Who Uses Illegal Drugs? Author(s): Robin Sickles and Paul Taubman Source: *The American Economic Review*, Vol. 81, No. 2, Papers and Proceedings of the Hundred and Third Annual Meeting of the American Economic Association (May, 1991), pp. 248-251 Published by: <u>American Economic Association</u> Stable URL: <u>http://www.jstor.org/stable/2006863</u> Accessed: 28-10-2015 16:48 UTC

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <u>http://www.jstor.org/page/info/about/policies/terms.jsp</u>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.



American Economic Association is collaborating with JSTOR to digitize, preserve and extend access to The American Economic Review.

Who Uses Illegal Drugs?

By ROBIN SICKLES AND PAUL TAUBMAN*

In this paper we will use the National Longitudinal Sample of Youth (NLSY) to estimate a model of who uses various drugs and at what ages. Data already exist on who takes illegal drugs, but thus far the descriptive analysis has not utilized recently developed statistical frameworks that provide for more informative estimates.

I. Prior Literature

Gary Becker and Kevin Murphy (1988) present a theoretical model of rational addiction that requires information on past, present and future prices. They do not study illegal drugs empirically in this and their related papers.

A major data source is the annual survey of high school seniors (HSS), also known as "Monitoring the Future." This work is summarized in L. Johnston et al. (1988). They find a growing use of drugs (measured by monthly, annual, and lifetime prevalence) over time, and differences by region and sex. Cocaine use showed marked increases from 1976, though this levelled off from 1986 to 1987. They often rely on cross-tabs that leaves many variables uncontrolled and the results subject to omitted variable bias.

J. Bachman et al. (1984) use ordinary least squares (OLS) regressions in which the drug use in the three years post-high school is related to various characteristics such as living arrangements. While an improvement over cross-tabs, OLS applied to categorical dependent variables yields inefficient estimates (see M. Nerlove and S. Press, 1973).

Johnston et al. used follow-up surveys of a subsample drawn from each cohort. They find the use of some drugs decline at older ages, say 35, though they do not determine if the heavy users have died, dropped out of the sample, or have been rehabilitated.¹

The HSS's initial restriction to high school seniors removes about 30 percent of the population who drop out of high school perhaps because of taking drugs. Studies based on the National Institute of Drug Abuse (NIDA) sample of people 12 and older show some heavy drug use of people less than 17 years old. (See J. D. Miller et al., 1982, and NIDA, 1985.)

Richard Clayton (1985) using the 1980 HSS presents univariate regressions that shows the frequency of use of cocaine is positively related to lifetime marijuana use and days out of school in the past month, but negatively related to high school grade point average. H. Abelson and Miller (1985), using the NIDA surveys covering 1974–82, show differences in the percentage using cocaine by education and race—for lifetime, 12 months, and last month measures. They find strong trends.

D. Kandel (1980) presents a recent survey of drinking and drug use among youth. People in their late 30's "mature out" of heroin use rather than die.

II. The Model

We assume that individuals maximize a utility function that has, as its arguments, various types of consumption and leisure. Note that some of the C_i s may affect utility by their impact on health in the utility function.

The choices of the level of the various consumption goods and leisure are subject to a budget constraint and a health production function. The health production function relates the stock or level of health to

^{*}Rice University, Houston, TX 77251 and NBER, and University of Pennsylvania, Philadelphia, PA 19104 and NBER, respectively. We thank Craig Strain for his valuable research assistance.

¹The rehabilitation literature as in J. F. Maddux and D. P. Desmond (1986) is not very encouraging on this score.

a person's endowments (E) and some of the C_i .

The constrained maximization of utility leads to demand functions for each of the C_i including drugs which will depend on the wage rate, endowments, prices, and tastes. We allow tastes to vary by socioeconomic status such as education, family background, martial status, and age. Family background measures will include parental education and religious preference. We do not include recently obtained prices at this stage of our study and thus the interpretation of our results as indicative of demand behaviors rests on the strong assumptions of highly price inelastic demand behavior.

The National Longitudinal Survey (NLS) contains several random samples of men and women in various age groups. Data on drug use have been collected in the youth segment, which started in 1979, in two time periods—1984 and 1988. Date of first use of various drugs is also available. For each sample, interviews have been conducted over time on many variables other than drugs.

This sample has drug use information measured over the last month, last year, and lifetime, and also amount used for a number of specific drugs including amphetamines, barbituates, heroin, and cocaine. We study separately marijuana, a combination of marijuana, cocaine, and all other drugs (including about 55 cases of barbituate use), and no drug use during the last 12 months. (Most of the hard drug observations are for cocaine.)

Self-Reported Drug Data Accuracy. Our sample uses surveys in which people are asked if they have taken various illegal drugs. Will such questions elicit valid and reliable information? Zili Amsel et al. (1976) concluded that such self-reported drug use data were fairly accurate using a sample of 829 addicts under treatment.

Johnston et al. used several waves of responses to the drug use questions in "Monitoring The Future," and conclude that either people lie consistently over time or provide reasonably accurate answers. They state: "Like most studies dealing with sensitive behaviors, we have no direct, objective validation of the present measures; however, the considerable amount of inferential evidence that exists strongly suggests that the self-report questions produce largely valid data" (p. 20). Moreover, a majority of seniors, and up to 80 percent of the subsequent subsample, report taking drugs.

E. Wish (1987) studied men recently arrested and held in the Manhattan Central Booking in 1984. About 95 percent of those approached agreed to an interview and 84 percent of these gave a urine specimen. The interview data yielded substantially smaller drug use than the urine specimens (for cocaine in 1986, 43 vs. 82 percent), but as Wish notes, the circumstances are not conducive to honesty.

B. S. Mensch and D. B. Kandel (1988) argue that NLS drug use reports are too low because of shame associated with admitting to partaking in an immoral activity to an interviewer whom you see annually. However, the head of the NLS, R. Olsen, has informed us of an unpublished study in which half the respondents were asked the questions by the interviewer and half were given a questionnaire to mail back. The drug use estimates were the same via the two methods, but the mailed-back questionnaire reported significantly more abortions.

Statistical Methods. Prior research has generally used estimates based on means for various groups or on OLS regressions. Using means for various groups is only useful if all cells have large numbers of observations, but available data sets are too small to allow for more than a few characteristics in defining a cell. The linear probability model has a number of statistical problems (G. S. Maddala, 1983).

We allow the demand response, Y, of an individual unit to be restricted to one of a number, say k + 1 ($k \ge 1$), of ordinal values, denoted for convenience by 1,...,k, k + 1. Using the LOGISTIC model in "SAS," we fit a parallel lines regression model based on the cumulative distribution probabilities of the response categories, rather than on their individual probabilities. The model has the form

$$g(\Pr(Y \le 1|x)) = \alpha_i + \beta' x, \quad 1 \le i \le k$$

| Variable | Analysis of Coeff. Est. | Maximum I Std. Error | Wald Chi-So. | Estimates Pr > Chi-So. |
|-------------------------|-------------------------------|----------------------------|-----------------|------------------------------|
| | | | | |
| INTERCPI | 2.697 | 0.528 | 26.134 | 0.0001 |
| INTERCP2 | 4.330 | 0.529 | 66.986 | 0.0001 |
| AGE | 07 | 0.011 | 43.338 | 0.0001 |
| MGRADE | -0.054 | 0.0097 | 31.342 | 0.0001 |
| FGRADE | -0.053 | 0.0075 | 49.289 | 0.0001 |
| FE | -0.012 | .0024 | 24.835 | 0.0001 |
| BLACK | 0.349 | .06 | 34.189 | 0.0001 |
| HISP | .279 | 0.079 | 12.328 | 0.0004 |
| INC84 | 6.95E-7 | 3.75E-6 | 0.034 | 0.8530 |
| ED | -0.403 | .076 | 28.317 | 0.0001 |
| EDSQ | 0.018 | 0.003 | 36.685 | 0.0001 |
| SEX | .313 | .045 | 48.689 | 0.0001 |
| CATH | -0.189 | .057 | 11.169 | 0.0008 |
| NORL | -0.653 | 0.078 | 69.929 | 0.0001 |
| BABT | 0.075 | .061 | 1.525 | 0.2168 |
| Association of Observed | of Predicted I Responses: | Probabilities | and | |
| Concordar | t = 62.4% | Somers $D = 0.252$ | | |
| Discordan | t = 37.2% | Gamma | = 0.253 | |
| Tied | = 0.5% | Tau-a | = 0.626 | |
| | | с | = 0.626 | |

TABLE 1-ORDERED LOGITS FOR 1984

TABLE 2—ORDERED LOGITS FOR 1988

| Variable | Analysis of Coeff. Est. | f Maximum Std. Error | Likelihood Wald <i>Chi</i> -Sq. | Estimates Pr > <i>Chi</i> -Sq. |
|---------------------------------|--------------------------------|---|--|--------------------------------------|
| INTERCP1 | -0.096 | 0.493 | .038 | 0.8461 |
| INTERCP2 | 1.360 | 0.493 | 7.599 | 0.0058 |
| AGE | -0.0042 | 0.0096 | 0.195 | 0.6591 |
| MGRADE | -0.055 | 0.0096 | 32.749 | 0.0001 |
| FGRADE | -0.038 | 0.0075 | 25.853 | 0.0001 |
| FE | -0.0042 | 0.0023 | 3.385 | 0.0658 |
| BLACK | 0.125 | 0.059 | 4.419 | 0.0355 |
| HISP | 012 | 0.079 | .022 | 0.8834 |
| INC84 | -4.4E-6 | 2.4E-6 | 3.565 | 0.0590 |
| ED | -0.048 | .066 | .528 | 0.4677 |
| EDSQ | .0032 | 0.0024 | 1.676 | 0.1955 |
| SEX | 0.263 | 0.045 | 33.606 | 0.0001 |
| CATH | -0.205 | .057 | 13.107 | 0.0003 |
| NORL | 384 | .078 | 24.481 | 0.0001 |
| BABT | .109 | .061 | 3.179 | 0.0746 |
| Association of Observed I | of Predicted Responses: | Probabilitie | s and | |
| Concordan Discordant Tied | t = 59.1% = 40.3% = 0.7% | Somers <i>I</i> Gamma Tau- <i>a</i> | D = 0.188 = 0.189 = 0.125 = 0.626 | |

where $\alpha_1, \ldots, \alpha_k$ are k intercept parameters, and β is the vector of slope parameters.

The logit function $g(\rho) = \log(\rho/(1-\rho))$ is the inverse of the cumulative logistic distribution function, which is $F(x) = 1/(1 + \exp(-x))$.

Suppose the response variable can take on the ordered values 1, ..., k, k+1. The probability that the *j*th observation has response *i* is given by

$$\Pr(Y_j = i | x_j)$$

$$= \begin{cases} F(\alpha_1 + \beta' x_j) & i = 1 \\ F(\alpha_i + \beta' x_j) & \\ -F(\alpha_i - 1 + \beta' x_j) & 1 < i \le k \\ 1 - F(\alpha_k + \beta' x_j) & i = k + 1 \end{cases}$$

In our estimates we have included an estimate of each individuals' fixed effect obtained from a Tobit estimate of a wage equation estimated over the period 1979–83. Here we use the independent variables in Tables 1 and 2 and family income. (Results from other specifications that alter the number of demand categories and the distribution of latent demand are available on request.) We average the residuals over time for each individual. (We used the inverse of the Mills ratio to correct for selectivity.) This estimated fixed effect is denoted as FE.

III. Results

We have calculated means and standard deviations in 1984 and 1988. We code drug use as in the last year: no use (about 30 percent in both years), only marijuana (about 35 and 30 percent in 1984 and 1988, respectively), and marijuana and other drugs, mostly cocaine. (Means for other variables are given in the Appendix, available on request.)

Tables 1 and 2 present our main findings based on ordered logits (ranging from no use = 0 to marijuana plus cocaine = 2). *MGRADE* and *FGRADE* are years of education of the mother and father and the religious preference dummies are Catholic, no religion, and Baptist. Other variable names are obvious. In 1984, all variables are statistically significant except income in 1984 and belonging to the baptist religion. Taking account of the ordering scale, use of drugs decreases with education of self and parents, wage fixed effects, and being Catholic or no religious preference. There are increases with being black or female.

In 1988 the sign and significance patterns are the same though AGE is now of marginal significance. The 1988 coefficients are generally of smaller size in absolute value.

The relative probability of moving from no drug use to moderate drug use in 1984 is equal to 11.6 times the coefficients shown in Table 1. For example, blacks are 400 percent more likely to make this move. The movement to hard drugs from the no use category is 3.2 times the coefficient or about 120 percent for blacks. (Calculated at the means for all other variables.) There are both bigger and smaller effects for other variables.

In both years, we have examined the results on other coefficients of dropping the wage fixed effects variable. Some of the coefficients such as black and income change greatly.

There are many significant effects of sociodemographic variables on drug use. The results seem stable over our two time periods. Estimates of income fixed effects are quite important with people who earn more using drugs more, though the wage fixed effects are weaker in 1988.

REFERENCES

- Abelson, H. and Miller, J. D., "A Decade of Trends in Cocaine Use in the Household Population," in E. Adams and N. Kozel, eds., Cocaine Use in America: Epidemiologic and Clinical Perspectives, Rockville: NIDA, Research Monograph Series 61, 1985.
- Amsel, Zili et al., "Reliability and Validity of Self-Reported Illegal Activities and Drug Use Collected from Narcotic Addicts," *International Journal of the Addictions*, March/April 1976, 11, 325–36.

Bachman, J., O'Malley, P. and Johnston, L.,

"Drug Use Among Young Adults: The Impact of Role Status and Social Environment," *Journal of Personality and Social Psychology*, March 1984, 47, 629–45.

- Becker, Gary and Murphy, Kevin M., "A Theory of Rational Addiction," *Journal of Political Economy*, August 1988, 96, 675-700.
- Clayton, Richard R., "Cocaine Use in the United States: In a Blizzard or Just Being Snowed?," in Cocaine Use in America: Epidemiologic and Clinical Perspectives, Rockville: NIDA, Research Monograph Series 61, 1985.
- Johnston, L., O'Malley, P. and Bachman, J., Illicit Drug Use, Smoking and Drinking By America's High School Students, College Students, and Young Adults, Washington: U.S. Department of Health and Human Services, 1988.
- Kandel, D., "Drug and Drinking Behavior Among Youth," *Annual Review of Sociology*, 1980, 6, 235–83.
- Maddala, G. S., Limited-Dependent and Qualitative Variables in Econometrics, Cambridge: Cambridge University Press, 1983.
- Maddux, J. F. and Desmond, D. P., "Relapse and Recovery in Substance Abuse Careers," in F. M. Tims and C. G. Leukefeld, eds., *Relapse and Recovery in Drug Abuse*, Washington: Division of Clinical Research, NIDA Research Monograph 72, 1986.
- Mensch, B. S. and Kandel, D. B., "Do Job Conditions Influence the Use of Drugs?," *Journal of Health and Social Behavior*, June 1988, 29, 169–84.
- Miller, J. D. et al., National Survey on Drug Abuse: Main Findings, Rockville: NIDA, 1982.
- Nerlove, M. and Press, S., Univariate and Multivariate Log-Linear and Logistic Models, Rand R1306-EPA/NIH, 1973.
- Wish, E., Drug Use Forecasting: New York 1984 to 1986, Washington: National Institute of Justice, February 1987.
- National Institute of Drug Abuse, National Household Survey on Drug Abuse: Main Findings 1985, Washington: U.S. Department of Health and Human Services, 1985.