Journal of Youth and Adolescence, Vol. 14, No. 6, 1985

Alcohol: The Gateway to Other Drug Use Among Secondary-School Students

John W. Welte[1] and Grace M. Barnes[2]

Received June 5, 1985; accepted October 24, 1985

The "stepping-stone" theory of progression into drug use is examined, based on the alcohol and other drug use of over 27,000 seventh- through eighth-grade students in New York State. The data show that students do not use illicit drugs unless they also use alcohol. White, black and Hispanic students all tend to initiate the use of drugs in the following order—alcohol, marijuana, pills, and "hard" drugs. Among blacks and Hispanics, pills are not as important a transition between marijuana and hard drugs as they are among whites. Cigarettes form an important step between alcohol and marijuana use for younger students, particularly for females. Since alcohol serves as the gateway to all other drug use, prevention approaches that control and limit alcohol use among adolescents may be warranted.

INTRODUCTION

The "stepping-stone" theory evolved over 20 years ago during debates on the legalization of marijuana. In the mid-1960s, the Federal Bureau of Narcotics (1965) widely publicized the notion that marijuana use was a dangerous first step to heroin addiction, and evidence was presented showing that most heroin addicts started their progression of drug use by first smoking marijuana. Debates quickly developed, with scientists noting flaws

[1]Senior Research Scientist, Research Institute on Alcoholism, New York State Division of Alcoholism and Alcohol Abuse, 1021 Main Street, Buffalo, New York 14203. He received his Ph.D. in Psychology for the State University of New York at Buffalo in 1976. His research interests are the social and psychological correlates of drinking.

[2]Senior Research Scientist, Research Institute on Alcoholism, New York State Division of Alcoholism and Alcohol Abuse, 1021 Main Street, Buffalo, New York 14203. She received her Ph.D. in Sociology from the State University of New York at Buffalo in 1983.

0047-2891/85/1200-0487$04.50/0

in the theory, since most marijuana users do not go on to become heroin addicts (Johnson, 1973).

Kandel (1975) later included alcohol use as a necessary stage in the sequence of drug use among adolescents, with legal drugs being a necessary intermediate between nonuse and marijuana use. A number of other investigators have found that adolescents are unlikely to use marijuana unless they have used alcohol first; they are likewise unlikely to use "hard" drugs, such as heroin or cocaine, unless they have first used marijuana (Huba *et al.*, 1981; Kandel and Faust, 1975; Johnston, 1973; O'Donnell, 1979). Refinements of this basic theme have been detected. Yamaguchi and Kandel (1984), who analyzed a longitudinal study of New York State high-school students and followed-up nine years later, discovered that for females, either alcohol or cigarettes could serve as a stepping stone to marijuana use. Donovan and Jessor (1983), examining two nationwide cross-sectional student surveys, found that problem drinking was an intermediate step between marijuana use and the use of pills (amphetamines, barbiturates), which in turn formed a bridge to hard drug use.

Mills and Noyes (1984), working with a sample of Maryland students, found that drug use was not only sequential but cumulative. By comparing "ever used" with current use, they showed that when young people acquire a new drug-use habit, they do not abandon the old ones, but rather add the new drug to their repertoire.

Sequence of initiation into drug use had been shown to vary by sex and across nationality. Adler and Kandel (1981) examined samples of adolescents in Israel and France, and they concluded that while definite sequential patterns exist in both countries, the initiation into the use of illegal drugs is much more sequential in Israel. Israeli youths tend to go through three steps: beer, wine, then liquor and cigarettes. These stages are absent in France. Yamaguchi and Kandel (1984) compared male and female Americans, and they concluded that cigarettes are more important for females than males as part of a sequence from alcohol to illicit drugs.

The present study is further refinement to the stepping-stone theory. It uses data from an extremely large sample of New York State high-school students, and it includes data on the use of alcohol and a large number of other drugs. Because of the ethnic heterogeneity of New York State, this large sample allows an examination of sequential patterns of alcohol and other drug initiation among ethnic groups not previously studied, as well as for a combination of sex and age groups.

METHODS

This survey was based on a final sample of 27,335 students from randomly selected public-school districts and private schools throughout New

York State. The sample was selected and statistically adjusted (weighted) to represent the 1,542,000 secondary-school students in grades 7–12 in New York State in 1983.

Sampling

At the highest level, geographic strata were formed, based on the eight designated health service areas (HSA) in the state. Within each HSA, each central city area was designated as one stratum and the rest of the HSA was designated as one stratum. This resulted in 23 geographic strata. Outside New York City, two school districts were sampled from each geographic stratum, taking the rural vs. urban balance into account. In New York City, every school district was selected. Within school districts, two or three public schools were selected, using stratification by type of school (e.g., science, vocational) in New York City. A total of 154 public schools were selected from 60 school districts.

Private schools of four types were selected: Catholic, Jewish, Christian other than Catholic, and nondenominational. Catholic schools were selected using the diocese as the top-level strata, and stratifying within diocese by sex of student where appropriate. The other types of private schools were selected at random from the entire state. This resulted in the selection of a total of 52 private schools.

Within each school, approximately four classes per grade (7 through 12) were chosen and these were stratified by type (e.g., advanced, bilingual).

Questionnaire

An anonymous, self-administered questionnaire was designed that could be completed during one class period. The questionnaire was administered to all students present on the date of the survey. The survey instrument was printed in an easily readable format suitable for machine optical scanning.

The questionnaire included personal/demographic information such as age, sex, and ethnicity, as well as extensive information on alcohol and other substance-use behaviors, and the problems and consequences associated with substance use.

Quality Control

Internal consistency checks were built into the questionnaire to permit elimination of inconsistent and frivolous responses. Of the 27,414 completed questionnaires, fewer than 100 were excluded because of gross inconsistency, leaving a final sample of 27,335.

Weighting Scheme

A weighting scheme, i.e., a statistical adjustment, was designed to produce an unbiased picture of New York State students. Students who reported high rates of truancy were given a greater weight to compensate for truants who were absent. The weights were then adjusted so that for each combination of geographic strata, grade level, and school type (public, Catholic, etc.), the sum of the weights were proportional to the number of students in that classification in the state.

Statistical Analysis

The progressive nature of initiation into drug use was analyzed using Guttman scaling. In our application, each item reflected whether the respondent had ever used a drug (or one of a group of drugs) or not. The drug-use scale is a good Guttman scale if those who have used any given drug have used the more common drugs also. Guttman scaling can be seen to be an ideal method to test for progressive patterns of drug use, and several investigators (Donovan and Jessor, 1983; Yamaguchi and Kandel, 1984) have used it as such.

If ever-used drug variables constitute a good Guttman scale, it can be assumed that the use of the drugs has been initiated in the scale order. For example, if a substantial number of persons used hard drugs before alcohol, the survey would have caught some of them in the interval between their first use of hard drugs and their first use of alcohol, producing some "nonscale" respondents who report hard drug use, but no alcohol use. The existence of a very small number of these nonscale respondents implies a time sequence in the first use of alcohol and hard drugs.

The drugs reported in this survey were categorized into six groups, using a variation of the grouping of Donovan and Jessor (1983). Our groups were alcohol, cigarettes, marijuana, over-the-counter drugs (this group consisted of solvents, glue, air fresheners, and nonprescription cough medicines), pills (this group consisted of barbiturates, amphetamines, and tranquilizers), and hard drugs (this group consisted of heroin, cocaine, and hallucinogens).

Ever-used dichotomous variables were used rather than basing the variable on whether or not the respondent had used the drug some substantial number of times. Preliminary analyses showed that "substantial-use" variables do not have good Guttman scale properties, whereas ever-used variables do.

Table I. Percent Ever-Used Six Drug Groups by New York State Students, Seventh Through Twelfth Grades

	N^a	Alcohol	Cigarettes	Marijuana	Over the counter	Pills	Hards
Overall	27,307	83	49	45	33	29	18
Male	13,519	85	43	47	35	28	20
Female	13,707	80	55	44	31	30	16
Ages 11–13	6,642	66	35	18	29	12	6
Ages 14–16	13,982	86	52	49	35	31	18
Ages 17–20	6,647	93	57	66	32	43	29
White	19,509	85	51	45	34	33	17
Oriental	524	62	41	23	31	20	12
American Indian	135	86	48	55	40	42	27
Black[b]	3,027	78	43	54	26	14	16
West Indian	706	80	37	39	25	13	9
Hispanic	2,329	78	46	46	35	23	21

[a]*N*'s of subgroups do not add up to overall *N* because variables defining subgroups were occasionally missing.
[b]Except West Indian.

RESULTS

Table I shows the prevalence of ever having used various drugs among New York State high-school students. Alcohol is by far the most commonly used drug. It has an ever-used rate of 83%, with the next highest rate being 49% for cigarettes. Males generally have higher ever-used rates for various drugs than females. The exceptions are pills and, particularly, cigarettes, which 12% more girls have tried than boys. Rates of use increase strongly with age, except for over-the-counter drugs. This increase is quite dramatic for marijuana, which has been used by 18% of respondents in the 11–13 age range, but 66% in the 17–20 age range.

Rates of drug use vary substantially among ethnic groups. American Indians have the highest rates in every drug category except cigarettes. Whites generally have high use rates. Blacks have low use rates except for marijuana. West Indians have about the same rates as other blacks for alcohol, over-the-counter drugs and pills, but have substantially lower rates of use in other categories. Hispanics are below average in the use of alcohol, cigarettes, and pills. Orientals have generally low rates of alcohol and other drug use.

The heaviest alcohol- and other drug-using groups are American Indians and whites, with blacks and Hispanics using at intermediate rates. Orientals and West Indians have lower rates of alcohol and other drug use than the other groups.

A scan of Table I shows that alcohol is always by far the most common drug in both sexes, and in all age and ethnic groups, with hard drugs being the least common except among blacks, who have used hard drugs more often than pills. Pills are always less commonly used than marijuana.

To investigate the progression of drug use with Guttman scaling, a "bottom-up" approach was used. Table II shows the scalability coefficients for each pair of drug groups. The scalability coefficient is a statistic that measures the extent to which a group of variables form a Guttman scale and that takes into account the marginal frequencies of the variables. It varies from 0 to 1, with 1 designating a perfect scale. Table II shows the coefficients for each possible two-variable scale, which measures the extent to which the survey respondents have not used the drug indicated in the column unless they had also used the drug indicated in the row. For example, the 0.99 in the upper right-hand corner means that the respondents almost never used hard drugs unless they had also used alcohol. There is also an implication that they used alcohol first, since if substantial numbers were intiating hard drugs before alcohol, the survey would catch some of these in the interval between initiating hard drugs and alcohol, and the coefficient would be lower than 0.99.

Table II. Scalability Coefficients for Drug Pairs

	Alcohol	Cigarettes	Marijuana	Over the counter	Pills	Hards
Alcohol		0.95	0.97	0.94	0.98	0.99
Cigarettes			0.79	0.76	0.84	0.89
Marijuana				0.72	0.88	0.98
Over the counter					0.64	0.78
Pills						0.86

The first row of Table II delivers a potent message. Respondents had not used any of the other drugs unless they had used alcohol also. Other than with alcohol, over-the-counter drugs do not scale well. Cigarettes are the second worst in scalability, although they scale a good deal better than over-the-counter drugs. Few respondents, for example, had used hard drugs without also having used cigarettes. Marijuana scales very well with alcohol and hard drugs, and fairly well with pills. The overall picture suggests a progression from alcohol to marijuana to pills to hard drugs, with cigarettes playing a lesser role.

Table III shows the scalability coefficients of four different scales—overall, and for several sex and age groups. A rough rule of thumb is that a coefficent above 0.7 is a good scale, although this has to be applied guardedly because there is a tendency for shorter scales to have higher coefficients, all other things being equal. Looking at the first row of Table III, we see that the scales containing over-the-counter drugs have mediocre scalability. Aside from their coming after alcohol in the drug-use sequence, they follow

Table III. Scalability Coefficients of Possible Scales for Sex and Age Groups[a]

	AMPH	ACMPH	AMOPH	ACMOPH
Overall	0.84	0.75	0.63	0.62
Males	0.85	0.69	0.66	0.59
Females	0.83	0.78	0.65	0.65
Ages 11–13	0.81	0.76	0.68	0.60
Ages 14–16	0.84	0.75	0.65	0.63
Ages 17–20	0.82	0.68	0.67	0.60
Males aged 11–13	0.82	0.74	0.70	0.61
Males aged 14–16	0.85	0.68	0.67	0.59
Males aged 17–20	0.83	0.68	0.69	0.61
Females aged 11–13	0.81	0.77	0.67	0.63
Females aged 14–16	0.83	0.78	0.66	0.66
Females aged 17–20	0.82	0.68	0.66	0.60

[a]AMPH: alcohol–marijuana–pills–hards; ACMPH: alcohol–cigarettes–marijuana-pills-hards; AMOPH: alcohol-marijuana-over the counter-pills-hards; ACMOPH: alcohol-cigarettes-marijuana-over the counter-pills-hards.

Table IV. Scalability Coefficients of Possible Scales for Ethnic Groups[a]

	AMH	AMPH	ACMPH	AMOPH	ACMOPH
White	0.97	0.88	0.79	0.64	0.63
Oriental	0.94	0.81	0.77	0.65	0.60
Indian	0.95	0.81	0.68	0.67	0.62
Black	0.91	0.80	0.67	0.61	0.57
West Indian	0.96	0.75	0.65	0.58	0.55
Hispanic	0.94	0.75	0.65	0.62	0.58

[a]AMH: alcohol-marijuana-hards; AMPH: alcohol-marijuana-pills-hards; ACMPH: alcohol-cigarettes-marijuana-pills-hards; AMOPH: alcohol-marijuana-over the counter-pills-hards; ACMOPH: alcohol-cigarettes-marijuana-over the counter-pills-hards.

no set pattern. For all groups, the alcohol-marijuana-pills-hard drugs (AMPH) scale is very good, with all the coefficients above 0.8. There is a strong tendency to initiate the use of these drugs in the scale order—first alcohol, then marijuana, followed by pills, and finally hard drugs. The scale including cigarettes (ACMPH) is quite inferior to AMPH for older students, but does nearly as well for younger students, particularly females. For younger students, and particularly females, cigarettes serve as a stepping stone from alcohol to marijuana. This is much less true for older students.

Table IV shows the coefficients for various scales among the ethnic groups. Drug use is more progressive among whites than among minorities. No scales containing over-the-counter drugs are acceptable for whites or several of the ethnic groups. The AMPH scale is at least acceptable in every group, but is excellent for whites, while marginal for Hispanics. A comparison of the first and second columns (AMH and AMPH scales) shows that the removal of pills improves the scalability less for whites than for any other group. Pills are an important stepping stone among whites, but not as much among minorities. An examination was made of matrices of two-drug coefficients for each ethnic group. These matrices, not shown here, are analogous to Table II, but contain only data for each separate ethnic group. Among all of the minority groups, the pill-hard drugs coefficient is much lower than it is among whites. Figures 1 and 2 show models of drug progession among

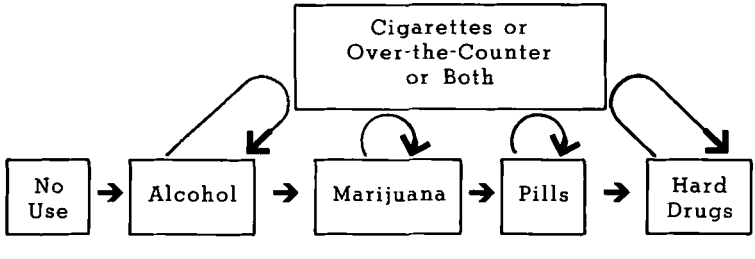

Fig. 1. First-use progression among white New York State secondary-school students.

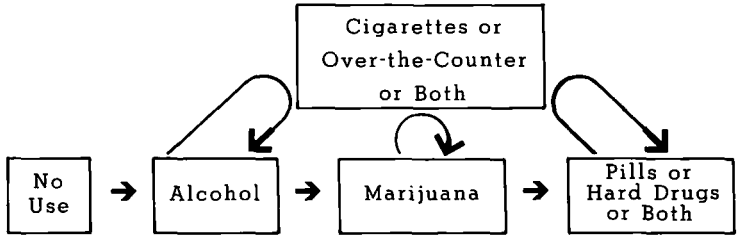

Fig. 2. First-use progression among black and Hispanic New York State secondary-school students.

whites, and blacks or Hispanics, respectively. These diagrams are, of course, an oversimplification, but they make the point that pills are important in the transition to hard drugs for whites, but less so for blacks or Hispanics. Both whites and minorities may use cigarettes or over-the-counter drugs at any stage after alcohol, or not at all.

DISCUSSION

Alcohol emerges as the "entry drug" for New York State teenagers. Unless alcohol is used first, there is very little use of any other drug, including cigarettes and over-the-counter drugs. New York State youth of every age and sex combination—as well as every ethnic group—follow a definite patter of progression from alcohol to marijuana to hard drugs. For whites, pills are an important step between marijuana and hard drugs, but not so important for minorities. Among blacks, in fact, use of hard drugs is more common than use of pills. Cigarettes are an intermediate step between alcohol and marijuana for younger teenagers, particularly if they are female.

Doubtless, the availability of drugs in various subcultures influences the sequential pattern. Among minorities, as compared with whites, hard drugs may be more common and pills less common. Cigarettes may serve as a stepping-stone for younger and female teenagers because smoking is a more deviant act for those groups than for older males. Once a young person has used a certain drug that to him/her seems risky or deviant, it is a smaller step to the next more risky or deviant drug.

What are we to make, in general, of this recurring finding of invariant sequences of initiation into drug use? Yamaguchi and Kandel (1984) have suggested that this phenomenon may indicate "the association of each class of drugs with different ages of initiation and/or individual attributes." Ages of initiation can explain why certain drugs, if they are used, are always used

first in a definite order. They cannot explain why young people never use a certain drug unless they have used the other first. In the present study, among over 27,000 young people, over 22,000 have used alcohol and 4,600 have used hard drugs. Only 40 individuals (0.1%), however, reported use of hard drugs without ever having used alcohol. This striking statistic cannot be explained merely by saying that greater age is associated with initiation of hard drugs, because, not only do these young people initiate use of hard drugs at a greater age than alcohol, but almost everyone who uses hard drugs also uses alcohol.

The same can be said of "individual attributes." Some people are willing to assume more risk than others. Nearly everyone associates more risk with the use of hard drugs than with alcohol. An explanation based on readiness to accept risk can explain why anyone who is willing to use hard drugs would also be willing to use alcohol, but it does not explain why he/she actually does so. Perhaps the pervasiveness of alcohol in our society might explain this result, but what can explain the progression from pills to hard drugs?

O'Donnell and Clayton (1982) have suggested that involvement in the drug subculture may be an intervening variable in the stepping-stone phenomenon from marijuana to heroin. Their idea is that once marijuana supplies an entry into the drug subculture, the young person makes the contacts that will eventually make it possible to use heroin if he/she is inclined. The problem with this theory is that it cannot serve as a general explanation of the stepping-stone phenomenon, because there is an equally strong stepping-stone effect from alcohol, which is legally sanctioned, to marijuana, which is not.

O'Donnell and Clayton (1982) have argued that the stepping-stone phenomenon is not merely a matter of correlation between the use of Drug A and Drug B, but that use of Drug A is a necessary (but not sufficient) cause for the use of Drug B. They point out that, in the case of marijuana and heroin, the generally-accepted criteria for causality are met:

1. their use is correlated,
2. marijuana use preceeds heroin use, and
3. their association has not been shown to be spurious.

We agree that the stepping-stone effect is unlikely to be caused by "third factors"; it seems more likely that the use of a particular drug makes the use of the next drug in the sequence, considered the next most risky or deviant, seem a smaller and more acceptable step to the young person. By whatever process, the use of a drug, in and of itself, makes the use of the next in the sequence much more likely. The general policy implication of this conclusion is that if a particular individual is stopped at one point in the sequence, he/she will go no farther. The progressively greater legal tolerance

for marijuana, although it may be seen as desirable for reasons of political philosophy (on which we cannot comment here), is not a favorable development from the point of view of public health. While all marijuana users do not go on to use harder drugs, nonetheless they are the population at risk for use of harder drugs. When the use of marijuana expands, the population at risk grows greater.

While a great deal of emphasis on the stepping-stone theory has centered around marijuana use, it is critically important to note that alcohol preceeds marijuana in the developmental sequence and that alcohol serves as the gateway to other drug use. Stated simply, alcohol use preceeds *all* other drug use. These results tend to justify a jaundiced view of the use of alcohol by adolescents. A recent philosophy of alcohol education has had the goal of teaching "responsible" or "social" drinking. This approach was developed as a more realistic one, given that a majority of adolescents drink alcoholic beverages. However, this practice has been attacked as initiating young people into subsequent alcohol abuse or alcoholism. The results from the present study indicate that the philosophy of teaching responsible drinking is also vulnerable to the charge that it opens the gate to the use of other drugs.

ACKNOWLEDGMENTS

The authors would like to express appreciation to Drs. Blanche Frank, James Schmeidler, Rozanne Marel, and Douglas Lipton from the New York State Division of Substance Abuse Services for their cooperation throughout this collaborative study. The data-processing assistance of Philip Matthei and Paula Richards is gratefully acknowledged. Thanks is also given to Kathleen Callanan who typed the tables and text for this article.

REFERENCES

Adler, I., and Kandel, D. (1981). Cross-cultural perspectives on developmental stages in adolescent drug use. *J. Stud. Alcohol* 42: 701-715.

Donovan, J. E., and Jessor, R. (1983). Problem drinking and the dimension of involvement with drugs: A Guttman scalogram analysis of adolescent drug use. *Am. J. Pub. Hlth.* 73: 543-552.

Federal Bureau of Narcotics. (1965). *Living Death: The Truth About Drug Addiction.* (pamphlet). U. S. Government Printing Office, Washington, D. C.

Huba, G. J., Wingard, J. A., and Bentler, P. M. (1981). A comparison of two latent causal models for adolescent drug use. *J. Person. Soc. Psychol.* 40: 180-193.

Johnson, B. D. (1973). *Marihuana Users and Drug Subcultures,* John Wiley & Sons, New York, pp. 90-121.

Johnston, L. (1973). *Drug and American Youth: A Report from the Youth in Transition Project,* Institute for Social Research, University of Michigan, Ann Arbor, Mich.

Kandel, D. B. (1975). Stages in adolescent involvement in drug use. *Science 190: 912-914.*

Kandel, D. B., and Faust, R. (1975). Sequence and stages in patterns of adolescent drug use. *Arch. Gen. Psychiatr.* 32: 923-932.

Mills, C. J., and Noyes, H. L. (1984). Patterns and correlates of initial and subsequent drug use among adolescents. *J. Consult. Clin. Psychol.* 52(2): 231-243.

O'Donnell, J. A. (1979). Determinants of early marihuana use. In Beschner, G. M., and Friedman, A. S. (eds.), *Youth Drug Abuse: Problems, Issues, and Treatment*, D. C. Heath, Lexington, Mass.

O'Donnell, J. A., and Clayton, R. R. (1982). The stepping-stone hypothesis: A reappraisal. *Chem. Depend.* 4: 229-241.

Yamaguchi, K., and Kandel, D. B. (1984). Patterns of drug use from adolescence to young adulthood: III. Predictors of progression. *Am. J. Pub. Hlth.* 74: 673-681.