

Chapter 1

Monitoring the Future Panel Study Design

Overview

Monitoring the Future (MTF) is an ongoing study conducted at the University of Michigan's Institute for Social Research under a series of investigator-initiated, competing research grants from the National Institute on Drug Abuse beginning in 1975. The MTF study includes annual surveys of nationally representative samples of 8th, 10th, and 12th grade students, as well as a subset of 12th grade students followed into adulthood from each graduating class. Repeating these annual surveys over time provides data to examine behavior change across history in consistent age segments of the population, as well as among key subgroups.

The panel study now has over 108,000 individuals, with approximately 28,500 surveyed each year including young adults ages 19 to 30 and adults ages 35 to 60. These data, gathered on national samples over such a large portion the lifespan, are extremely rare and can provide needed insight into the epidemiology, etiology, and life course history of substance use and relevant behaviors, attitudes, and other factors. The current report is the latest in a series of publications dating back to 1986 and updated annually since then, all available at [monitoringthefuture.org](https://www.monitoringthefuture.org).

Participants

Young Adults (Ages 19 to 30)

In 2021, young adults (N=4,909) were from the 12th grade classes of 2009 to 2020 and provided data at modal ages 19 to 30 (see Table 1). Each individual participates in a young adult follow up survey every two years. However, because each cohort's follow up sample is split into two random subsamples that are surveyed in alternate years (at ages 19/20, 21/22, 23/24, 25/26, 27/28, 29/30), a representative sample of people from each 12th grade class is obtained every year.

Adults (Ages 35 to 60)

In 2021, adults ages 35 to 60 (N=5,636) were from the 12th grade classes of 2004, 1999, 1994, 1989, 1984, and 1979 and provided data at modal ages 35, 40, 45, 50, 55, and 60, respectively (see Table 1). In the analyses in this report, combined prevalence estimates for adults ages 35 to 50 are reported.

Research Design & Procedures: Base Year

The MTF panel first samples participants in 12th grade, which corresponds to modal age 18. The methods and findings regarding this base year survey are available [elsewhere](#). Briefly, 12th graders have been surveyed in the spring of each year since 1975. Each year's data collection of 12th graders takes place in 120–140 public and private high schools selected to provide an accurate representative cross-section of 12th graders throughout the contiguous United States. In 2020, due to the school shutdowns that came with the COVID-19 pandemic in March 2020, only 36 schools participated in data collection for 12th graders. Analyses of the 2020 12th grade data indicated that the curtailed sample did not differ from the nationally

representative results from previous years in terms of sociodemographic characteristics.¹

The final year of high school, 12th grade, is a strategic starting point at which to begin longitudinal panel surveys to monitor drug use and related attitudes of youth through adulthood. Completion of high school represents the end of an important developmental period in the United States, demarcating both the end of universal education and, for many, the end of living full time in the parental home. Therefore, it provides an important base year from which to follow individuals as they transition to adulthood. There is also a practical advantage: it is the final point at which a reasonably good national sample of an age-specific cohort can be drawn from schools. However, a limitation of the MTF study design is the exclusion of individuals who dropped out of high school before graduation—approximately 5–15% of each age cohort nationally. The dropout rate has been declining in recent years; it was 5% in 2020, according to U.S. Census statistics.² Because the proportion of students who drop out is small and remains relatively constant from year to year, drop out omission should introduce little or no bias in analyses of trends.

A multistage random sampling procedure is used to secure the nationwide sample of 12th graders each year. Stage 1 is the selection of particular geographic primary areas from within each of 105 strata in the U.S. Stage 2 is the selection of one or more high schools in each area (with probability proportionate to the student enrollment size for 12th grade). Stage 3 is the selection of 12th graders within each high school. Weights are assigned to compensate for differential probabilities of selection at each stage of

¹ Miech, R., Leventhal, A., Johnston, L., O'Malley, P. M., Patrick, M. E., & Barrington-Trimis, J. (2021). [Trends in use and perceptions of nicotine vaping among US youth from 2017 to 2020](#). *JAMA Pediatrics*, 175(2), 185.

² United States Census Bureau. [CPS Historical Time Series Tables on School Enrollment](#). Released August 2021. Accessed April 11, 2022.

sampling. Final weights are normalized to average 1.0, so that the weighted number of cases approximately equals the unweighted number of cases overall. In order for us to be able to check observed trends in any given one-year interval, schools participate in the study for two consecutive years on a staggered schedule, with one half being replaced with a new randomly-selected half sample of schools each year. Therefore, in any given year about half of the schools in the sample are participating for the first time and the other half are participating for their second and final year.

Because many survey questions are needed to cover all of the topic areas in the MTF study, much of the survey content is divided into six different questionnaire forms that are randomly distributed to participants in equal proportions. (Five questionnaire forms were used between 1975 and 1988.) About one third of each form consists of key, or “core,” variables common to all forms. All demographic and key drug variables are contained in this core set of measures. Many other specific drugs that have been added over time are in one or more forms but not in the core set. All tables in this report list the sample sizes upon which the statistics are based, stated in terms of the weighted number of cases which, as explained above, is roughly equivalent to the actual number of cases.

Research Design & Procedures: Panel Study

Each year from the 12,000–19,000 12th graders originally surveyed, a panel subsample (N~2450³) is selected. At that point they are randomly assigned to begin longitudinal follow up one year later (age 19) or two years later (age 20). Each participant is surveyed every other year through age 29/30 (i.e., at ages 19/20, 21/22, 23/24, 25/26, 27/28, 29/30). Young adults are given the

³ Only students providing (a) contact information necessary for longitudinal follow up and (b) valid data on sex are eligible for panel subsample selection. As noted previously, 12th grade data collection in 2020 was curtailed due to the COVID-19 pandemic, and all 12th grade students providing contact information and valid data on sex were selected with certainty (n=1,225).

same questionnaire form (of 6 forms) as they were originally given in 12th grade. Starting at age 35, participants are surveyed every 5 years, currently through age 60. At ages 35 to 60, there is only a single questionnaire form at each age that is given to all participants. The panel design is illustrated in Table 1. Typically, panel data are collected in April through October.

Oversampling Based on Substance Use

In order to ensure that drug using populations are adequately represented in the panel surveys, 12th graders reporting 20 or more occasions of marijuana use in the previous 30 days (i.e., daily or near daily users) or any use of the other illicit drugs in the previous 30 days are selected with higher probability (by a factor of 3.0) than the remaining 12th graders. Differential weighting is then used to compensate for these differential sampling probabilities. Because those in the drug using stratum receive a weight of 0.33 in the calculation of all statistics to correct for their overrepresentation at the selection stage, there are actually more panel respondents than are reported in the weighted numbers given in the tables.

Data Collection Procedures

Survey mode. Up through 2017, all panel surveys were conducted by mailing paper surveys. In 2018 and in 2019, one random half of those aged 19 to 30 received the standard MTF panel procedures with mailed paper surveys; the other random half received new web-push procedures and were encouraged to complete web-based surveys. Analyses of the web-push experiment among young adults documented that, once sociodemographic characteristics were controlled, there were very few differences in substance use prevalence estimates by condition or survey mode.⁴ We combined the

⁴ Patrick, M. E., Couper, M. P., Jang, B. J., Laetz, V., Schulenberg, J. E., O'Malley, P. M., Bachman, J., & Johnston, L. D. (2022). [Building on a sequential mixed-mode research design in the Monitoring the Future Study](#). *Journal of Survey Statistics and Methodology*, 10(1), 149-160.

responses from the two modes in both 2019 and 2020, and the results from combining the two modes are shown in this volume (and in the two previous editions). In 2020, the web-push condition became the standard at age 19 to 30. Also in 2020, we began the transition to web-push survey administration for ages 35 to 60, with one random half receiving the standard MTF mailed surveys and the other half receiving the web-push procedures. Results of the web-push experiment among adults again documented very few differences in substance use prevalence estimates.⁵ Therefore, we have combined responses from the two survey modes in the estimates shown here.

Mail-based procedures. Using information provided by 12th grade respondents, contact is maintained with the subset of individuals selected for inclusion in the follow up panels. Newsletters are sent to them each year, providing a short summary of study results on a variety of survey topics. Name and address corrections are requested from both the U.S. Postal Service and the individual. Panel questionnaires are sent in the spring to each individual based on their scheduled panel participation, with an incentive check (currently \$25); reminder letters and postcards are sent at fixed intervals thereafter; telephone callers attempt to gather updated location information and prompt response. If requested by the respondent, a second copy of the questionnaire is sent. No questionnaire content is administered by phone. If a respondent asks not to be contacted further, the request is honored.

Patrick, M. E., Couper, M. P., Parks, M. J., Laetz, V., & Schulenberg, J. E. (2021). [Comparison of a web-push survey research protocol with a mailed paper and pencil protocol in the Monitoring the Future panel survey](#). *Addiction*, *116*(1), 191-199.

Patrick, M. E., Couper, M. P., Jang, B., Laetz, V. B., Schulenberg, J., Johnston, L. D., Bachman, J., O'Malley, P. M. (2019). [Two-year follow-up of the sequential mixed-mode experiment in the U.S. National monitoring the future study](#). *Survey Practice*, *12*(1).

⁵ Patrick, M. E., Pang, Y. C., Terry-McElrath, Y. M., Laetz, V., & Couper, M. P. (in press). Comparison of a web-push vs. mailed survey protocol in the Monitoring the Future panel study among adults ages 35 to 60.

Web-push procedures. The web-push condition follows many of the standard mail-based procedures, including initial contact, mailing of newsletters, survey invitation with incentive check, and follow up contact with nonrespondents. In the web-push procedures, respondents are given access to respond online (i.e., a link and PIN), and then they are later offered a paper survey if they do not respond to the web survey. They are also contacted by email and text message (with their permission). We ensure confidentiality of web-based responses by immediately encrypting data. By design, respondents can pause their web surveys and then easily get back into them; we email reminders to both nonrespondents as well as respondents with a partially completed survey. The web-based surveys are optimized for a variety of operating systems and devices, including computers, tablets, and smartphones. Those who do not respond to the web survey within a month are sent paper versions of the surveys. In the process of telephoning nonrespondents, web surveys and paper surveys are offered.

Panel Attrition & Retention

Longitudinal studies—including MTF—experience attrition. Survey response rates in general have been declining,⁶ and response is typically differentially associated with health risks including substance use.⁷ A vital feature of the MTF panel study is the very low cost per respondent, which allows us to survey such large numbers of respondents.

⁶ U.S. Bureau of Labor Statistics. [Household and establishment survey response rates](#). Updated June 1, 2022. Accessed June 21, 2022.

⁷ Keyes, K. M., Jager, J., Platt, J., Rutherford, C., Patrick, M. E., Kloska, D. D., & Schulenberg, J. (2020). [When does attrition lead to biased estimates of alcohol consumption? Bias analysis for loss to follow-up in 30 longitudinal cohorts](#). *International Journal of Methods in Psychiatric Research*, 29(4), e1842.

McCabe, S.E., & West, B.T. (2016). [Selective nonresponse bias in population-based survey estimates of drug use behaviors in the United States](#). *Social Psychiatry & Psychiatric Epidemiology*, 51(1), 141-153.

Response Rates

Response rates by cohort and data collection wave are shown in Table 2. The largest drop in response rates occurs at the first follow up. Average response rates across the five most recent cohorts to complete each follow up survey were 35.7% for the first follow up at age 19/20 (cohorts 2015–2019), and 36.2% for the second through sixth follow ups at ages 21–30 (cohorts 2004–2017). Due to cohort differences in the propensity to respond, response rates are higher among earlier than later cohorts: 35–41% at ages 35 to 45 and 39–55% at ages 50 to 60. Response rates within cohort tend to decline with the length of the follow up interval.

The impact of the change from paper to web-push methodology on response rates has been examined. We found a significant difference in response rates by survey condition combining across ages 19 to 30 in 2019; the web-push response rate was 39.1% (95% confidence interval [CI] = 37.89, 40.2). This was significantly higher than the standard MTF response rate of 35.1% (95% CI = 33.96, 36.29).⁸ In 2020, when the web-push condition was the standard procedure for ages 19 to 30, the overall response rate was 41%. No significant differences between survey modes were observed among respondents ages 35–60 in 2020.⁹

The response rates are respectable, especially given the relatively low data collection costs and the extended period over which respondents are followed. Weights can be used to adjust for attrition.

⁸ Patrick, M. E., Couper, M. P., Parks, M. J., Laetz, V., & Schulenberg, J. E. (2020). [Comparison of a web-push survey research protocol with a mailed paper and pencil protocol in the Monitoring the Future panel survey](#). *Addiction* 116(1), 191-199.

⁹ Patrick, M. E., Pang, Y. C., Terry-McElrath, Y. M., Laetz, V., & Couper, M. P. (in press). Comparison of a web-push vs. mailed survey protocol in the Monitoring the Future panel study among adults ages 35 to 60.

Impact of Panel Attrition

An important purpose of the MTF panel study is to estimate drug prevalence levels among U.S. high school graduates as they move across adulthood. Thus, we have always been concerned about making appropriate adjustments to account for panel attrition. Our standard adjustment for this publication series uses a drug specific post-stratification procedure in which we reweight each cohort's panel sample so that the 12th grade use distribution for a specific drug is the same for the panel respondents as it was for all of the 12th grade students from which they were selected. This procedure is carried out separately for cigarettes, alcohol, and marijuana, as well as other illicit drugs (combined). As expected, it produces prevalence estimates in the panel data that are somewhat higher than those uncorrected for attrition. However, the adjustments are relatively modest. In the MTF panel, we have extensive data from the 12th grade surveys for panel nonrespondents; these data can be used to make additional adjustments.

We are not able to adjust for the absence of students who dropped out prior to 12th grade. Because nearly all college students have completed high school, the omission of high school dropouts should have almost no effect on college student prevalence estimates, but this omission does affect the estimates for noncollege young adults and the combined young adult estimates. The omission of about 5–15% of each cohort¹⁰ who dropped out prior to 12th grade likely means that drug use estimates reported here are likely somewhat lower than would be observed for the age group as a whole. Nevertheless, the year to year trends should be little affected by the limitations in sample coverage.

¹⁰ United States Census Bureau. [CPS Historical Time Series Tables on School Enrollment](#). Released August 2021. Accessed April 11, 2022.

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