

**THE MONITORING THE FUTURE PROJECT
AFTER TWENTY-SEVEN YEARS:
DESIGN AND PROCEDURES**

Monitoring the Future Occasional Paper 54

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

Institute for Social Research
The University of Michigan
Ann Arbor, Michigan

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INTRODUCTION AND OVERVIEW

This occasional paper updates and extends earlier papers in this series (Bachman & Johnston, 1978; Bachman, Johnston & O'Malley, 1991a, 1996). Our purpose in this paper, as in the earlier ones, is to provide a detailed description of the Monitoring the Future research design, including sampling design, data collection procedures, measurement content, and questionnaire format. Here, as before, we have tried to include sufficient information for others who wish to evaluate our results, to replicate aspects of the study, or to analyze data which we have archived.

Much has changed in the twenty-seven years since the project was launched in 1974. Most notably, there have been dramatic changes in the attitudes and behaviors that the project was designed to monitor, particularly those involving the use of drugs. There also have been substantial additions to the study design and procedures, as we outline below and detail in subsequent sections. But perhaps more important than any of these changes is the fact that the basic study design described in our 1978 paper has remained constant in its fundamental characteristics; we view this consistency in survey methods across the years as a key condition for successfully measuring change.

Basic Design Surveying High School Seniors and Young Adults

From its outset, the Monitoring the Future project was designed with two interrelated components: (1) annual nationwide surveys of high school seniors using group-administered questionnaires, and (2) periodic follow-up questionnaires mailed to subsamples of each senior class cohort. This design permits us to examine at least four kinds of trends or changes:

1. Changes common to all cohorts in a given historical period, i.e., secular trends or period effects;
2. Maturation changes or age effects that appear consistently in the longitudinal data from all graduating classes;
3. Changes from one graduating class cohort to another, i.e., enduring cohort differences; and
4. Longitudinal changes reflecting the differential impacts of various important post-high school environments (including college, military service, various types of employment, homemaking, unemployment) and major role transitions (marriage, pregnancy, parenthood).

We acknowledge, of course, that these several types of trends or changes, while easily distinguished in the abstract, are often intertwined in the real world, so that the analysis problems of separating one pattern from another are formidable. Nevertheless, this cohort-sequential design (Schaie, 1965; Labouvie, 1976) is uniquely powerful for addressing this complex of questions; it creates analysis possibilities that would not exist in either a longitudinal study that followed a single panel of respondents for a number of

years, or a series of once-only cross-sections (e.g., surveys of each high school class without any longitudinal follow-up). Several analyses examining age, period, and cohort effects related to drug use (O'Malley, Bachman, & Johnston, 1984, 1988) provide concrete illustrations of how this design has permitted us to distinguish among the first three types of change listed above; other analyses (e.g., Bachman, O'Malley, & Johnston, 1984; Bachman, Johnston, & O'Malley, 1991b; Bachman, O'Malley, Johnston, Rodgers, & Schulenberg, 1992; Bachman, Wadsworth, O'Malley, Johnston, & Schulenberg, 1997; Bachman et al., 2002) provide examples of the fourth type of change; and a series of annual monographs (e.g., Johnston, O'Malley, & Bachman, 2001b) also has assessed change, particularly of the first type.

Annual surveys of high school seniors. Each spring, beginning with the class of 1975, the project has surveyed about 14,000 to 18,000 seniors, located in 125 to 140 public and private high schools and selected to provide a representative cross-section of high school seniors throughout the coterminous United States. Confidential questionnaires, usually administered during regularly scheduled class periods, cover background and demographic characteristics, use of drugs, and a wide variety of other topics outlined later. Respondents are asked to provide their names and mailing addresses on forms that are then separated from the questionnaires (but linkable by code numbers accessible only to research staff). These address forms provide an opportunity for mailing one or more newsletters reporting project results; more importantly, they provide the opportunity to conduct follow-up surveys by mail which can then be linked to senior-year data.

Follow-up surveys of young adults. The Monitoring the Future design includes longitudinal follow-ups of graduates from the class of 1976 and each subsequent class, as shown in Figure 1. The initial design called for large-scale subsamples from each graduating class to be followed each year for the first five years after high school. In order to improve follow-up response rates, we modified this design after the first two years so that each follow-up participant is asked to complete a survey only every other year. In addition, an "honorarium" check is included with the questionnaire, and prompts by mail and eventually by phone are used as necessary to encourage return of the questionnaires. (However, because of the additional costs of these procedures, we substantially reduced the target numbers of follow-up cases from each class.) Given the resulting high rates of follow-up returns, as well as the importance of tracking drug use and its correlates further into young adulthood, we extended this schedule of biennial follow-ups so that it now reaches to 13 or 14 years beyond high school, when respondents are in their early thirties.

These follow-up panels have become increasingly valuable as the biennial series of surveys of drug use and other experiences extend to cover all of young adulthood. However, the pace of change tends to diminish by the mid-thirties; also, some of the questionnaire items relevant for high school seniors and young adults become less central. Accordingly, after the seventh scheduled follow-up for each graduating class (when most respondents have reached age 31 or 32), we modified the follow-up strategy in two important ways: First, the next follow-up does not occur until 17 years after graduation (average age of 35), with future follow-ups occurring at 5-year intervals (see

Figure 1). This schedule of less frequent data collection is intended to reduce respondent burden as well as research costs. Second, the questionnaire content was revised to eliminate less central items and include more extensive measurement of key events occurring between high school graduation and the mid-thirties and later. In sum, this 5-year cycle of follow-ups after age 35 is a reduced burden strategy for reaping further research dividends from the young adult panels.

Expanded Design Including Eighth and Tenth Grade Students

We outline later in this paper a number of factors that led to our choice of the high school senior year as an optimal starting point for monitoring the attitudes, experiences, and behaviors of young adults. In general, our experiences during the past twenty-seven years have confirmed that initial judgment. However, we also acknowledged at the outset that one key shortcoming of the design was that its coverage omitted those youth who left high school before the end of their senior year. A further limitation, of course, is that beginning with the senior year constrained our measurement of earlier events, particularly earlier use of drugs. In order to deal with these limitations, the Monitoring the Future project was expanded in 1991 to include nationwide surveys of students in the eighth and tenth grades.

Each spring, beginning in 1991, the project surveys about 17,000-19,000 eighth grade students located in about 180 schools, and about 14,000-18,000 tenth grade students located in about 130-140 schools, using questionnaires and procedures patterned after those used for the surveys of seniors.

SCOPE, PURPOSES, AND RATIONALE

The issues addressed in the Monitoring the Future project are broad in scope and of fundamental importance to the nation: views about personal lifestyles, confidence in social institutions, intergroup and interpersonal attitudes, concerns about conservation and ecology, behaviors and attitudes related to drug use, and other social and ethical issues. A major emphasis is placed on drug use and attitudes about drugs, both because use of drugs is itself a particularly serious problem among young people, and also because it is a symptom of other deeper problems and discontents.

Rationale for Annual Nationwide Sampling of High School Seniors

The study employs large-scale, nationally representative samples of high school seniors, obtained on a recurring annual cycle. Each of these aspects of the sample will be discussed in this section. First, however, we should note that for purposes of studying drug use, our choice of a “normal” population, rather than relying on institutional samples or records, reflects our interest in all types and stages of drug use. Our own findings and those of many others make it abundantly clear that the use of psychoactive drugs is widespread in the population. Studies of the general population are certainly no substitute for special in-depth examinations of drug addicts, drug overdose data, and the like; but it is equally true that such specialized information sources do not provide a

Figure 1. OVERVIEW OF MONITORING THE FUTURE COHORT-SEQUENTIAL DESIGN, 1976-2002

Class of:	Year of Data Collection																													
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002			
1976	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32			35						40						
1977		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32			35						40					
1978			18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				35					40				
1979				18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				35					40			
1980					18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				35					40		
1981						18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				35						
1982							18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				35					
1983								18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				35				
1984									18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				35			
1985										18	19	20	21	22	23	24	25	26	27	28	29	30	31	32			35			
1986											18	19	20	21	22	23	24	25	26	27	28	29	30	31	32			35		
1987												18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				
1988													18	19	20	21	22	23	24	25	26	27	28	29	30	31	32			
1989														18	19	20	21	22	23	24	25	26	27	28	29	30	31			
1990															18	19	20	21	22	23	24	25	26	27	28	29	30			
1991																18	19	20	21	22	23	24	25	26	27	28	29			
1992																	18	19	20	21	22	23	24	25	26	27	28			
1993																		18	19	20	21	22	23	24	25	26	27			
1994																			18	19	20	21	22	23	24	25	26			
1995																				18	19	20	21	22	23	24	25			
1996																					18	19	20	21	22	23	24			
1997																						18	19	20	21	22	23			
1998																							18	19	20	21	22			
1999																								18	19	20	21			
2000																									18	19	20			
2001																										18	19			
2002																											18	19		

NOTE: Entries indicate modal age of respondents at data collection: 18 = base year, in school 12th grade; 19 and older = follow-up, by mail.

complete picture of drug use or drug users, since for most users no institutional contact is involved.

Nationally representative samples. The use of nationally representative samples rather than local, state, or regional ones reflects our conviction that we are dealing with national (indeed, international) issues. It had been necessary in the past to make guesses about national drug trends based on local data, because only local data were available. Since there are some substantial regional differences both in levels and trends of drug use (Johnston et al., 2001b), and since much of the policy in the field is set at the federal level, it continues to be desirable to select our respondents such that they represent the nation as a whole (and also provide data for large regional subgroups).

Senior year as starting point. The choice of the senior year of high school as the point of our initial sampling and the starting point for our longitudinal data collections seems optimal for several reasons. First, the completion of high school represents the end of an important developmental stage in this society, since it demarcates both the end of universal public education and, for many, the end of living in the parental home. Therefore, it is a logical point at which to take stock of the cumulated influences of these two environments on American young people.

Second, the completion of high school represents the jumping-off point from which young people diverge into widely differing social environments. Environments such as college, business firms, and military service are generally thought to have new and important socializing effects. Measurements taken near the end of twelfth grade represent the state of each graduating class before entering these environments. By comparing these “before” measures with the follow-up or “after” measures taken over the years following graduation, we can assess many of the impacts of these different post-high school experiences.

Entering new environments is not the only important change which coincides with the end of high school. Most young men and women now reach the formal age of majority shortly before or after graduation. More important, the years following high school mark the assumption of full adult roles, including supporting oneself financially, living away from parents, marrying, and becoming a parent. Findings from the project have shown that a number of these role experiences have substantial impacts upon various forms of drug use (Bachman, O’Malley, & Johnston, 1984; Bachman, Johnston, & O’Malley, 1991b; Bachman et al., 1992; Bachman et al., 1997; Bachman et al., 2002).

Finally, there are some important practical advantages to building a system of data collections around samples of high school seniors. The last year of high school constitutes the final point at which a reasonably good national sample of an age-specific cohort can be drawn and studied with this degree of economy. The need for systematically repeated, large-scale samples from which to make reliable estimates of change requires considerable stress on efficiency and feasibility; the present design meets those requirements.

Omission of dropouts from senior samples. One limitation of the samples of high school seniors is that they do not include in the target population those young men and women who drop out of high school before the last few months of the senior year. This excludes a relatively small proportion of each age cohort—between 15 and 20 percent (National Center for Education Statistics [NCES], 1996a, c, 2001)—though not an unimportant segment, since we know that illicit drug use tends to be higher than average in this group (Bachman, O’Malley, & Johnston, 1978; Johnston, 1973; Mensch & Kandel, 1988; National Institute on Drug Abuse [NIDA], 1991a).

For the purposes of estimating characteristics of the entire age group, the omission of high school dropouts does introduce certain biases; however, the low proportion of dropouts sets outer limits on the bias (Johnston & O’Malley, 1985; Johnston et al., 2001b). For the purposes of estimating changes from one cohort of high school seniors to another, which has become the most important use of the descriptive statistics on drug use, the omission of dropouts represents a problem only if different cohorts have considerably different proportions who drop out. However, recently published government statistics indicate a great deal of stability in dropout rates since 1975, and neither we nor government demographers see any reason to expect dramatic changes in those rates for the foreseeable future (NCES, 2001).

The effects of missing dropouts are discussed at greater length in Johnston and O’Malley (1985) and in our annual reports on trends in drug use; the summary and conclusions about dropouts from the most recent report (Johnston et al., 2001b, p. 384) bear repeating here:

In sum, while we believe there is some underestimation of the prevalence of drug use in the cohort at large, as a result of the dropouts being omitted from the universe of the study, we think the degree of underestimation is rather limited for all drugs (with the possible exceptions of heroin, crack and PCP) and, more importantly, that trend estimates have been rather little affected. Short of having good trend data gathered directly from dropouts, . . . we cannot close the case definitively. Nevertheless, we think the available evidence argues strongly against alternative hypotheses—a conclusion which was also reached by the members of the NIDA technical review on this subject held in 1982.

“...the analyses provided in this report show that failure to include these two groups (absentees and dropouts) does not substantially affect the estimates of the incidence and prevalence of drug use” (Clayton & Voss, 1982).

Some may use the high school data to draw conclusions about changes in drug use for the entire age group. While we do not encourage such extrapolation, we suspect that the conclusions reached would be valid on the whole, since over 80 percent of the age group is in the surveyed segment of the population and since we expect that changes among those not in school very likely parallel changes among those who are in school. Nevertheless, we recognize the value of periodically checking the results of the present

monitoring system against those emerging from other data collection systems using different methods, such as household interviews. It is encouraging to note that when we have compared trend data from this study with trend data from interview studies, estimating levels of drug use for the same age groups, the findings have shown a high degree of similarity.

We should note here that although the samples of high school seniors do not include dropouts, the new samples of tenth graders and especially eighth graders omit relatively few of those who drop out. Thus these recent additions to the Monitoring the Future project provide opportunities for providing data on those who will become dropouts, as we discuss below.

Large-scale samples. The use of relatively large-scale samples for our base-year data collections from each graduating high school class has several advantages. Most important, many aspects of drug use constitute fairly rare events; in order to have sufficiently large numbers for analysis of such events, the initial sample must be quite substantial. Similarly, the accurate assessment of relatively small changes over time requires large-scale samples. A related advantage is that the smaller numbers of seniors sampled for inclusion in the follow-up surveys can be selected so as to overrepresent heavy drug users. The relationship between base-year and follow-up samples is spelled out later; for present purposes it is sufficient to note that since the cost per respondent is a great deal higher in the follow-up data collections than in the base-year ones, the use of large samples in the base year in order to select smaller and more efficient follow-up samples is quite cost effective.

Another advantage of the large-scale samples is that they permit the use of several different but overlapping questionnaire forms, thereby substantially increasing the content which can be covered by the study and also reducing the tedium for respondents of an “all drug questionnaire.” Because a common core of drug use items appears in all questionnaire forms (along with a common core of demographic items), such core dimensions can be related to any of the other questionnaire items irrespective of form. A further point about the use of large-scale samples for the senior year data collections is that it is actually easier in most schools to obtain large numbers of seniors than to select a small but representative subsample. Given that our base-year data collection procedures are highly cost-effective (group-administered questionnaires scored automatically), the decision to use large samples of seniors has not substantially increased the overall cost of the study.

Annual data collection. The choice of an annual cycle of data collection, surveying each new senior class (rather than every second or third class, for example), has a number of administrative advantages in terms of stability in project staffing and success in maintaining school participation. More important, though, are the scientific and policy formulation benefits that derive from the fact that the annual cycle adds greatly to the sensitivity of the indicators. Clearly, a series of annual data collections provides a faster feedback system than a biennial or less frequent arrangement. We have found that we can reliably detect emerging trends from rather small changes; thus we do not need to wait for large shifts to detect them reliably. It provides further assurance, however, to be able to determine that a shift—even a statistically significant one—is

confirmed by at least one measurement subsequent to the two that initially established its existence; an annual system provides such confirmation much faster than a biennial one (i.e., in two years versus four). The detailed data provided by annual measurement also permit fine-grained comparisons among trends. For example, we were able to observe that the rise in concern about the health consequences of regular marijuana use began a year or more earlier than the decline in actual marijuana use (Bachman, Johnston, O'Malley, & Humphrey, 1986; Johnston, 1985).

Finally, the annual cycle permits a more rapid measurement response when a troubling new drug problem emerges. The advent of "crack" is an excellent case in point: we were able to enter it into the spring 1986 measurement, soon after concern about it rose. Since neither the 1985 NIDA Household Survey of Drug Use nor the 1985 Monitoring the Future survey contained questions on crack, the country would have had to wait until late 1987 to get reliable national data on the spread of this serious problem, had we been in a biennial cycle.

Rationale for Annual Nationwide Eighth and Tenth Grade Samples

We noted above that a critical limitation of the Monitoring the Future surveys beginning with high school seniors was the omission of dropouts from the sample universe. That omission is surely a primary reason for extending the study to lower grades, but not the only one. In this section we discuss a number of the reasons for the surveys of lower grades.

First, however, we note that the surveys of eighth graders and tenth graders, like the ongoing surveys of high school seniors, are large-scale, nationally representative, and repeated on an annual basis. We spelled out in the previous section the rationale for these characteristics in the senior survey, and we think the arguments apply equally well to the surveys in lower grades: (1) Large-scale samples permit the measurement of rare events, the accurate assessment of relatively small changes, and the over-sampling of important subgroups for follow-up analyses. (2) The problems we are studying occur nationwide, and the assessment of trends in these problem areas can best be managed with nationally representative samples. (3) An annual cycle of data collection provides a prompt feedback system; moreover, the use of the same schedule for eighth and tenth grade surveys as for seniors permits a broadened range of comparisons in annual reports of drug trends.

More complete representation of age cohorts. School-based surveys of eighth grade students miss very few of those who are ages 13-14. Almost no dropping out of school occurs before the end of eighth grade, and thus it is safe to say that an eighth grade survey of the type employed by Monitoring the Future includes virtually all early (or middle) adolescents in its sampling universe. The very small proportion who have serious reading disabilities are not covered by a survey that employs self-completed questionnaires, of course, but otherwise the eighth grade samples should provide good coverage of practically the whole age cohort—in contrast to the senior surveys, which miss those who drop out.

The surveys of tenth grade students sample adolescents two years later. They fail to include those who drop out early, of course. Such losses are only moderate from a

numerical standpoint because most dropping out occurs in eleventh and twelfth grade after individuals have reached age sixteen, but those who drop out earliest are arguably the most seriously troubled adolescents and thus do represent important limitations to the tenth grade samples. In sum, the tenth grade samples provide distinctly more complete representation of the age cohort than do the senior year samples, but not quite as complete as the eighth grade samples.

Sampling of earlier stages in developmental sequences. The eighth grade samples, focusing on students four years younger than high school seniors, tap into a distinctly different point in adolescent development. For example, problems such as cigarette smoking, which generally are well developed by the senior year, may only be getting underway in eighth grade. (Among all high school seniors who ever smoked on a *daily* basis, two-thirds did so only after eighth grade; however, most seniors who ever smoked at all had their first cigarette in eighth grade or earlier.) Thus the eighth grade samples provide a cross-section of younger adolescents who are at the threshold of engaging in all sorts of new behaviors, including problem behaviors.

The tenth grade surveys sample students after an important additional two years of growth and development, involving experimentation with a variety of adult-like roles and activities including drug use. Thus in several respects the tenth grade samples provide a useful “middle ground” between the eighth and twelfth grade samples—a way of tapping into a middle point in terms of developmental sequences.

Finally, having reliable trend data on three grades allows us to see whether the different age groups are moving in parallel or not. When they are found not to be, we first search for methodological explanations and, if we find none, for theoretical ones. As it turns out, we have found that the younger teens are often the first to show a turnaround in use, which we have interpreted as reflecting their greater sensitivity to changing social forces influencing drug use (Johnston et al., 2001b).

MEASURES

In this section we present in some detail the measures used in the Monitoring the Future surveys of high school seniors and young adults, and we note the additional measurement areas included in the special surveys of adults at modal ages 35 and 40. Finally, we summarize the content and format of the new questionnaires used to survey eighth and tenth graders, beginning in 1991; this can be done rather briefly, since these new questionnaires are derived largely from the senior year surveys.

Overview and Conceptual Framework: Seniors and Young Adults

Our measures include a wide range of behaviors, attitudes, values, experiences, plans, concerns, and general lifestyle orientations. The base-year surveys of high school seniors are kept largely unchanged from year to year, thus permitting us to compare different graduating classes in their responses to the same questions. Similarly, much of the follow-up questionnaire content is kept identical to the base-year content to permit an assessment of longitudinal change.

For certain descriptive purposes it is useful to distinguish four broad areas of the measurement content:

1. “Monitored” attitudes and behaviors (repeated in base-year and follow-up data collections)
2. Background and demographic characteristics (measured in base year only)
3. High school experiences, role behaviors, and satisfactions (measured in base year only)
4. Post-high school experiences, role behaviors and satisfactions (measured in follow-up only)

Figure 2 presents a schematic representation of these four areas of measurement. Note that the lower boxes on both the left and right sides of the figure are identical in content, representing the fact that the monitored variables are included in both base-year and follow-up questionnaires.

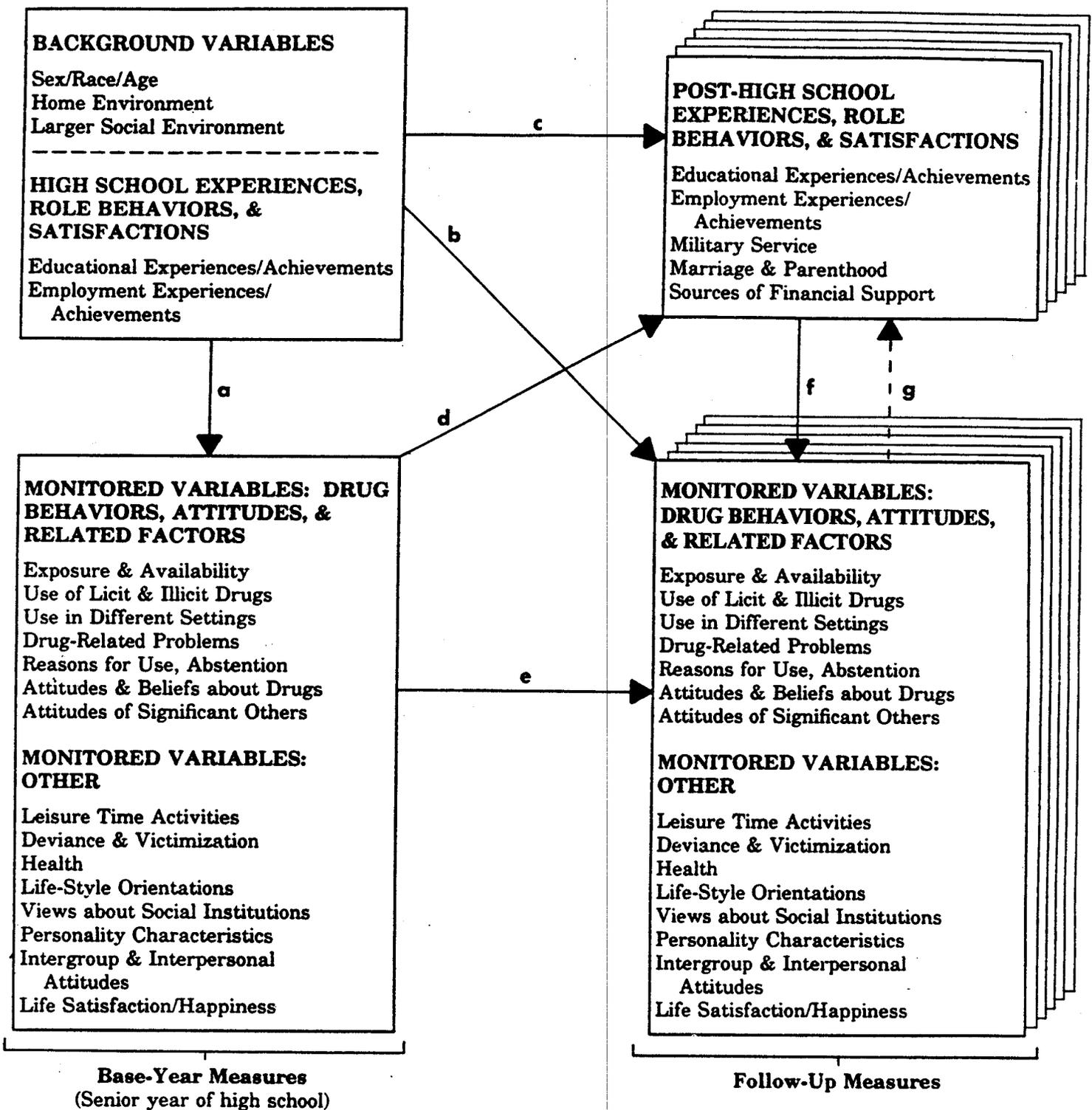
The arrows shown in Figure 2 represent at a very general level some of the causal connections that can be explored using the data collected from a single class or cohort. We assume that background and demographic variables will have an impact on the monitored variables measured in both the base-year and follow-up data collections (as shown by arrows a and b), and also upon post-high school experiences (arrow c). We expect that some of the attitudes and behaviors measured in the senior year of high school will predict (and perhaps be causes of) post-high school experiences (arrow d), and they also surely will be strong predictors of later responses to the same questions (arrow e). Arrow f denotes the important impact we expect post-high school experiences to have on some of the attitudes and behaviors we monitor, but we also acknowledge (with arrow g) that in some instances the causal direction may be largely in the opposite direction. This conceptual framework is not a recipe for relational analyses; it simply indicates some of the major classes of relationships that can be examined within the longitudinal panels created for each senior class. Not shown in Figure 2 are (a) cross-cohort analyses and (b) relational analyses that can be conducted using some monitored variables to explain other monitored variables (e.g., relating attitudes and beliefs about drugs to various patterns of drug use). These and other analysis possibilities are discussed in the section “Analysis Activities.”

Outline of Questionnaire Content: Seniors and Young Adults

It is beyond the scope and purposes of this report to present a detailed listing of questionnaire content that appropriately would be classified into each category in Figure 2. Instead, we present in Table 1 a more detailed outline of the major content areas shown in Figure 2. The table is organized according to the several broad areas of measurement content introduced earlier. Some general comments about each of these areas follow.

Monitored variables: Drug behaviors and drug attitudes. The measures of drug use, and drug-specific attitudes and beliefs, lie at the center of this system of monitoring. (They represent about half of the total space available in the most recent senior year and post-high school follow-up questionnaires.) As Table 1 indicates, the questionnaires

Figure 2. CATEGORIES OF BASE YEAR AND FOLLOW-UP MEASUREMENT



Note: See Table 1 for an expanded listing of variables under each broad category.

include extensive usage measures for licit and illicit substances, plus attitudes about their use, beliefs about their harmfulness, and a host of other factors relevant to each. (Table 2 shows the full list of the nearly 40 classes and subclasses of drugs currently contained in the study. The number of drugs covered has grown over the years and probably will continue to grow in future years.)

It should be noted that this series of surveys encompasses more classes of drugs than any other recent or ongoing, large-scale epidemiological investigation; furthermore, this series provides much more detailed information about most drugs than any other study. These results are made possible by the large numbers of cases being surveyed and in turn permit us to divide a very large amount of substantive drug-related content into the different questionnaire forms. (As discussed later, the high school senior surveys used five questionnaire forms from 1975 through 1998. We added a sixth form in 1989 and subsequently revised other forms. Many of these changes were undertaken in order to include key drug measures in more than one form; only a modest amount of new content material was introduced.)

The variables in this large category of monitored drug behaviors and attitudes might be thought of in terms of the following subcategories:

1. Descriptors of the patterns of drug-using behavior, including frequency, quantity, recency, multiple concurrent use, multiple non-concurrent use, and age at first use.
2. Descriptors of the social and physical setting in which drug use takes place, as well as the time of day. (These variables not only are of interest descriptively, but may prove useful in developing a more complex typology of drug users, when used in combination with variables in category 1.)
3. Self-reported reasons for use, abstention, and termination.
4. Self-reported consequences (or problems) resulting from drug use, including effects on automobile accidents, other impaired driving, various interpersonal relationships, cognitive functioning, emotional stability, energy level, physical health, school performance, work performance, and trouble with the police.
5. Aspects of the immediate social environment likely to contribute to respondent's use (and attitudes about use) of various drugs, including extent of exposure to use, friends' use, availability, parental awareness of use, perceived attitudes of friends and parents, perceived norms among the high school student body regarding drug use, perceived social connotations (or labeling) of drug use by friends, exposure to drinking and drug use at parties, and exposure to drug education in the school curriculum, and exposure to media ads about and depictions of substance use.

Various attitudes and beliefs regarding drugs and drug-control policies, including the perceived harmfulness of various drugs, personal disapproval of their use, the connotations associated by the respondent with being a user of different types of drugs (including cigarettes), and preferences regarding legal status for different drugs.

Table 1. MEASUREMENT CONTENT

MONITORED VARIABLES: DRUG BEHAVIORS, ATTITUDES, & RELATED FACTORS

EXPOSURE AND AVAILABILITY (for various drugs)

- Exposure to people who were using
- Exposure at parties, specifically
- Proportion of friends using*
- Perceived availability*

USE OF LICIT AND ILLICIT DRUGS

(See Table 2 for list of specific classes)

- Lifetime prevalence and frequency of use*
- Annual prevalence and frequency of use*
- Monthly prevalence and frequency of use*
- Quantity consumed (selected drugs)*
- Indirect measures of quantity used per occasion (i.e., degree & duration of highs)
- Mode of administration (selected drugs)
- Injection of any drug for non-medical use*
- Patterns of multiple drug use: concurrent
- Patterns of multiple drug use: not concurrent
- Age at first use*
- Duration of daily use (marijuana only)
- Attempts to quit*
- Felt need to quit or cut back
- Expected future use*
- Prescribed use of psychotherapeutic drugs
- Use of over-the-counter psychoactives

FREQUENCY OF USE IN DIFFERENT SETTINGS (various drugs)

- While alone
- With a few friends
- At parties*
- With spouse/date
- With adults
- At home*
- At school*
- In a car*
- During the daytime

DRUG-RELATED PROBLEMS (various drugs)

- Checklist of 15 problems
- Having “bad trips”
- Auto accidents and violations under the influence
- Driving after drinking

REASONS FOR USE, ABSTENTION, AND TERMINATION OF USE (various drugs)*

ATTITUDES AND BELIEFS REGARDING THE USE OF VARIOUS DRUGS

- Perceived harmfulness*
- Personal disapproval*
- Social connotations attached to use*
- Preferred legal status (various drugs)
- Preferences re. marijuana decriminalization

* The asterisk indicates that these items appear on the 8th and 10th grade questionnaires, in addition to the 12th grade.

ATTITUDES OF SIGNIFICANT OTHERS (regarding various drugs)

- Parental awareness of use
- Perceived friends' disapproval of use
- Perceived status attached to use in the school
- Perceived social connotations of use by respondent's acquaintances
- Perceived pressure to use *

EXPOSURE TO DRUG EDUCATION

- Types *
- Rated helpfulness *
- Effect on use *

EXPOSURE TO DRUG TREATMENT

- Inpatient
- Outpatient

EXPOSURE TO DRUG TESTING

- Pre-employment
- Post-employment

EXPOSURE TO ANTI-DRUG AND ANTI-SMOKING ADS*

- Level of recalled exposure
- Credibility of ads *
- Judged impact of ads *

MONITORED VARIABLES: OTHER

14 LEISURE TIME ACTIVITIES (patterns and frequency of activities)*

PARTICIPATION IN ORGANIZED ACTIVITIES

- In school
- Out of school

DELINQUENT AND OTHER DEVIANT BEHAVIOR

- Theft and vandalism *
- Interpersonal aggression *
- Driving violations and accidents
- Drunk driving and exposure to drunk driving *
- Violations and accidents under the influence of various drugs
- Carrying weapons to school

VICTIMIZATION

- Theft and vandalism *
- Interpersonal aggression *

HEALTH: HABITS, SYMPTOMS, AND MEDICAL CARE CONTACT*

HEIGHT, WEIGHT*

LIFE-STYLE VALUES, ATTITUDES AND BEHAVIORS

- Educational values, preferences, expectations, and experiences *
- Vocational values, occupational aspirations, and experiences *
- Material life style, aspirations, and expectations *
- Family structure, marriage, and sex role preferences and experiences *
- Religious affiliations, practices, and views *
- Political affiliations, participation, and views
- Views on family planning and population
- Views on conservation and pollution control
- Distributive equity: Concepts of equity and sharing of resources
- Concern with social problems facing the nation
- Values, attitudes, and expectations about social change *
- Health and fitness orientation
- Deviance proneness

* The asterisk indicates that these items appear on the 8th and 10th grade questionnaires, in addition to the 12th grade.

VIEWS ABOUT ALIENATION FROM SOCIAL INSTITUTIONS

- Educational system and its opportunities
- Economic system and its opportunities
- Government and political leadership
- Military system
- Other social institutions

INTERGROUP AND INTERPERSONAL RELATIONSHIPS AND ATTITUDES

- Inter-generational relations
- Race relations
- Sex discrimination
- Radius of concern for other people

LIFE SATISFACTION/HAPPINESS

- Global satisfaction*
- Specific satisfactions (13 domains)

ADDITIONAL PERSONALITY CHARACTERISTICS

- Self-esteem*
- Internal control (locus of control)
- Proneness for risk-taking*
- Loneliness*
- Depression
- Optimism
- Trust in others*
- Life goals

BACKGROUND VARIABLES (Base-year data collection only)

PERSON CHARACTERISTICS

- Gender*
- Race/Ethnicity*
- Age*

HOME ENVIRONMENT

- Parental education*
- Household composition*
- Size of family of origin
- Birth order
- Mother working*

LARGER SOCIAL ENVIRONMENT

- Region*
- Urbanicity (senior year)*
- Urbanicity while growing up

* The asterisk indicates that these items appear on the 8th and 10th grade questionnaires, in addition to the 12th grade.

SCHOOL EXPERIENCES, ROLE BEHAVIORS, AND SATISFACTIONS

(Base-year data collection only)

EDUCATIONAL EXPERIENCES

Grades in school*

Self-concept of intelligence and school ability

Curriculum*

Satisfaction with school experiences*

Absenteeism & cutting classes*

Perceptions of school characteristics

Selected school characteristics (derived from aggregated data)*

Victimization in school*

History of being held back*

Liking school, problems at school

Feeling safe at school

EMPLOYMENT EXPERIENCES

Pay*

Hours worked*

Nature of job held*

POST-HIGH SCHOOL EXPERIENCES, ROLE BEHAVIORS, AND SATISFACTIONS

(Follow-up data collection only)

HOME AND LARGER ENVIRONMENT

Region

Urbanicity

Household composition

Type of dwelling

EDUCATIONAL EXPERIENCES

College attendance

2 or 4 year institution

Size of school

Academic performance (grades)

Field of study (academic major)

Satisfaction with educational attainment/experience

Fraternity/sorority memberships

EMPLOYMENT EXPERIENCES

Pay

Type and status of job

Organizational setting

Type

Size

Unemployment experiences

Job satisfaction

MILITARY SERVICE

Pay

Rank

MARRIAGE AND PARENTHOOD

Marital/engagement status

Pregnancy

Number of children

* The asterisk indicates that these items appear on the 8th and 10th grade questionnaires, in addition to the 12th grade.

Table 2. CLASSES OF DRUG USE INCLUDED IN THE STUDY¹

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

¹All classes are included in the twelfth grade and the twelfth-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 eighth and tenth 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 et al., 2001b (Volume I), Appendix E.

[‡] Not a psychoactive substance.

Monitored variables: Other relevant social values, attitudes, and behaviors.

The other monitored variables include views about personal lifestyles, confidence in social institutions, intergroup and interpersonal relations and attitudes, and additional social and ethical issues. Taken together, these variables comprise roughly another 30 percent of total questionnaire space. Many of these dimensions are related to the changing life experiences of young adults in America, and many have been shown to relate—directly or indirectly—to changing patterns of drug use.

We monitor some lifestyle measures known to be connected to the use of certain drugs, and others that we hypothesize to be related. Many of the repeatedly measured variables are not hypothesized to fall into lifestyle orientations, but nevertheless are considered important as predictors and/or consequences of use. Their label “monitored” reflects the periodicity of their measurement rather than their position in the causal scheme. A number are known or hypothesized predictors of use (e.g., self-esteem, employment) while others are hypothesized consequences of use (e.g., somatic symptoms, other health symptoms, accidents, importance placed on various life goals).

It is not possible, nor would it be appropriate, to devote the same level of data collection effort to each of these areas as we devote to drug use and attitudes. Our strategy has been to make use of multiple questionnaire forms in which basic drug use measures are included for all respondents, but the other monitored topics (including attitudes, beliefs, and perceptions about drugs) now are spread out among six different subsamples (with some sets of drug-related items appearing on more than one of the six questionnaire forms). This strategy permits a much more extensive measurement of both the drug variables and the non-drug variables than would otherwise be feasible.

Background variables. A number of background dimensions are measured in the initial data collection, including gender, race, age, parental education (an indicator of socioeconomic level), region, and urbanicity. The importance of these factors to the various types of drug use under study has been carefully documented for periods extending from 1975 through 1979 (Bachman, O’Malley & Johnston, 1980; Bachman, Johnston & O’Malley, 1981); 1986 (Bachman, O’Malley, & Johnston, 1986); 1989 (Bachman, Johnston, & O’Malley, 1990; Wallace & Bachman, 1991); 1997 (Brown, Schulenberg, Bachman, O’Malley, & Johnston, 2001); and 2000 (Johnston, O’Malley, and Bachman, 2001a, 2001b). Their importance as control and conditioning variables in most multivariate analyses is self-evident.

Experiences, role behaviors, and satisfaction in high school. We include in this category a number of measures of school performance and adjustment, because their connection with illegal drug use and other delinquent behavior has been demonstrated by our own earlier research (Bachman, 1970; Bachman, Green, & Wirtanen, 1971; Johnston, 1973; Bachman & Johnston, 1978; Johnston, O’Malley, & Eveland, 1978) and confirmed by more recent analyses with Monitoring the Future data (Bachman, O’Malley, & Johnston, 1980; Bachman, O’Malley, & Johnston, 1981; Bachman, O’Malley, & Johnston, 1986; Bachman, Schulenberg, O’Malley, & Johnston, 1990; Brown et al. 2001; Schulenberg, Bachman, O’Malley, & Johnston, 1994). This category also includes measures of the school social environment (peer norms, bases of peer status, student-

teacher relations, counselor contact), student composition (in terms of gender, race, socioeconomic level, etc.), structural features of the school (size, curricular composition, drug use prevention courses), curriculum of the student, behavior of other students (delinquency, victimization, absenteeism, drug use), and so on.

While still in high school, a substantial proportion of American young people hold paying jobs, (Bachman, Bare, & Frankie, 1986; Bachman, Johnston et al., 1981; Bachman & Schulenberg, 1991, 1993; Cole, 1980). Further, while educators generally have presumed that such work constructively influences young people (Coleman et al., 1974), our own work and that of others has brought this assumption very much into question (Bachman, 1983; Bachman, Johnston et al., 1981; Bachman & Schulenberg, 1991, 1993; Cole, 1980; Greenberger & Steinberg, 1979, 1986). Thus the measures of hours worked and income earned during senior year, which also are contained in the present study, can act not only as dependent variables in relation to drug use (following the anomie and impaired social performance hypotheses) but also as independent variables predictive of drug use. The study also measures total income from all sources.

Included in the base-year questionnaires are certain measures of interpersonal relationships, particularly with parents. Perceived consistency between parents' attitudes and the students' attitudes is measured in a number of domains. Additional measures include serious fights with parents and satisfaction with relationships with parents. There is also a measure of adult contact (proportion of time spent with adults over 30).

Post-high school experiences, role behaviors, and satisfactions. Social environments such as college, military service, civilian employment, and living arrangements, as well as role responsibilities involved in marriage and parenthood, are known to be linked to patterns of drug use and attitudes (Bachman, O'Malley & Johnston, 1978; Bachman et al., 1984, 1997, 2002; Johnston, 1973; O'Donnell, Voss, Clayton, Slatin, & Room, 1976). It seems likely that such areas of post-high school experiences will continue to influence, and be influenced by, drug use and attitudes—although there is little reason to suppose that the patterns of relationship will remain altogether unchanged. Thus, for each of the areas noted above, we measure key experiences during the years following high school.

Our follow-up questionnaires include measures of adjustment and attainment in these environments (pay, grades in college, college completion, satisfaction, unemployment) both as potential consequences of drug use and as potential causes. For similar reasons, we also measure the quality of interpersonal relationships with key others in the respondent's life (spouse, children, parents, older adults, friends). Finally, we measure some detailed features of the respondents' major social environments, such as size and type of school attended, major field of study, size and type of employing organization, educational and employment status of spouse, number and age of children, and type of dwelling in which respondent resides. All of these measures provide opportunities for examining important subgroups separately in terms of drug use and other behaviors.

Relative emphasis assigned to different content areas. We noted parenthetically that about half of the total space in the senior year and post-high school questionnaires is devoted to items that deal explicitly with drugs (including behaviors, perceptions, and attitudes). About 20 percent of the total space is devoted to background variables in the case of base-year questionnaire, and to post-high school experiences in the case of follow-up questionnaires. The remaining space is devoted to questions monitoring other relevant social values, attitudes, and behaviors.

It may be useful at this point to spell out why this study monitors many variables that do not deal explicitly with drugs. The rationale has both a substantive side and a practical side.

From a substantive standpoint, many of the monitored variables are obvious and known correlates of drug behaviors (e.g., social and political alienation, delinquency, religiosity), and their inclusion permits a continuous examination of the absolute and relative importance of their correlations with drug use over time. Other of the monitored variables also are likely to show important associations with drug use, even though some such associations have not been demonstrated (or even hypothesized) in prior studies of the correlates of drug use. Monitoring these several factors in the dynamics of drug use can provide a better understanding of them not only in a cross-sectional sense, but also in terms of their importance across a particular part of the life cycle and across a particular historical period (e.g., Johnston & O'Malley, 1978). Further, we expect that various lifestyle orientations and social and political attachments (or detachments) will show shifting relationships with drug use. Thus, in addition to providing a better understanding of things as they are, the monitoring of these variables may provide leading indicators of things to come.

Still another substantive rationale for this study is monitoring change along a number of dimensions (other than drug use) that may be subject to fairly rapid social change; monitoring these changes provides a richer context for assessing the relative degree of turbulence in the area of drug use. Clearly, drug use and related attitudes have changed enormously during the past quarter of a century and will probably continue to change. We can enrich our understanding of such changes by contrasting them with changes (similarly measured) in attitudes and behaviors related to jobs, citizenship, marriage, parenthood, delinquency, and so on.

There are also important practical advantages to including some questionnaire content that extends beyond drug use and closely related topics. Our experience clearly indicates that in surveying a "normal" or representative cross section of youth, the best way to gather substantial amounts of information about drug use and explicitly drug-related factors is to embed those topics into a broader set of issues of concern to youth. Entrance into schools, cooperation by teachers and parents, and both initial and follow-up participation by students are all greatly enhanced by being able to present a study that is a genuinely broad exploration of the lifestyles and values of youth, rather than simply a study of youth and drugs. Even with the breadth of coverage provided in our questionnaires, we still find a few respondents and school officials who object to the extent of drug emphasis; however, such reactions are relatively infrequent. Much more

frequent are positive responses about the range of interesting and important topics that are covered. Our high rate of return on follow-up questionnaires is an additional indication that young people find the research worth their effort.

Questionnaire Organization and Format: Seniors and Young Adults

Six questionnaire forms. The base-year surveys of high school seniors presently use six questionnaire forms; follow-up surveys of graduates use a matched set of forms (five forms were used prior to 1989). The use of multiple forms is made possible by the large number of high school seniors we survey in each base-year data collection; it is made desirable by our wish to monitor many more variables than can be covered in a single questionnaire requiring only one class period to complete. Keeping the survey administration within a single class period minimizes the disruption of the school's schedule and encourages a higher proportion of schools to participate. In addition, a 45- to 50-minute questionnaire has a better chance of maintaining respondent involvement than a longer one, particularly during the follow-up phase.

We will not review here the differences in questionnaire content from one form to another; the complete content of the senior surveys is included in an annual series reporting univariate and selected bivariate response distributions for all questionnaires (e.g., Bachman, Johnston, & O'Malley, 2001). It is sufficient for present purposes to note that Form 1 deals in greater detail with drug use and reasons for drug use than do any of the remaining forms. Because these detailed questions about drug use require more space than most other questions, Form 1 requires more pages (but generally does not take longer to complete due to branching around inapplicable questions). Forms 2 through 6, both base-year and follow-up, are 12 pages long; Form 1 is 20 pages long in the base-year version, and 16 pages long in the follow-up.

Matching base-year and follow-up forms. All respondents selected for longitudinal study receive follow-up questionnaires that match their base-year forms. Thus, in effect, for each of the classes of 1976 through 1988 there are five parallel longitudinal panels, corresponding to Forms 1 through 5; for the classes of 1989 onward there are six.

Advantages and limitations of multiple forms. The major advantage of the use of multiple forms is that it enables much greater measurement coverage. A corollary advantage is that the many questions about drug use, drug attitudes, drug availability, and so on are spread across several forms. This dispersion avoids the serious problems of respondent fatigue and boredom that are endemic to drug research generally and that would be extreme in the case of this study, which has so much instrumentation about drugs.

The use of multiple forms adds a complexity at the analysis stage. Because not all variables in the study are measured on the same set of respondents, not all can be included in the same multivariate analyses. However, we believe this problem is limited. First, during the initial questionnaire design, we made extensive efforts to minimize this problem, such as: (a) including the major dependent variables dealing with drug use in

all questionnaires, (b) including the most obvious control or moderating variables in all questionnaire forms (these include measures of demographic and family background characteristics, plus certain measures of school and work status), and (c) including in the same questionnaire factors that we felt a priori should be examined together. Second, in 1989 we built a new questionnaire Form 6 primarily by selecting key drug-related items from other questionnaire forms in order to have them appear together for purposes of correlational analyses. (In addition, this method increased the numbers of cases for these questions, now asked on two out of six forms rather than just one out of five). Third, we made additional revisions in 1990 so that four of the six questionnaire forms now include measures of (a) perceived risk, (b) disapproval, (c) friends' use of cigarettes, alcohol, marijuana, and cocaine, and (d) perceived availability of the illicit drugs marijuana and cocaine. Thus we have substantially expanded the potential for correlational analyses involving drug-related perceptions and attitudes, and we have exploited that potential in a recent book (Bachman et al., 2002).

Questionnaires for follow-ups at modal ages 35 and 40. We noted earlier that we end the biennial sequence of follow-ups after the seventh such survey (which occurs 13 or 14 years after the senior year, at modal ages of 31 or 32). At 17 years after graduation (modal age 35), we then survey the full retained follow-up samples. A similar instrument surveys these respondents five years later, at modal age 40.

The age-35 and age-40 surveys contain both continuing content and new content particularly suited to those in their mid-thirties and those starting their forties. Because we use only a single age-35 questionnaire rather than multiple forms, much of the material spread across the six forms used for the age 19-32 follow-ups is not included in this new questionnaire. The same is true for the age-40 questionnaire, which is similar but not identical to the age-35 questionnaire. We continue to include the core measures of drug use that currently appear in all questionnaire forms, thereby ensuring the ability to extend the analysis of age-related trends and patterns in drug use. These questionnaires also include key drug perception and attitude items from the base-year and follow-up questionnaire forms.

The new questionnaire content involves some retrospective data to fill gaps in the cumulated panel data record (e.g., fairly rapid shifts in marital status that may not have been detected by follow-up "snapshots" every two years). It includes information about spouses and children and fairly extensive information about current employment. Each of these new content areas holds promise for analysis in conjunction with the drug use histories accumulated from the senior year survey and the seven post-high school surveys.

The new content material was adapted successfully to the optically scanned questionnaire format used throughout the Monitoring the Future study—a format very familiar to panel respondents who have completed prior questionnaires. Project staff must do special coding before machine scanning; however, the methods (mailed, optically scanned questionnaires with continued guarantees of confidentiality) are generally quite similar to the first seven (age 19-32) post-high school surveys.

Content and Format of Eighth and Tenth Grade Questionnaires

Before initiating the eighth and tenth grade surveys in 1991, we needed to make several broad decisions concerning questionnaires. First, could we use the senior year questionnaires, with virtually no changes, in surveys of lower grades? We decided against using the same questionnaires for a number of reasons, including our judgment that the questionnaires for lower grades should be somewhat shorter and less complex than those administered to seniors.

Second, need the questionnaires for eighth graders differ from those for tenth graders? We believed that any differences would not be worth the additional costs and complexities; in effect, we decided that questionnaires designed for eighth graders would also serve quite well for tenth graders.

Next, to what extent would the new eighth/tenth-grade questionnaires parallel the senior-year questionnaires in format and content? Our general decision was to use items identical to those in the senior surveys whenever possible, but not to attempt the same breadth of coverage. We discuss next some of the reasoning behind this decision, and we also describe many of the specific characteristics of the eighth/tenth-grade questionnaires.

Questionnaire length and difficulty. The senior-year questionnaires were developed and refined so as to occupy a full class period. Our goal for the eighth/tenth-grade questionnaires was to do the same, but we recognized that some students in eighth grade (and, to a lesser extent, tenth grade) would be more limited than seniors in their reading skills, and thus would require questionnaires a bit shorter and with lower difficulty levels. We aimed for 10-20 percent less questionnaire material (i.e., fewer items) in the eighth/tenth-grade questionnaires than in the senior questionnaires. (The new questionnaires still cover 12 pages, but less densely than do the senior surveys.) We also decided that some items in the senior surveys that asked relatively complex questions would be above the difficulty level of some eighth (or tenth) grade readers, and thus did not consider them for inclusion.

Number of questionnaire forms. We discussed in a previous section the advantages and limitations of multiple forms as related to the questionnaires for high school seniors and young adults. Although the same basic issues were relevant to our decision concerning the eighth/tenth-grade questionnaires, several considerations led us to a distinctly different outcome. Specifically, the eighth/tenth-grade questionnaires initially involved only two forms, and the majority of the material (the first two-thirds) is identical across those two forms.

The primary consideration leading to fewer forms was the large amount of material judged essential for inclusion in all forms, leaving rather little space for “form-specific” items. Our decision to reduce the overall number of questionnaire items, coupled with the need to cover all of our basic measures of drug use and demographic material, left us with less space available for other material. Moreover, the importance of being able to conduct correlational analyses among drug-related measures, a consideration that prompted the revisions of the senior and follow-up forms in 1989 and

1990, argued for including many drug-related measures on a single form, leaving still less room for other material.

The two forms served us well from 1991 to 1996. In 1997 we decided that it was important to increase coverage of tobacco-related behaviors, in the light of major changes occurring in the nation regarding youth and tobacco. Accordingly, because the two existing forms were already too long for added material, we created two new forms. The strategy was to add the new tobacco-related material (questions about ease of access to cigarettes, brand smoked, etc.) to each of the new forms, retaining most but not all of the original material from each of the original forms. Each of the original (unchanged) forms was administered to a random one-third of respondents from 1997 on, while each of the two new forms was administered to one-sixth. Thus, the new material related to tobacco was available from one-third (one-sixth times 2) of the sample, while original material was available for the entire sample (in the case of material that was retained in all forms), or from one-third (in the case of material that was retained in one of the original forms, but not included in the new forms).

Content covered. Nearly all of the items used in the original eighth/tenth-grade questionnaire forms were selected (usually unchanged) from the senior year forms. Since we covered the conceptual framework and content of the senior questionnaires in detail above, it is unnecessary to repeat the material here. Instead, we have noted in Tables 1 and 2 those variables that appear also in the eighth/tenth-grade forms. In general, most of the monitored variables having to do with drugs (own use, friends' use, perceived risks, disapproval, etc.) are included (representing a bit more than half of total questionnaire space), along with most of the background variables and measures of educational and employment experiences. Coverage of the "other" monitored variables, for reasons discussed earlier, is considerably more limited in the eighth/tenth-grade forms.

Pretesting of eighth/tenth grade questionnaires. Although we closely adapted the questionnaire content and survey procedures used for eighth and tenth grade students from the high school senior surveys, we still considered it necessary to carry out some pretesting of the forms and procedures. Draft questionnaires were administered in several classrooms of eighth grade students, plus a small group of tenth grade students. (The greater emphasis on eighth graders was based on our assumption that whatever worked for eighth graders would also prove acceptable to tenth graders.) The completed questionnaires and subsequent discussions led to a small number of revisions in items. Additionally, the discovery that most respondents finished early and considered the questionnaires too heavily focused on drugs led us to add some non-drug material at the end of the questionnaire forms. As a final step, the small group of tenth grade students who had completed the earlier draft version reviewed the revised questionnaires.

SAMPLING AND DATA COLLECTION PROCEDURES

In this section we detail the sampling and data collection procedures for the annual surveys of high school seniors, the follow-ups of high school graduates, and the surveys of eighth and tenth graders. The measurement instruments employed in each of

these surveys are self-completed questionnaires using closed-ended items and designed for optical scanning. (The preceding section “Measures” contains information about questionnaire content and format.)

Base-Year Data Collections from High School Seniors

The design involves data collections from high school seniors during the spring of each year, beginning with the class of 1975. As indicated in Figure 1, each new senior year data collection represents the start of a panel study of that high school class. Thus we refer to each senior class survey as a base-year data collection. (Figure 1 begins with the class of 1976, because we did not include the class of 1975 in follow-up surveys after 1977.)

Samples of seniors. The base-year data collection each year takes place in approximately 110-120 public high schools and 15-20 private high schools, selected to provide an accurate cross section of high school seniors throughout the 48 coterminous states. The sampling procedure is multi-stage (Kish, 1965), as follows: Stage 1 is the selection of particular geographic areas, Stage 2 is the selection of one or more high schools in each area, and Stage 3 is the selection of seniors within each high school.

Stage 1: Geographic areas. The geographic areas used in this study are the primary sampling units developed for use in the Survey Research Center’s nationwide surveys. These currently consist of 108 primary areas throughout the coterminous United States. In addition to the 28 largest metropolitan areas, containing about one-third of the nation’s population, 80 other primary areas are included: 16 in the Northeast, 20 in the North Central (i.e., Midwest) area, 32 in the South, and 12 in the West.

Stage 2: Schools. In the major metropolitan areas two or more high schools often are included in the sampling design; in most other sampling areas a single high school is sampled. In all cases, the selections of high schools are made with probability proportionate to size of senior class. The larger the senior class (according to recent records), the higher the selection probability assigned to the high school. (For a discussion of this procedure and its advantages, see Kish, 1965, pp. 220f.) If a sampled school is unwilling to participate, a replacement school is selected from the same geographic area, as discussed in the later section, “Representativeness and Validity.”

Stage 3: Students. Within each selected school, up to about 350 seniors may be included in the data collection. In schools with fewer than 350 seniors, the usual procedure is to include all of them in the data collection. In larger schools, a subset of seniors is selected either by randomly sampling classrooms or by some other random method that is convenient for the school and judged to be unbiased. All respondents in a school are assigned a sample weight that takes account of variations in the sizes of samples from one school to another, as well as the (smaller) variations occurring at the earlier stages of sampling.

The result of this three-stage sampling procedure each year is a nationally representative cross section of about 14,000 to 18,000 young men and women in the

senior classes of about 125 to 140 high schools throughout the United States. Because most of the schools are located in or near the primary sampling units used by the Survey Research Center for personal interview studies, we are able to use local SRC field representatives to administer the questionnaires in the schools. The questionnaire administration methods are described later; what is important to note here is that the particular area sampling procedure used in Stage 1 makes possible this effective and highly cost-efficient field procedure.

We should noted that each survey of seniors now employs six questionnaire forms, as discussed earlier in the section, "Measures." For the key drug use and demographic variables that appear in all forms, the full sample of about 14,000 to 18,000 seniors provides data each year. For other measures, the sample size averages around 2,300 or more seniors each year.

Two-year participation by sampled schools. One other important feature of the base-year sampling procedure is that each school (except for half of those in the initial 1975 sample) is asked to participate in two data collections, thereby permitting us to replace half of the total sample of schools each year. This means, for example, that the 1991 sample consisted of two distinct half-samples: roughly 65 schools that had already participated in the 1990 data collection before participating in 1991, plus another 65 schools that participated for the first time in 1991 and participated again in 1992. (Very few schools take part for one year and then decline to participate in the second.) One advantage of having schools participate for two years is administrative efficiency; it is a costly and time-consuming procedure to recruit a school, and a two-year period of participation cuts down that recruiting effort substantially. Another advantage is that whenever we notice a shift in scores from one graduating class to the next, we can check to be sure that the shift is not attributable to some differences in the newly sampled schools. Indeed, we make such checks routinely.

School recruiting procedures. Early during the fall semester a project staff member makes an initial contact with each sampled school by sending a letter to the principal describing the study and requesting permission to survey seniors. The staff member follows with a telephone call to deal with any questions or problems and (as is often necessary) makes arrangements to contact and seek permission from other school district officials.

Securing the cooperation of selected schools is often a long and arduous process. No school is an isolated unit; each is part of a larger local school district or system. Frequently, approval for a school's participation in the survey is required from some official in addition to the principal of the selected school. In some cases this is the superintendent or, particularly in the larger systems, an official (or review committee) whose approval is required for all research conducted in the system. Further complicating the process is the considerable variation in local rules governing research conducted in schools. School boards, teacher associations, and parent associations all may have a voice in whether or not a school participates.

The standard procedure for recruiting a school involves an initial telephone contact with the principal after he or she has received a letter of invitation. If a school refuses, the refusal often occurs at this point. The reasons most commonly given are objections to using student time for surveys, over-participation in surveys that year, some temporary crisis or disruption in the system that year (mandatory testing, a teacher strike, budgetary difficulties), disapproval due to survey content, and concerns about adverse parental reaction to a survey dealing with social issues. Often a principal will want, or be required, to obtain approval from another source. When refusals occur at higher levels, the reasons given tend to be the same as those listed above.

Once the project staff member obtains the school's agreement to participate, he or she makes arrangements by phone for selecting a random sample of seniors (when the school is large) and for administering the questionnaires. The staff member assigns a local Survey Research Center representative to carry out the administration, and a specific date for the survey is mutually agreed upon.

Pre-administration arrangements. The local SRC representative visits the school two weeks before the actual administration date to meet the teachers whose classes will be affected. The representative provides a brochure describing the study, a brief set of guidelines about the questionnaire administration, and a supply of flyers to be distributed to the students a week to ten days before the questionnaire administration. The guidelines to the teachers provide a suggested announcement to students when distributing the flyers. (Samples of these advance materials are included in the appendices.)

The students' first acquaintance with the study usually comes from the teacher's announcement and the short descriptive flyer. In announcing the study, the teachers are asked to stress that the questionnaires used in the survey are not tests, and that there are no right or wrong answers. The flyer tells students that they will be invited to participate in the study, points out that their participation is strictly voluntary, and stresses confidentiality (including a reference to the fact that the Monitoring the Future project's special government grant of confidentiality that protects their answers). The flyer also presents positive reasons for participation (e.g., the topics are interesting; the data will be important and widely distributed).

Questionnaire administration. The local representatives of the SRC and their assistants conduct the questionnaire administration in each school, following standardized procedures detailed in a project instruction manual. The questionnaire administrations take place in classrooms during normal class periods whenever possible; however, circumstances in some schools require the use of larger group administrations. Teachers are only asked to introduce the SRC staff members and remain present in order to help guarantee an orderly atmosphere for the survey. Teachers are urged to avoid walking around the room, lest students feel that their answers might be observed.

The actual process of completing the questionnaires is quite straightforward. Respondents receive sharpened pencils because the questionnaires are designed for

automatic scanning. Most respondents can finish within a 45-minute class period; for those who cannot, an effort is made to provide a few minutes of additional time.

Procedures for assuring that participation is voluntary and that confidentiality is protected. Any study that relies on voluntary reporting of drug use must have procedures to guarantee the confidentiality of such reports. Respondents should adequately understand these procedures so that they are comfortable about providing honest answers, and so that the voluntary nature of their participation is clear.

We noted that the first information students receive about the survey consists of a descriptive flyer stressing confidentiality and voluntary participation. These themes are repeated in the oral instructions at the start of the actual questionnaire administration; and the SRC representative specifically tells any students who do not wish to participate that they have the option of working quietly on their own school work during the class period. Each participating student is instructed to read the message on the cover of the questionnaire, which stresses the importance and value of the study, notes that answers will be kept strictly confidential, and makes this further statement about voluntary participation: "This study is completely voluntary. If there is any question you or your parents would find objectionable for any reason, just leave it blank." The instructions to seniors then point out that in a few months all participants will receive a mailed summary of nationwide results, and that after a year some students will get a follow-up questionnaire. The cover message explains that these are the reasons for asking that name and address be written on a special form that students will remove from the questionnaire and hand in separately. The message also relates that the information on the questionnaire and on the tear-out form cannot be matched except by use of a special computer file at the University of Michigan.

Near the end of the administration period, the SRC staff member instructs students to separate the address form, fill it out, and pass it in separately. The completed questionnaires and the address forms then remain in the possession of the SRC representative until they are mailed. When mailed, the address forms go to SRC, while the questionnaires go directly to the company that scores them, using optical scanning procedures. Once the address forms are separated from the questionnaires it would be impossible for anyone, either research staff or school personnel, to match the two again without the data on the computer file. The questionnaires have an ordered sequence of code numbers, but the computer-printed numbers on the address forms are random numbers. The match between questionnaire and address is never made. Follow-up questionnaires with new numbers are matched to base-year questionnaires without ever directly associating respondents' names with either questionnaire.

The statements and procedures dealing with confidentiality seem to satisfy nearly all high school seniors who participate in the project. As a part of an early data collection, individual interviews were conducted in six participating schools located in five different states. Of a total of 123 interviewees, 91 had completed a Monitoring the Future questionnaire the previous day, and only two of them said that they were not aware of the project's promise of confidentiality. All interviewees were asked, "How much faith do you have in this guarantee?" Only two said they did not have faith in the

promise; 85 percent had complete faith in the confidentiality guarantee; the rest said that they did not care (often saying they “had nothing to hide”).

Follow-Up Data Collections from High School Graduates¹

As shown in Figure 1, the design of the Monitoring the Future study includes longitudinal follow-ups of each graduating class. The procedures, discussed in detail here, involve mailed questionnaires, modest payment for each participation, and (when needed) additional prompts by mail and eventually by phone.² As noted earlier, the “standard” follow-up surveys continue through the seventh wave for each class (13 or 14 years after graduation), followed by “age-35” and “age-40” surveys at 17 and 22 years (respectively) after graduation.

Follow-up design and strategy. Given the cost and staff effort involved in conducting follow-up surveys, we decided to select only a sub-sample of each original class sample for inclusion in the follow-up panel. From each senior class, two separate groups are selected, using stratified random sampling procedures; each group numbers about 1,200. Members of one group are invited to participate in the first year after graduation, and every two years after that; those in the other group are invited to participate in the second year after graduation, and every two years after that. The result of this approach is that individual participants are surveyed on a two-year cycle, beginning either one or two years after graduation. We introduced the two-year cycle to reduce respondent burden and boredom. The follow-up samples are drawn so as to be largely self-weighting; however, because the primary focus of the study is on drug use, recent users of illicit drugs are over-sampled for follow-ups by a factor of three to one. All analyses use weights to adjust for the differential selection probabilities.

The rationale for over-sampling drug users is twofold. First, the study is designed to monitor drug use, by far the single most important area of research treated in the project. Second, the proportions of the age group using illicit drugs are sufficiently low that over-sampling is needed to produce enough cases for detailed longitudinal analysis.

Selecting sub-samples for follow-up data collections. The process of sub-sampling to select follow-up respondents uses a stratified random procedure in which the probability of any individual being selected for follow-up is proportional to his or her base-year sampling weight. (The procedure is carried out separately for those in the “recent drug use” stratum noted earlier, and for those in the residual stratum consisting of all other base-year respondents.) As explained earlier, the base-year sampling procedure necessitates sampling weights. In particular, because our base-year data collection may include as many as 400 seniors per high school, some schools are represented by nearly

¹The follow-up design and procedures were modified extensively after the 1977 data collection. This section describes the new approach. In 1976 and 1977 follow-ups, larger numbers of individuals were invited to participate and no payment was used; but the response rates were about 65 percent in the first year of follow-up and still lower in the second year. The investigators judged these rates to be inadequate and developed intensive procedures for use on smaller samples.

²Beginning with the class of 1992, the payment was increased from five to ten dollars, to compensate for inflation over the life of the study, after an experiment indicated that higher payment was justified based on increased follow-up response rates.

400 students, whereas other smaller schools may be represented by only 100 or fewer. The result is that students from small schools are likely to have higher base-year weights (i.e., be counted more heavily) than students from larger schools. This variation in sampling weights arises from administrative needs in the base-year data collection; however, for the follow-up data collections it is much more efficient to have essentially equal weights. Accordingly, we chose target follow-up samples with probability of selection proportional to base-year sampling weight, with the result that follow-up weights are equal for virtually all respondents within each of the two strata. Then, to adjust for the over-sampling of follow-up respondents in the “recent drug use” stratum, at the analysis stage we assign them weights one-third the size of the weights of those assigned to the other stratum.

These sub-sampling procedures occur for each graduating class, thereby producing the target sample for a longitudinal panel that will be involved in follow-up data collections. Each such target sample is then split randomly into two equal halves (cutting across all base-year schools as well as the two strata discussed above). Respondents in one half are asked to complete follow-up questionnaires on the odd-numbered years following graduation; those in the other half are asked to do so on the even-numbered years. This strategy, illustrated in Figure 3, permits us (within the same budget) to have twice as many respondents from a given class as we could if we returned to the same individuals every year. However, the primary motivation for requesting biennial rather than annual participation was to reduce the burden on individual respondents and thus maintain a higher level of continuing participation while still having enough information on each respondent to permit quite detailed longitudinal analyses. Because half the follow-up respondents from any graduating class are surveyed one year and the other half the next, we still retain the capability of doing detailed cohort trend analyses on an annual basis.

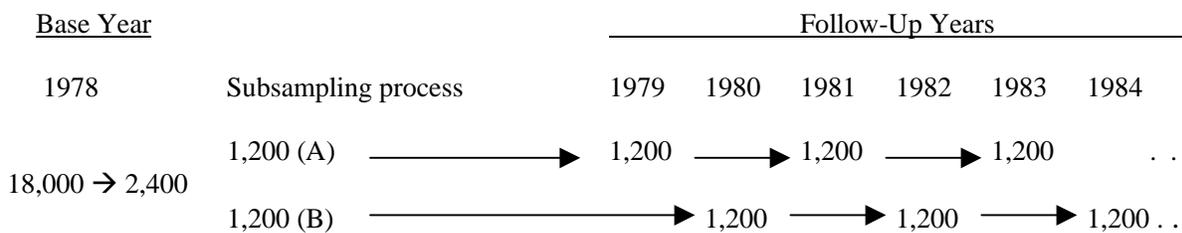
Follow-up procedures. The follow-up procedures consist largely of a series of mailings carried out by the project staff in Ann Arbor. The first item is a letter explaining that the respondent has been chosen for follow-up study and expressing hope that he or she will participate. The next item is a newsletter mailed in December, which describes some of the project findings for that year and announces a follow-up data collection within a few months.³ Included with the newsletter is a card asking the respondent to indicate any change of address or (in the case of respondents who marry) change of name. This mailing thus serves three distinct purposes: (a) it gives all respondents some feedback from the earlier data collection; (b) it announces the forthcoming data collection to potential participants; and (c) it provides an occasion for updating the file of names and addresses.

³Actually two different newsletters are written each year: one for seniors who will not be followed longitudinally or are being followed for the first time, and one for those being followed on subsequent occasions. We judge these newsletters to be important for continued participation in the study by respondents, but are always mindful of the possibility of contaminating future measurements. The content, therefore, is carefully selected to minimize any such effects.

Figure 3. Target Samples for a Given Class

Approximate Age	“Grade Level”	Approximate Number Targeted	Subsample Group	Number Targeted for Longitudinal Analysis
18	Senior Year	18,000	A and B	2,400
19	1 yr. past H.S.	1,200	A	
20	2 yr. past H.S.	1,200	B	2,400
21	3 yr. past H.S.	1,200	A	
22	4 yr. past H.S.	1,200	B	2,400
23	5 yr. past H.S.	1,200	A	
24	6 yr. past H.S.	1,200	B	2,400
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Example: High School Class of 1978 Follow-Up Schedule



The next mailing consists of the questionnaire used in the follow-up study, which is sent out in April. Enclosed with each questionnaire is a check made out to the respondent (in the first years of the study the amount was five dollars; after 1991 it has been ten dollars). A return postage-paid mailing envelope is provided, and an address correction form is attached to the back of the questionnaire. The mailing label containing the respondent's name and address is affixed to the form; respondents are asked to detach the form, leaving only a code number to identify the questionnaire.

Respondents are asked to correct any errors in the mailing label, provide information on any change in their names or addresses, and then mail the card back separately. This procedure of having a name and address card that is separated from the questionnaire is closely parallel to the procedure used in the base-year data collection, and is designed to provide the same high degree of confidentiality.

Within a week after the initial mailing of questionnaires, we send postcards to all target respondents. The message contains a word of thanks to those who already have completed their questionnaires, and reminds others that the questionnaires are very important to us and that we hope for an early response.

The next steps in the process are contingent upon receipt or non-receipt of a completed questionnaire. About four weeks after the initial questionnaire mailing, we send a letter to all those who have not yet responded, indicating that we have not received the questionnaire and urging them to complete and return it as soon as possible. Several weeks later we attempt contact by telephone all those who still have not responded in order to prompt their response. An additional questionnaire is sent, when requested. The overall effectiveness of this follow-up sequence is indicated by response rates that are reasonably high for mailed questionnaires, particularly for ones that take a fairly long time (roughly 40 minutes) to complete.

Data Collection from Students in Eighth and Tenth Grades

The sampling design and procedures used for the surveys of eighth and tenth grade students were patterned very closely after those used for the surveys of high school seniors. Since we have described the latter in considerable detail, we need review them only briefly here.

Samples of tenth grade students. The data collection each year (beginning in 1991) takes place in approximately 125 public schools and private schools, selected to provide an accurate cross section of tenth grade students throughout the 48 coterminous states. The procedures are virtually identical to those used in the data collections from high school seniors, as described above. The sample is multi-stage, with Stage 1 the selection of geographic areas, Stage 2 the selection of one or more schools in each area,⁴ and Stage 3 the selection of tenth grade students in each school. As with seniors, up to about 350 tenth grade students may be included in the data collection, with random

⁴Here, as in the surveys of seniors, schools are asked to participate for two years.

sampling of classrooms used to sample students in schools with more than 350 tenth graders. The resulting samples number about 14,000-18,000 tenth graders.

Samples of eighth grade students. The procedures for sampling eighth graders are identical to those for tenth graders, except that approximately 160 public and private schools (mostly junior high schools and middle schools) are sampled, and 17,000-19,000 students are surveyed. Because schools serving eighth grade students tend to be smaller than those serving tenth or twelfth grade students, there were fewer instances in which it was necessary to subsample from among a large number of eighth graders; in most instances all eighth grade students in the school were included in the sample. The number of eighth grade schools is larger than the number of tenth or twelfth grade schools because of the tendency for middle schools or junior high schools to have fewer students in each grade than their senior high school counterparts.

Administrative procedures. For the surveys of eighth and tenth grade students, the school-recruiting procedures, pre-administration arrangements, questionnaire administration procedures, and procedures for ensuring voluntary participation are essentially identical to those for the twelfth grade students, as described earlier. In addition, we utilize an active parental dissent procedure for all eighth and tenth grade students, unless of course a school requires an active consent procedure.

From 1991 to 1997, procedures for protecting student confidentiality for eighth and tenth graders were identical to those for twelfth graders, and names and addresses were obtained. For a variety of reasons, as noted in the next paragraph, it was later decided that there would be no further longitudinal panel follow-up surveys of eighth and tenth graders, making it unnecessary to obtain names and addresses. Accordingly, in 1998 we chose to switch from a confidential to an anonymous procedure. However, we wished to ascertain the effect of the different procedures on estimates of substance use and related variables. Thus, in 1998 half of the eighth and half of the tenth grade schools were surveyed under the usual “confidential” procedures; in the remaining schools, no names and addresses were obtained, and the questionnaires were administered anonymously. Beginning in 1999, all eighth and tenth grade schools have been surveyed using anonymous procedures. An analysis of the data collected under the two procedures indicated that differences in drug use and related measures were extremely small, possibly zero, in the eighth grade and essentially zero in the tenth grade (O’Malley, Johnston, Bachman, and Schulenberg, 2000).

Follow-ups of selected respondents from eighth grade. Beginning with the initial (1991) survey of eighth grade students, we also undertook follow-up surveys of selected subsets using a modification of the eighth/tenth grade survey instrument and employing mail follow-up procedures quite similar to those used in our follow-ups of high school graduates. We had multiple purposes for this effort, most notably an attempt to gather drug-related data from nationally representative samples of high school dropouts (which could then be combined with our same-aged samples of high school seniors in order to provide a more complete representation of the total U.S. population of young people at modal age 18). Given that objective, the selection of eighth grade respondents targeted for follow-up included an over-sampling of individuals whose

responses indicated a high likelihood of dropping out of high school. The follow-ups took place at two-year intervals. After several years it became clear that in spite of vigorous follow-up efforts, panel attrition was excessive among respondents most likely to drop out of school (i.e., those in the highest risk stratum); we therefore concluded that the continued addition of new follow-up cohorts was not justified. Another purpose of the follow-ups was to examine the etiology of adolescent substance use, including its complex interrelationships with educational attainments (or failures). We judged that we could meet this purpose for the survey to a reasonable degree by continuing the two-year cycle of follow-ups of the three initial panels surveyed as eighth graders in 1991-1993. We desired to continue surveying these individuals because we had already accumulated substantial panel data with reasonably high *overall* response rates (i.e., 70 percent retention in the second follow-up).

REPRESENTATIVENESS AND VALIDITY

Two major sources of bias in survey results are non-representativeness in the sample and invalidity in the measures. An important source of inaccuracy (but not bias) in survey results is sampling error. In this section we address the adequacy of the study along each of these critical dimensions.

Representativeness of Samples (Lack of Bias)

The base-year samples for this study are intended to provide an unbiased representation of secondary school students throughout the coterminous United States. It will now be useful to consider the extent to which the obtained samples of schools and students are likely to be representative of *all* students (i.e., unbiased), and also the degree to which the data obtained are likely to be valid.

We can distinguish at least four ways in which the survey data collected in the Monitoring the Future project might fall short of being fully accurate: (1) some sampled schools refuse to participate, which could introduce some bias; (2) the failure to obtain questionnaire data from 100 percent of the students sampled in participating schools could also introduce bias; (3) the answers provided by participating students are open to both conscious and unconscious distortions, which could reduce validity; and (4) limitations in sample size and/or design place limits on the accuracy of estimates. The effects of this last factor are appropriately termed random sampling errors; these can be estimated statistically, and several illustrations are provided later. The possible effects of the other three factors, however, are non-random biases and are not amenable to precise quantification; instead, we must rely on informed judgment. In the following sections we discuss and offer our judgments on each, elaborating on the facts that underlie our inferences.

School participation. As we noted earlier, each school is asked to participate for two years; therefore, a new half-sample (about 60-80 schools, depending on the grade) is recruited each year. When a school is unwilling or for some reason unable to participate, a substitute school is selected to match the originally sampled school in geographic

composition and size. It is reasonable to ask whether nonparticipation of some of the originally sampled schools is likely to have a significant effect on the findings. Insofar as population estimates are concerned, the answer depends on two factors: the rate of participation for initially sampled schools, and the similarity of the substitute schools to the original schools they are replacing. With respect to the first factor, our recent experience suggests that 50-70 percent of initially sampled schools will participate during any given year. With respect to the second factor, the substitutes are chosen carefully to be as similar as possible to the original school. There is no particular reason to expect that the students in schools that refuse are greatly different from those in schools that agree to participate. The reasons for school nonparticipation are based primarily on general policy issues and/or on somewhat happenstance events that are not likely to relate systematically to student drug use. Moreover, in general, schools are not so different in terms of drug use as some might believe. For example, in 1992 the percentage of variance in marijuana use that was “between schools” was about 4 to 6 percent, depending on the measure (lifetime, annual, monthly). In other words, 95 percent of the variation in marijuana use was within schools. The percentage of variation in alcohol use between schools was also around 5 percent, and for cigarettes about 3 to 4 percent. For illicit drugs other than marijuana, the percentages were even lower. For crack cocaine and inhalants, for example, the percentage was less than 2 percent. In sum, substitute schools are likely to be quite similar to the refusal schools in terms of drug use and related variables.

There is one additional point to be considered. Insofar as monitoring changes is concerned, the effects of school nonparticipation should be minimal. Any systematic biases that might emerge should be approximately replicated from year to year; thus the trend data should accurately reflect any major changes occurring. We can conduct a partial check on the adequacy of the sample for estimating trends by following this step: compare trend data based on the total samples with trend data based only on the half-samples that remain constant across adjacent years. Since these half-samples consist of the same schools, their trends cannot be affected by fluctuations in the school composition of the sample, as might be true for the entire samples. Early in the course of the study we examined drug use trend estimates for 1975 and 1976, comparing the data from all schools with the data from only the constant half-sample. These estimates were extremely similar, suggesting that any errors due to sampling of schools is constant. That exercise has been repeated for the 1976-77 schools, the 1977-78 schools, the 1978-79 schools, and so on up to the present time, each time with the same basic outcome—a confirmation of the trend data found for the total samples. (Although the trend estimates are fairly accurate, the absolute prevalence estimates are less stable, as would be expected from subsamples only half the size of the full samples.)

Student participation. Recent surveys have obtained usable questionnaires from about 83 to 84 percent of the seniors in our target samples (a figure, incidentally, which compares quite favorably with most national household surveys). While a very few (less than 1 percent) explicitly refuse to complete the questionnaires, most non-respondents simply are absent from school on the day of the administration. Absentee rates tend to be higher than average in the last third of senior year due to several factors, particularly a higher frequency of extracurricular activities. Eighth and tenth graders yield higher response rates (about 88-89 percent). Because only one survey administration is

conducted in each school (except in cases where the participation rate is less than 70 percent), students absent from class on that day are excluded. Students with higher absentee rates tend to have higher than average rates of drug use (Kandel, 1975; Bachman, Johnston et al., 1981), so missing them is likely to have some effect on drug use estimates.

It is possible to adjust drug use estimates to correct for absenteeism. The questionnaires include items asking respondents how often (and why) they have been absent recently. Responses to these questions can be used to reweight the data to *estimate* total sample findings (i.e., the findings that would have emerged if absentees could have been included). While such an approach has some appeal, we have thus far elected not to incorporate the correction into most of our data analyses. There are several reasons for this decision. First, after we made such adjustments to the drug usage rates using the data on absenteeism (see Johnston & O'Malley, 1985; Johnston et al., 2001b), we found that the adjusted figures were only slightly higher than the unadjusted ones. (For example, overall prevalence figures were usually increased by only one-half to two percentage points for the various drugs.) The complexity of computing adjusted data did not seem to be justified by such slight changes. Second, the fairly disparate sampling weights created by this adjustment substantially increase the sampling variance (Kish, 1965, p. 560); this results in much larger ranges of uncertainty around only slightly less biased estimates. Finally, as has been pointed out earlier, this study focuses heavily on trends, and any systematic, consistent errors are not likely to affect trend data. Thus, we have concluded that the effects of student nonparticipation on prevalence and trend estimates are minimal and not worth the cost and difficulty of correction in most of our reports.

Omission of dropouts. We estimate that the omission of dropouts from the sample of high school seniors has a somewhat greater impact on drug use prevalence rates than does the omission of absentees. Again, *trends* should not be affected substantially, because overall dropout rates have changed rather little in recent years. Specifically, “. . . the percentage of students who leave high school before graduating has gradually declined, and differences between dropout rates for blacks and whites have also narrowed, although most of these changes occurred before the mid-1980s” (NCES, 1996b, p. vi). Plausible estimates of drug prevalence rates among dropouts, based on data from a few studies that have included dropouts (Johnston, 1973; Abelson, Fishburne, & Cisin, 1977; Bachman et al., 1978; Fishburne, Abelson, & Cisin, 1980; NIDA, 1991a), can be used to determine an estimate for the overall age cohort. The resulting biases are not dramatic, largely because the dropouts represent only about 15-20 percent of the population. We estimated some time ago (Johnston & O'Malley, 1985) that lifetime prevalences for marijuana, amphetamines, and cocaine are underestimated by about 6 percent, 5 percent, and 4 percent, respectively. Lifetime prevalences for other illicit drugs are underestimated by 3 percent or less. Annual prevalence rates for marijuana, amphetamines, and cocaine are underestimated by about 6 percent, 5 percent, and 3 percent, respectively; annual prevalences for other illicit drugs are underestimated by 2 percent or less. Lifetime and annual use prevalences for alcohol are underestimated to a lesser degree, 1 percent and 2 percent, respectively. For a further discussion of the dropout issue, see Johnston et al. (2001b), Appendix A, in Volume I.

Follow-up participation. All large-scale longitudinal surveys inevitably suffer from some panel attrition, and the follow-up data collections in this research are no exception. In the first follow-up after high school, 70-80 percent of those initially targeted for participation returned completed questionnaires. The retention rate declines with time, as would be expected. Additionally, retention for recent cohorts has not been as high as for earlier cohorts. Nevertheless, by the seventh follow-up (13-14 years after high school, modal age 31-32) the total panel retention in recent years remained fairly high, at about 55 percent of the initial target sample. These retention rates are respectable compared to most panel studies (particularly considering the low cost nature of the data collection method) and are quite acceptable for analysis purposes.

Of course, those who participate are on average somewhat different from those who do not participate, and the likely effect is to underestimate behaviors such as drug use. In previous analyses of Monitoring the Future follow-up data, we have reweighted the data to obtain estimated overall drug use prevalence rates which are adjusted for non-participation, so as to eliminate most of the bias. Briefly, the procedure used is to reweight participating follow-up respondents so that each follow-up panel has (when reweighted) the same base-year prevalence as the total base-year sample for that class year.⁵

In each follow-up panel, we followed this procedure for all prevalence measures of several licit and illicit substances. As one would expect, the adjusted follow-up prevalence measures are higher than the unadjusted figures, though not dramatically so. For example in the 1982 follow-up of the classes of 1976-1981, we found that 30-day prevalence of any alcohol use was increased by 0.3 percentage points (from 78.2 percent before adjustment, to 78.5 percent after adjustment), and the 30-day prevalence of daily use was increased by 1.0 percentage points (from 7.7 percent to 8.7 percent). A measure of heavy drinking (having 5 or more drinks in a row on at least one occasion in the prior two weeks) increased by 1.7 percentage points (from 40.3 percent to 42.0 percent). We should note that the adjustments are rather minimal in part because follow-up participation rates are fairly high, and because the financial inducement to participate probably reduces the degree to which willingness to participate varies among subgroups.

Validity of Self-Report Data

A basic question in all survey work is the extent to which respondents' answers should be taken at face value. In this study, what respondents say about their use of drugs is of special concern. While the study includes no direct, objective validation of the self-

⁵For example, suppose 50 percent of the entire base-year sample reported using marijuana in senior year, but among those participating in a given follow-up panel from that class only 40 percent had (as seniors) reported such use. The follow-up respondents who had been users in base-year would be weighted 5/4, and follow-up respondents who had been non-users would be weighted 5/6, thus creating a 50 percent base-year usage rate for the reconstructed follow-up panel. The follow-up prevalence rates would then be derived by applying these weights to follow-up data. Alternative procedures have been investigated in other analyses of the follow-up data. One procedure involved an extensive search for important predictors (using base-year variables other than use of a specific substance) of participation. Because even the best variables had little power to predict non-participation, the procedure described above provides what we believe to be the best adjustments.

report measures of drug use, a good deal of inferential evidence exists to support their validity:

1. A considerable proportion of all respondents, ranging from 41 to 66 percent of each senior class, have admitted to some illicit drug use (Johnston et al., 2001b, Volume II). These proportions have ranged up to 86 percent by the time respondents reach their forties.
2. Monitoring the Future data have shown some substantial and predictable relationships between self-reported drug use and other items dealing with attitudes about drug use, and with behaviors such as academic performance, delinquency, and the self-reported use of licit drugs (Bachman et al., 1978, 1980, 1990, 1997, 2002; Bachman, Johnston, et al., 1981; Bachman, Johnston, O'Malley, & Humphrey, 1988; Bachman, Schulenberg, O'Malley, & Johnston, 1990; Johnston, 1973; Johnston, O'Malley, & Eveland, 1978; Osgood, Johnston, O'Malley, & Bachman, 1988; Schulenberg et al., 1994). Panel analyses employing several waves of the follow-up data have shown a high degree of stability in these self-reports of drug use (Bachman, O'Malley et al., 1981; Bachman et al., 1984, 1997, 2002; Bachman, Schulenberg, O'Malley, & Johnston 1990; O'Malley, Bachman, & Johnston, 1983; Osgood et al., 1988; Schulenberg et al., 1994). We view these various findings as providing considerable empirical evidence of construct validity.
3. Very few respondents decline to answer the drug use items, even though they are specifically instructed to leave blank any questions they feel they cannot answer honestly. For all illicit drugs, the high school senior rates of missing data in 2000 were below 4 percent, which is less than 2 percent above normal for that point in the questionnaire. These data suggest there is very little underreporting by intentional skipping of questions.
4. Although the longitudinal design of the MTF study does not provide anonymity to twelfth grade respondents, and did not provide anonymity to eighth and tenth grade students from 1991 to 1997, the available evidence suggests that anonymity makes little difference in student self-reports of substance use. Most investigators who have compared groups differing in degree of anonymity have found little or no difference in self-reports (Bjarnason & Adalbjarnardottir, 2000; Brown, 1975; Haberman, Josephson, Zanes, & Elinson, 1972; King, 1970; Leutgert & Armstrong, 1973). Of particular relevance to the MTF study is that an analysis of surveys conducted in 1998 found very few differences in reporting between anonymous versus confidential procedures in eighth and tenth grade schools. As stated in O'Malley, Johnston, Bachman, and Schulenberg (2000, p. 51): "These findings are quite reassuring for school-based surveys that use anonymous conditions. Equally or more important, the findings are quite reassuring for surveys of high school students across both survey conditions examined here. At least with the confidential procedures used in the present study, tenth grade students were just as willing to report their drug-using

behaviors as were those surveyed using anonymous procedures. And even for surveys of pre-high school students, the results show at most only a very modest mode of administration effect and quite possibly no effect at all.”

5. A number of methodological studies (e.g., Petzel, Johnson, & McKillip, 1973; Single, Kandel & Johnson, 1975) have included fictitious drugs in survey questionnaires. These fictitious drugs have shown very low levels of reported use, indicating that intentional overreporting is likely to be minimal. (And, in fact, this overreporting may not have been intentional; some respondents, particularly those who tend to be indiscriminate in their drug use, may have erroneously believed that they had actually used the fictitious drugs.)
6. Studies employing other data collection methods have shown roughly similar prevalence rates of drug use for the same age group (Abelson & Atkinson, 1976; Abelson & Fishburne, 1976; Abelson et al., 1977; Fishburne et al., 1980; Miller et al., 1983; NIDA, 1991b; O'Donnell, Voss, Clayton, Slatin, & Room, 1976; and special comparisons using unpublished National Youth Survey data, Elliott, 1986 personal communication). Generally, however, somewhat lower rates are found in the household interview surveys, compared to the school and mail-out surveys used in the Monitoring the Future study. Rootman and Smart (1985) note a similar finding of more use of tobacco, alcohol, and marijuana in a school survey compared to a household survey. They suggest that two explanations may account for the differences in estimated rates: (1) respondents may be more likely to give socially desirable answers to questions asked in the home than at school, and (2) drug users may be more likely to be missed in household surveys than in school surveys, because the former tend to have lower response rates.
7. Methodological studies have utilized various methods to determine the validity of self-report data on illicit drug use and other illegal behaviors: urinalysis for drug use; polygraph verification; official police, court, medical, and treatment agency documents; and reports by peers, parents, and teachers. Generally, the findings from these studies have been encouraging (see, for example, Amsel, Mandell, Matthias, Mason, & Hocherman, 1976; Bale, 1979; Bale, Van Stone, Engelsing, & Zarcone, 1981; Bauman, Koch, & Bryan, 1982; Bonito, Nurco, & Schaffer, 1976; Cisin & Parry, 1979; Hansen, Marlotte, & Fielding, 1985; Robins, 1974; Smart, 1975; Smart & Jarvis, 1981; Stacy, Widaman, Hays, & DiMatteo, 1985; Whitehead & Smart, 1972). Gold (1977) reviewed the literature on self-reported delinquent behavior of adolescents and concluded that “the best single measure of delinquent behavior available is self-report of delinquency,” and “it is accurate enough for use in rigorous research designs and with sophisticated statistics.” Similarly, methodological studies have investigated the comparability of self-report data and public records for the legal drugs. In particular, with respect to cigarettes and alcohol, aggregate sales data have been correlated with self-report data, and the results are very supportive of

the general validity of self-reports (under proper survey conditions). Hatzianandreu et al. (1989) compared national estimates of cigarette use based on self-reports from surveys with national estimates based on tax records, and concluded that surveys were a reliable surveillance tool for monitoring changes in smoking behavior. Smith, Remington, Williamson, and Anda (1990) compared self-reported alcohol use data with state-level data on sales, and concluded that “per capita sales of alcohol generally parallel self-reported consumption. . .” (p. 312).

8. Another line of research on validity has investigated the question whether “objective” or “bogus pipeline” methods are needed. It is reassuring that several investigators have shown that confidential questionnaires were as likely to be valid (that is, they did not produce lower estimates) as questionnaires administered under conditions of objective validation or bogus pipeline procedures. Akers, Massey, Clark, and Lauer (1983) showed that neither a biochemical measure nor a bogus pipeline procedure produced higher estimates of smoking in adolescents (grades 7-12) compared to a confidential questionnaire; and Campanelli, Dielman, and Shope (1987) reported that self-reports of alcohol use by adolescents (grades 7-9) were not affected by a bogus pipeline procedure.
9. The aggregate level trends in reported friends’ use tend to parallel very closely the trends in self-reported own use. In addition to their own use, we also ask respondents about the proportions of their friends who use various substances. If there were a tendency for concealment of reporting of one’s own behaviors, presumably there would be less of a tendency to underreport friends’ behaviors. The fact that trends in friends’ use parallel own use suggests a high degree of validity in self-reports of use.
10. Different substances show different trajectories over time. Marijuana use declined earlier than did cocaine, and use of other substances (alcohol for example) did not decline at the same time.
11. One sort of bias that does seem to exist in these self-report measures is a tendency for respondents to underestimate the number of times they have used a drug when recalling an interval as long as one year. Early in the study we examined and reported this problem in some detail (Bachman & O’Malley, 1981) and noted that it may occur for a wide variety of self-reports of behaviors when the reporting interval grows long. We do take account of this possible source of bias in our reporting of drug use findings. In particular, our reports of annual use either (a) focus on the distinction between no use and any use, or (b) treat reports of the amount of annual usage in relative rather than absolute terms.

Although the evidence is reassuring for the validity of self-reports in general, under proper conditions, we should note that the evidence is far less convincing for other situations. In particular, when adverse consequences may ensue from honest reporting, or

when respondents are not convinced of confidentiality, self-reports must be considered questionable. Surveys of pregnant women (Cohen, Green, & Crombleholme, 1991), arrested individuals (Fendrich & Xu, 1994; Harrison, 1992), juveniles interviewed at home under varying degrees of privacy (Gfroerer, 1985), and employees questioned at their work site (Lehman & Simpson, 1992) are examples of situations wherein validity may well be diminished. These conditions, wherein admission of use could have substantial negative consequences for the individual, are very different from the conditions of the Monitoring the Future in-school group-administered surveys.⁶

In sum, while there is almost certainly some degree of underreporting of illicit drug use on self-report surveys, we believe that it is far less than most people intuitively assume. Further, for purposes of monitoring trends across time, a fairly constant degree of underreporting should have almost no effect on trend estimates.

Sampling Precision in Annual School Surveys

The errors possible in an estimate based on a sample survey can be classified into two categories—sampling and non-sampling. Having just discussed several possible sources of non-sampling errors, we now focus on sampling error. Sampling error occurs because observations are made on only a sample rather than the entire population under study. For example, during most years of this study there have been roughly 3 million seniors located in more than 20,000 high schools throughout the coterminous United States. Our samples of about 14,000-18,000 seniors clustered in about 125 to 140 schools can provide close, but less than perfect, estimates of the responses that would be obtained if all seniors in all schools were asked to participate.

One cannot know for any particular statistic exactly how much error has resulted from sampling; however, one can make reasonably good estimates of confidence intervals, or ranges within which the value would be likely to fall if all schools and all seniors were invited to participate, rather than using only samples of seniors in samples of schools. In a detailed report of drug use in the classes of 1975 through 1983 (Johnston, O'Malley, & Bachman, 1984, Appendix B), we provided detailed tables of confidence intervals for percentages based on the total samples and various subgroups, taking into account that sampling errors differ depending on the drug involved (since clustering by schools differs from one drug to another), the size of the percentage, and whether comparisons among groups or trends across time are involved. Further data on confidence intervals for the full range of Monitoring the Future measures are provided in the annual reports of questionnaire responses from the nation's secondary school students (e.g., Johnston et al., 2001b).

⁶In follow-up mail surveys, however, we have found that the degree of recanting of earlier drug use (that is, denying ever having used a substance after reporting such use in an earlier survey) varies by occupational status. Specifically, respondents in the military and those in police agencies are more likely to recant having used illicit substances (Johnston & O'Malley, 1996). These individuals may feel greater likelihood of negative consequences of revealing past use of illicit drugs.

For present purposes, it is sufficient to note that from the 1976 senior sample onward, no 95 percent confidence intervals for the total sample, or one-year trends, exceed a value of ± 2.5 percentage points. The majority of confidence intervals are ± 1.0 percent or smaller. Here are several examples of these levels of accuracy: a one-year decline in monthly prevalence of cocaine use from 2.8 percent for the class of 1989 to 1.9 percent for the class of 1990 was statistically significant ($p < .001$). Between the class of 1994 and the class of 1995, statistically significant *increases* included (but were not limited to) 4.0 percent for annual marijuana use ($p < .01$), 2.2 percent for 30-day marijuana use ($p < .05$), 2.2 percent for daily cigarette use ($p < .05$), and 0.6 percent for daily alcohol use ($p < .01$). Between the class of 1999 and the class of 2000, 30-day cigarette use declined by 3.2 percent ($p < .01$), daily smoking declined by 2.5 percent ($p < .05$), and half-pack-or-more-per-day smoking declined by 1.9 percent ($p < .01$). On the whole, we feel that these samples provide a high level of accuracy, thus permitting the reliable detection of fairly small shifts from one year to the next. Incidentally, they also permit a high level of confidence when shifts do not occur. These comments are specific to the surveys of twelfth graders, but the points would apply equally well to the surveys of eighth and tenth graders, where sample sizes are somewhat larger.

Summary Evaluation: Consistency and the Measurement of Trends

We have noted at several points that a primary purpose of the Monitoring the Future project is to measure changes from one time to another. Accordingly, the measures and procedures have been standardized and applied consistently across each data collection. We have argued that to the extent that any biases remain because of limits in school and/or student participation, and to the extent that there are distortions (lack of validity) in the responses of some students, it seems very likely that such problems will exist in much the same way from one year to the next. In other words, biases in the survey estimates should tend to be consistent from one year to another, leaving the measurement of trends relatively unaffected by such biases. This argument, which is plausible in the abstract, is much more compelling when examined in the light of actual data spanning a full quarter century as shown in our most recent NIDA-published annual monograph (Johnston et al., 2001b). Even when usage patterns are shifting appreciably from year to year, there is still a regularity and consistency in the findings which provide a great deal of reassurance that the data have high reliability, and that even fairly small trends are genuine. There is, in other words, an orderliness from one year to the next that suggests a high level of precision and sensitivity to trends.

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