Impact of early, weekly drinking on latent classes of alcohol involvement progression and recovery: Evidence from the NESARC Waves 1 and 2

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ARTICLE INFO

ABSTRACT

Introduction: Early drinkers have been found to have higher risk of developing alcohol use disorder; however, the association of early drinking with progression to problematic alcohol involvement that does not meet disorder criteria (i.e., subclinical problems) or to severe stages of alcohol involvement, sex-specific associations, and relationship of early drinking with alcohol recovery have rarely been investigated.

Methods: Using data from Waves 1 and 2 of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), we applied latent transition analyses to investigate the impact of weekly drinking before age 18 on alcohol progression and recovery operationalized as three classes of alcohol involvement using abuse and dependence indicators. We analyzed data separately for male (n = 12,276) and female (n = 14,750) drinkers and applied propensity score methods to address confounding.

Results: We observed significant associations between early, weekly drinking and alcohol involvement class membership at Wave 1 for both males and females. For males, early, weekly drinking was also associated with greater odds of transitioning from moderate to severe alcohol problems (aOR = 3.19, 95% CI = 1.72, 5.35). For females, early, weekly drinking predicted the transition from no to severe problems (aOR = 2.98, 95% CI = 1.11–8.00). Contrary to our hypothesis, early, weekly drinking was associated with greater likelihood of transition from severe to no problems for males (aOR = 3.23, 95% CI = 1.26, 8.26).

Discussion: Frequent, early drinking seems to be an important indicator of drinking progression with differential associations by sex. This information is useful to identify those at greater risk of progressing to severe drinking problems to intervene appropriately.

1. Introduction

Numerous previous studies have demonstrated that those who first drink at younger ages have a greater likelihood of developing an alcohol use disorder (e.g., Chou & Pickering, 1992; Grant & Dawson, 1997). However, much of the initial evidence that established this association relied on cross-sectional data (DeWit, Adalf, Offord, & Ogborne, 2000) and did not adequately control for confounding. More recent prospective studies (e.g., King & Chassin, 2007; Newton-Howes & Boden, 2016; Warner & White, 2003) have found associations between age of onset and alcohol outcomes diminish once appropriate controls are added to the models. Maimaris and McCambridge (2014), in a systematic review of prospective cohort studies, conclude that "There is some evidence of at least small, rather inconsistent, effects of [age of first drink] on adult alcohol problems in all studies, however, these effects attenuate or disappear with more rigorous control for

confounding…. The most sensible conclusions are that we do not yet know whether starting drinking earlier leads to adult alcohol problems" (p. 273–274).

Well-designed longitudinal studies have shown prospective associations between early drinking and alcohol outcomes. Grant, Stinson, and Harford (2001) found a significant prospective association in models adjusting for demographics, antisocial behavior, marijuana use, and family history of alcoholism between the onset of regular drinking (i.e., 2 or more drinks per week) and the development of alcohol dependence eight and 12 years later. Further, this association was examined in a nationally-representative longitudinal dataset. Dawson, Goldstein, Patricia Chou, June Ruan, and Grant (2008) found that after controlling for confounders, age at first drink significantly predicted incident alcohol dependence for those who began drinking before age 15 compared to ages 18 or older and for incident alcohol abuse for age of first drink before age 15 and ages 15–17 compared to ages 18 or older.

While evidence is mixed on the impact of early drinking on incident alcohol use disorders, how early drinking impacts transition across stages of alcohol problems, for example from moderate to severe problems, is also not fully understood. As most past research has focused on the association of early drinking with alcohol use disorder, association with progression to problematic alcohol involvement that does not meet disorder criteria (i.e., subclinical problems), or to more severe stages of alcohol involvement has not been adequately examined. Sannibale and Hall (2001), in a treatment sample, provide evidence that severity of alcohol problems was predicted by an earlier age of onset of drinking for both men and women, though analyses did not adjust for confounding factors. Similarly, Hasin and Glick (1992) found that severity of alcohol dependence was greater among those who initiated before age 15 compared to later initiation. Few studies though have considered how the impact of age of onset may vary by frequency of drinking.

Furthermore, less attention has been paid to improvements in substance abuse, such as recovery and remission, particularly in population-based prospective samples. Recovery is often defined broadly as a process, and primarily relates to behavior change that leads to improvements in health while remission is often defined as no longer meeting criteria for a substance use disorder (National Institute on Drug Abuse, n.d.). Cross-sectional data findings suggest that younger age of onset may be associated with a lower likelihood of remission from both alcohol abuse and dependence because of age of onset's relationship with alcohol severity (Kalaydjian et al., 2009). Using National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) Wave 1, Hingson, Heeren, and Winter (2006) found in models that controlled for a wide range of confounders that the younger the age of drinking onset, the greater the risk of chronic relapsing dependence. Similarly, Dawson et al. (2008), also analyzing NESARC Wave 1, found that recovery related to severity of dependence.

It is important to analyze the association between age of onset of drinking with problematic use or recovery separately by sex since previous work suggests the course of alcohol use disorders vary by sex even if differences have not always been observed in age of onset (e.g., Flory, Lynam, Milich, Leukefeld, & Clayton, 2004; Hawkins et al., 1997). Sannibale and Hall (2001), for example, found that men have a longer history of severe alcohol use disorder compared to women. Grant and Dawson (1997), analysis of cross-sectional data from the National Longitudinal Alcohol Epidemiologic Survey is one of the few studies that has examined the association of age of onset of drinking with alcohol abuse and dependence separately for males and females while controlling for demographic characteristics, family history of alcohol problems, and drinking behaviors. They found a stark drop off in risk of alcohol dependence for both males and females who began drinking at age 18 or later. Similarly, Dawson et al. (2008) found a significant interaction between sex and age of first drink where initiating drinking between ages 15–17 (compared to 18 and older) increased the risk of incident alcohol dependence among females but not males.

The current study attempts to answer the following research question: Does early, weekly drinking impact later transitions in problematic alcohol use among males and females? In an attempt to address confounding better than previous studies, we utilize a propensity score weighting approach, which balances the distribution of confounders between those who began drinking weekly before age 18 as compared to those who drank less before age 18 or initiated alcohol use at age 18 or older. We hypothesize that early, weekly drinking increases the risk of progression and impedes recovery for both males and females.

2. Materials and methods

We use data from Wave 1 (2001–2002) and Wave 2 (2004–2005) of the NESARC. This U.S. population-based survey was conducted by the National Institute on Alcohol Abuse and Alcoholism using face-to-face computer-assisted personal interviewing. Wave 1 included 43,093 civilian participants ages 18 and older with a response rate of 81%. Wave 2 re-interviewed 34,653 of the 39,959 who were eligible for follow-up (87%).

Our sample was restricted to individuals who completed both waves of data collection and reported drinking alcohol in their lifetime in any quantity or frequency at either Wave 1 or Wave 2. Our rationale for excluding those who reported lifetime abstinence at both waves was that these individuals were not at risk for progression or remittance from alcohol problems. We also excluded a minimal number of individuals with missing data, resulting in a sample of 12,276 males and 14,750 females from the 34,653 who completed both waves of the NESARC (78.0%).

Data were weighted to represent the U.S. non-institutionalized, civilian population using demographic information from the 2000 Census. More details on the NESARC are available in Grant et al. (2004, 2009). Since this study used de-identified, publicly available data, it did not require Institutional Review Board approval.

2.1. Measures

Outcome: Transitions in Alcohol Involvement Across Waves: The NESARC assessed the clinical features of abuse and dependence using the Alcohol Use Disorders and Associated Disabilities Interview Schedule (AUDADIS-IV) (Grant et al., 2003), a structured diagnostic interview designed to assess alcohol disorders according to DSM-IV criteria (Association, 1994). Past-year symptom questions were combined to form yes/no indicators of the alcohol use disorder criteria. These include four abuse criteria: 1) recurrent drinking resulting in a failure to fulfill major role obligations; 2) recurrent drinking in hazardous situations; 3) recurrent drinking-related legal problems; and 4) continued drinking despite recurrent interpersonal problems caused or exacerbated by drinking; and seven dependence criteria: 1) tolerance; 2) experiencing two or more withdrawal symptoms; 3) drinking larger amounts or for a longer period than intended; 4) having a persistent desire or unsuccessful attempts to cut down on drinking; 5) spending a great deal of time obtaining alcohol, drinking, or recovering from drinking's effects; 6) giving up important social, occupational, or recreational activities in order to drink; and 7) continuing to drink despite physical or psychological problems caused by drinking. To align with the approach used in DSM-5 and prior latent class analyses (Crum, Green, Stuart, La Flair, Kealhofer, Young, & Reboussin, 2018; Ehlke, Hagman, & Cohn, 2012; Green et al., 2019; La Flair et al., 2012, 2013; Muthén, 2006), we considered abuse and dependence criteria together. In accordance with previous work, we selected a three-class model for both males and females based on fit statistics and parsimony in latent class analysis (see Crum et al., 2018): A no problem class (84.9% at Wave 1, 82.3% at Wave 2 for females; 80.7% at Wave 1, 76.1% at Wave 2 for males), a moderate problem class (12.4% at Wave 1, 14.6% at Wave 2 for females; 15.8% at Wave 1, 20.2% at Wave 2 for males), and a severe problem class (2.7% at Wave 1, 3.1% at Wave 2 for females; 3.5% at Wave 1, 3.7% at Wave 2 for males). Supplemental Fig. 1 shows item

probabilities for Wave 1 and Wave 2 for males and females separately to help characterize the classes.

In this study, we define progression as movement from a less severe alcohol involvement class (e.g., no problems) in Wave 1 to a more severe alcohol involvement class (i.e., moderate problems or severe problems) in Wave 2, and recovery as movement from a more severe class (e.g., severe problems) in Wave 1 to a less severe class (i.e., moderate problems or no problems) in Wave 2. Recovery in essence captures a reduction in past year alcohol use disorder criteria between Wave 1 and Wave 2 and does not consider drinking levels, quality of life improvement, or clinical outcomes, nor does it imply long-term recovery.

Independent Variable: Drinking weekly before age 18 was based on a question asked at Wave 1 about how old the respondent was when the respondent "first started drinking at least once a week." Respondents who reported an age younger than 18 were classified as early, weekly drinkers while those who reported initiating at age 18 or older or reported never drinking at least weekly were classified as non-early, weekly drinkers; 14.4% of males and 6.9% of females in our analytic sample were considered early, weekly drinkers.

Confounders: To build the propensity score model, we included age (continuous variable), race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic and Others), education (≥12 years, <12 years), family history of alcoholism (any first-degree relative reported as "alcoholic or problem drinker"), lifetime mood disorders (major depressive disorder, dysthymia, mania, hypomania), lifetime anxiety disorders (generalized anxiety disorder, panic disorder, social phobia, specific phobia), and lifetime drug use disorder.

2.2. Statistical analysis

We first estimated the transition probabilities between the three classes of alcohol involvement between Wave 1 and Wave 2 separately for males and females. To do so, we conducted latent transition analyses (LTA) using Markov modeling (Collins & Wugalter, 1992; Reboussin, Liang, & Reboussin, 1999). Within this LTA framework, logistic regression assessed the potential influence of initiating weekly drinking before age 18 on the probability of 1) progressing from less to more advanced stages of alcohol involvement, as well as 2) the probability of moving from a more advanced stage of alcohol problems to less symptomatic involvement (i.e., recovery). The estimated odds ratio for transitioning from one class to another relative to remaining in the same class for early, weekly drinkers compared to non-early, weekly drinkers was estimated by computing the interaction of alcohol involvement class at time 1 by the early drinking variable. Models addressed confounding by applying inverse probability of treatment weighting (IPTW), which adjusted for the baseline differences between early, weekly drinkers and non-early weekly drinkers (Curtis, Hammill, Eisenstein, Kramer, & Anstrom, 2007; Rubin, 2010; Stuart, 2010). We computed propensity scores (i.e., probability of initiating drinking weekly before age 18) in R using a logistic regression model. The resulting propensity scores reflected each participant's likelihood of being an early, weekly drinker given sociodemographic and clinical characteristics. An individual's data were then weighted by the inverse probability of being an early, weekly drinker. LTAs were conducted in Mplus version 7.0. To address both the complex sample design and confounding, we multiplied the propensity score weights and the survey weights and included the resulting combined weights in the LTA transitions (DuGoff, Schuler, & Stuart, 2014). To assess the effectiveness of IPTW in balancing the early weekly drinkers with later onset or less frequent drinkers on measured potential confounders, we compared characteristics of the groups both before and after applying the weights (Stuart, 2010) and deemed the application of IPTW as successful.

We stratified by sex to examine differential associations for males and females. We previously confirmed that sex-stratified analyses were appropriate by testing whether the structure of the 3-class model varied for females compared to males (see Crum et al., 2018). Results of sex

invariant testing showed that pooling data across sex lead to a significantly worse model fit (likelihood difference test statistic = 276.84, p < 0.001, and 182.25, p < 0.001 for Waves 1 and 2, respectively). Results indicated that latent class structures differed significantly between females and males (e.g., males had higher conditional probabilities for developing tolerance and drinking under physically hazardous conditions).

We examined the cross-sectional association, as well as progression and recovery through propensity score-adjusted models. We also conducted sensitivity analyses as shown in the Supplemental Tables by dividing the age of onset into three groups: less than or equal to 14, 15 to 17 years of age, and 18 years and older. In these analyses, frequency of drinking was not taken into consideration due to the small sample size for weekly drinking among those age 14 or younger.

3. Results

As shown in Table 1, those who began drinking weekly before age 18 were significantly different from those who never drank weekly or began drinking weekly later. For both males and females, early weekly drinkers were younger, in the White racial/ethnic group, had less education, were significantly more likely to have a mood or anxiety disorder, and were more likely to report drug use at Wave 1.

Fig. 1 presents the transition probabilities for classes of alcohol involvement for males and females separately. For both sexes, there was high stability across waves; an estimated 88.4% of males and 91.0% of females who were in the no problem class at Wave 1 remained in that class in Wave 2. Similarly, an estimated 66.4% of males and 53.0% of females in the moderate alcohol involvement class at Wave 1 remained in the moderate class at Wave 2. Further, an estimated 43.6% of males and 35.8% of females in the severe alcohol involvement class at Wave 1 remained in the severe class at Wave 2. Transition probabilities also showed significant progression and recovery. For recovery, an estimated 24.7% of males and 36.0% of females in the moderate alcohol involvement problem class at Wave 1 transitioned to the no problem class at Wave 2, while an estimated 32.5% of males and 42.8% of females in the severe problem class at Wave 1 transitioned to the moderate class at Wave 2. In terms of progression, for females, the biggest change was among those in the moderate problems class at Wave 1 moving to severe problems at Wave 2 (11.0%). For males, an estimated 10.6% transitioned from no problems at Wave 1 to moderate problems at Wave 2. Extreme transitions (i.e., from no problems to severe problems across waves) were rare (1.0% for males and 0.9% for females).

Table 2 presents the cross-sectional association between weekly drinking before age 18 as reported in Wave 1 and the Wave 1 latent classes of alcohol involvement. For males, those who began weekly drinking before age 18 were more likely to be in the moderate or severe alcohol involvement class than the no alcohol problems class both before and after propensity score weighting (p's < 0.001). Similarly, females who began weekly drinking before age 18 were also more likely to be in the moderate alcohol involvement class than the no alcohol problems class both before (p < 0.001) and after (p < 0.014) propensity score weighting. Moreover, females who began drinking weekly before age 18 were more than six times as likely to be in the severe alcohol involvement class compared to the no problems class before incorporating propensity score weights (p < 0.001). After applying propensity score weights, this association was reduced and became marginally significant (p = 0.061). In all cases, adjusting for propensity of initiating drinking weekly before age 18 reduced the magnitude of the association between early, weekly drinking and classes of alcohol involvement.

Table 3 presents the association between weekly drinking before age 18 and transitions in classes of alcohol involvement between Waves 1 and 2. In terms of progression to more severe stages of alcohol involvement, males who began drinking weekly before age 18 were 3.19 times as likely as males who began drinking later or less frequently to progress from moderate to severe alcohol problems between Waves after
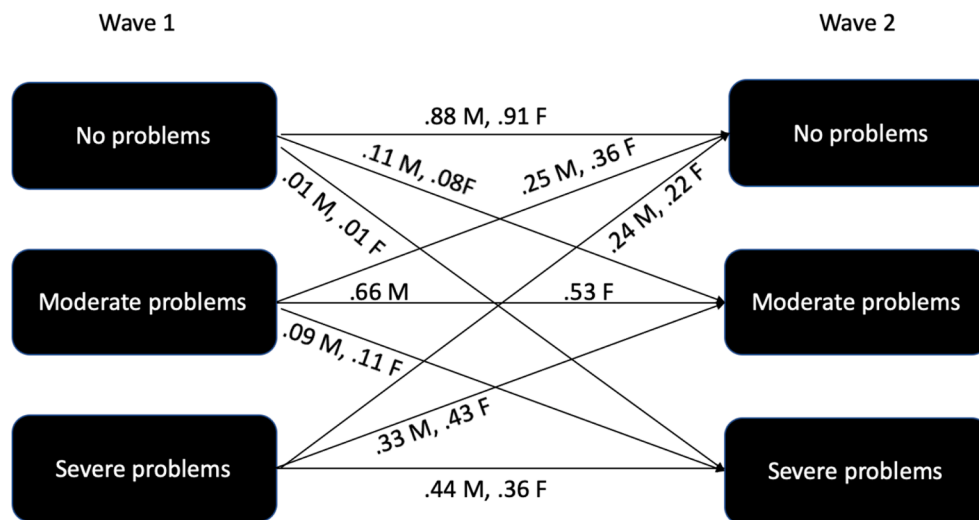
Table 1

Characteristics of the study sample participants: Males (n = 12,276) and females (n = 14,750) by weekly drinking before age 18; Ns, weighted percent and p-values, NESARC, Wave 1.

Characteristics at Baseline	*Males*							*Females*						
	Total Males		Weekly Drinking Before Age 18					*Total Females*		Weekly Drinking Before Age 18				
			No		Yes		*p*-value[a]			No		Yes		*p*-value[a]
	N	%	N	%	N	%		N	%	N	%	N	%	
Age (years)														
18–35	3892	35.2	3272	34.5	620	39.2	<0.001	5027	34.3	4556	33.2	471	48.6	<0.001
36–49	3914	30.6	3290	29.9	624	34.6		4436	30.1	4036	29.5	400	38.8	
50+	4470	34.2	3941	35.6	529	26.2		5287	35.6	5145	37.3	142	12.6	
Race/ethnicity														
White	7785	74.1	6608	73.7	1177	75.8	0.002	9022	75.6	8322	75.4	700	82.6	<0.001
Black	1850	9.5	1604	9.6	246	8.8		2897	10.8	2749	11.0	148	8.3	
Hispanic	2287	12.2	1972	12.3	315	11.9		2459	9.7	2313	9.9	146	7.3	
Other	354	4.2	319	4.3	35	3.4		372	3.5	353	3.7	19	1.8	
Education (years)														
<12	1913	14.4	1531	13.2	382	21.5	<0.001	1953	11.4	1790	11.3	163	13.4	<0.001
≥12	10,363	85.6	8972	86.8	1391	78.5		12,797	88.5	11,947	88.7	850	86.6	
Mood disorders[b]														
Major depressive disorder	1552	12.1	1229	11.0	323	18.5	<0.001	3386	22.7	3003	21.4	383	39.2	<0.001
Dysthymia	386	3.0	287	2.6	99	5.5	<0.001	893	5.7	748	5.0	145	14.6	<0.001
Mania	404	3.2	281	2.7	123	6.4	<0.001	586	3.9	477	3.4	109	10.8	<0.001
Hypomania	339	2.7	254	2.3	85	5.0	<0.001	381	2.4	328	2.2	53	5.6	<0.001
														<0.001
Anxiety disorder[b]														
Generalized anxiety disorder	355	2.8	279	2.6	76	4.1	<0.001	844	5.7	737	5.4	107	10.4	<0.001
Panic disorder	442	3.6	337	3.2	105	5.8	<0.001	1023	7.0	873	6.4	150	14.8	<0.001
Social phobia	546	4.4	445	4.2	101	5.6	0.001	835	5.8	721	5.3	114	12.7	<0.001
Specific phobia	842	6.6	678	6.2	164	9.1	<0.001	1888	12.8	1666	12.1	222	22.4	<0.001
														<0.001
Drug Use Disorder														
Absent	10,436	84.8	9308	88.5	1128	63.6	<0.001	13,504	91.5	12,836	93.5	668	65.3	<0.001
Present	1840	15.2	1195	11.5	645	36.4		1246	8.5	901	6.5	345	34.7	
Family History of Alcoholism														
Absent	8462	69.4	7482	72.1	980	53.9	<0.001	9351	64.1	8907	65.6	444	44.7	<0.001
Present	3814	30.6	3021	27.9	793	46.1		5399	30.6	4830	34.4	569	55.3	

[a] Rao-Scott chi-square tests of difference.
[b] Diagnostic categories are not mutually exclusive.

Fig. 1. Transition Probabilities Across Waves by Sex: Males (n = 12,276) and Females (n = 14,750). Note: M = male, F = female.

propensity score adjustment (p < 0.001). Extreme transitions for males between no problems and more serious alcohol involvement classes were not statistically significant either before or after applying propensity weights.

Before propensity score weighting, females who started drinking

before age 18 were twice as likely to transition from no problems to moderate problems between waves (p = 0.001); however, after propensity score adjustment, this association was no longer statistically significant (p = 0.191). Females who began drinking weekly before age 18 were approximately three times as likely as those who began drinking

Table 2
Cross-Sectional Association of Weekly Drinking before Age 18 with Alcohol Involvement Class at Baseline: NESARC Wave 1.

Alcohol Involvement Class	Sampling Weight Adjusted Odds Ratio, 95% CI, p-value	Propensity Score Adjusted Odds Ratio, 95% CI, p-value
	Males (n = 12,276)	
No Problems	Reference	
Moderate	**2.30 (1.92, 2.77), p < 0.001**	**1.39 (1.15, 1.68), p < 0.001**
Severe	**5.82 (4.44, 7.62), p < 0.001**	**2.18 (1.54, 3.09), p < 0.001**
	Females (n = 14,750)	
No Problems	Reference	
Moderate	**4.32 (3.31, 5.64), p < 0.001**	**1.46 (1.08, 1.98), p = 0.014**
Severe	**6.43 (4.57, 9.04), p < 0.001**	1.56 (0.98, 2.50), p = 0.061

Table 3
Longitudinal Association of Weekly Drinking before Age 18 with Alcohol Involvement Transitions across NESARC Waves 1 and 2.

Transition Direction	Top Estimate – Sampling Weights Bottom Estimate – Sampling & Propensity Score Weights	
	Males N = 12,276	**Females N = 14,750**
Progression	Odds Ratio, 95% Confident Interval and p-value	
No Problems to Moderate	0.94 (0.67, 1.32), p = 0.783[a]	**2.02 (1.32, 3.10), p = 0.001**[a]
	0.77 (0.54, 1.10), p = 0.156[b]	1.33 (0.87, 2.04), p = 0.191[b]
No Problems to Severe	0.38 (0.06, 2.46), p = 0.310[a]	1.87 (0.44, 7.93), p = 0.394[a]
	0.44 (0.11, 1.40), p = 0.152[b]	**2.98 (1.11, 8.00), p = 0.030**[b]
Moderate to Severe	**2.60 (1.49, 4.54), p = 0.001**[a]	1.61 (0.89, 2.92), p = 0.116[a]
	3.19 (1.72, 5.35), p < 0.001[b]	1.36 (0.61, 3.05), p = 0.451[b]
Recovery	Odds Ratio, 95% Confident Interval and p-value	
Moderate to No Problems	1.26 (0.78, 2.01), p = 0.340[a]	1.66 (0.94, 2.94), p = 0.081[a]
	1.15 (0.72, 1.85), p = 0.560[b]	1.26 (0.66, 2.41), p = 0.476[b]
Severe to No Problems	1.75 (0.89, 3.46), p = 0.106[a]	1.30 (0.52, 3.25), p = 0.576[a]
	3.23 (1.26, 8.26), p = 0.014[b]	1.20 (0.36, 4.04), p = 0.768[b]
Severe to Moderate	0.73 (0.36, 1.45), p = 0.368[a]	0.91 (0.37, 2.23), p = 0.829[a]
	0.90 (0.37, 2.19), p = 0.822[b]	1.75 (0.48, 6.28), p = 0.392[b]

[a] Sampling Weight Adjusted.
[b] Propensity Score Adjusted.

later or less frequently to transition from no problems to severe problems between Waves after propensity score adjustment (p = 0.030).

Contrary to our hypothesis, early, weekly drinking males had a higher likelihood of recovering from severe alcohol involvement after propensity score adjustment. Males who started drinking weekly before age 18 were over three times as likely as males who began drinking later or less frequently to transition from severe problems at Wave 1 to no problems at Wave 2 (p = 0.014, see Table 3). Initiating weekly drinking before age 18 was not related to recovery for females.

Sensitivity analyses showed that when the frequency of drinking was not taken into account, for males, only the youngest of early drinkers (<age 15) showed a higher risk of progression to severe alcohol problems across waves after adjusting for confounding, compared to those who began drinking at ages 18 or older (OR = 2.83, 95% CI = 1.18–6.77). No other associations were observed for males for progression, despite strong cross-sectional associations (See Supplementary Table 1). Moreover, these youngest early drinking males also had a lower likelihood of transitioning from severe to moderate problems

across waves as (OR = 0.23, 95% CI = 0.07–0.71, See Supplementary Table 2). For females, when frequency of early drinking was not taken into account, we observed no association between early drinking (either at the onset of < 15 or onset of 15–17 compared to 18 +) and transitions in alcohol involvement across waves in propensity score-adjusted models (see Supplementary Table 3). Again, we see strong cross-sectional associations with class membership (see Supplementary Table 1).

4. Discussion

While prevention programming has focused on delaying the onset of alcohol use until legal ages (age 21 in the United States), age of onset is rarely used as a screening tool to identify those at greatest risk of alcohol use progression to severe problems. Our analyses provide sex-specific findings indicating a higher risk of progression from moderate problems to severe problems for males and of progression from no problems to severe problems for females among those who initiate weekly drinking before age 18. The strong associations of early, weekly alcohol use with latent classes of problematic alcohol use in both sexes at both Waves and the association of transition across the Waves from moderate to severe use pattern in males or from no use to severe use in females underscore the negative implications of early regular drinking for future alcohol outcomes. These findings highlight the benefits of enforced drinking age limits now imposed in all states (Voas, Tippetts, & Fell, 2003) and the need to further limit access and advertising of alcoholic beverages to adolescents (Austin & Hust, 2005; Montgomery & Chester, 2009).

Interestingly, males who began drinking weekly before age 18 had a high likelihood of transitioning from severe to no problems over the three-year period. This enhanced recovery was opposite of what we hypothesized, perhaps because the males who have the most severe problems were significantly younger than males with no problems. In fact, males in the severe class were on average 32.3 years old, males in the moderate class were on average 36.2 years old, and males in the no problem class were on average 47 years in age (similar patterns were observed for females, 32.7, 34.8, 46.0 years, respectively). A number of other studies have found that frequent drinking among young adult males may be somewhat normative and not associated with psychopathology (Alonso et al., 2004; Crum et al., 2008; De Graaf, Bijl, Spijker, Beekman, & Vollebergh, 2003). It is possible that these young men who simply aged out of heavy drinking were over-represented in the early, weekly drinker subgroup at Wave 1. This finding may also have to do with how we defined recovery, which captured a decrease in alcohol-related problems as opposed to decreased drinking levels or long-term abstinence.

Findings should be considered in the context of multiple limitations. First, the NESARC relied on recall to establish age at the first drink. Previous work has found that individuals tend to recall an older age of first use as they age (Labouvie, Bates, & Pandina, 1997). In our analytic sample, only 5.6% of the females and 9.0% of the males reported their first drink before age 15, which is low compared to national surveys of adolescents (Esser, Clayton, Demissie, Kanny, & Brewer, 2017; Schulenberg, Johnston, O'Malley, Bachman, Miech, & Patrick, 2020). Second, causal conclusions cannot be drawn from observational studies such as NESARC. Despite our use of propensity score weighting to emulate the distribution of covariates that would be found in a randomized design, there may be additional confounders not included in the NESARC dataset that remained unaccounted for. Third, some matching variables may actually function as mediators (e.g., education) and should be tested in future work. Finally, the 3-year period between Waves 1 and 2 may not be long enough to reflect longer-term trends in problematic alcohol use patterns. Findings should be replicated in longer-term follow-up studies.

Despite limitations particularly surrounding our ability to make causal conclusions, our study provides evidence that early, weekly

drinking may impact progression to and recovery from various stages of alcohol involvement, with differential patterns of associations by sex, and this information is valuable for identification of and intervention with high-risk groups. This builds on prior research, which has mainly focused on an alcohol use disorder as the outcome with little emphasis on separate patterns for males and females. Future studies should examine potential mechanisms through which early, weekly drinking leads to progression to or recovery from problematic alcohol involvement in males and females to facilitate sex-specific prevention and intervention.

Author Disclosures

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.abrep.2022.100410.

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