RELIABILITY AND VALIDITY OF THE DATA AND MEASURES FROM TWO NATIONAL SURVEYS OF ADOLESCENT DRINKING

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Reliability and validity are basic issues in any type of research and are especially important to the study of the attitudes, motivations and behaviors of adolescents in areas such as alcohol use, drug use and deviant behavior. The fundamental issues of reliability and validity may be more difficult to examine in studies of adolescents. The usual problems of recall, recognition and reporting could be compounded by a number of factors more characteristic of adolescent than adult experience such as peer pressure, rapidly changing attitudes, maturation, exposure to new experiences and parental sanctions. The subject area of reports, the context in which the reports were obtained and the point of the respondent in the developmental process are some of the confounding issues that might affect interpretations of the reliability and validity of the data. Despite these problems, evidence of reliability and validity is available.

In studies of drug use among high school students, Haberman et al. (1972) found adequate levels of internal consistency. Mayer and Filstead (1979) found high test-retest reliabilities of a measure of alcohol involvement for adolescents. Johnston (1973) reports that the drug use questions in his survey of high school students had a nonresponse rate of less than two percent, even though respondents were specifically instructed not to answer questions that made them uncomfortable or would force them to misrepresent themselves to the interviewer. Length of recall also has been found to affect reports of prevalence (Uppal, Babst, and Schmeidler, (1977).

Although the use of construct validation procedures in alcohol research among high school students has been limited. Kandel (1975), Jessor and Jessor (1978) and Johnston (1973) argue that the patterns of relationships among alcohol and drug use and other behaviors are consistent with current theories of substance abuse. Attempts have been made to compare self-reported use with perceptions of friends' use. In one study 63 percent of adolescents whose best friends were drug users reported drug use compared to 22 percent of those whose best friends were nonusers (Single, Kandel, and Johnson, 1975). Users have been found to differ from non-users on a number of variables not directly connected to drug use including absenteeism (Single, Kandel, and Johnson, 1975), poor school performance, delinquency, and countercultural lifestyle (Johnston, 1974). No studies have attempted to verify reports of adolescent alcohol use with chemical tests, record searches or proxy reports.

This paper discusses the examination of the validity and reliability of the data in the 1974 and 1978 surveys of adolescent drinking conducted by RTI and the construct validity of indices of alcohol use and misuse developed for the study. The context for this discussion involves the potential problems in obtaining reliable, valid and useful data from adolescents concerning behaviors usually considered deviant by society.

I. METHODOLOGY

The 1974 study consisted of a stratified random sample of 13,122 participants who were in grades 7 - 12 during the spring of 1974. The 1978 study consisted of two components: one composed of 4,918 participants who were in grades 10 - 12 during the spring of 1978; the second composed of 839 participants who had been 7th - 8th graders in the spring of 1974 and had participated in the 1974 study (Rachal et al., 1975; 1980).

Data were collected using a basic 33-page self-administered questionnaire. The structure of the instrument was based on the problem-behavior theory developed by Jessor and Jessor (1973). Selected items from the personality, perceived envionment, and behavior systems of explanatory variables in problem behavior theory were included. The questionnaire required about 45 minutes to complete and was administered during regular class periods during the spring of 1974 and the spring of 1978. Names of the respondents were not entered on the instruments, which were sealed in envelopes upon completion. All aspects of the survey administration were conducted by survey staff of the Research Triangle Institute and did not involve teachers or other school officials.

II. INTERNAL VALIDITY OF THE DATA

In the 1974 and 1978 studies, various dimensions of internal validity were examined. The examination of two of these dimensions, item response rates and response consistency, are discussed in this paper.

Item Response Rates

A list of 19 items items were drawn from each of the major sections of the questionnaire to cover a wide range of topics and question formats. We examined the percentages of missing responses for each item for the 10th-12th graders in both the 1974 and 1978 studies. We excluded response rates for the 7th-9th graders in the 1974 study to attain comparability in reading ability and experience.

The rates of missing data ranged from 0.0 percent for school grade to 8.5 percent for the desire to try cocaine. In general these missing data rates are comparable to those found in other studies.

The rates of missing data were generally higher in 1978 though the questionnaires and instructions were generally the same for both studies. The two major differences that might affect responses are that (1) the 1974 form was machine scored and (2) the 1978 questionnaire indicates that respondents in 1974 were followed and reinterviewed.

We also examined the possible effects of the threatening nature of questions on nonresponse. The average rate of missing data for the low threat questions was 1.34 percent in 1974 and 2.92 percent in 1978 compared to rates for the high threat questions of 3.28 percent in 1974 and 4.02 percent in 1978. These data appear to support the idea that more missing data will occur in questions that are perceived as threatening (Bradburn et al., 1977).

Response Consistency

An extensive analysis of the consistency of responses within questionnaires in the 1974 and 1978 cross-sectional studies and across questionnaires in the panel study was conducted by Jessor, Donovan and Widmer (1980).

There are a number of questions regarding respondents' use, frequency and quantity of use, and experience of effects or consequences of use of alcohol and illicit drugs. It was possible to determine their consistency of response to these behavior questions. Separate examinations of internal, logical consistency of answers to the drinking and drug use questions were carried out. An example of an inconsistent response is a report in one question of never drinking, yet later providing an age when he or she had a first drink. Almost 90 percent of the 10th-12th graders in 1974 and 96 percent in 1978 gave logically consistent responses to both the drinking and drug-use items, while less than one percent gave inconsistent responses to both these sets of questions. After checking discrepancies among subgroups in the sample and excluding inconsistent respondents, the consistent subsample was not markedly different from the larger sample in its socio-demographic composition.

III. CONSTRUCT VALIDITY OF THE DRINKING LEVEL MEASURES

Frequency and quantity measures can be used separately to classify drinking levels. Early analysis of the quantity and frequency items in the 1974 Study, however, showed that many teenagers drink small amounts relatively frequently. Thus, a simple frequency typology would overstate the drinking patterns of a significant proportion of the sample.

Classification schemes consisting of a relatively small number of categories and using both quantity and frequency information have been efficiently used in the past. Quantity-frequency (Q-F) indices provide classifications for analysis and meaningful definitions of consumption levels. In this section, we describe the validation of the Main Drinking Level (MDL) used to delineate adolescent drinking levels in the 1974 and 1978 RTI studies.

Ten quantity-frequency categories were developed based on consumption of absolute alcohol per day and frequency of consumption. These ten categories were then combined into the six drinking level groups shown in table 1. At least two issues are evident. One is the appropriateness of the labelling of the six MDL groups and the relationship of these names to each other. The second is whether the combinations of quantity-frequency (Q-F) categories in each MDL group are justified.

Correlates of Drinking Levels

In table 2 we present the correlates of the major levels of drinking in the 1978 study. From this table it is clear that higher proportions of heavier and moderate heavier drinkers use higher amounts on the average drinking occasion, have a higher consumption of absolute alcohol per day, and have drunk a higher volume of alcohol on one occasion. Self-reported problems, episodes of drunkenness, and number of alcohol related problems areas also increase with drinking levels. Other correlates, including drinking alone, drinking and driving, importance of personal effects of drinking and the use of marihuana follow the same pattern. From these results, it seems clear that the MDL drinking level index does represent a useful and meaningful indication of involvement in drinking.

Comparison with Alternative Definitions of Drinking Levels

In working with this data set, other definitions, other labels and different combinations of drinking categories could have been used. In table 2 we also show the correlates of the MDL drinking level index with the basic quantity and frequency measures. The patterns of relationships are essentially the same - as frequency, quantity or drinking level rises, more alcohol is consumed, more problems are reported and more negative behavior, such as drinking alone, driving after drinking, or marihuana use, is reported.

Two patterns of results, each at the extremes of the distribution, indicate the drinking level index may be a better measure of drinking involvement than either quantity or frequency. The "small" quantity, for example, appears to be composed of teenagers who have fewer drinking related problems and who show less negative behavior than those in the infrequent/light category which is largely composed of drinkers of small amounts. On the other hand, the "once a month or less" frequency measure has higher proportions of teenagers with drinking problems and those who display negative behavior than the infrequent/ light classification which is largely composed of these low frequency drinkers. (See table 1 for the definitions of the drinking types.) Similarly, the heavier drinking level category appears to be more useful than either the "large" quantity or "once a week or more" frequency measures. Clearly, the heavier drinkers drink greater amounts and drink more frequently than the other drinking groups. They also report more drinking related problems and more negative behaviors associated with drinking. From these analyses, the use of the MDL index seems more appropriate to classify drinking patterns, especially very minimal or heavy patterns, than quantity or frequency measures alone.

IV. CONSTRUCT VALIDITY OF ALCOHOL MISUSE

In this section the definition of alcohol misuse used in the studies and the association and significance of this definition for several important variables are briefly reviewed. The discussion provides information relating to the

conceptual and operational adequacy of this definition compared to other definitions.

At least four definitions of alcohol misuse can be developed from the data in the study. An adolescent who is more than a minimal drinker and who reported being drunk six or more times or who reported two or more episodes of alcohol related problems in three areas is classified as an alcohol misuser according to criteria established by Jessor and Jessor (1973). Other definitions are based on self-admission of a problem, self-report of six or more times drunk in the past year, and self report of alcohol related problems in three or more areas in the past year.

Correlates of Misuse

The alcohol misuser group differed significantly from alcohol users and nonusers in the expected direction for each of several variables examined. There were statistically significant differences between the user and misuser groups across a variety of social and behavioral variables (Rachal et al., 1980).

Alcohol misusers could have been so classified mainly because of responses to items in the "drunk" question or to the items concerning problem areas. In table 3, the data from both the 1974 and 1978 studies show high proportions of alcohol misusers who reported being drunk at least once or twice a month (43.7 percent, 1974; 37.2 percent, 1978) or being drunk at least once a week (29.0 percent, 1974; 42.7 percent, 1978). For most alcohol misusers negative consequences were also involved (80.5 percent, 1974; 71.7 percent, 1978). Many (25.4 percent, 1974; 15.3 percent, 1978) reported alcohol related problems in three or more areas.

The data (see table 3) indicate that most young people identified as alcohol misusers were involved in a substantial amount of drinking. High proportions (81.6 percent, 1974; 78.0 percent, 1978) were identified as moderate/heavier or heavier drinkers. Misusers also reported using five or more drinks on the average drinking occasion (73.5 percent, 1974; 68.4, 1978) and drinking at least once a week (67.7 percent, 1974; 63.3 percent, 1978). A majority (68.8 percent, 1974; 58.9 percent, 1978) reports using twelve or more drinks in a single drinking episode. Few (3.9 percent, 1974; 7.9 percent, 1978) report never having more than five drinks. Evidence from these reports supports the concept that alcohol misusers do drink frequently and drink large amounts.

As stated previously, alcohol misusers reported a high frequency of times drunk and alcohol related problems in a number of areas. We see in table 3 that in addition 22.7 percent in 1974 and 15.6 percent in 1978 admitted that alcohol had been a problem, and majorities of self-admitted problem drinkers in each year (60.7 and 69.0 percent, respectively) were classified as alcohol misusers. These data suggest that the alcohol misuser definition taps a construct that indicates substantial trouble with drinking.

Comparison with Alternative Definitions of Misuse

In table 3, the alcohol misuser definition and other alternative definitions of alcohol misuse are correlated with a variety of measures of drinking patterns and indications of alcohol misuse. The highest correlation of the alcohol misuser definition is with the criterion of drunk six or more times; the lowest correlation is with alcohol related problems in three or more areas.

The patterns of relationship with the other variables are generally the same. As expected, the patterns are virtually the same for the alcohol misuser and the drunkenness only indices. Substitution of the drunkenness index for the alcohol misuser measure could be justified but, despite the minimal differences, the alcohol misuser construct has more general implications and a firmer theoretical base.

V. CONCLUSIONS

In this paper we have attempted to provide a foundation for the examination of the quality of the basic data and the validity and utility of the definitions and classification schemes used in two national studies of adolescent alcohol use. Although no empirical checks of response validity could be made, the evidence of item response rates and response consistency indicates that the data are reliable and valid for general descriptive analyses.

The measures used in the study were designed to obtain the data necessary for meaningful classification of drinking levels and alcohol misuse. These measures appear to be reliable and valid indicators of the behaviors assessed: indicators that will be useful to both researchers and policymakers. The MDL drinking level classification delineates the extent of alcohol use among junior and senior high school students. The MDL was based on previous quantity-frequency typologies. The more comprehensive analyses undertaken further establish the construct validity of the MDL and show that the MDL is superior to other classification schemes based on quantity or frequency alone. Alcohol misuse as defined in the studies indicates significant involvement in alcohol use and alcohol related problems. The analyses presented in this paper and elsewhere suggest that adolescents classified as alcohol misusers represent a group of teenagers whose behavior differs from others on a number of dimensions of interest to researchers, educators, alcoholism prevention and treatment personnel, policymakers and parents.

More detailed and comprehensive information on drinking levels and problem drinking might be desirable and, indeed, is necessary for some types of research, but the constraints of a large-scale, random-sample questionnaire study preclude such exhaustive assessments. Small-scale studies or clinical research focusing on specific objectives would be more appropriate sites for the detailed data collections suggested in a review of the 1974 study (Marden et al., 1976). The data from such studies might be useful in supplementing and expanding the information from these survey studies.

REFERENCES

Bradburn, N.M., Sudman, S., Blaire, E., & Stocking, C. Question threat and response bias. Sociological Methods & Research, December 1977.

Haberman, P.W., Josephson, E., Zanes, A., & Elinson, J. High school drug behavior: A methodological report on pilot studies. In S. Einstein & S. Allen, (Eds.), Proceedings of the First International Conference on Student Drug Surveys. Farmingdale, N.Y: Baywood Publishing Co., 1972.

Jessor, R., Donovan, J.E., & Widmer, K. Adolescent drinking behavior-Volume II. Psychosocial factors in adolescent alcohol and drug use: the 1978 national sample study and the 1974-78 panel study. Research Triangle Park, N.C.: Research Triangle Institute, 1980.

Jessor, R., & Jessor, S.L. Problem behavior and psychosocial development: a longitudinal study of youth. New York: Academic Press, 1978.

Jessor, R. & Jessor, S.L. Problem drinking in youth: personality, social and behavioral antecedents and correlates. Proceedings of the Second Annual Alcoholism Conference. Rockville, Md.: National Institute on Alcohol Abuse and Alcoholism, 1973, 3-23.

Johnston, L. Drug use during and after high school: Results of a national longitudinal study. American Journal of Public Health Supplement, Part Two, 1974, 64, 29-37.

Johnston, L. Drugs and American Youth. Ann Arbor, Mich.: Institute for Social Research, 1973.

Kandel, D. Stages in adolescent involvement in drug use. Science, 1975, 190, 912-914.

Marden, P., Zylman, R., Fillmore, K.M., & Bacon, S.D.. Comment on a national study of adolescent drinking behavior, attitudes and correlates. Journal of Studies on Alcohol, 1976, 37, 1346-1358.

Mayer, J., & Filstead, W.J. The Adolescent Alcohol Involvement Scale. An instrument for measuring adolescents' use and misuse of alcohol. Journal of Studies on Alcohol, 1979, 40, 291-300.

Rachal, J.V., Guess, L.L., Hubbard, R.L., Maisto, S.A., Cavanaugh, E.R., Waddell, R., & Benrud, C.H. Adolescent drinking behavior - Volume I. The extent and nature of adolescent alcohol and drug use: the 1974 and 1978 national sample studies. Research Triangle Park, N.C.: Research Triangle Institute, 1980. (NTIS No. PB 81-199267)

Rachal, J.V., Williams, J.R., Brehm, M.L., Cavanaugh, B., Moore, R.P., & Eckerman, W.C. A national study of adolescent drinking behavior, attitudes and correlates. Research Triangle Park, N.C.: Research Triangle Institute, 1975. (NTIS No. PB-246-002)

Single, E., Kandel, D., & Johnson, B. The reliability and validity of drug use responses in a large scale longitudinal survey. Journal of Drug Issues, 1975, 5, 426-443.

Uppal, G.S., Babst, D.V. & Schmeidler, J. Assessing age-ofonset data on substance abuse among New York State public secondary school students. American Journal of Drug and Alcohol Abuse, 1977, 4, 505-515.

Table 1: 1974 and 1978 RTI Studies: Components of Drinking Levels and Unweighted Percentages, 10th-12th Graders

Drinking Level Group (Frequency/Quantity)	1974	1978
Abstainers (No use)	20.0%	23.0%
Infrequent (≤ Once a month/ ≤ 1 drink)	10.7	8.1
Light	17.5	19.3
(≤ Once a month/2-4 drinks)	(15.4)	(17.3)
(3-4 times a month /≤ 1 drink)	(2.1)	(2.0)
Moderate	18.0	17.0
(≤ Once a month/≥ 5 drinks)	(5.1)	(4.7)
(3-4 times a month/2-4 drinks)	(11.0)	(10.8)
(≥ Once a week/≤ 1 drink)	(1.9)	(1.5)
Moderate/Heavier	17.9	17.9
(3-4 times a month/≥ 5 drinks)	(7.5)	(6.9)
(≥ Once a week/2-4 drinks)	(10.4)	(11.0)
Heavier (≥ Once a week/≥ 5 drinks)	15.9	14.7

Table 2

1978 RTI Study: Relationships of Drinking Behaviors, Attitudes,
and Alternative Definitions of Drinking Level, 10th-12th Grades

	Quantity			Frequency			Quantity-Frequency			
	Small	Medium	Large	Once a Month or Less	3-4 Times a Month	Once a Week or More	Infrequent/ Light	Moderate	Moderate/ Heavier	Heavier
Drinking Level										
Infrequent/ Light	90.1%	44.2%	- %	85.9%	10.2%	- %	100.0%	- %	- %	- %
Moderate	9.9	27.7	18.1	14.1	55.0	5.5	-	100.0	-	-
Moderate/ Heavier	-	28.1	26.1	-	34.8	40.4	-	-	100.0	-
Heavier	-	-	55.8	-	-	54.1	-	-	-	100.0
Sample n	738	1921	1291	1649	968	1333	1515	838	876	721
Highest Average Amount Used										
Small (One Drink or Less)	80.1	4.3	0.0	34.7	6.1	3.1	41.6	4.9	0.1	0.0
Medium (2-4 Drinks)	18.8	87.1	0.0	49.5	52.7	36.5	56.4	59.9	52.1	0.0
Large (5 or More Drinks)	1.1	8.6	100.0	15.8	41.2	60.4	2.0	35.2	47.8	100.0
Sample n	738	1921	1291	1649	968	1333	1515	838	876	721
Absolute Alcohol Per Day										
Less than .69 ozs.	99.2	88.8	47.7	100.0	91.0	39.3	100.0	99.3	65.5	18.5
.69-2.00 ounces	0.8	10.2	36.6	0.0	9.0	44.1	0.0	0.7	32.3	53.5
More than 2.00 ounces	0.0	1.0	15.7	0.0	0.0	16.6	0.0	0.0	2.2	28.0
Sample n	738	1921	1291	1649	968	1333	1515	838	876	721
Highest Amount Ever Used										
3 Drinks or Less	72.5%	15.9%	0.2%	41.7%	11.3%	4.1%	48.9%	9.9%	3.3%	0.1%
4-5 Drinks	15.2	28.8	1.5	22.7	18.8	9.5	25.8	22.3	11.8	0.4
About 6 Drinks	5.8	22.3	7.8	13.0	19.9	12.2	12.1	24.3	17.4	4.3
About 9 Drinks	3.7	16.2	22.7	11.5	21.1	17.7	7.9	21.3	24.7	16.0
12 or More Drinks	2.8	16.8	67.8	11.1	29.0	56.5	5.3	22.2	42.9	79.2
Sample n	738	1884	1290	1613	967	1332	1479	837	876	720
Self-Admission of a Drinking Problem										
Not a Problem	97.8	93.5	85.2	96.7	91.9	85.1	97.4	92.5	89.5	80.9
Mild Problem	1.7	5.8	11.9	2.7	7.4	12.0	2.2	6.7	8.9	15.0
Considerable Problem	0.4	0.6	1.9	0.4	0.6	1.9	0.3	0.7	1.3	2.3
Serious Problem	0.1	0.2	1.0	0.1	0.1	1.1	0.1	0.0	0.4	1.8
Sample n	722	1836	1246	1579	947	1278	1448	816	854	686
Times Drunk										
Not Drunk	73.1	26.8	3.9	50.4	17.9	8.0	57.1	19.9	7.8	2.0
One Time	13.4	17.2	5.3	19.0	12.6	4.6	19.6	15.2	7.1	1.4
2-5 Times	9.1	28.4	21.6	21.3	30.2	18.3	17.5	36.5	26.2	12.0
6-10 Times	1.4	5.9	12.3	4.1	11.2	8.0	2.4	9.9	11.1	9.1
Once or Twice a Month	1.4	12.5	22.9	3.6	19.0	22.6	2.3	12.7	27.3	22.7
Once a Week or More	1.7	9.2	34.1	1.7	9.1	38.5	1.2	5.9	20.4	52.8
Sample n	724	1835	1265	1578	952	1294	1447	820	856	701

Table 3
1974 and 1978 RTI Studies: Relationships of Drinking Behaviors and Indicators of
Problem Drinking to Alternative Definitions of Alcohol Misuse, 10th-12th Graders

	Self-Admission of Drinking Problem		Drunk Six or More Times		Alcohol Related Problems in Three Areas*		Alcohol Misusers,** (Combined Drunkenness and Alcohol Related Problems)	
	1974	1978	1974	1978	1974	1978	1974	1978
Drinking Level								
Infrequent/Light	12.1%	13.0%	4.1%	6.5%	6.9%	8.3%	3.6%	5.6%
Moderate	14.6	18.8	14.2	16.4	12.7	10.5	14.8	16.4
Moderate/Heavier	30.6	27.8	34.8	35.4	30.4	25.6	35.4	36.2
Heavier	42.7	40.4	46.9	41.7	50.0	55.6	46.2	41.8
Sample n	560	324	1498	1422	510	277	1470	1394
Highest Amount Ever Used								
3 Drinks or Less	5.0	3.4	0.7	2.4	3.1	3.3	0.6	1.7
About 4-5 Drinks	5.2	12.0	3.2	6.0	3.9	3.3	3.3	6.2
About 6 Drinks	11.8	13.9	9.7	12.2	7.3	8.0	10.1	12.0
About 9 Drinks	17.5	14.5	17.0	21.0	13.9	12.7	17.2	21.2
12 or More Drinks	60.5	56.2	69.4	58.5	71.8	72.7	68.8	58.9
Sample n	560	324	1498	1420	510	275	1470	1394
Self-Admission of Problem Drinking								
Not a problem	- %	- %	78.0%	84.7%	60.8%	64.3%	77.3%	84.4%
Mild Problem	82.7	82.7	17.7	12.1	31.5	26.0	18.3	12.5
Considerable Problem	9.5	11.7	2.5	2.2	4.6	6.7	2.7	2.1
Serious Problem	7.8	5.6	1.8	1.0	2.9	3.0	1.7	1.0
Sample n	560	324	1498	1395	510	269	1470	1368
Times Drunk in Past Year								
Not Drunk	5.4%	6.5%	-	-	3.4%	3.3%	0.1%	0.0%
One Time	7.3	6.5	-	-	3.0	2.6	0.1	0.1
2-5 Times	29.6	20.6	-	-	22.6	17.7	1.9	1.0
6-10 Times	11.1	11.8	25.8%	19.4%	14.5	10.7	25.2	19.0
Once or Twice a Month	22.1	19.0	44.1	37.3	26.8	22.5	43.7	37.2
Once a Week or More	24.5	35.5	30.1	43.3	29.7	43.2	29.0	42.7
Sample n	560	321	1498	1422	510	271	1470	1394
Number of Problem Areas								
None	14.5	18.4	20.0	29.1	-	-	19.5	28.3
1-2	50.8	51.7	56.1	56.3	-	-	55.1	56.4
3-4	31.5	25.9	22.4	13.7	93.3	93.5	23.5	14.2
5	3.2	4.1	1.5	0.9	6.7	6.5	1.9	1.1
Sample n	559	321	1498	1420	510	277	1470	1392
Alcohol Misuser ** **Category**								
User	39.3	31.0	3.9	0.4	26.9	18.1	-	-
Misuser	60.7	69.0	96.1	99.6	73.1	81.9	100.0	100.0
Sample n	549	310	1498	1383	510	260	1470	1394

*Problems were mentioned in at least three of the five problem areas (school, friends, police, dates, or driving).

**Alcohol Misuser is defined as an adolescent who is more than a minimal drinker and who reported being drunk six or more times or who reported two or more episodes of alcohol related problems in three or more areas.

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