In R. M. Lerner, A. C. Petersen, & J. Brooks-Gunn (Eds.), *Encyclopedia of adolescence* (pp. 44–52). New York: Garland Publishing, Inc.
- Zimmerman, M. A., & Schmeelk-Cone, K. H. (2003). A longitudinal analysis of adolescent substance use and school motivation among African American youth. *Journal of Research on Adolescence*, *13*(2), 185–210.
- Zucker, R. A. (1989). Is risk of alcoholism predictable? A probabilistic approach to a developmental problem. *Drugs and Society*, *3*, 69–93.
- Zucker, R. A. (1994). Pathways to alcohol problems and alcoholism: A developmental account of the evidence for multiple alcoholisms and for contextual contributions to risk. In R. A. Zucker, J. Howard, & G. M. Boyd (Eds.), *The development of alcohol problems: Exploring the biopsychosocial matrix of risk* (pp. 255–289). Rockville, MD: National Institute on Alcohol Abuse and Alcoholism.
- Zucker, R. A. (2003). Casual structure of alcohol use and problems in early life: Multilevel etiology and implications for prevention. In A. Biglan, M. C. Wang, & H. J. Walberg (Eds.), *Preventing youth problems. Issues in children's and families' lives* (pp. 33–61). New York: Kluwer Academic/Plenum Publishers.

- Zucker, R. A. (2006). Alcohol use and alcohol use disorders: A developmental-biopsychosocial systems formulation covering the life course. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology: Volume 3. Risk, disorder, and adaptation* (2nd ed., pp. 620–656). Hoboken, NJ: Wiley.
- Zucker, R. A., Wong, M. M., Clark, D. B., Leonard, K. E., Schulenberg, J. E., Cornelius, J. R., et al. (2006). Predicting risky drinking outcomes longitudinally: What kind of advance notice can we get? *Alcoholism: Clinical and Experimental Research*, 30, 243–252.