The Influence of Paternal Separation, Paternal History of Alcohol Use Disorder Risk, and Early Substance Use on Offspring Educational Attainment by Young Adulthood

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ABSTRACT. Objective: This study aimed to determine the associations among paternal alcohol problems, separation, and educational attainment in European American and African American offspring and whether offspring early alcohol/tobacco/marijuana use influenced these associations. **Method:** Families with offspring ages 13–19 years at intake were selected from state birth records and screened by telephone to determine high-risk or low-risk status (with/without paternal heavy drinking). Families of men with two or more driving-under-the-influence offenses were added as a very-high-risk group. Data from 340 African American and 288 European American offspring who were not enrolled in school at their last interview were analyzed. Educational attainment was modeled as less than high school, high school only (reference category), and some college or higher. Separation was defined as offspring report of not having lived continuously in the same household with their biological father from birth to age 14. Analyses were stratified by race. **Results:** In European Americans, neither family risk status nor early alcohol/

tobacco/marijuana use was associated with educational outcomes. However, paternal separation significantly elevated the likelihood of not completing high school in all models (relative risk ratios [RRRs] = 6.0–8.1, $p < .001$). For African American offspring, likelihoods of high school noncompletion were elevated marginally for paternal separation in only one model, but significantly for early marijuana use (RRRs = 2.8–3.2, $p < .05$). Very-high-risk status significantly reduced the likelihood of post-high school education in an adjusted model (RRR = 0.4, $p < .05$). **Conclusions:** High school noncompletion was significantly associated with paternal separation in European Americans and with early marijuana use in African American offspring. In addition, very-high-risk status reduced the likelihood of post-high school education in African American offspring only, suggesting that research with ethnically diverse samples yields important differences when examining outcomes of both separation and substance use on offspring education. (*J. Stud. Alcohol Drugs*, 78, 426–434, 2017)

ALTHOUGH PARENTAL ALCOHOL USE disorder (AUD) and its effects on separation have been a topic of ongoing investigation (Collins et al., 2007; Waldron et al., 2011, 2013), little is known about the independent effects of parental AUD and separation on outcomes for offspring (Waldron et al., 2014a, 2014b) in African American families, who remain an understudied population in the alcohol field (Chartier & Caetano, 2010; Sher, 1991; Waldron et al., 2013).

The idea that parental separation, especially in parents with alcohol and drug use disorder, has an effect on offspring drug use is not a new one, although risks to offspring associated with separation in parents with substance use disorders have not often been explored (Waldron et al., 2014a, 2014b). Children of parents with AUD more frequently use drugs both licit and illicit and use them earlier than do children whose

parents do not have an AUD (Hill et al., 2000; Lieb et al., 2002; Sher, 1991). Most recently, in two independent samples, one a general population sample of adolescent/young adult female twins and the other a sample of adolescent offspring of Australian twins, parental separation and parental AUD both strongly predicted early use of alcohol, tobacco, and marijuana, which in turn heightens risk of subsequent development of drug and alcohol use disorders (Grant & Dawson, 1997; Waldron et al., 2014a, 2014b). Offspring educational completion in families in which parental AUD is present is another informative outcome to study, given the link between parental AUD and offspring early drug use.

Early drug use also affects educational completion, although results for specific substances have been mixed. In Finnish twins, adolescent drinking was associated with lower future education, but smoking was both a risk factor and an outcome of educational attainment (Latvala et al., 2014); in longitudinal data from Australian youth, both weekly marijuana use and daily smoking were linked with failure to complete high school, but regular and heavy alcohol use was not (Lynskey et al., 2003). Results of a longitudinal study of familial alcoholism, with assessments spanning Grade 5 to post-high school, found that early drug use—but not alcohol use—was significantly related to reduced probabilities of

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college degree completion (King et al., 2006). Conversely, in an adult male sample using a discordant twin design, Grant et al. (2012) found that adult male twins who had used alcohol early (before age 18) had lower educational attainment than their non-early-using co-twins, but this relationship was not observed for early use of other drugs. More recently, using a latent class analysis, Kelly et al. (2015) showed that polydrug users in Grade 9 (hence implicitly early users) as well as alcohol-only users were at elevated risk for failing to complete high school.

Because many of the studies have not included ethnically diverse samples, associations in other race/ethnic groups are not well known. In addition, a number of studies (but not all, e.g., Horwood et al., 2010; van Ours & Williams, 2009) have focused on one end of the educational spectrum—failure to complete high school—without considering failure to obtain or complete education beyond high school.

An issue in prior research is whether early drug use causes the observed educational difficulties or is a consequence of them (Krohn et al., 1997). As Latvala et al. (2014) point out, the association could be bidirectional, with early drug use interfering with educational achievement and engagement in the educational process as well as low educational achievement contributing to drug use (Ellickson et al., 2001; Hayatbakhsh et al., 2011; Pitkänen et al., 2008). However, the operationalization of early initiation has not been consistent across studies, and in some cases, it is unclear whether first-time use has been captured.

Various studies have focused on use in the past year (Ellickson et al., 2001), heavy use by age 14 (ignoring early non-heavy users; Pitkänen et al., 2008), and frequency of use without determining initiation age (Hayatbakhsh et al., 2011). Thus, different phenotypes make it difficult to draw comparisons across studies.

By using age at first use, we can establish provenance. Some studies (Grant et al., 2006, 2012; Lynskey et al., 2003) have used reported age at first use and could therefore be certain of the timing of initiation in relation to the termination of schooling. We are using an easily replicable phenotype of age at which 25% of the sample has used the drug, which has been used by others (Blustein et al., 2015). We are aware that temporality does not ensure causality, but we are focused on drug use at an age that is sufficiently early to precede school completion.

The evidence suggests that parental separation, especially in those parents with substance use disorders, increases risk of offspring early substance use, which in turn elevates risk of later substance use disorder, and that offspring's own substance use and problems increase the risk of reduced educational attainment. King et al. (2006) have pointed out that the same factors that predict offspring substance use predict reduced educational attainment. In addition to affecting educational outcomes by way of early drug use, parental separation can also affect offspring educational attainment

because of socioeconomic factors associated with separation status, from financial barriers to education, lack of parental supervision, or time spent with deviant peers. Offspring from these high-risk families would therefore be at increased risk for low educational attainment.

Here we explore in high-risk samples of African American and European American offspring the associations of paternal separation in childhood, paternal history of serious alcohol problems and disorder, and early substance use with offspring educational attainment. We consider three levels of educational attainment, including a broad measure of post-high school education, in contrast to other studies in which high school noncompletion has been the focus or in which higher education has been defined narrowly as university completion/noncompletion. Last, our analyses take into account other factors that might explain educational attainment so that the observed effects of the variables of interest are net of the other pertinent factors. These attributes underscore the main strengths of the present study.

Method

Sample ascertainment

This secondary analysis is of data from the Missouri Family Study (MOFAM), a longitudinal high-risk family study designed to study the effects of paternal alcoholism on development of adolescent/young adult offspring alcohol involvement and disorder and other outcomes over time. African American families were oversampled to investigate differences between African American and European American offspring in pathways to AUD and related conditions. Using state birth records, families were selected with children ages 13, 15, 17, or 19 years at the time of the first interview and with at least one other child over age 12 born to the same mother and father (Duncan et al., 2012). Only families with mothers of European American and African American race/ethnicities as identified in the birth record data were included in the study, reflecting the main races/ethnicities in Missouri at the time the study began.

Mothers were screened over the phone to confirm that the children were full siblings and to determine the risk status of the family. If the mother reported the father as having a history of excessive drinking, the family was considered high risk (HR); otherwise the family was considered low risk (LR). Additional families were identified by matching men who had received two or more driving-under-the-influence (DUI) offenses in state driving records to state birth record data; these families were designated as very high risk (VHR; Duncan et al., 2012). Mothers, fathers, and offspring were interviewed with a comprehensive psychiatric interview, and offspring were interviewed every 2 years. Because interviewed fathers were a highly selected sample (only about half of fathers were interviewed, with many deceased,

incarcerated, lost to follow-up, or refusals), we elected to use maternal reports about fathers.

The design called for an enrollment goal of 300 European American families—75 LR, 75 HR, and 150 VHR—and 450 African American families—150 in each risk category. The goal was achieved; 317 European American (84 LR, 79 HR, and 154 VHR) and 450 African American (151 LR, 150 HR, and 149 VHR) families were enrolled, with 806 African American and 655 European American offspring interviewed at least once. High and low risk status assigned at screening was confirmed using the mothers' full interview report of fathers meeting alcohol abuse or dependence criteria, and if not confirmed, a new family risk level was created to reflect misclassification. VHR status was not changed, as this was based on record report of fathers' multiple DUI offenses. However, because multiple DUI offenses are indicative of serious alcohol problems but not necessarily AUD, we refer to overall paternal risk as "alcohol problems or disorder."

Assessments

Offspring and their parents were interviewed with comprehensive structured psychiatric interviews developed by the Midwest Alcoholism Research Center that were based in part on the Semi-Structured Assessment for the Genetics of Alcoholism (Duncan et al., 2012). Interviews covered substance use behaviors and problems, psychiatric disorders (e.g., depression, anxiety, conduct disorder), and demographic characteristics including educational, marital, child bearing, and job histories. Offspring were sought for interviews every 2 years.

Educational outcomes

We limited our analyses to 628 offspring who were not enrolled in any school at the time of their most recent interview (i.e., not pursuing further schooling), which included 288 European American and 340 African American participants, reflecting 43% of the total interviewed sample, with a mean age of 23.9 years ($Mdn = 24$; Table 1). Offspring were categorized based on their highest educational level attained: less than high school (<HS), comprising those who did not graduate from high school and did not receive a General Educational Development (GED) credential; those who had only 12 years of education and completed high school or had fewer than 12 years but received a GED (HS only); and those with some education beyond high school (>HS). Those who had completed vocational or technical school certifications but did not receive a high school diploma or a GED were counted as less than high school. Individuals with a high school degree and a degree from a vocational, technical, or 2-year college were counted as having some college/post-high school education. In all analyses, "HS only" was the reference outcome.

Separation from father

Paternal separation was defined by offspring report of not having lived continuously in the same household with their biological father from birth to age 14. This includes offspring who had never lived with their fathers as well as those who had lived apart from their fathers because of divorce, separation, or other dissolution of the biological parents' relationship or for other reasons (e.g., incarceration). More than 90% of separations were due to marital break-ups. Once a separation had occurred, most offspring (about 90%) did not return to live with the biological father. Mean age of offspring at paternal separation was 4.7 years, with a median age of 5. Only separation from the biological father was counted in these analyses, but separation from the biological mother was exceedingly rare (7 cases of 628), likely because of the study design that was reliant on mothers as custodial parents.

Early use of alcohol, tobacco, and marijuana

Offspring early use of alcohol, tobacco, and marijuana was based on the offspring's own report of first use, selecting as the cutoff the age by which 25% had reported trying the drug for the first time. Separate cutoff ages for European American and African American offspring were defined for early alcohol use (before age 14 in European American, before age 15 for African American); cutoff ages were the same for early use of tobacco (before age 12) and marijuana (before age 14).

Other variables included in the models

Analyses controlled for offspring age at most recent interview, sex, mothers' reports about their own and the biological fathers' highest educational level, their history of alcohol dependence (as defined in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* [DSM-IV]; American Psychiatric Association, 1994), household income, and offspring grades in seventh grade. Covariates based on offspring report included conduct disorder, childhood depression, and generalized anxiety disorder, with all onsets before age 15. We included parental education because it is closely linked with offspring educational achievement (Poon et al., 2000) and has been used as a proxy for socioeconomic status (Thompson et al., 2015). Mother's alcohol dependence was included in part to account for assortative mating in high-risk families and the additional risk to offspring in those families. Fathers' educational attainment was based on mothers' reports and was categorized in a similar way to that of the mothers' and offspring education, and a dummy variable was included to account for missing information. Household income as reported by the mother is defined as a quasicontinuous measure reflecting 21 cate-

TABLE 1. Comparison of offspring and familial characteristics, European American (EA) and African American (AA) youth

Variable	European American (<i>n</i> = 288)	African American (<i>n</i> = 340)	<i>p</i>
Offspring characteristics			
Age at most recent interview, in years			
<i>M</i> (<i>SD</i>)	23.9 (3.6)	23.9 (3.9)	
<i>Mdn</i> (range)	24 (17–34)	23 (17–37)	.99
Offspring education, %			
Less than high school	13.2	22.4	.02
High school only	33.3	32.4	
Post-high school education	53.5	45.3	
Male, %	50.4	54.7	.28
Early drug use, %			
Early tobacco (<age 12)	25.5	17.9	.03
Early alcohol use			
(<age 14 EA, <age 15 AA)	22.2	19.7	.45
Early marijuana (<age 14)	16.0	17.4	.66
Any early use	36.1	35.0	.79
Conduct disorder (before age 15), %	10.8	18.5	.007
Early onset MDD (before age 15), %	8.8	5.4	.10
GAD (before age 15), %	6.9	11.5	.05
Seventh-grade academic achievement, by mother's report, quartile			
<i>M</i> (<i>SD</i>)	3.6 (2.7)	4.3 (2.5)	.002
<i>Mdn</i>	3.0	4.0	
Separated from biological father, %	44.8	65.6	.0001
Family characteristics			
Family risk status, ^a %			
Low risk	22.6	37.9	.0001
High risk	22.9	23.5	
Very high risk	47.9	20.9	
Misclassified—false positive	3.5	10.3	
Misclassified—false negative	3.1	7.4	
Mother's education, %			
Less than high school	8.7	15.0	.20
High school only	35.9	34.5	
Post-high school education	55.4	50.4	
Father's education, by mother report, %			
Less than high school	22.9	21.5	.02
High school only	41.3	47.6	
Post-high school education	33.3	22.7	
Missing father's education	2.4	8.2	
Household income ^b			
<i>M</i> (<i>SD</i>)	14.3 (5.2)	10.7 (5.5)	
<i>Mdn</i>	16	10	<.0001
Maternal lifetime DSM-IV alcohol dependence, %	11.1	10.9	.95

Notes: MDD = major depressive disorder; GAD = generalized anxiety disorder; DSM-IV = *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*. ^aFalse positives are high-risk families in which mothers reported at screening interview that the father was an excessive drinker but, at full interview, did not report that the father met alcohol abuse or dependence criteria. False negatives are low-risk families in which mothers did not report at screening interview that the father was an excessive drinker but, at full interview, reported that the father met criteria for alcohol abuse or dependence. ^bHousehold income as reported by the mother is defined as a quasi-continuous measure reflecting 21 categories of income from *no income* to *\$150,000 or more*.

ries of income from *no income* to *\$150,000 or more*. As a measure of academic potential, we created quartiles based on mothers' reports of grades in seventh grade, using the same cutpoints for European American and African American offspring; three dummy variables were used in analysis, with the second highest quartile as the referent group. Both internalizing and externalizing symptoms have been related to educational achievement (Brook & Newcomb, 1995; Vander

Stoep et al., 2002). We included conduct disorder (three or more symptoms before age 15), DSM-IV depression, and generalized anxiety disorder, both before age 15.

Data analysis

Data preparation was conducted in SAS Version 9.2 (SAS Institute Inc., Cary, NC), and statistical analyses were

conducted with STATA Version 14 (StataCorp LP, College Station, TX). Multinomial regressions were used with “high school only” as the base outcome. Tetrachoric correlations did not indicate collinearity problems (all correlations $< .75$; results available on request).

Three models were computed to assess the influence of family risk, paternal separation, and early drug use. The first included paternal separation, family risk status categories, and covariates of offspring age, sex, maternal and paternal education levels, maternal report of household income, and maternal alcohol dependence. In Model 2, early alcohol, tobacco, and marijuana use were added. In the last model, conduct disorder, depression, generalized anxiety disorder, and seventh-grade achievement were included. Before we computed Model 1, the interaction between family risk status and paternal separation was studied to determine whether there were differential effects of paternal separation based on family risk status.

Our analyses were run separately for European American and African American offspring. In support of this decision, we drew on the long-standing literature (e.g., Imbens & Rubin, 2015; Rubin, 1973) warning of the dangers of using simple adjustment methods like linear regression when there is substantial covariate imbalance (i.e., a significant difference in a covariate[s] between groups), as in the sample here for socioeconomic status in European Americans and African Americans (see Imbens & Rubin, 2015). Our sample is drawn from a population in which there are marked socio-cultural and socioeconomic differences between European American and African American groups. Under these circumstances of substantial imbalance in socioeconomic status, as noted in Imbens and Rubin (2015), a pooled analysis, with or without interaction terms, will not be trustworthy and would be statistically misleading. Thus, we have conducted analyses stratified by race.

Results

The sample for analysis was limited to those no longer enrolled in school at their most recent interview. There were differences between those in and out of school. Results are not shown but are summarized here. In both European American and African American participants, those out of school were older, had parents with lower education, came from lower income households, had lower grades in seventh grade, were more likely to have used substances early, and had a higher prevalence of conduct disorder. There were no differences between those in and out of school for depression, generalized anxiety disorder, mothers with alcohol dependence, and paternal separation.

In African American but not European American subjects, those not in school were significantly more likely to be male and significantly less likely to come from VHR families, the latter reflecting later enrollment (and hence younger

participants still in school) in African American VHR families. For the sample of out-of-school subjects analyzed here, descriptive characteristics of—and significant differences between—African American and European American offspring are displayed in Table 1.

European American offspring

Model results for European American offspring are displayed in Table 2. There was no interaction between VHR status and paternal separation ($p > .6$). Because there were too few European American subjects from HR families who were at the lowest level of educational attainment (< 5) to provide a trustworthy estimate of interaction, we studied only main effects of HR family status. In Model 1, paternal separation was associated with increased likelihood of not completing high school. There was no significant association of family risk status with educational outcomes. Early alcohol, tobacco, and marijuana use (Model 2) were not significantly associated with educational outcomes. Separation from the father remained associated with failure to complete high school but not with education beyond high school. In the fully adjusted model (Model 3), the association between paternal separation and high school noncompletion remained. As shown in Table 2, low paternal education (marginally) and low grades (significantly) were linked to reduced likelihood of post-high school attainment. Misclassified family risk and older age were linked to a significantly higher likelihood of post-high school attainment.

African American offspring

Results of parallel models for African American offspring are displayed in Table 3. There was no interaction of paternal separation and family risk status ($p > .16$). In Model 1, paternal separation was marginally associated with increased likelihood of high school noncompletion; there was no association with post-high school education. VHR status was associated with a reduced probability of education beyond high school, but this was marginally significant. In Model 2, early marijuana use was associated with a significantly elevated likelihood of high school noncompletion ($p < .05$). In Model 3, early marijuana use remained significantly associated with high school noncompletion. In addition, VHR status was significantly associated with reduced likelihood of post-high school education. Higher parental education and older age significantly increased—and low grades decreased—the likelihood of post-high school education.

Analyses using an alternative definition of paternal separation

Analyses were re-run using a definition of paternal separation that was limited to dissolution of the parental

TABLE 2. European American relative risk ratios (RRRs) for all models

Variable	Model 1				Model 2				Model 3			
	<HS		>HS		<HS		>HS		<HS		>HS	
	RRR	[95% CI]	RRR	[95% CI]	RRR	[95% CI]	RRR	[95% CI]	RRR	[95% CI]	RRR	[95% CI]
Paternal separation	5.96***	[2.08, 17.06]	0.72	[0.34, 1.50]	5.77**	[1.89, 17.63]	0.72	[0.34, 1.52]	8.09***	[2.70, 24.29]	0.78	[0.33, 1.86]
Family risk status												
High risk	1.63	[0.20, 13.48]	0.88	[0.32, 2.43]	2.12	[0.26, 17.36]	0.86	[0.32, 2.34]	1.51	[0.17, 13.03]	0.83	[0.28, 2.43]
Very high risk	3.68	[0.42, 32.48]	1.35	[0.44, 4.11]	4.63	[0.54, 39.79]	1.29	[0.41, 3.99]	5.02	[0.49, 51.20]	1.26	[0.36, 4.47]
Misclassified risk status ^a	3.52	[0.07, 187.13]	7.55**	[1.65, 34.51]	5.47	[0.10, 287.52]	6.62*	[1.44, 30.43]	2.56	[0.10, 62.55]	7.21**	[1.62, 32.06]
Early use ^b												
Early marijuana	—	—	—	—	2.57	[0.51, 12.95]	0.53	[0.16, 1.75]	3.54	[0.44, 28.22]	0.57	[0.15, 2.15]
Early alcohol	—	—	—	—	0.88	[0.28, 2.83]	1	[0.45, 2.20]	0.38	[0.06, 2.37]	1.15	[0.45, 2.92]
Early tobacco	—	—	—	—	0.72	[0.22, 2.32]	1.25	[0.53, 2.96]	0.38	[0.09, 1.65]	1.24	[0.52, 2.99]
Sex	0.68	[0.27, 1.73]	0.46*	[0.25, 0.84]	0.66	[0.27, 1.66]	0.47*	[0.26, 0.87]	0.54	[0.18, 1.65]	0.60	[0.30, 1.17]
Age	1.06	[0.89, 1.27]	1.37***	[1.21, 1.54]	1.07	[0.89, 1.28]	1.37***	[1.21, 1.54]	1.20†	[0.99, 1.44]	1.29***	[1.14, 1.47]
Mom alcohol dependence	0.19*	[0.04, 1.02]	0.61	[0.23, 1.57]	0.21†	[0.04, 1.14]	0.63	[0.24, 1.63]	0.16*	[0.03, 0.96]	0.70	[0.24, 2.07]
Mom <HS education	4.84†	[0.85, 27.70]	0.73	[0.16, 3.41]	4.57	[0.63, 32.90]	0.66	[0.13, 3.32]	3.07	[0.53, 17.63]	0.65	[0.12, 3.53]
Mom >HS education	1.16†	[0.45, 3.00]	1.96†	[0.98, 3.93]	1.04	[0.40, 2.66]	1.97*	[1.00, 3.89]	0.77	[0.27, 2.26]	1.41	[0.71, 2.81]
Dad <HS education ^c	1.11	[0.39, 3.21]	0.42*	[0.18, 0.96]	1.22	[0.39, 3.82]	0.43†	[0.18, 1.02]	1.03	[0.29, 3.64]	0.42†	[0.16, 1.09]
Dad >HS education ^c	0.99	[0.19, 5.21]	1.94	[0.84, 4.49]	1.19	[0.21, 6.73]	1.82	[0.79, 4.18]	1.43	[0.34, 6.01]	1.67	[0.73, 3.79]
Dad missing education ^c	1.71	[0.29, 10.08]	0.42	[0.12, 1.47]	0.97	[0.08, 11.44]	0.47	[0.13, 1.72]	1.89	[0.23, 15.39]	0.79	[0.15, 4.22]
Household income ^d	0.95	[0.87, 1.03]	1.07	[0.97, 1.18]	0.94	[0.87, 1.03]	1.07	[0.97, 1.18]	0.94	[0.85, 1.04]	1.08	[0.98, 1.19]
Early GAD ^e	—	—	—	—	—	—	—	—	0.62	[0.13, 2.98]	0.84	[0.17, 4.20]
Early conduct disorder ^e	—	—	—	—	—	—	—	—	1.30	[0.21, 8.24]	0.99	[0.31, 3.10]
Top quarter grades ^f	—	—	—	—	—	—	—	—	1.47	[0.14, 15.88]	1.27	[0.48, 3.38]
Third quarter grades	—	—	—	—	—	—	—	—	1.18	[0.16, 8.58]	0.74	[0.26, 2.14]
Bottom quarter grades	—	—	—	—	—	—	—	—	2.99	[0.43, 20.58]	0.28*	[0.10, 0.77]
Missing grades	—	—	—	—	—	—	—	—	13.33*	[1.07, 165.69]	0.25	[0.03, 1.85]
Early depression ^e	—	—	—	—	—	—	—	—	7.90*	[1.14, 54.70]	1.12	[0.24, 5.31]

Notes: All RRRs are relative to the high school-only group. HS = high school; CI = confidence interval; GAD = generalized anxiety disorder. ^aMisclassified status reflects (1) families in which the mother reported at screening interview that the father was an excessive drinker but, at her full interview, did not report that the father met criteria for alcohol abuse or dependence ("false positives") or (2) families in which the mother did not report at screening interview that the father was an excessive drinker but at full interview reported that the father met criteria for alcohol abuse or dependence ("false negative"). These were combined into one variable. ^bEarly alcohol use (before age 14 for European American, before 15 for African American), early marijuana (before 14), early tobacco (before 12). ^cFather's education reported by mother. ^dHousehold income reported by mother, defined as a quasicontinuous measure reflecting 21 categories of income from no income to \$150,000 or more. ^eEarly GAD, conduct, depression before age 15. ^fGrades in seventh grade by mother's report, by quartile.

†.10 ≥ *p* > .05; **p* < .05; ***p* < .01; ****p* < .001.

relationship. Inferences did not change for African American offspring, but in European American offspring the significance of the separation variable was at the trend level only (results available on request).

Discussion

In this study, we analyzed data on European American and African American offspring from families at different levels of risk for AUD to study influences of paternal alcohol problems and disorder (as reflected in family risk levels), paternal separation, and offspring early drug use on educational attainment while controlling for other covariates. All offspring were no longer enrolled in any school at their last interview.

In European American offspring, we observed an association of paternal separation with failure to complete high school, over and above the influence of parents' own educational attainment, and the associations remained consistently significant in all models. In African American offspring, the initial marginal association with separation disappeared with the addition of other covariates. African American offspring often have strong extended family networks (Brown et al., 2002), which may offset the negative influence of separation from the father on outcomes like educational attainment (Brewster & Padavic, 2002; Jarrett et al., 2010; Johnson, 2000).

Early marijuana use was associated with high school noncompletion only in the African American sample, in line

TABLE 3. African American relative risk ratios (RRRs) for all models

Variable	Model 1				Model 2				Model 3			
	<HS		>HS		<HS		>HS		<HS		>HS	
	RRR	[95% CI]	RRR	[95% CI]	RRR	[95% CI]	RRR	[95% CI]	RRR	[95% CI]	RRR	[95% CI]
Paternal separation	1.97 [†]	[0.95, 4.10]	0.78	[0.40, 1.53]	1.79	[0.84, 3.83]	0.76	[0.38, 1.50]	1.6	[0.72, 3.54]	0.75	[0.36, 1.56]
Family risk status												
High risk	1.46	[0.60, 3.56]	0.54	[0.22, 1.30]	1.46	[0.60, 3.56]	0.54	[0.22, 1.32]	1.79	[0.68, 4.75]	0.5	[0.19, 1.29]
Very high risk	0.8	[0.32, 2.00]	0.47 [†]	[0.20, 1.10]	0.79	[0.31, 2.01]	0.48 [†]	[0.20, 1.14]	0.84	[0.31, 2.28]	0.40*	[0.16, 1.00]
Misclassified risk status ^a	0.89	[0.33, 2.43]	0.94	[0.38, 2.34]	0.97	[0.35, 2.68]	0.92	[0.36, 2.38]	1.03	[0.32, 3.24]	0.78	[0.28, 2.14]
Early use ^b												
Early marijuana	—	—	—	—	2.75*	[1.19, 6.32]	1.43	[0.48, 4.20]	3.20*	[1.22, 8.37]	1.48	[0.45, 4.84]
Early alcohol	—	—	—	—	1.79	[0.70, 4.56]	0.87	[0.38, 1.99]	1.64	[0.56, 4.76]	1.02	[0.41, 2.49]
Early tobacco	—	—	—	—	0.46	[0.16, 1.31]	1.02	[0.43, 2.40]	0.45	[0.16, 1.23]	0.88	[0.32, 2.39]
Sex	1.58	[0.79, 3.17]	0.39**	[0.21, 0.72]	1.38	[0.67, 2.82]	0.39**	[0.20, 0.74]	1.26	[0.61, 2.59]	0.49*	[0.26, 0.94]
Age	1.17*	[1.03, 1.32]	1.36***	[1.22, 1.51]	1.15*	[1.01, 1.31]	1.35***	[1.22, 1.51]	1.16*	[1.01, 1.32]	1.31***	[1.17, 1.45]
Mom alcohol dependence	0.61	[0.20, 1.86]	2.14	[0.75, 6.16]	0.62	[0.20, 1.92]	2.11	[0.72, 6.12]	0.69	[0.21, 2.19]	2.23	[0.71, 6.94]
Mom <HS education	1.70	[0.66, 4.35]	2.18	[0.77, 6.14]	1.71	[0.67, 4.35]	2.09	[0.74, 5.91]	2.00	[0.73, 5.45]	2.10	[0.65, 6.85]
Mom >HS education	0.79	[0.33, 1.90]	3.98***	[1.87, 8.47]	0.83	[0.34, 2.05]	3.97***	[1.85, 8.50]	0.93	[0.35, 2.44]	4.27***	[1.90, 9.58]
Dad <HS education ^c	2.02 [†]	[0.97, 4.19]	1.52	[0.63, 3.68]	1.63	[0.77, 3.46]	1.52	[0.60, 3.83]	1.59	[0.73, 3.47]	1.51	[0.57, 4.01]
Dad >HS education ^c	0.28	[0.06, 1.36]	3.15**	[1.45, 6.85]	0.23 [†]	[0.05, 1.14]	3.16**	[1.45, 6.87]	0.20 [†]	[0.04, 1.08]	3.14**	[1.42, 6.91]
Dad missing education ^c	1.29	[0.34, 4.94]	1.44	[0.40, 5.12]	1.28	[0.32, 5.07]	1.48	[0.40, 5.47]	1.09	[0.27, 4.37]	1.69	[0.42, 6.88]
Household income ^d	0.93 [†]	[0.86, 1.00]	1.04	[0.97, 1.11]	0.93 [†]	[0.86, 1.01]	1.04	[0.97, 1.11]	0.91*	[0.84, 0.98]	1.02	[0.95, 1.09]
Early GAD ^e	—	—	—	—	—	—	—	—	0.85	[0.30, 2.44]	0.91	[0.31, 2.72]
Early conduct disorder ^e	—	—	—	—	—	—	—	—	1.33	[0.45, 3.88]	1.12	[0.43, 2.91]
Top quarter grades ^f	—	—	—	—	—	—	—	—	3.28	[0.39, 27.30]	1.81	[0.40, 8.17]
Third quarter grades	—	—	—	—	—	—	—	—	2.97 [†]	[0.93, 9.51]	0.65	[0.27, 1.53]
Bottom quarter grades	—	—	—	—	—	—	—	—	1.87	[0.53, 6.61]	0.42 [†]	[0.18, 1.02]
Missing grades	—	—	—	—	—	—	—	—	2.85	[0.78, 10.42]	0.19*	[0.05, 0.79]
Early depression ^e	—	—	—	—	—	—	—	—	0.35	[0.06, 2.06]	1.17	[0.34, 4.04]

Notes: All RRR are relative to the high school–only group. HS = high school; CI = confidence interval; GAD = generalized anxiety disorder. ^aMisclassified status reflects (1) families in which the mother reported at screening interview that the father was an excessive drinker but, at her full interview, did not report that the father met criteria for alcohol abuse or dependence (“false positives”) or (2) families in which the mother did not report at screening interview that the father was an excessive drinker but at full interview reported that the father met criteria for alcohol abuse or dependence (“false negative”). These were combined into one variable. ^bEarly alcohol use (before age 14 for European American, before 15 for African American), early marijuana (before 14), early tobacco (before 12). ^cFather’s education reported by mother. ^dHousehold income reported by mother, defined as a quasicontinuous measure reflecting 21 categories of income from no income to \$150,000 or more. ^eEarly GAD, conduct, depression before age 15. ^fGrades in seventh grade by mother’s report, by quartile.

[†].10 $\geq p > .05$; * $p < .05$; ** $p < .01$; *** $p < .001$.

with an extensive literature implicating early use as a predictor of reduced educational attainment (Kelly et al., 2015; Verweij et al., 2013). Consistent with our finding, a recent study reported reduced rate of high school graduation among African American offspring who were moderate and heavy marijuana smokers (Green et al., 2016).

It was surprising to not observe an association with early substance use in European American offspring. It may be that differences in motivation for use explain the findings. One study found that although European Americans and African Americans used similar amounts of marijuana, African American participants endorsed more social, coping, and conformity motives, which suggests susceptibility to peer influences that could translate into lower educational attainment.

We observed a significant association of VHR status on reduced likelihood of post–high school education in African American offspring. African American offspring in VHR families may experience additional neighborhood adversities or attend schools with lower performance and fewer resources or opportunities for post–high school education. Also, the VHR definition may not capture the same constellation of risk environments in African American as in European American families. Drunk driving is more prevalent in European American versus African American men (Caetano & Clark, 2000). The definition of paternal separation included incarceration, which might be linked to VHR status, but results were unchanged when the definition was based solely on relationship dissolution. This finding merits further investigation.

Unexpectedly, in European American offspring only, we observed a significantly increased likelihood of post-high school education associated with misclassified family risk. Explanations for this result are unclear, and small numbers precluded computing separate estimates for type of misclassification, which might have provided further insight into the findings. Last, among the African American sample only, high education in both mothers and fathers was significantly and strongly (relative risk ratios > 3) associated with offspring obtaining education beyond high school. Perhaps African American parents with post-high school education come from more stable environments with higher values placed on education. It is not clear why the observation did not hold in European American offspring.

Study results should be considered in light of a number of limitations. Educational outcomes in the post-high school group are heterogeneous, encompassing technical training through graduate school. A larger sample might allow for more homogeneous education outcomes. Our results reflect only those who were not enrolled in school and included higher proportions of those with conduct disorder, low academic achievement, early substance use, and from lower socioeconomic status circumstances. Results might differ for the full sample once everyone had passed through the prime period for completion of education. Families were drawn from one midwestern state and may not generalize to more geographically diverse samples. We do not know whether paternal alcohol problems or disorder were the reason for separation, nor do we have information about their recency. Family risk definition would remain the same for men with remitted versus active alcohol problems or disorder, although the impact on family environment would likely be quite different. Information about other significant parental figures was not obtained, which may include an extended network of relatives for African American offspring that may mitigate the adverse impact of paternal separation. We had only a subjective measure of cognitive ability via maternal report of seventh-grade academic performance. Fathers' status was based on maternal report and may not be completely accurate. Last, offspring were oversampled for fathers with serious alcohol problems and disorder and thus with adverse family situations, but these may differ across race/ethnic groups, including differences in peer and social contexts, and neighborhood effects, among others (Lynskey et al., 2003; Tucker et al., 2015).

In conclusion, in European American participants, paternal separation increased the likelihood of failing to complete high school but was not linked to post-high school educational attainment, whereas early substance use was not linked to educational outcomes. Among African American offspring, early marijuana use was associated with failure to complete high school and VHR status was linked with failure to obtain post-high school education. Findings need

replication in other samples, including perhaps an exploration of underlying cultural explanations.

Our study provides evidence that early marijuana use was linked to lower educational attainment in African American offspring. To the degree that this finding reflects drug availability, it may be of particular interest given the changing climate toward marijuana, including both its medicalization and legalization. The suggestion that VHR status was associated with lower likelihood of education beyond high school in African American offspring highlights the need to address disparities in school systems to improve opportunities for advanced education. An advantage of the current study is its use of broad educational outcomes for post-high school education, unlike other studies in which high school dropout or university attendance has been the focus. Findings also suggest that intervention programs for DUI offenders might consider incorporation of family-based approaches in addition to focusing on the individual offender. Overall, the findings underscore the importance of studying diverse populations rather than assuming that results based on a single ethnicity are generalizable to other subgroups.

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