The Prognostic Implications of DSM-IV Abuse Criteria in Drinking Adolescents

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Abstract

Background—The validity of the DSM-IV diagnostic criteria for alcohol abuse has been questioned, and additional issues have been raised regarding the performance of this label in adolescents. While future diagnostic manuals might alter the approach to abuse, it is worthwhile to evaluate the implications of the current definition that has been in place since 1994.

Methods—The 616 12-to-19-year-old subjects (mean 16.5 years) were offspring identified in the Collaborative Study on the Genetics of Alcoholism (COGA) protocol who had ever consumed a full drink and who were followed up five years later using age-appropriate semi-structured interviews. Following the guidelines for evaluating the utility of the diagnostic labels of Robins and Guze (1970), the subjects with alcohol abuse were compared with other groups regarding clinical validators and clinical course.

Results—At initial interview, the pattern of most alcohol use and problem variables were least severe for teenagers with no diagnosis, intermediate for those with abuse, and the highest for individuals with alcohol dependence. At follow-up, 50% of those with initial abuse maintained that diagnosis, 19% developed dependence, and 31% had no DSM-IV diagnosis. Baseline alcohol abuse

predicted follow-up diagnosis even when evaluated along with initial demographic and substance use characteristics.

Conclusions—These results support some assets for the DSM-IV alcohol abuse criteria in these adolescents, including indications of both cross-sectional and predictive validities. Additional studies will need to compare the current abuse label with other possible approaches.

Keywords

Diagnosis; Alcohol; Abuse

I. Introduction

The alcohol use disorders (AUDs) of abuse and dependence are highly prevalent and costly conditions. Subsumed under the more generic label of "alcoholism," they have historically been considered to represent subgroups of patients, and the most recent diagnostic manuals list the two "axes" of abuse and dependence (Babor and Dolinsky, 1998; Saunders, 2006). The lifetime risk for alcohol dependence in adults is about 18%, and for alcohol abuse, as high as 12%, with prior year figures of 5% and 4%, respectively (Grant, 1997; Harford et al., 2005; Hasin et al., 2007; Saha et al., 2006).

The criteria for dependence, which are fairly similar across the recent versions of the Diagnostic and Statistical Manuals (DSMs) and the International Classification of Diseases (ICD), are built on the relatively clearly defined alcohol dependence syndrome proposed by Edwards (1986), who also implied the possible relevance of a second condition based on additional alcohol-related issues (Grant, 1996; Hasin and Grant, 2004; Hasin et al., 1994, 1996, 2006). In the DSM's, the second entity is called abuse, and is diagnosed through repeated interpersonal, legal, occupational or school problems, or the repeated use of alcohol in hazardous situations (American Psychiatric Association, 1994; Saunders and Schuckit, 2006). However, the ICD system rejected the inclusion of legal and social problems into the criteria for a second axis disorder because of concerns that these items change in a society over time and may have different meanings across cultures (Anthony et al., 2005; Gruenberg, 1967; Hasin et al., 2006; Ridenour et al., 2003; World Health Organization, 1992). Therefore, the ICD defines the second syndrome based solely on clearly established medical and psychological consequences related to the substance, labeling it as harmful use (Hasin et al., 2006). Both systems imply that the second label (e.g., abuse in DSM-IV) is the less severe disorder by giving dependence precedence, as abuse and harmful use can only be diagnosed in the absence of dependence. In addition, the threshold for dependence requires three or more symptoms, while abuse or harmful use can be labeled with repetitive problems in only one area (Hasin et al., 2006).

The reliability and validity of dependence have been fairly well established, but there is more controversy regarding the labels of abuse and harmful use. Potential problems include the lack of a clear conceptual framework upon which these second conditions are based, the difficulty of defining a syndrome when repetitive problems are only required in one life area, and concerns that the criterion items may be less reliable than those used for dependence (Hasin et al., 2003, 2006; Schuckit et al., 2005). Regarding reliability, evaluations of the abuse criteria in general population samples have reported reliabilities of 45% to 73% compared to 70% or higher for dependence, although several studies have noted even lower reliability estimates for abuse (Canino et al., 1999; Chatterji et al., 1997; Easton et al., 1997; Grant et al., 1996; Hasin et al., 2006; Vrasti et al., 1998). Another concern is that more than 70% of individuals with alcohol abuse endorse only one item, the use of alcohol in hazardous situations (Hasin and Paykin, 1999a; Hasin et al., 1997a; Schuckit et al., 2005). This criterion that may be particularly

age sensitive, as it most often relates to drinking and driving, while operating a motor vehicle in the absence of a parent or guardian is usually not initiated before age 16 or 17 (Hasin et al., 1999c). Additional reservations include the finding that about 15% of individuals with alcohol dependence do not also meet criteria for the potentially less severe condition, abuse (Hasin and Grant, 2004), and documentation that some of the abuse items are endorsed at a lower rate in the general population than some of the dependence criteria (Saha et al., 2006).

An additional controversy relates to whether abuse and dependence represent separate conditions. Some evaluations of the DSM-IV AUD criteria have used multivariate analyses across the four abuse and seven dependence items to observe how the two conditions are related. Several larger studies of general population samples have supported the existence of two separate factors that resemble abuse and dependence (Cottler et al., 1995; Harford and Muthen, 2001; Martin et al., 2006; Muthen, 1995; Muthen et al., 1993). The presence of multiple subgroups among those with AUDs has also been supported by latent class analyses, although it is not clear whether these latent groups correspond with DSM-IV abuse and dependence (Bucholz et al., 1996). However, some other studies have indicated that only one factor is involved (Hasin et al., 1999a; Nelson et al., 1999). An additional approach based on Item Response Theory (IRT) also indicated that a unidimensional model was the best fit regarding severity (Martin et al., 2006). While useful, IRT defines severity based on the theory that items that are endorsed more commonly must be less "severe," and the outcome is not necessarily consistent with a clinical approach where severity might relate to intensity of drinking, the number of hospitalizations or a higher prevalence of more life-threatening problems.

Other concerns reflect the fact that, in a categorical approach such as abuse and dependence, some persons exhibit elements of a disorder but don't fit clearly into either of the categories (De Bruijn et al., 2005; Eng et al., 2003; Wells et al., 2006). For AUDs, such individuals have been referred to as diagnostic "orphans" as first proposed by Hasin and Paykin (1999b), and have been reported to demonstrate levels of drinking and associated alcohol problems that are greater than subjects with no diagnoses and less than those with abuse and dependence (Eng et al., 2003; Pollock and Martin, 1999). An estimated 10% of adolescents from the general population and about a third of those in clinical settings may demonstrate one or two alcohol dependence symptoms, but not meet criteria for abuse (Chung and Martin, 2005; Chung et al., 2002; Eng et al., 2003, Lewinsohn et al., 1996).

Despite the criticisms expressed above, a number of positive attributes for the alcohol abuse label have been reported. These include external validators where subjects with abuse exhibit lower levels of alcohol intake and related problems than those with dependence, but higher rates than individuals with no AUD diagnosis (Dawson, 2000; Hasin and Paykin, 1999a; Schuckit et al., 2005); prognostic validators where between 20% to 50% of those with abuse still meet criteria for this disorder on one-to-three-year follow-up compared to about 5% for those with no diagnosis at baseline (De Bruijn et al., 2005); and support for the independent nature of abuse as only about 10% of adults with abuse go on to dependence (Grant et al., 2001; Hasin et al., 1997b; Schuckit et al., 2005).

Specific concerns have been raised regarding the application of AUD criteria to adolescents. These reflect the facts that the criteria were originally established for adults and some items may be difficult for adolescents to interpret; the instability of drinking patterns seen between ages 12 and 20; and the high rate of endorsement for many dependence items such as tolerance and using more than intended among teenagers with no diagnosis in the general population (Chung and Martin, 2002, 2005; Chung et al., 2002; Clark, 2004; Deas et al., 2000; Harford et al., 2005; Martin et al., 1996; Schuckit et al., in press; Wells et al., 2006). However, for adolescents with alcohol abuse, the levels of drinking and nondiagnostic alcohol-related

problems at the time of study and on follow-ups are usually between figures for alcohol dependence and those with no AUD, and only about 10% with abuse convert to alcohol dependence at follow-up (Baer et al., 2003; Chung and Martin, 2001; Chung et al., 2002; Langenbucher et al., 2000; Pollock and Martin, 1999; Wells et al., 2006; Winters et al., 1999).

Of course, abuse is not the only factor associated with an enhanced risk for future alcohol-related problems in adolescents. Other characteristics include an older age, male sex, Caucasian race, heavier drinking, additional substance use, externalizing personality attributes such as conduct problems, and an early age of onset of use of alcohol and drugs (Clark, 2004; Wells et al., 2006). These and other attributes need to be considered in any evaluation of how alcohol abuse diagnoses relate to alcoholic outcomes.

The analyses presented here use cross-sectional and prospective data from a large sample of adolescents from the Collaborative Study on the Genetics of Alcoholism (COGA) (Schuckit et al., 2005, 2007) to evaluate several of the guidelines for judging the validity and clinical usefulness of a diagnostic label suggested by Robins and Guze (1970). These include observing whether the label of alcohol abuse in adolescents is associated with distinct cross-sectional validators and a unique clinical outcome. We hypothesized that, at baseline, alcohol abuse would relate to unique cross-sectional validators compared to the other groups, and would predict a higher future risk for alcohol problems that would remain significant even when considered in the context of additional relevant characteristics. Our goal is to evaluate the implications and correlates of the existing DSM-IV criteria for alcohol abuse which have been in use since 1994, and the analyses are not a broad search for the optimal criteria that might be considered in future manuals as the ideal core concepts that underlie a second AUD label in addition to dependence.

II. Methods

The data reported here were gathered using informed consent. Information was evaluated regarding alcohol use, abuse, dependence, and associated problems from adolescent drinking subjects participating in either of two phases of the six-center-wide COGA study. The individuals included are 12-to-19-year-old offspring of original COGA probands (N=506) and comparison families (N=110) who had ever consumed a full drink of alcohol and who were in the appropriate age range during the phases of the study described below. This collaborative investigation began in 1990 by recruiting the original probands as alcohol-dependent inpatients in AUD treatment programs who met both DSM-III-R (American Psychiatric Association, 1987) and Feighner et al (1972) criteria for alcohol dependence and alcoholism, and who reported multiple relatives available for participation. Comparison subjects were selected at each center using driver's license records, patient rosters from dental and medical clinics, or from randomly selected students at a university. The first phase of recruitment began in 1990 with a follow-up in Phase II initiated in 1995, with about 80% of appropriate Phase I subjects participating (N=448). In addition, 168 new participants entered the protocol if they were 12-to-19 years old when families were re-interviewed during Phase II, with subsequent follow-ups of about 80% in the ongoing Phase III. Therefore, all these offspring were originally identified at age 12 to 19 and followed about five years later (4.9 [standard deviation 1.23] years). Among the 616 subjects, 235 (60.9%) were the only offspring studied from a family, 106 (27.5%) were from families where two siblings were selected, and only 11.7% came from families with three or more siblings. As a consequence, the average cluster size was small (1.515) and the design effect was 1.046, suggesting that non-independence (family clustering) did not pose a problem for a single-level analysis (Muthén and Satorra, 1995). As such, the use of multi-level modeling was not warranted.

During all phases of the work, subjects were evaluated by trained interviewers using the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA) instrument (Bucholz et al., 1994; Hesselbrock et al., 1999). All individuals were given age-appropriate SSAGAs including an adolescent version for those ages 12 through 17, and an adult interview for participants age 18 and over. Overall, reliability across adult and adolescent interviewers for the SSAGA includes kappa statistics of .64 to .86 for alcohol-related items, with sensitivities of about 90%, specificity of ~ 70%, and positive and negative predictive values of 65% and 95%, respectively when compared with another standardized diagnostic schedule. Because the analyses focused on the cross-sectional and predictive values of the alcohol abuse diagnosis in teenagers, AUDs were defined using DSM-IV criteria, but, to remain consistent with prior reports from COGA, all other diagnoses used DSM-III-R. Diagnostic "orphans" were recorded to identify subjects who endorsed one or two alcohol dependence items but did not meet criteria for either abuse or dependence (Eng et al., 2003).

The follow-up evaluations for subjects identified in Phase I and followed in Phase II, and those new subjects added to the study in Phase II but followed-up in Phase III involved the same SSAGA interviews as used in new subjects. However, items central to the analyses were coded to indicate both the lifetime values as well as the most recent (i.e., follow-up interval) experiences. In the SSAGA, a standard drink was defined as 12 grams of ethanol, with the quantity and frequency of alcohol use based on the subjects' estimate of the prior six months. The seven nondiagnostic alcohol-related problems included alcohol-related fights, injuries, general help-seeking, treatment for alcohol-related concerns, psychological symptoms (i.e., ever feeling depressed, nervous, suspicious or muddle-headed the day after drinking), staying intoxicated for several days at a time, or any other interference with life functioning.

The analytic procedures involved chi^2 (χ^2) for comparisons across categorical data, and ANOVA for continuous variables, using Tukey's MHSD statistic for post hoc analyses for continuous items where appropriate. Correlations used the Pearson Product Moment approach for continuous variables and point-biserial correlations for nominal data. Logistic regressions involved simultaneous entry.

III. Results

The Population at T1

The baseline (i.e., Time 1 or T1) background for the 616 adolescents who had ever consumed a full drink (Table 1) revealed an average age of about 16.5 (1.73 - standard deviation or SD) years and a 10th grade education, for a group primarily Caucasian and about equally split on sex. In the six months prior to T1, 53% had consumed alcohol, an average of about two days per week, consuming between four and five drinks per drinking day (the median was 2.5). About one in four reported experiencing at least one alcohol abuse item (usually drinking in a hazardous situation), 35% acknowledged at least one dependence item (most often tolerance), and 24% noted one or more non-diagnostic alcohol-related difficulties. Regarding the latter, while not shown in the table, about 10% each endorsed alcohol-related fights, injuries, and/or psychological symptoms as defined above, with about 5% each reporting staying intoxicated for several days, seeking help or treatment for an alcohol-related issue, and other life problems. One in three ever used tobacco, almost 60% ever used an illicit drug, 18% ever had a drug diagnosis, and 22% ever met criteria for conduct disorders.

Comparisons of Diagnostic Validators Across Diagnostic Groups at T1

Table 2 divides subjects into four groups based on their alcohol diagnosis at T1. Group 1 is composed of 371 subjects (60.2%) with no alcohol-related label, and Group 2 has 68 adolescents (11.0%) who reported one or two dependence items but did not meet criteria for

alcohol abuse (i.e., diagnostic "orphans"). Therefore, using DSM-IV criteria, 439 adolescents (Groups 1 and 2) did not have an AUD at T1. Group 3 consists of 101 (16.4%) teens with T1 alcohol abuse, and Group 4 has 76 (12.3%) with alcohol dependence. The groups were similar on sex and the percent who were Caucasian, but those with no T1 diagnosis and diagnostic "orphans" were younger, and had slightly less education. The proportions who ever met criteria for conduct disorder were similar for those with abuse or dependence, these were higher than "orphans," with the lowest rate for those with no diagnosis.

Alcohol and drug intake and problems generally reflected the diagnostic pattern, with highest figures for those with alcohol dependence, lowest for no diagnosis, and abuse falling in between. Subjects with abuse (Group 3) were different from those with no diagnosis (Group 1) and from those with dependence (Group 4) on most relevant alcohol and drug items (by definition, the prevalence of endorsement of abuse items could not be evaluated across most groups).

Compared to subjects labeled diagnostic "orphans" (Group 2) those with abuse (Group 3) were more likely to have conduct disorder, endorsed the dependence item of decreasing activities in order to drink, reported more non-diagnostic alcohol problems, and had more drug use and substance-related problems. However, despite similar drinking patterns for members of Groups 2 and 3, the "orphans" were more likely to report tolerance and having been unable to cut down on drinking. Orphans differed from the no diagnosis Group 1 by reporting higher rates of conduct disorder, higher prior six months drinking, non-diagnostic alcohol problems, and drug use. While not shown in the table, 93% of those with dependence also met criteria for alcohol abuse; and 74.3% of those with abuse and 38.2% with dependence endorsed only one abuse criterion, 22.8% and 23.7% admitted to two, and 3.0% and 31.5% reported three or four items.

Outcomes at T2

Table 3 addresses the outcomes over five years for subjects in each of the four diagnostic categories established at Time 1. Because the DSM-IV approach combines Groups 1 and 2, in that system 66% of those with no diagnosis at T1 maintained the no diagnosis designation at T2. Considering the T2 "orphan" category separately still resulted in almost half of those in Group 1 holding the same designation at outcome. For subjects who were "orphans" at T1, no distinct outcome pattern at T2 was observed, with almost 47% labeled as no diagnosis by DSM-IV criteria (i.e., were in outcome groups 1 and 2), including only 23.5% who maintained an "orphan" label at T2. Because tolerance was the most frequently endorsed item in Group 2 and reflecting questions regarding how well this item performs overall (Schuckit et al., in press), the outcomes associated with a T1 "orphan" label were also evaluated separately for the 32 members of Group 2 who had endorsed a dependence item other than tolerance. However, the pattern of outcomes for this subgroup of Group 2 was similar to the pattern shown in Table 3.

Also regarding Table 3, almost 40% of those with T1 dependence had the same diagnosis at T2. However, because DSM-IV guidelines for this label note that continuation of any of the 11 abuse or dependence symptoms indicates that full remission from dependence had not been achieved, 85% of those in Group 1 would have maintained dependence at follow-up. The evaluation of Table 3 indicated that the pattern of outcomes across the four T1 diagnoses differed significantly ($\chi^2 = 114.1$, p< .001). In addition, the likelihood of maintaining the same diagnosis at follow-up was significantly more than chance for individuals with no baseline diagnosis ($\chi^2 = 69.0$, p< .001), abuse ($\chi^2 = 17.2$, p< .001), and dependence ($\chi^2 = 38.4$, p< .001), but not for diagnostic orphans ($\chi^2 = 1.6$, p = .22).

The significance of the overall χ^2 across Table 3 allowed for a more detailed evaluation of potential differences for outcome across T1 diagnostic groups. Thus, the T2 pattern of diagnoses for the 371 Group 1 individuals with no T1 diagnosis was significantly different

than that for "orphans" (Group 1 vs. 2, $\chi^2 = 13.3$, p< .004); differed from the outcome for those with abuse (Group 1 vs. 3, $\chi^2 = 43.6$, p< .001); and was a significantly different outcome than for those with Time 1 dependence (Group 1 vs. 4, $\chi^2 = 80.5$, p< .005). While the outcome for diagnostic "orphans" was not significantly different from those with abuse (Group 2 vs. 3, $\chi^2 = 4.7$, p = .20), "orphans" differed significantly regarding outcome from those with T1 dependence (Groups 2 vs. 4, $\chi^2 = 22.5$, p< .001). Finally, the T2 patterns for subjects originally labeled as abuse and dependence at T1 were also significantly different from each other (Groups 3 vs. 4, $\chi^2 = 13.2$, p< .005).

Reflecting the emphasis on the prognostic implications of T1 abuse, the evaluations next focused on the 540 drinkers who at T1 had abuse or no diagnosis (including "orphans"), after deleting the 76 individuals with T1 dependence. Table 4 describes the correlations among key T1 variables for this subsample, as well as the manner in which each characteristic related to a T2 AUD diagnosis of alcohol abuse or dependence (T2 Abuse or Depend). The items in Table 4 reflect SSAGA variables shown to correlate with an enhanced risk for AUDs among teenagers in previous studies. Most T1 items included in the table correlated significantly with the T2 outcome of alcohol abuse or dependence, including a T1 abuse diagnosis, male sex, Caucasian race, T1 conduct disorder, the drinking quantity at T1, the presence of any of the additional 7 alcohol problems, illicit drug use, and smoking histories. However, a T1 label of diagnostic "orphan" did not correlate with abuse or dependence at T2, although the correlation was a trend (r=.08, p<.08). A T1 abuse diagnosis in this young sample related to an older age and all alcohol, drug, and smoking-related items. In addition, while not included in the table, there was no relationship of the T2 designation of abuse or dependence and membership in COGA versus comparison families (r = −.05, p=.25).

In light of the 80% rate of endorsement of hazardous use for Group 3 subjects, an analysis evaluated an additional characteristic for this item. Because driving while intoxicated is often cited as the basis for reporting this problem, and most adolescents don't get a license to drive without a parent in the car until age 16 or 17, a possible age effect was considered. Indeed, the correlation between the T1 hazardous use item and a T2 AUD was .27 overall (p<.001), .50 for those > age 17 (p<.001) and .16 for those ≤ age 17 (p<.01).

Table 5 presents the results of a regression analysis evaluating whether a T1 diagnosis of alcohol abuse was related to the T2 AUD outcome in the context of all additional significant predictors from T1 in the 540 drinkers from Table 4. Five items contributed significantly to the regression. The odds ratio (OR) associated with T1 alcohol abuse was 3.29 (p<.0001), indicating that a T1 abuse label was a robust predictor of T2 AUDs compared to all other T1 items, including a T1 designation of a "diagnostic orphan." Reflecting concerns that the results in Table 5 might reflect unique aspects of the high AUD density COGA families, the analyses were repeated for the adolescents from control pedigrees. The results were similar to those presented in Table 5, with significant contribution to the prediction of the T2 outcome by the T1 variables of an alcohol abuse diagnosis, sex, and Caucasian race, although a T1 label of "orphan" did not contribute. Finally regarding the potential impact of non-independence on the results, the regressions were carried out in the sample of 556 children when only one offspring was randomly chosen per family. Once again, the significant predictors of T2 AUDs were T1 abuse, sex, and Caucasian race, but an "orphan" label did not enter the equation.

IV. Discussion

These analyses were structured primarily to evaluate two aspects of the potential clinical validity of the criteria for DSM-IV alcohol abuse as applied to drinking adolescents (American Psychiatric Association, 1994; Robins and Guze, 1970). Over the past decade, many clinicians and researchers have used these abuse criteria, and this diagnostic approach will remain

operational until DSM-V is published in about 2012. Our goal here was not to determine the optimal approach to a second axis of AUDs in addition to dependence, but to improve our understanding of the implications of the current system, and the analyses were not structured to compare multiple possible diagnostic approaches. Thus, our analyses offer little clarification regarding what the essential core of a second AUD label might be or the optimal way to measure it (Anthony et al., 2005).

Several reasonable concerns have been raised about the potential usefulness of the alcohol abuse label in teenagers (Clark, 2004; Martin et al., 1995; Wells et al., 2006). However, the current data offer some indications that the DSM-IV approach may have some value in this population. Consistent with prior reports in adults and teenagers (e.g., Hasin and Paykin, 1999a; Schuckit et al., 2005; Wells et al., 2006; Winters et al., 1999), evaluations of relevant variables provided external validity for the diagnosis of abuse, as alcohol intake and problem patterns for those with this label were lower than for subjects with dependence and higher than for those with no diagnosis. Also consistent with some prior studies (e.g., Chung and Martin, 2001; De Bruijn et al., 2005; Hasin et al., 1997b; Wells et al., 2006), there was evidence of predictive validity for abuse as about half of individuals with abuse at T1 maintained that diagnosis at follow-up, with rates that were higher than for those with no T1 diagnosis. The ability of T1 alcohol abuse in adolescents to predict future alcohol problems remained significant even when measured in the context of additional T1 characteristics that correlated with T2 outcomes, including consideration of a T1 label of diagnostic "orphan" (individuals who endorsed one or two dependence items but who did not meet criteria for alcohol abuse).

These analyses also support the contention that alcohol abuse may be associated with less severe problems than dependence in these teenagers. Regarding prognosis, only 15% of subjects with dependence at T1 fell into the no diagnosis categories as defined in DSM-IV (Groups 1 and 2), compared to 31% of those with abuse, and T1 abuse was associated with lower alcohol quantities, frequencies, and related problems than dependence. The current findings were based on a prospective evaluation of the pattern of clinically relevant items over a five-year period, and lead to different conclusions than the one-year cross-sectional and retrospective evaluation of Saha et al. (2006) where severity was defined as a correlate of a lower frequency with which a diagnostic item was endorsed in the general population. The differences in conclusions across these two studies underscore the need for additional long-term prospective studies of diverse populations to determine the relative severity of alcohol abuse and dependence.

The present results are also consistent with several other studies (Grant et al., 2001; Hasin et al., 1997b; Schuckit et al., 2005) indicating that relatively few people with alcohol abuse go on to dependence. This question would have been difficult to evaluate using DSM-III or DSM-III-R, because DSM-IV is the first of the modern DSMs to use separate items to define abuse and dependence. As suggested by Robins and Guze (1970), the potential importance of abuse as a diagnostic approach is reinforced by the recognition that, at least over a five-year period, abuse did not appear to be just an early phase of another diagnosis (dependence), implying that had the label not been available to clinicians, many people at high risk for future alcohol problems might have been missed. There are several possible reasons why abuse and dependence might not fully overlap and have different prognostic implications, including a possible lesser severity for abuse. It is also possible that the same overall predisposing factors may operate for the two syndromes, but with other characteristics (e.g., personality, socioeconomic stratum, levels of stress, peer influences, etc.) affecting which disorder develops. Our understanding about the differences between abuse and dependence might improve once more genetic polymorphisms contributing to the AUD risk are identified and replicated, which may facilitate evaluations of whether the same biological underpinnings contribute to the risk for both abuse and dependence.

While the emphasis in this paper was on the performance of DSM-IV alcohol abuse compared to no diagnosis and dependence, the evaluations also considered the possible impact of a label of diagnostic "orphan." As shown in Table 3, this diagnosis had the least consistency across T1 and T2, with 38% moving to abuse, few becoming dependent, and equal proportions labeled no diagnosis and "orphans" at follow-up. While the "orphan" category did not correlate significantly with T2 AUD in Table 4, those considered "orphans" were almost twice as likely to have a T2 AUD than those not considered orphans at T1 when included in the full logistic regression model. However, T1 abuse was a more robust predictor of T2 outcome in the same model with greater than a threefold risk for T2 AUDs among those with T1 abuse. The cross-sectional validators of the "orphan" diagnoses in Table 2 did not place it as a proxy for either the no diagnosis or abuse categories. The reasons for the less robust predictive validity for an "orphan" diagnosis are not clear. However, they did not just reflect poor performance of the item of tolerance, as the ability of Group 2 membership to predict T2 outcomes was not improved after excluding subjects who reported only tolerance at T1. Therefore, it is not obvious what to do with the "orphan" group label in the future; adding these subjects to the abuse group might increase heterogeneity and dilute the prognostic meaning of abuse, but, at the same time, the label indicates a greater likelihood of future problems than no diagnosis.

Finally regarding "orphans," it is interesting to note that while at T1 members of Groups 2 and 3 had similar quantities and frequencies of drinking, "orphans" were more likely to report tolerance and an inability to cut down on drinking. The different rate of endorsement of these two dependence items may be a consequence of the fact that those in Group 2, but not those in Group 3, were required to have reported at least one dependence item. It is also possible that the higher rate of conduct disorder and drug use in Group 3 may have contributed to less insight regarding some of the effects of alcohol as a consequence of greater impulsivity, or a cognitive set where, for example, tolerance or control of use of alcohol may have been seen as less obvious in comparison to drugs like cocaine or opioids.

The label of alcohol abuse in DSM-IV may have some assets, but it is important to remember that no alternative approaches were evaluated here. These include "withdrawal gate", hybrid, and latent models suggested elsewhere (Bucholz et al., 1996; Langenbucher et al., 2000; Muthén, 2006). Therefore, future work should explore additional diagnostic schemes, including the possibility that a more dimensional diagnostic approach might help clinicians avoid the pitfalls of categorical labels and obviate the need for two separate AUD syndromes, as well as a possible identification of abuse criteria where maladaptive consequences of alcohol use, and the practice of hazardous use might be considered separately (Anthony et al., 2005; Saunders and Schuckit, 2006). However, such steps might diminish the simplicity of diagnostic categories that are optimally useful to clinicians, and dimensional approaches may be converted by administrators and clinicians back into categories through the establishment of thresholds (Saunders and Schuckit, 2006). Also, implementation of a new diagnostic scheme may make it difficult to benefit from the almost two decades of clinical experience and research results based on the DSM-IV. If a two-label system is maintained, however, it will be important to consider the possibility that some abuse items occur with such rarity as to jeopardize their usefulness (e.g., legal problems), the fact that "use of alcohol in hazardous situations" is often the only criteria endorsed by individuals with alcohol abuse (with an implication that clear guidelines need to be developed on how to interpret this criterion), the potential pejorative connotation of the term "abuse," as well as the problem of defining a "syndrome" through the endorsement of repetitive problems in only one life area, the threshold for abuse in DSM-IV.

The interpretation of these results requires that careful attention be paid to the liabilities as well as the assets of this use of data from the COGA protocol. First, the severity of alcohol-related problems among the original probands and the high density of AUDs in some of these families may indicate that some of the results in these offspring might not generalize to other groups.

Children from COGA families may carry an exaggerated risk for AUDs. In this light, the rate of alcohol abuse in the current group (16%) is higher than the 6% to 8% reported for the general population (Chung et al., 2002). Second, while many attributes of abuse at T1 and T2 could be measured through this protocol, we could not evaluate the relevance of other diagnostic approaches, or compare DSM-IV alcohol abuse with the ICD diagnosis of harmful use. Third, because a range of clinical characteristics and external validators were incorporated in the analyses, the results might reflect Type 1 errors, although this danger is diminished by using the regression reported in Table 5. An additional limitation of the current work is that the focus was primarily on alcohol abuse criteria as applied to adolescents, and it is not clear that similar results will be observed regarding adult populations, in subjects with abuse of other substances, or in individuals with dependence.

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Table 1

Characteristics of the 616 Adolescent Drinkers at Time 1

Variables @ Time 1		Variables @ Time 1	
Background		**DSM-4 Alcohol Abuse Items (%)**	
Sex (% male)	47.2		
Age: mean (std)	16.5 (1.73)	1. Interference with major role	7.9
Race (%)		2. Hazardous situation	22.1
Caucasian	73.2	3. Legal problems	0.3
Black	14.5	4. Use despite social problems	13.3
Hispanic	9.3	At least one abuse item	27.9
Other	3.1		
Education: mean (std)	10.5 (1.61)	**DSM-4 Alcohol Dependence Items (%)**	
Conduct Dx (%)	21.9	1. Tolerance	29.8
		2. Withdrawal	4.7
Substance History (%)		3. Larger amounts, longer periods	21.5
Ever use tobacco	34.6	4. Inability to cut down	16.2
Ever use illicit drugs	58.6	5. Much time spent using	7.7
Ever use drug other than marijuana	25.8	6. Reduction in important activities	5.3
Any drug dx	17.9	7. Use despite physical/psych problems	13.6
Any drug dx other than marijuana	4.9	At least one dependence item	35.2
Alcohol Use: Last 6 Months		Dx Orphan (1-2 dependence items, no abuse dx)	11.0
Any Drink	53.4		
Usual quantity (drinks/drinking day)	4.7 (2.95)	**Any of 7 Non-Diagnostic Problems (%)**	23.7
Usual frequency (days/week)	1.8 (1.35)		

In this and all subsequent tables, Dx = diagnosis; psych = psychological; # = number; depend = dependence; T1 = Time 1 or baseline; T2 = time 2 or follow up ~ 5 years later; orphan = at Time 1 endorsed 1 or 2 dependence items but did not meet criteria for abuse.

Table 2

Comparison of Diagnostic Groups Across the 616 Adolescent Drinkers at Time 1

Variables @ Time 1	Group 1 No Dx N=371	Group 2 Orphan N=68	Group 3 Abuse N=101	Group 4 Depend N=76	Overall χ^2 or F-Test	1 vs 2	1 vs 3	1 vs 4	2 vs 3	2 vs 4	3 vs 4
Background											
Sex (% male)	44.5	47.1	52.5	53.9	3.62						
Age: mean (std)	16.2 (1.79)	16.5 (1.52)	17.0 (1.49)	17.4 (1.41)	15.67^c	NS	*	*	NS	*	*
Caucasian	69.3	79.4	77.2	81.6							
Education: mean (std)	10.2 (1.64)	10.7 (1.36)	11.0 (1.29)	11.0 (1.76)	9.82^c	NS	*	*	NS	NS	NS
Conduct Dx (%)	1.7	23.5	39.6	42.1	55.21^c	5.51^a	38.31^c	37.59^c	4.74^a	5.57^a	0.11
Alcohol Use: Last 6 Months											
Any Drink	38.5	72.1	77.2	77.6	83.39	26.23^c	47.71^c	38.91^c	0.58	0.59	0.01
Usual quantity (drinks/drinking day)	3.2 (2.40)	4.9 (2.32)	5.7 (2.70)	7.1 (2.84)	38.25^c	*	*	*	NS	*	*
Usual frequency (days/week)	1.3 (0.86)	1.6 (1.11)	2.2 (1.30)	2.9 (1.80)	26.71^c	NS	*	*	NS	*	*
DSM-4 Abuse Items (%) $^\surd$											
1. Interference with major role	NA	NA	11.9	48.7	29.34^c	NA	NA	NA			41.47^c
2. Hazardous situation	NA	NA	83.1	68.4	5.30^a	NA	NA	NA			24.99^c
3. Legal problems	NA	NA	0.0	2.6	2.69	NA	NA	NA			37.24^c
4. Use despite social problems	NA	NA	33.7	63.2	15.17^c	NA	NA	NA			89.59^c
Any abuse item	NA	NA	100.0	93.4	6.84^b						46.72^c
# Abuse items endorsed	NA	NA	1.3 (0.52)	1.8 (1.01)	21.54^c						26.49^c
DSM-4 Dependence Items (%)											
1. Tolerance	NA	64.7	47.5	93.4	41.17^c	NA	NA	NA	4.84^a	18.40^c	41.47^c
2. Withdrawal	NA	1.5	0.0	22.4	36.65^c	NA	NA	NA	1.49	14.33^c	24.99^c
3. Larger amounts, longer periods	NA	19.1	32.7	78.9	60.19^c	NA	NA	NA	3.77	51.40^c	37.24^c
4. Inability to cut down	NA	26.5	7.9	77.6	95.82^c	NA	NA	NA	10.74^c	37.76^c	89.59^c
5. Much time spent using	NA	4.4	4.0	47.4	67.70^c	NA	NA	NA	0.02	33.53^c	46.72^c
6. Reduction in important activities	NA	0.0	9.9	43.4	53.71^c	NA	NA	NA	7.16^b	38.30^c	26.49^c
7. Use despite physical/psych problems	NA	4.4	9.9	52.6	63.17^c	NA	NA	NA	1.72	39.84^c	39.07
Any dependence item	NA	100.0	72.3	100.0	45.07^c	NA	NA	NA	22.60^c	NA	25.03^c
# of dependence items endorsed	NA	1.2 (0.41)	1.1 (0.87)	4.2 (1.19)	295.68^c	NA	NA	NA	NS	*	*
Any of 7 Non-diagnostic Problems (%)	4.6	17.6	52.5	84.2	276.49^c	15.90^c	144.16^d	269.57^c	20.83^c	63.80^c	19.49^c
# of 7 non-diagnostic problems	0.1 (0.23)	0.2 (0.47)	0.8 (0.98)	2.5 (1.91)	202.00^c	NS	*	*	*	*	*
Ever Used Any Illicit Drug (%)	43.4	63.2	87.1	90.8	102.30^c	9.09^b	60.92^c	56.72^c	13.31^c	15.76^c	0.58
Illicit Drug Use History (%)											
Marijuana	42.6	58.8	86.1	89.5	99.37^c	6.12^a	60.32^c	55.47^c	16.24^c	17.98^c	0.44
Cocaine	0.8	2.9	22.8	36.8	127.60^c	2.32	73.58^c	126.90^c	12.68^c	25.01^c	4.19^a
Amphetamine	4.6	8.8	18.8	34.2	63.86^c	2.08	22.82^c	63.69^c	3.22	13.38^c	5.24^a
Depressant	1.9	7.3	10.9	28.9	70.57^c	6.46^a	17.55^c	76.14^c	0.59	10.99^c	9.32^b
Hallucinogen	5.9	10.3	37.6	51.3	127.01^c	1.77	71.87^c	110.26^c	15.54^c	27.78^c	3.31
Opioid	1.3	5.9	16.8	30.3	85.05^c	5.88^a	42.83^c	89.82^c	4.48^a	14.00^c	4.47^a
Other	4.0	11.8	19.8	21.0	37.24^c	6.90^b	28.72^c	28.28^c	1.90	2.23	0.04
# drugs used (among users)	1.4 (0.80)	1.7 (1.19)	2.5 (1.75)	3.3 (2.21)	29.39^c	NS	*	*	*	*	*

Variables @ Time 1	Group 1 No Dx N=371	Group 2 Orphan N=68	Group 3 Abuse N=101	Group 4 Depend N=76	Overall χ^2 or F-Test	1 vs 2	1 vs 3	1 vs 4	2 vs 3	2 vs 4	3 vs 4
Any Drug Dx (abuse/depend) (%)	3.5	5.9	22.8	42.1	106.44[c]	0.87	41.83[c]	103.81[c]	8.64[b]	25.11[c]	7.57[b]
# drug dx (among users)	0.1 (0.33)	0.1 (0.29)	0.3 (0.68)	0.6 (0.86)	17.40[c]	NS	*	*	NS	*	*
Drug diagnosis (%)											
Marijuana	3.0	4.4	18.8	29.0	67.52[c]	0.39	33.50[c]	62.28[b]	7.44[b]	15.06[c]	2.50
Cocaine	0.3	0.0	3.0	9.2	30.80[c]	0.18	6.89[b]	28.69[c]	2.06	6.58[b]	3.17
Amphetamine	0.8	1.5	5.9	9.2	21.28[c]	0.28	11.18[c]	20.36[c]	2.05	4.10[a]	0.68
Depressant	0.0	0.0	0.0	5.3	28.61[c]	NA	NA	19.70[c]	NA	3.68	5.44[a]
Opiate	0.0	0.0	3.0	5.3	19.59[c]	NA	11.09[c]	19.70[c]	2.06	3.68	0.60
Ever Use Tobacco (%)	18.6	35.3	59.4	78.9	135.55[c]	9.59[b]	66.56[c]	111.90[c]	9.45[b]	28.14[c]	7.59[b]

[a] $p < .05$

[b] $p < .01$

[c] $p < .001$

* Tukey's Post-hoc comparisons significant at the .05 level.

√ By definition, abuse items can only be compared across Groups 3 and 4.

Table 3

Course of Alcohol Diagnoses Over Time (T2) for the Baseline Groups (T1) for the 616 Adolescent Drinkers

	T2 Outcomes (%)			
	Group 1 None N=208	Group 2 "Orphan" N=111	Group 3 Abuse N=202	Group 4 Dependence N=95
T1 Diagnoses (N)				
None (371 in Group 1)	46.6	19.4	24.3	9.7
"Orphan" (68 in Group 2)	23.5	23.5	38.2	14.7
Abuse (101 in Group 3)	15.8	14.9	50.5	18.8
Dependence (76 in Group 4)	4.0	10.5	46.0	39.5

*
Statistical analyses are offered in the text.

Table 4

Pearson Product-Moment Correlation and Point-Biserial Matrix for all Time 1 (T1) Variables and Time 2 (T2) Alcohol Diagnosis for 540 Non-dependent Drinkers

	T2 Abuse or Depend	T1 Abuse	T1 Age	Sex	Caucasian	T1 Conduct Dx	Current Drink at T1	T1 Dx Orphan	T1 Alc Probs	T1 Use Drug	T1 Dx Drug
T1 Abuse	.26^c										
T1 Age	−.03	.18^c									
Sex	.22^c	.06	.03								
Caucasian	.19^c	.06	−.02	.01							
T1 Conduct Dx	.15^c	.25^c	−.06	.23^c	−.04						
Current Drink at T1	.15^c	.26^c	.23^c	.09^a	.05	.03					
T1 Dx Orphan	.08	−.18^c	.02	.01	.06	.04	.17^c				
T1 Alc Probs	.18^c	.48^c	.11^a	.08	.03	.20^c	.20^c	.01			
T1 Use Drug	.15^c	.32^c	.19^c	.13^b	−.11^b	.21^c	.42^c	.07	.25^c		
T1 Dx Drug	.10^b	.37^c	.12^b	.07	−.04	.22^c	.16^c	−.06	.29^c	.35^c	
T1 Smoke	.16^c	.33^c	.06	−.05	.09^a	.23^c	.16^c	.06	.25^c	.37^c	.42^c

^{a} p <.05

^{b} p <.01

^{c} p <.001

The abbreviations used here include: T1 Abuse is the presence of an alcohol abuse diagnosis at Time 1; T2 abuse or dependence is the presence of alcohol abuse or dependence at Time 2; T1 Age is age at Time 1; T1 Conduct Dx is conduct diagnosis at Time 1; Current Drink T1 is whether the subject had a drink in the 6 months prior to Time 1 interview; T1 Dx Orphan (Diagnostic Orphans) are subjects who at Time 1 endorsed 1 or 2 alcohol dependence items but did not have alcohol abuse; T1 Alc Probs is the number of non-diagnostic alcohol problems endorsed as ever having occurred before Time 1 interview; T1 Use Drug and Dx Drug relate to use and abuse/ dependence (respectively) regarding illicit drugs ever before Time 1 interview; and T1 Smoke is ever having used tobacco products before Time 1.

Table 5

Logistic Regression Predicting Time 2 Abuse/Dependence from Time 1 Abuse and Other Predictors from Table 4 for 540 Non-dependent Drinkers

	Wald X^2	Odds Ratio (OR)	p-value
T1 Abuse	14.59	3.29	.0001
T1 Age	5.10$^{\surd}$	0.88	.03
Sex	21.39	2.51	<.0001
Caucasian	11.26	2.13	.001
T1 Conduct Dx	0.27	1.15	.61
Current Drink at T1	0.89	1.23	.35
T1 Dx "Orphan"	4.06$^{\surd}$	1.80	.05
T1 Alc Probs	0.85	1.22	.35
T1 Use Drug	0.71	1.22	.40
T1 Dx Drug	0.32	0.83	.58
T1 Smoke	1.61	1.37	.21

$^{\surd}$While not significant in Table 4, these two items were included to place the performance of additional predictors in perspective.