The Five-Year Diagnostic Utility of “Diagnostic Orphans” for Alcohol Use Disorders in a National Sample of Young Adults*

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ABSTRACT. Objective: This study was conducted to assess the association of “diagnostic orphans” at baseline and subsequent development of Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) alcohol use disorders (AUDs) 5 years later. **Method:** A sample of 8,534 respondents was drawn from the National Longitudinal Survey of Youth for the years 1989 and 1994. Diagnostic orphans were defined as respondents who met one or two alcohol dependence symptom criteria but did not meet the criteria for a diagnosis of alcohol abuse or dependence. Using multinomial logistic regression analysis, 1994 assessments of DSM-IV AUD were regressed on 1989 baseline assessments of diagnostic orphan status and DSM-IV AUD. In addition to

demographic characteristics, other background variables included heavy episodic drinking at baseline and early problem behaviors (antisocial behaviors, illicit substance use, and age at onset of alcohol use). **Results:** Findings from this 5-year prospective study indicate that diagnostic orphan status at baseline was predictive of DSM-IV AUD at follow-up. These associations remained significant when other early behavioral problems were included in the models. **Conclusions:** The present findings have important diagnostic implications for the proposed DSM-V, particularly for a dimensional diagnosis incorporating less severe forms of alcohol dependence. (*J. Stud. Alcohol Drugs*, 71, 410-417, 2010)

THE TERM *DIAGNOSTIC ORPHAN* IS APPLIED to individuals who have met one or two symptom criteria from the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association, 1994), for alcohol dependence but do not qualify for a diagnosis of DSM-IV alcohol abuse or dependence (Hasin and Paykin, 1998, 1999; Martin et al., 1996). Similarly, the term has been used to describe individuals with subthreshold drug-dependence symptoms (Degenhardt et al., 2002, 2008; Lynskey and Agrawal, 2007; Wu et al., 2008). Estimates for the percentage of alcohol use disorder (AUD) diagnostic orphans among adolescents range between 2% and 17% in general populations and 8% and 34% in clinical settings (Chung and Martin, 2005; Chung et al., 2002; Harford et al., 2005; Pollack and Martin, 1999; Schuckit et al., 2008). National estimates in 2001 for adolescents ages 12-17 were as follows: for males, 2.9% and 1.1% for one and two DSM-IV AUD diagnostic criteria, respectively, and for females, 3.2%

and 1.2%, respectively (Harford et al., 2005). The prevalence estimates among adults in the general population are generally higher than among adolescent samples (Eng et al., 2003; Hasin and Paykin, 1998, 1999; McBride et al., 2009a; Sarr et al., 2000), matching the general age distribution pattern of alcohol dependence (Li et al., 2007).

In a longitudinal community- and treatment-based sample of 372 adolescent drinkers ages 13-19 years old, Pollack and Martin (1999) found that 9.4% were diagnostic orphans at baseline. Comparisons with external validation measures (i.e., alcohol and other illicit substance use) revealed that orphans were midway between drinkers with no symptoms and those with alcohol dependence but similar to those with alcohol abuse. Larger proportions of orphans (30%) than drinkers without symptoms (17%) developed new symptoms between baseline and 1-year follow-up (Pollack and Martin, 1999). In a longitudinal study of DSM-IV AUD among young persons ages 12-19, Schuckit et al. (2008) compared baseline orphan status (11%) with no AUD symptoms (60%), alcohol abuse (16%), and alcohol dependence (12%). Drug use and substance-related problems were lowest for young people with no AUD symptoms and highest for those with alcohol dependence, with the rate for young people with alcohol abuse falling in between. Compared with orphans, those with alcohol abuse had higher drug use and problems, although drinking patterns were similar. Compared with no AUD symptoms, orphans reported heavier drinking, more alcohol-related problems, and drug use. At the 5-year follow-up, a larger proportion of diagnostic orphans pro-

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gressed to abuse than to dependence. The proportions with alcohol dependence for the following baseline diagnostic groups were as follows: no AUD symptoms, 10%; orphans with one or two dependence criteria, 15%; alcohol abuse, 19%; and alcohol dependence, 40%. The proportions with alcohol abuse at follow-up were the following: no AUD symptoms, 24%; orphans with one or two dependence criteria, 38%; alcohol abuse, 51%; and alcohol dependence, 46%.

Among adult samples, Hasin and Paykin (1999) reported that heavy drinking and family history of alcoholism were lower among orphans and respondents with no AUD symptoms than among alcohol-dependent respondents in a national sample. Comparisons between current diagnostic status (last 12 months) and prior diagnostic status (before past 12 months), however, indicated that the risk for dependence was higher among orphans than among those with no AUD symptoms. Nonetheless, in a prospective community study of at-risk drinkers, Hasin and Paykin (1998) found that orphans were not at increased risk for alcohol dependence at the follow-up 1 year later. In a 5-year follow-up of 439 young men, Eng et al. (2003) found that approximately 11% of diagnostic orphans developed alcohol abuse compared with 2.7% for those with no AUD symptoms at baseline. Approximately 5.6% of orphans developed alcohol dependence compared with 8.8% of those with alcohol abuse at baseline. Compared with alcohol abusers, orphans had lower levels of alcohol and other drug use at baseline and fewer alcohol-related problems over the 5-year period.

An analysis of 740 individuals from the St. Louis Epidemiologic Catchment Area study included respondents with alcohol abuse in addition to alcohol dependence (Sarr et al., 2000). Consistent with findings reported for adolescent samples, the Epidemiologic Catchment Area findings indicated that, with respect to alcohol use and drug dependence, diagnostic orphans most clearly resembled individuals with alcohol abuse. Similar conclusions were reported by Ray et al. (2008) in an analysis replicating studies in the general population with clinical samples (1,793 treatment-seeking psychiatric outpatients). However, when compared with those with alcohol abuse, diagnostic orphans were less likely to meet diagnostic criteria for substance use disorders (i.e., cannabis, stimulants, cocaine). More recent studies indicate that diagnostic orphans, when compared with individuals with alcohol abuse, have greater AUD severity (Gelhorn et al., 2008) and are more impaired in certain life domains (McBride et al., 2009a). Of further relevance to differences between diagnostic orphans and those with alcohol abuse are potential differences among orphans with either one or two dependence criteria. McBride et al. (2009b, 2009c) report that orphans with two dependence criteria engage in more frequent hazardous drinking and have poorer mental health than orphans with one dependence criterion.

These studies raise questions regarding the future status of orphans within the DSM-IV categorical framework. Find-

ings from these studies do not support inclusion of orphans with those with alcohol abuse. By definition, however, DSM-IV alcohol abuse often includes some individuals meeting one or two dependence criteria. In addition to prospective studies in which some orphans develop subsequent dependence, the inclusion of orphans in the abuse category would further confound the conceptual clarity between abuse and dependence. Moreover, orphan status is generally defined by the most prevalent dependence criteria (i.e., higher endorsement for tolerance and drinking more/longer) as reported in several studies (Grant et al., 2007; Harford and Muthén, 2001; Hasin and Paykin, 1998; Langenbucher et al., 2004; Martin et al., 2006; Saha et al., 2006). Further, the inclusion of diagnostic orphans with one and two dependence criteria is complicated because the two orphan groups could be quite different.

Based on the limited samples used in recent prospective studies (Eng et al., 2003; Schuckit et al., 2008), additional long-term studies are required to assess the diagnostic utility of orphan status and to further clarify the diagnostic implications for orphans with one versus two dependence criteria. The purpose of the present article is to describe the course of respondents classified as diagnostic orphans at baseline to examine the longer term consequences of the development of DSM-IV AUD 5 years later. Related objectives include identifying demographic characteristics, alcohol use, and other early behavioral problems associated with diagnostic orphan status, and determining the most common dependence criteria met among diagnostic orphans. Based on the literature, it is hypothesized that diagnostic orphan status at baseline will be associated with risks for DSM-IV AUD at follow-up.

Method

Sample

The National Longitudinal Survey of Youth 1979 is an annual survey of 12,686 young people throughout the United States (Ohio State University, 1994). The survey was initiated in 1979 and included (a) a cross-sectional sample representative of the noninstitutionalized civilian segment of young people living in the United States in 1979 and ages 14-21 as of December 31, 1978 ($n = 6,111$); (b) a supplemental sample designed to oversample civilian Hispanic, Black, and economically disadvantaged non-Hispanic, non-Black youth ($n = 5,295$); and (c) a supplemental military sample ages 17-21 as of December 31, 1978 ($n = 1,280$). In the cross-sectional and supplemental samples, respectively, screening interviews were completed in 91.2% and 91.9% of the occupied dwelling units selected for screening, and baseline interviews were successfully conducted in 89.7% and 88.7% of those designated for such an interview in 1979 (Frankel et al., 1983). The military sample was dropped

in 1985, but 201 respondents randomly selected from this sample were retained for future interviews (excluded $n = 1,160$). The oversampled economically disadvantaged non-Black and non-Hispanic youth ($n = 1,632$) were dropped after 1990 (Ohio State University, 2006). Data were collected annually from 1979 to 1994, and biennially from 1996 to the present. Symptom measures related to DSM-IV AUD were first included in 1989 and again in 1994. Of the total 8,891 respondents who were reinterviewed in 1994, 8,534 (96%) had complete information for DSM-IV AUD and other relevant variables in the analysis and, therefore, were used as our working sample for the study.

Measures

Past-year DSM-IV AUD was assessed only in 1989 and 1994, using a set of 22 symptom-item questions designed to operationalize the DSM-III-R AUD diagnosis (American Psychiatric Association, 1987). These items have been adapted to operationalize the DSM-IV AUD diagnosis (see Harford and Muthén, 2001). Because the items were developed before the publication of DSM-IV, several criteria are represented by a single item and the abuse criterion for alcohol-related legal problems was not included. The diagnoses derived from these symptom items have demonstrated good test-retest reliability (Grant et al., 1995, 2003) and population validity (Cottler et al., 1997; Harford and Grant 1994). For the current study, past-year diagnostic status in 1989 and 1994, respectively, was coded into the following five categories: no DSM-IV AUD symptoms, one dependence criterion (Orphan 1), two dependence criteria (Orphan 2), DSM-IV alcohol abuse, and DSM-IV alcohol dependence.

Demographic variables included gender (male), age in years, race/ethnicity (Hispanic, Black, and White/Other as referent), marital status (never married, previously married, and married as referent), and educational status (less than 12 years, more than 12 years, and 12 years as referent). Baseline risky drinking was measured by heavy episodic drinking (one or more occasions of having six or more drinks per occasion) in the past month. Several studies have shown that early onset of substance use (alcohol and other drugs) is a risk factor for subsequent DSM-IV substance-use disorder (Goldstein et al., 2007; Grant and Dawson, 1997; Hingson et al., 2006; McCabe et al., 2007). Consequently, we included age at onset of drinking (15 years or younger vs. 16 years or older) and illicit substance use measured earlier in 1980 (coded as two dichotomous variables for any marijuana use and other illicit drug use in the past year, respectively). In addition, antisocial behavior, excluding the use of alcohol, was measured based on a summary of 13 items administered in 1980 that assessed the frequency of various behaviors (e.g., shoplifting, property damage, or fighting) during the past year (Cronbach's $\alpha = .80$). The summary scores were dichotomized at the upper quintile (20%) to 4 or higher versus

3 or lower, based on inspection of the skewed distribution and to offset inclusion of less serious behavior problems.

Analysis

Multinomial logistic regression was used to assess the relationships between diagnostic status at baseline (1989) and that at follow-up (1994), controlling for demographic characteristics and early behavioral problems. The referent group for this analysis was no AUD symptoms. We conducted several analyses, beginning with an unadjusted model using only baseline diagnostic status as the predictor and adding demographic status, heavy episodic drinking, and early indicators of alcohol use and illicit drug use in subsequent models. In all models, each of the 1989 diagnostic groups were significantly related to increased risk for the 1994 diagnostic outcomes, although their odds ratios (ORs) were reduced in the full model. Results (ORs with 95% confidence intervals [CIs]) are presented for the final full model only. Analyses were conducted using SAS, Version 8 (SAS Institute, Inc., Cary, NC).

Results

Diagnostic status in 1989 was distributed as follows: no AUD symptoms, 71.1 %; Orphan 1, 11.5%; Orphan 2, 2.8%; alcohol abuse, 10.6%; and alcohol dependence, 4.0%. In 1994, the distribution was no AUD symptoms, 74.5%; Orphan 1, 10.2%; Orphan 2, 2.7%; alcohol abuse, 8.9%; and alcohol dependence, 3.7%. The distribution of demographic characteristics and other background measures by diagnostic status in 1989 and 1994 is shown in Table 1. In general, diagnostic groups at baseline and follow-up were ordered with increasing proportions of males, marital disruption (i.e., separation/divorce), high school dropouts, heavy episodic drinking, substance use, and antisocial behaviors.

Cross-sectional multinomial regression at baseline (data not shown) indicated that Orphan 2 was more likely than Orphan 1 to exhibit heavy episodic drinking (OR = 2.11, CI [1.56, 2.85]) and antisocial behaviors (OR = 1.58, CI [1.19, 2.10]), but the two orphan groups did not differ with respect to age at onset of drinking and early use of marijuana or other illicit drug. Respondents with baseline alcohol abuse were more likely than Orphan 1 to exhibit heavy episodic drinking (OR = 2.10, CI [1.75, 2.53]) and other illicit drug use (OR = 1.49, CI [1.22, 1.82]). When compared with Orphan 2, respondents with baseline alcohol abuse were not significantly different in heavy episodic drinking but were more likely to exhibit other illicit drug use (OR = 1.40, CI [1.03, 1.91]) and less likely to report antisocial behaviors (OR = 0.75, CI [0.57, 0.99]). Comparable cross-sectional relationships were present at follow-up in 1994. Respondents with alcohol abuse in 1994 compared with Orphan 1 were more likely to exhibit heavy episodic drinking (OR = 1.51,

TABLE 1. Prevalence (%) of demographic characteristics, and drinking and other substance use measures by DSM-IV AUD diagnostic status in 1989 and 1994^a

Demographic characteristics, drinking and other substance use measures ^b	AUD diagnostic status in 1989					AUD diagnostic status in 1994						
	Total (N = 8,534)	No AUD symp. (n = 6,268)	Orphan 1 (n = 916)	Orphan 2 (n = 250)	Alcohol abuse (n = 758)	Alcohol depend. (n = 342)	Total ^c (N = 8,534)	No AUD symp. (n = 6,427)	Orphan 1 (n = 822)	Orphan 2 (n = 246)	Alcohol abuse (n = 688)	Alcohol depend. (n = 351)
Gender												
Male	50.3	44.0	57.8	65.5	71.6	73.1		45.6	57.1	57.1	69.9	75.0
Race/ethnicity												
Hispanic	6.5	6.8	5.2	7.0	4.6	8.2		6.5	6.4	6.3	5.7	7.4
Black	14.2	15.9	11.0	15.7	6.7	12.2		14.8	11.0	21.1	9.3	17.7
White/other	79.4	77.3	83.8	77.3	88.7	79.6		78.7	82.6	72.6	85.0	74.9
Age, in years	27.9	28.0	27.8	27.6	27.6	27.6	33.0	33.0	32.8	32.9	32.7	32.5
Marital status												
Never married	32.5	27.9	42.2	48.2	42.5	48.6	21.1	18.7	21.9	27.9	29.2	41.8
Married	54.4	59.9	42.6	39.7	42.0	32.1	60.9	65.3	57.9	45.8	47.3	26.2
Previously married	13.1	12.1	15.2	12.0	15.5	19.3	18.0	16.0	20.2	26.3	23.5	32.0
Education												
<11 years	12.3	12.1	11.2	17.3	10.6	21.5	10.7	9.3	11.6	20.1	12.5	25.7
12 years	44.0	43.5	43.4	50.5	42.9	52.6	42.6	42.2	40.1	47.5	44.7	48.5
>12 years	43.7	44.4	45.4	32.2	46.5	25.9	46.7	48.5	48.3	32.4	42.8	25.8
Heavy episodic drinking (1989)	33.1	15.8	62.9	80.2	80.8	94.9		23.7	51.1	58.3	66.1	73.6
Early-onset alcohol use (1982)	20.2	16.9	23.3	27.2	28.9	42.1		17.1	24.4	24.0	34.4	33.6
Marijuana use (1980)	46.1	40.8	54.1	60.6	60.7	69.2		41.5	57.4	54.1	62.7	62.2
Other illicit drug use (1980)	20.1	16.4	23.4	27.5	32.5	39.1		16.4	27.9	22.4	34.6	36.3
Antisocial behaviors												
>4 (1980)	19.2	14.9	22.4	35.4	32.4	38.9		15.5	23.2	22.9	33.6	44.8

Notes: DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; AUD = alcohol use disorder; sympt. = symptoms; depend. = dependence. ^aData are weighted to 1994; ^bage, marital status, and education were measured in 1989 and 1994, respectively. Drinking and substance use were measured in years as indicated in parentheses; ^conly presenting distributions that changed between 1989 and 1994.

TABLE 2. Prevalence (%) of diagnostic status in 1994 by diagnostic status in 1989

AUD diagnostic status in 1989	AUD diagnostic status in 1994				
	No AUD symptoms	Orphan 1	Orphan 2	Alcohol abuse	Alcohol dependence
No AUD symptoms	84.4	7.6	1.9	4.4	1.6
Orphan 1	61.7	19.0	4.5	11.3	3.5
Orphan 2	48.7	15.1	8.8	17.5	9.9
Alcohol abuse	44.1	16.2	3.2	27.9	8.5
Alcohol dependence	33.0	11.3	5.1	25.4	25.1
Total	74.5	10.2	2.7	8.9	3.7

Notes: Data are weighted to 1994. AUD = alcohol use disorder.

CI [1.27, 1.80]) and other illicit drug use (OR = 1.22, CI [1.01, 1.50]). When compared with Orphan 2, respondents with alcohol abuse in 1994 were more likely to exhibit other illicit drug use (OR = 1.49, CI [1.07, 2.09]), although the association for antisocial behavior was no longer statistically significant. In addition, and unlike the baseline comparisons, respondents with alcohol abuse in 1994 when compared with Orphan 1 and Orphan 2 were more likely to report early onset of alcohol use (OR = 1.34, CI [1.11, 1.62], and OR = 1.37, CI [1.02, 1.84], respectively).

Among orphans at baseline with one dependence criterion, drink more/longer (87.2%) and tolerance (11.8%) ac-

counted for 99% of all endorsed dependence criteria. Among those with two dependence criteria, the combinations of endorsed criteria are distributed as follows: drink more/longer and tolerance, 77.1%; drink more/longer and time spent drinking, 8.0%; drink more/longer and continued to drink despite problems, 4.8%; drink more/longer and withdrawal, 3.6%; tolerance and time spent, 1.7%; drink more/longer and give up activities, 1.6%; drink more/longer and unsuccessful attempts to cut down, 1.4%; tolerance and continued to drink despite problems, 1.0%; and withdrawal and continued to drink despite problems, 0.8%.

The 5-year outcomes for each of the baseline diagnostic

TABLE 3. Odds ratios and 95% confidence intervals (CI) for AUD diagnostic status in 1994

AUD diagnostic status in 1989, demographic characteristics, and drinking and other substance-use measures ^b	OR [CI] for AUD diagnostic status in 1994 ^a (referent group = no AUD symptoms)			
	Orphan 1	Orphan 2	Alcohol abuse	Alcohol dependence
AUD diagnostic status in 1989				
No AUD symptoms	1.00	1.00	1.00	1.00
Orphan 1	2.28** [1.92, 2.72]	1.98** [1.42, 2.75]	2.09** [1.68, 2.60]	1.63** [1.13, 2.35]
Orphan 2	1.99** [1.42, 2.80]	3.72** [2.35, 5.89]	3.28** [2.34, 4.61]	3.95** [2.50, 6.22]
Alcohol abuse	2.31** [1.89, 2.82]	1.74** [1.18, 2.58]	5.81** [4.76, 7.08]	4.57** [3.32, 6.28]
Alcohol dependence	1.77** [1.27, 2.48]	2.56** [1.57, 4.19]	5.18** [3.88, 6.91]	11.0** [7.74, 15.7]
Gender				
Male	1.21** [1.06, 1.38]	1.10 [0.86, 1.41]	1.67** [1.43, 1.94]	1.85** [1.45, 2.36]
Race/ethnicity				
Hispanic	0.99 [0.77, 1.28]	0.94 [0.58, 1.50]	0.89 [0.66, 1.19]	1.03 [0.69, 1.54]
Black	0.83 [0.68, 1.02]	1.48** [1.10, 1.99]	0.73** [0.57, 0.92]	1.19 [0.89, 1.59]
White/other	1.00	1.00	1.00	1.00
Age, in years (1994)	0.97* [0.94, 0.99]	0.96** [0.92, 1.02]	0.95** [0.92, 0.97]	0.93** [0.89, 0.97]
Marital status (1994)				
Single	1.19* [1.02, 1.40]	1.59** [1.28, 2.12]	1.79** [1.52, 2.12]	3.68** [2.85, 4.76]
Married	1.00	1.00	1.00	1.00
Previously married	1.31** [1.12, 1.54]	1.79** [1.35, 2.37]	1.73** [1.45, 2.08]	3.51** [2.69, 4.58]
Education (1994)				
<11 years	1.30* [1.05, 1.60]	1.78** [1.31, 2.42]	1.24 [0.99, 1.54]	2.11** [1.62, 2.75]
12 years	1.00	1.00	1.00	1.00
>12 years	1.09 [0.96, 1.25]	0.67** [0.52, 0.87]	0.91 [0.78, 1.05]	0.58** [0.45, 0.74]
Heavy episodic drinking (1989)	1.95** [1.67, 2.25]	2.65** [2.00, 3.52]	2.04** [1.71, 2.42]	2.36** [1.78, 3.13]
Early-onset alcohol use (1982)	1.15 [0.99, 1.34]	1.12 [0.85, 1.47]	1.49** [1.28, 1.74]	1.22 [0.97, 1.54]
Marijuana use (1980)	1.41** [1.22, 1.63]	1.32* [1.02, 1.71]	1.36** [1.15, 1.60]	1.10 [0.86, 1.41]
Other illicit drug use (1980)	1.39** [1.18, 1.63]	1.13 [0.83, 1.54]	1.59** [1.33, 1.89]	1.79** [1.38, 2.32]
Antisocial behaviors >4 (1980)	0.96 [0.82, 1.13]	0.93 [0.69, 1.25]	1.18* [1.00, 1.40]	1.72** [1.36, 2.18]

Notes: AUD = alcohol use disorder; OR = odds ratio; CI = confidence interval. ^aData are weighted to 1994; ^byears in parentheses indicate when the corresponding measures were obtained.

* $p < .05$; ** $p < .01$.

categories are shown in Table 2. Only 6% of baseline respondents with no DSM-IV AUD symptom met DSM-IV criteria for alcohol abuse or dependence in 1994. This proportion increased across each of the other baseline diagnostic categories as follows: Orphan 1, 14.8%; Orphan 2, 27.4%; alcohol abuse, 36.4%; and alcohol dependence, 50.5%. The proportions with alcohol dependence in 1994 were similar for baseline Orphan 2 (9.9%) and alcohol-abuse (8.5%) groups.

The longitudinal results from the multinomial logistic regression model for 1994 outcomes are shown in Table 3. When adjusted for background variables, each of the baseline diagnostic categories, compared with respondents with no baseline AUD symptoms, was significantly related to increased risks for each of the diagnostic categories in 1994. Based on inspection of the confidence intervals of the ORs, there were no significant differences in the effects of the baseline categories on either diagnostic orphan outcome. In contrast, the likelihood of having alcohol abuse in 1994 was significantly higher for baseline respondents with abuse or dependence than for the two orphan groups. The likelihood of having alcohol dependence in 1994 was significantly higher for baseline respondents with alcohol dependence than for all other baseline groups and for baseline Orphan 2 and alcohol-abuse groups when compared with the Orphan 1 group. The odds for alcohol dependence in 1994 were not significantly different between baseline Orphan 2 and alcohol-abuse groups.

The associations between other background variables and each of the outcomes were similar. When compared with respondents with no AUD symptoms, respondents who were male, younger, were not married, did not complete high school, and reported heavy episodic drinking in 1989, as well as earlier marijuana and other illicit drug use, were more likely to meet criteria for orphan status and AUD. In contrast to AUD outcomes, early antisocial behaviors were not related to orphan status at follow-up.

Discussion

The present study lends support for the diagnostic utility of respondents who do not meet the DSM-IV diagnosis of alcohol dependence. Findings indicate that risk for both alcohol abuse and dependence over this 5-year period increased among both orphan groups when compared with respondents with no AUD symptoms. The odds of developing alcohol dependence also were higher for orphans with two than with one dependence criterion. Moreover, the increased odds of developing dependence were similar between those with baseline alcohol abuse and orphans with two dependence criteria. These findings are consistent with those reported by Schuckit et al. (2008) and Eng et al. (2003). In view of the enhanced risk for AUD, diagnostic orphans would appear to be an important target group for treatment and intervention.

Comparisons among the diagnostic groups at baseline are consistent with studies that show that orphans with one or two dependence criteria exhibit levels of drinking and drug use that are greater than those with no AUD symptoms but less than those with abuse or dependence (Eng et al., 2003; McBride et al., 2009a; Pollack and Martin, 1999; Ray et al., 2008; Schuckit et al., 2008). In the present study, comparisons of heavy episodic drinking between diagnostic orphans and alcohol-abuse groups varied by number of dependence criteria. Orphans with two dependence criteria were similar to those with alcohol abuse in terms of risky drinking, although earlier onset of illicit drug use was higher among those with alcohol abuse than either orphan group. Comparisons between diagnostic orphans and those with alcohol abuse, however, are complicated because although alcohol abuse requires the presence of only a single abuse criterion, it may also include respondents with one or two dependence criteria. In the present study, respondents with baseline alcohol abuse included two prevalent dependence criteria: tolerance (25%) and drink more/longer (80%). As shown in our results, these two criteria accounted for the majority of all dependence criteria endorsed among orphans, which is consistent with the higher endorsement for these criteria as reported in the general literature (Chung and Martin, 2005; Hasin and Paykin, 1998; Martin et al. 1996).

Previous findings from item response theory (IRT) analyses indicate that these two criteria (i.e., tolerance and drink more/longer) are best conceptualized as representing less severe forms of the disorder (Gelhorn et al., 2008; Saha et al., 2006). To confirm this in the present study, we conducted an IRT analysis of the dependence criteria for both years (analysis not presented). Consistent with the other studies, our IRT results indicated that, compared with other dependence criteria, tolerance was lowest in item discrimination and moderately low in item difficulty (i.e., severity), whereas drink more/longer was high in item discrimination and low in item difficulty.

The baseline groups in this study may reflect a spectrum of criterion severity as proposed by Lynskey and Agrawal (2007). The ordering of baseline groups with respect to criterion severity is consistent with the increased frequency of heavy drinking, marijuana and other illicit drug use, early onset of alcohol use, and antisocial behaviors for these groups.

Several limitations need to be considered when interpreting the present results. First, the 1994 DSM-IV diagnostic estimates are based on the past year and do not include any AUDs that occurred between baseline and follow-up. Consequently, undetected orphan status may have emerged during this 5-year period. Second, we were unable to assess the abuse criterion for legal problems. Third, other risk factors were limited to baseline or earlier onset of alcohol and drug use and do not capture the emergence of risk factors at later periods in development. Fourth, despite the large sample

used in this study, it comprised only 67% of the initial National Longitudinal Survey of Youth sample (or 86% of those eligible for interviews in 1994) and may not be generalized to the entire survey population. Fourth, the age cohorts were limited to ages 25-32 in 1989, and the findings might differ for other age groups.

The present findings have important diagnostic implications for the proposed DSM-V. They support incorporation of diagnostic orphans into the forthcoming DSM-V. This poses no problem for a dimensional diagnosis incorporating less severe forms of alcohol dependence, an approach recommended in a number of recent studies (Gelhorn et al., 2008; Langenbucher et al., 2004; Li et al., 2007; Martin et al., 2006). Future studies are needed to explore diagnostic schemes incorporating orphan status and optimal cutoffs for dependence severity.

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