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Regular Article

Adolescent predictors of psychiatric disorders in adulthood: The role of emotional distress and problem drinking in emerging adulthood

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Abstract

The current study evaluated risk factors in adolescence on problem drinking and emotional distress in late adolescence and emerging adulthood, and meeting criteria for diagnosed disorders in adulthood. The study included 501 parents and their adolescent who participated from middle adolescence to adulthood. Risk factors in middle adolescence (age 18) included parent alcohol use, adolescent alcohol use, and parent and adolescent emotional distress. In late adolescence (age 18), binge drinking and emotional distress were assessed, and in emerging adulthood (age 25), alcohol problems and emotional distress were examined. Meeting criteria for substance use, behavioral, affective, or anxiety disorders were examined between the ages of 26 and 31. Results showed parent alcohol use predicted substance use disorder through late adolescent binge drinking and emerging adulthood alcohol problems. Behavioral disorders were indirectly predicted by adolescent and emerging adult emotional distress. Affective disorders were indirectly predicted by parent emotional distress through adolescent emotional distress. Finally, anxiety disorders were predicted by parent alcohol use via adolescent drinking; parent emotional distress via adolescent emotional distress, and through adolescent alcohol use and emotional distress. Results provided support for the intergenerational transmission of problem drinking and emotional distress on meeting criteria for diagnosed psychiatric disorders in adulthood.

Keywords: alcohol problems; emotional distress; intergenerational transmission; psychiatric disorders

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Psychiatric disorders negatively impact millions of adults every year and are associated with a broad range of adverse outcomes (Blanco et al., 2021). In the United States, the 12-month prevalence rate of adult psychiatric disorders is around 21% (SAMHSA, 2020), while lifetime prevalence is 47% (Kessler et al., 2007). Research suggests that most disorders have their onset during young adulthood, with two-thirds experiencing first onset by 25 years old (Kessler et al., 2007). Two of the most common conditions experienced during this time include problem drinking and depressive symptomology (Pedrelli et al., 2016). The etiology of adult psychiatric disorders may include factors such as the transmission of behavior across generations and continuity of individual behavior over time. For example, parental substance use experienced during adolescence, as well as adolescent heavy alcohol use increases problem drinking and other deviant behaviors into emerging adulthood (Bolland et al., 2016; Diggs & Neppl, 2018; Pharo et al., 2011; Thompson et al., 2014; Yap et al., 2017). Relatedly, emotional distress has been shown to increase from early to late adolescence, continue into emerging adulthood (Roza et al., 2003), and is associated with higher levels of mood disorders such as affective and anxiety disorders in adulthood (Roza et al., 2003; Trick et al., 2016).

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Despite this evidence, more research is needed regarding specific mechanisms that help explain associations between problem behavior as experienced in adolescence and psychiatric disorders in adulthood. For example, although substance use and emotional distress are transmitted across generations and often begin in adolescence and continue over time, findings are mixed. Emotional distress has been found to co-occur with substance use (Wilens et al., 2005), predict substance use (King & Chassin, 2008), and be a consequence of using substances (Trim et al., 2007). Some studies have found that adolescent emotional distress is linked to drinking over time (Diego et al., 2003; King, & Chassin, 2008), while others demonstrate that higher alcohol use during early adolescence is associated with emotional distress in later adolescence and early adulthood (Ruiz et al., 2020). It is possible that mixed findings may be due, in part, to examining the period of young adulthood where alcohol use is highly prevalent and may occur for reasons outside of an association with distress (Pedrelli et al., 2016). In addition, gender may influence the association between alcohol use and emotional distress (Pedrelli et al., 2016), where males tend to engage in heavier drinking than females (Bolland et al., 2016), and females may experience higher rates of depressive symptoms than males (Kessler et al., 2005). Thus, it is important for longitudinal studies to examine these associations across various developmental stages and examine the effect of gender (Pedrelli et al., 2016). Moreover, adolescents from rural areas may be at greater risk for externalizing and substance use disorders (SUD) than those from more urban settings (Kessler et al., 2005;

Rueter et al., 2007). Indeed, rural living increases risk of using alcohol, weekly drinking and drunkenness, and use of other substances (Martin et al., 2019).

Taken together, the present investigation extends earlier research by prospectively evaluating mechanisms during emerging adulthood that help explain how alcohol and emotional distress as experienced during adolescence, relate to psychiatric disorders in adulthood. Specifically, we examined parental alcohol use, adolescent alcohol use, as well as adolescent and parental emotional distress during middle adolescence. Adolescent problem drinking and emotional distress were examined during both late adolescence and emerging adulthood, and psychiatric disorders (alcohol use disorders, behavioral disorders, affective disorders, and anxiety disorders) in adulthood. The present investigation adds to the limited research examining rural adolescent alcohol use and emotional distress to predict a multitude of mental health disorders in adulthood, while also taking gender into consideration.

Continuity and consequences of risky drinking

It is well established that substance use is linked to negative outcomes such as poor academic performance, participation in other risky behaviors, problems related to work and family life, accidental injuries, as well as long-term health consequences (Bardo et al., 2007; Diggs & Neppl, 2018; Glasheen et al., 2015). Often initiated in adolescence, problem drinking increases throughout adolescence into young adulthood. Indeed, by the time adolescents are 16 years old, almost 46% have consumed alcohol in their lifetime (SAMHSA, 2020). This percentage increases to 60% at age 18 and 91% by 23 years old. Alcohol use can lead to binge drinking which is considered especially problematic and described as a pattern of alcohol use that increases blood alcohol concentration to 0.08-gram percent or above (NIAAA, 2004), repeated over multiple, frequent occasions (Kuntsche et al., 2017). It is defined as four or more drinks on the same occasion for females and five or more drinks on the same occasion for males, usually within 2 hr, on at least 1 day in the past month (NIAAA, 2018). Rates of problem drinking may peak in young adulthood at ages 18–24 (30.0%) and 25–34 (29.7%; Kanny et al., 2013). In addition, living in a rural area of the United States may influence adolescent alcohol use. For example, rural adolescents report greater alcohol use, binge drinking, and heavy drinking compared to their urban counterparts (Coomber et al., 2011). Rural high school students also report greater access to alcohol compared to their urban counterparts (Warren et al., 2015). Thus, it may be especially important to investigate consequences of alcohol use for rural adolescents.

According to the Social Learning Theory (Bandura & Walters, 1977), continuity of behavior may occur when individuals exposed to problem behaviors in the family of origin emulate this same type of problem behavior across the life span. In addition, genetic vulnerability may also influence individual problem behavior over time (Kim-Cohen et al., 2005). With these ideas in mind, parental alcohol use experienced in the family of origin is associated with alcohol rates in both adolescence and adulthood (Aquilino & Supple, 2001; Cruz et al., 2012; Haller & Chassin, 2013; Knight et al., 2014). Indeed, adolescents with parents who engage in problem drinking are at higher risk of psychological problems, as well as SUD (Brook et al., 2010). There is also evidence that adolescents were more likely to develop problem drinking if they were exposed to parents who drank moderately or heavily than those whose parents never or mildly drank alcohol (Alati et al., 2014; NIAAA, 2004). Moreover, parents who live in a rural area are at higher risk for drinking compared to parents in an urban area (Chan et al., 2016). In addition, rural adolescents are less likely to have a parent disapprove of their drinking, which can contribute to increased alcohol use (Gale et al., 2012). Taken together, adolescent and parental drinking both influence heavy drinking into adulthood (Alati et al., 2014; Diggs & Neppl, 2018), which is a life stage of increased risk for developing an alcohol-related disorder, along with other psychiatric illness such as conduct disorder, depressive disorder, and generalized anxiety disorder (Grant et al., 2015). Thus, it is reasonable that poor mental health may be a consequence of experiencing heavy drinking over time (Haller & Chassin, 2013).

Continuity and consequences of emotional distress

The negative effects of emotional distress (which may include anxiety, depressive symptoms, and hostility) affect millions of Americans every year (SAMHSA, 2020; Neppl et al., 2020; Stein et al., 2014). Emotional distress relates to poor physical health (Osborn, 2001), work functioning and lost wages (Kessler et al., 2008), disrupted family relationships (Conger et al., 1992; Kavanaugh et al., 2018), and substance use (Grant et al., 2015). For adolescents, the percentage of those who experienced a major depressive episode in the last year rose from 9.0% in 2004 to 15.7% in 2019 (SAMHSA, 2020). For young adults, 8.8% of 18- to 25-year-olds reported a major depressive episode in the last year (SAMHSA, 2020). The onset may be attributed to increases in life stress. For example, adolescence is a period of transitions including puberty, self-identity, dating, and other social changes that leave the adolescent at risk for experiencing more stressors (Graber, 2009). Emerging adulthood is another critical time of role transitions, where individuals are faced with decisions regarding higher education, work, family, romantic relationships, and where to reside (Arnett, 2015). According to the stress-generation perspective, for depressed individuals, these stressors create continued stress and conflict in relationships, which leads to more depression (Hammen, 2006). Together, these continued stressful circumstances and further depression may contribute to the onset of mood disorders such as depression and anxiety (Graber, 2009).

Moreover, children whose parents are depressed are at higher risk of negative outcomes such as poor school performance, childhood depression, difficulty in interpersonal relationships, oppositional defiant disorder, delinquency, and substance abuse (Dean et al., 2010; Eckshtain et al., 2018; Sweeney & MacBeth, 2016). Indeed, adolescents whose parents have a history of serious mental disorders are at an increased risk for developing a substance misuse disorder (Dean et al., 2010). There is also evidence that parental internalizing behavior assessed during late childhood is associated with adolescent internalizing at age 13–18 years old (Kim et al., 2009). Parental depression has also been associated with increased risk for depression in both adolescence (Monti & Rudolph, 2017) and adulthood (Betts et al., 2015), and a family history of distress relates to mental functioning throughout adulthood (Jones et al., 2016). The current study will contribute to this literature by examining the influence of both parental emotional distress and adolescent distress to predict various mental health disorders in adulthood.

The association between alcohol use and emotional distress

Given the prevalence of alcohol use and emotional distress in adolescence and emerging adulthood, there is evidence they co-occur and are associated over time. This association may stem from

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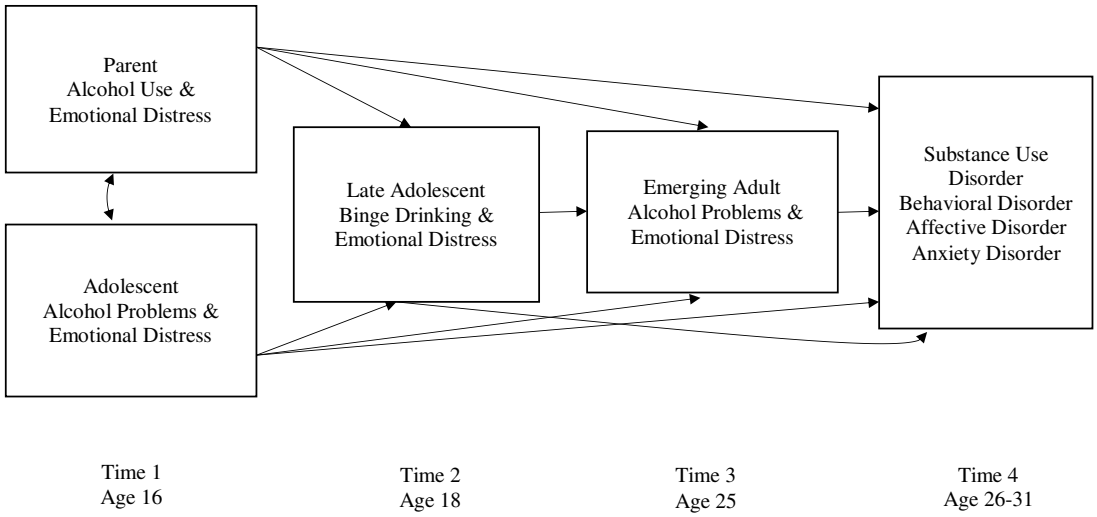

Figure 1. Conceptual model.

self-medication, which is explained as the comorbidity of depression and anxiety with SUD, where substances such as alcohol, are used as coping mechanisms for distressing symptoms associated with depression and anxiety (Khantzian, 1987; see Hawn et al., 2020). The co-occurrence between depression and substance use may also be intertwined where alcohol influences psychological well-being, which leads to more alcohol use, and then to further decreases in psychological functioning (see Leve et al., 2012). However, while numerous studies have examined such associations, their relation is still unclear (Hawn et al., 2020; Pedrelli et al., 2016). For example, ample research shows that alcohol use in adolescence relates to emotional distress such as depression in both later adolescence and adulthood (Edwards et al., 2014; Pedrelli et al., 2016; Trim et al., 2007). Indeed, Gilman and Abraham (2001) found the chance of developing depressive disorders had a dose-response relationship with alcohol use severity. Others find emotional distress to be the result of heavy alcohol use (King & Chassin, 2008). A large 10-year follow-up cross-sectional study found the odds of developing alcohol use disorders were 2–5 times higher among persons with anxiety and depressive disorders (Swendsen et al., 2010). Finally, while some longitudinal studies examining the effect of alcohol use in adolescence on emotional distress in adulthood find small but significant mean effects, other studies find no association over time (see Pedrelli et al., 2016).

All in all, parental alcohol use and emotional distress experienced in the family of origin, as well as the adolescent's own behavior may influence psychiatric disorders in adulthood. However, the nature of the association between alcohol use and emotional distress as possible mediators in these relations is unclear. Thus, we extend this literature by examining associations between parental and adolescent drinking and emotional distress, as they relate to meeting criteria for psychiatric disorders in adulthood. Further, we examine problem drinking and distress across emerging adulthood as mechanisms to help explain these associations.

Present study

The present investigation used data from a two-decade longitudinal study of adolescents and their parents followed from adolescence to adulthood. We measured parent alcohol use, parent emotional distress, adolescent alcohol use, and adolescent emotional distress during middle adolescence (Time 1). Adolescent binge drinking and emotional distress were measured during late adolescence (Time 2), and alcohol problems and emotional distress were measured again during emerging adulthood (Time 3). Substance use, behavioral, affective, and anxiety disorders were measured during adulthood (Time 4). We expected that both adolescent and parental alcohol use as experienced in adolescence would relate to problem drinking in young adulthood. Similarly, we expected that adolescent and parental emotional distress would relate to emotional distress in young adulthood. We also expected that alcohol problems in young adulthood would relate to SUD in adulthood. In addition, given that emotional distress may include anxiety, hostility, and depressive symptoms, we expected that it would relate to behavioral, affective, and anxiety disorders in adulthood (see Figure 1). Finally, since there is some evidence that alcohol use and emotional distress are related, while other studies show little to no association (Pedrelli et al., 2016), it could be that alcohol problems leads to emotional distress, or emotional distress leads to substance use, or there will be no association. That is, alcohol use in adolescence may only relate to later alcohol problems and emotional distress as experienced in adolescence may only be associated with emotional distress.

Method

Participants

Data come from the Family Transitions Project (FTP), a longitudinal study of 559 youth and their families. FTP represents an extension of two earlier studies: The Iowa Youth and Families Project (IYFP) and the Iowa Single Parent Project (ISPP). In IYFP, data ($N = 451$) were collected annually from 1989 through 1992. Participants included a target adolescent and their biological parents. When interviewed in 1989, the adolescent was in seventh grade (M age = 12.7 years). Families were recruited from schools in eight rural counties. Due to the rural nature of the Midwestern sample, all participants were Caucasian. Families were lower middle or middle class with 34% residing on farms, 12% living in nonfarm rural areas, and 54% living in towns with fewer than 6,500 residents. In 1989, parents averaged 13 years of schooling and had a median family income of $33,700. Fathers' average age was 40 years, while mothers' age was 38. ISPP began in 1991 when the adolescent was in 9th grade (M age = 14.8 years),

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which was the same grade as the IYFP youth. Participants included the adolescents and their single mothers ($N = 108$). Some non-resident fathers participated via the phone and answered questions regarding social behaviors, individual characteristics, and relationships. When available, non-resident father scores were utilized in the measures. Participants were Caucasian, primarily lower middle or middle class, and lived in the same geographic area as IYFP families. In 1994, families from ISPP combined with IYFP to create the FTP. Measures and procedures were identical. At that time, adolescents from both studies were in 12th grade. The FTP has followed the target with a 90% retention rate, from 1989 through 2007 (M target age = 31 years).

The present study included adolescents who participated from middle adolescence into adulthood ($n = 501$). Data were analyzed at four developmental time periods. Time 1 assessed adolescent and parent risk factors at age 16. Time 2 assessed late adolescent binge drinking and emotional distress at age 18. Alcohol problems and emotional distress were measured at time 3 during emerging adulthood (25 years old), and the occurrence of psychiatric disorders was obtained at time 4 at the most recent age of positive diagnosis between the ages of 26 and 31. This project has been approved by the Institutional Review Board at Iowa State University.

Procedures

In the IYFP and ISPP, families were visited in their homes by a trained interviewer. Monetary incentives were provided. During the visit, each family member completed questionnaires pertaining to individual characteristics, social behaviors, and family relationships. In the ISPP, non-custodial fathers completed a telephone interview that assessed many of the same individual characteristics that single mothers in the ISPP completed. This includes 11 out of 15 of the emotional distress items, social behaviors (including frequency of being drunk), and family relationships. In the FTP, when the adolescent was an adult, they were also visited by a trained interviewer. During these visits, questionnaires were completed, and at age 31, diagnostic interviews for psychiatric disorders were administered by an interviewer. The interview was a structured diagnostic interview based on the University of Michigan Composite International Diagnostic Interview, assessing Diagnostic and Statistical Manual of Mental Disorders-III-Revised criteria (Kessler et al., 1994).

Measures

Parent alcohol use (Time 1; adolescent age 16)

Mothers and fathers (when applicable) reported how many days in the past month they had 2 or 3 alcoholic beverages, how many days they had 4 or more alcoholic beverages, and if they had been drunk in the past year. Scores on these items were standardized and averaged for mothers and fathers separately ($r = .44$, $p < .001$), and then averaged together to create the manifest variable in the model. If the child only had one parent respond, only the responding parent's score was utilized.

Parent emotional distress (Time 1; adolescent age 16)

Emotional distress was assessed via mother and father (if available) self-report using 15 items from the Symptom Checklist-90-Revised (SCL-90-R; Derogatis, 1994). This same measure was used across all time points in the model (Derogatis, 1994). Items used from the anxiety subscale included: nervousness or shakiness inside, trembling, heart pounding or racing, and feeling so restless you could not sit still. Items used from the depression subscale included: feeling low in energy/slowed down, thoughts of ending your life, feeling lonely, feeling blue, worrying too much about things, feeling no interest in things, feeling hopeless about the future, feeling everything is an effort, and feelings of worthlessness. Items used from the hostility subscale included getting into frequent arguments and having urges to break or smash things. Response categories assessed how distressed the parent felt during the past week, ranging from 1 (not at all) to 5 (extremely). Scores were averaged for mothers and fathers separately ($r = .14$, $p < .01$) and then averaged together to create a global severity index, which is a measure of overall distress using the SCL-90-R ($\alpha = .90$).

Adolescent alcohol use (Time 1; age 16)

Adolescents reported on their frequency of drinking beer, wine, and liquor in the past 30 days. Scores on each of the three types of alcohol use were averaged to create the manifest variable in the model ($\alpha = .88$).

Adolescent emotional distress (Time 1; age 16)

Emotional distress was assessed via self-report using the same 15 items (averaged) from the SCL-90-R as above ($\alpha = .92$).

Late adolescent binge drinking (Time 2; age 18)

Adolescents responded to two independent questions regarding their frequency of drinking alcohol in the past 30 days, specifically how often they had three or four drinks in a row and how often they had five or more drinks in a row. These questions were assessed on a scale from 1 (never) to 5 (every day) and averaged to create binge drinking in the model ($r = .90$, $p < .001$).

Late adolescent emotional distress (Time 2; age 18)

Emotional distress was assessed via self-report using the same 15 items (averaged) from the SCL-90-R as above ($\alpha = .91$).

Emerging adult alcohol problems (Time 3; age 25)

Emerging adults reported on their frequency of having five or more drinks in a row in the past 30 days on a scale from 1 (never) to 6 (every day) as well as how often they got into a fight, into trouble with their parents, and how often they had troubles with their spouse or girlfriend/boyfriend because of their drinking. Scores on these items were standardized and averaged for the manifest variable in the model ($\alpha = .60$).

Emerging adult emotional distress (Time 3; age 25)

Emotional distress was assessed via self-report using the same 15 items (averaged) from the SCL-90-R as above ($\alpha = .92$).

Adult psychiatric disorders (Time 4; age 26–31)

The most recent diagnosis of behavioral, substance use, affective, and anxiety disorders using the University of Michigan Composite International Diagnostic Interview (Kessler et al., 1994) between the ages of 26 and 31 was assessed with 0 indicating the participant had not met criteria for the disorder between those ages and 1 indicating they had met criteria for the disorder between ages 26 and 31. Behavioral disorders included meeting criteria for conduct disorder, adult antisocial behavior, or both. SUD included meeting criteria for alcohol abuse without hierarchy, alcohol dependence, substance abuse without hierarchy, substance dependence, or a combination thereof. Affective disorders included meeting criteria for manic episode without hierarchy, hypomanic episode without hierarchy, major depressive episode, dysthymia without hierarchy,

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Table 1. Descriptive statistics

	Mean	*SD*	Minimum	Maximum	*N*
Parent alcohol use	0.02	2.04	−2.07	10.68	424
Parent emotional distress	1.37	.36	1.00	3.20	424
Alcohol use (age 16)	1.64	.79	1.00	5.33	423
Emotional distress (age 16)	1.55	.58	1.00	5.00	422
Binge drinking (age 18)	4.52	.77	1.00	4.00	446
Emotional distress (age 18)	1.58	.57	1.00	4.33	446
Alcohol problems (age 25)	0.01	.75	−.22	8.71	428
Emotional distress (age 25)	1.37	.46	1.00	3.60	428
Substance use disorders	0.13	.33	.00	1.00	459
Behavioral disorders	0.20	.40	.00	1.00	459
Affective disorders	0.13	.34	.00	1.00	459
Anxiety disorders	0.18	.39	.00	1.00	459
Per capita income	0.89	3.90	−7.77	5.80	430
Mother age	41.20	4.95	32.25	56.31	431
Father age	43.06	.87	33.00	71.77	430
Adolescent gender (1 = Male)	0.44	.50	.00	1.00	446
Family of origin (1 = 2-parent)	0.82	.38	.00	1.00	459

or a combination thereof. Finally, anxiety disorders included meeting criteria for panic disorder, agoraphobia, social phobia, simple phobia, generalized anxiety disorder without hierarchy, or a combination thereof.

Covariates

In adolescence, total annual household income from the past 12 months (parent report) was divided by number of people in the household, which represented the financial resources available for each family member, creating the per capita income variable at Time 1. Mother and father age was reported at Time 1, and we controlled for the type of household that the adolescent grew up in (0 = ISPP, 1 = IYFP). Finally, we moderated by adolescent gender in the model (0 = female, 1 = male).

Analytic plan

Descriptive statistics were obtained for each of the variables in the current study using SPSS (see Table 1). A measurement model was then conducted using M*plus* Version 8 (Muthén & Muthén, 1998–2017). Next, a logit model was conducted in M*plus*, where we used Monte Carlo integration to estimate the significance of the hypothesized pathways due to having binary dependent variables. Thus, we provided the Akaike Information Criterion and Bayesian Information Criterion instead of chi-square and other practical model fits. Any missing data were handled by maximum likelihood estimation methods (Muthén & Muthén, 1998–2017), which is utilized for logit models. To assess indirect effects, an indirect model was conducted in Mplus to analyze full pathways through all four time points in the model.

Two steps were followed to determine if pathways in the full model differed by gender. Monte Carlo integration was again utilized, and a two-class structure was fit to the data based on gender (males and females). The first step included specifying a fixed logit model, in which all pathways were constrained to be the same. The next step(s) included freeing one model pathway at a time. If there was a change in the loglikelihood value of greater than 3.941, it would be an indication that a freed pathway between males and females was significantly different from the fixed pathway between males and females, with the change of one degree of freedom.

Results

Correlations among study variables were obtained in M*plus* Version 8. Table 2 shows correlations among all study variables and the control variables. The direction of all correlations were consistent with hypotheses, which justified further statistical tests of the causal pathways in the model. Due to the nature of the variables, we utilized Monte Carlo simulation in M*plus* Version 8, to estimate the magnitude of the associations between the study variables. Beta weights were obtained for Times 1–3, and variables predicting Time 4 disorders were output as log odds, as each psychiatric disorder was categorized as dichotomous (0 = did not meet criteria between ages 26 and 31, 1 = did meet criteria between ages 26 and 31). Any missing data were handled by Maximum Likelihood procedures in M*plus*. The model fit the data well. Results showed that 12.6% had met criteria for a SUD, 20% had met criteria for a behavioral disorder, 13.1% had met criteria for an affective disorder, and 18.3% had met criteria for an anxiety disorder between the ages of 26 and 31. The logit model we tested included all control variables. Measures within the same time point were set to be correlated with each other, while measures across time were regressed on each other. Control variables were set to predict each of the variables in the model and were specified to be correlated with the other control variables. The results are presented in Figure 2 and show coefficients that reached statistical significance.

Parent alcohol use and emotional distress at Time 1 were correlated in the full model ($r = .13$, $SE = .03$, $p < .01$), as well as the correlation between adolescent alcohol use and emotional distress ($r = .24$, $SE = .02$, $p < .001$). Although zero-order correlations between adolescent drinking and emotional distress within each time point were significantly related to each other, in the predictive model, the relation between adolescent drinking and emotional distress at times 2 and 3 only reached marginal significance when all other pathways in the model were estimated simultaneously ($r = .09$, $SE = .02$, $p = .056$; $r = .09$, $SE = .02$, $p = .066$ at Times 2 and 3 respectively). In terms of the intergenerational associations from Time 1 to Time 3 in the model, parent alcohol use was related to adolescent binge drinking at age 18 ($b = .16$, $SE = .02$, $p < .001$), while parent emotional distress was associated with subsequent emotional distress at age 18 ($b = .12$, $SE = .08$, $p < .05$). Adolescent alcohol use at Time 1 was associated with binge drinking at age 18 ($b = .39$, $SE = .04$, $p < .001$) as well as alcohol problems at age 25 ($b = .11$, $SE = .05$, $p < .05$). Similarly adolescent emotional distress at Time 1 was associated with higher emotional distress at Times 2 ($b = .35$, $SE = .05$, $p < .001$) and 3 ($b = .21$, $SE = .04$, $p < .001$), at ages 18 and 25 respectively. In sum, drinking and emotional distress were related within the second generation across time from age 16 to 25, and parent alcohol use predicted further drinking, while parent emotional distress predicted subsequent emotional distress 2 years later.

SUD. For a one-unit increase in parent alcohol use and adolescent alcohol problems at age 25, the log odds of having a SUD between the ages of 26 and 31 increased by .14 ($OR = 1.15$, $SE = .06$, $p < .05$) and .20 ($OR = 1.69$, $SE = .21$, $p < .05$)

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Table 2. Correlations among study constructs

Study constructs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Parent alcohol use	–																
2. Parent emotional distress	.14***	–															
3. Alcohol use (age 16)	.12**	.08	–														
4. Emotional distress (age 16)	.04	.13**	.25***	–													
5. Binge drinking (age 18)	.20***	.08	.41***	.08	–												
6. Emotional distress (age 18)	.07	.14**	.02	.36***	.06	–											
7. Alcohol problems (age 25)	.03	.05	.18***	.10***	.23***	.07*	–										
8. Emotional Distress (age 25)	-.03	.12**	.03	.30***	−.02	.25***	.10***	–									
9. Substance use disorders	.15*	.03	.19**	.10	.17**	-.02	.23***	.00	–								
10. Behavioral disorders	.13	.16*	.02	.18**	.14	.14*	.05	.21***	.36***	–							
11. Affective disorders	.06	.07	.12	.21***	−.07	.22**	.04	.32***	.14	.37***	–						
12. Anxiety disorders	−.02	.04	.10	.20**	−.02	.21**	.22*	.32***	.27**	.23*	.46***	–					
13. Per capita income	−.03	−.18***	−.05	.00	−.03	.06	−.09	-.02	−.05	−.14**	−.02	−.02	–				
14. Mother age	−.13*	.05	−.07	−.11*	−.02	−.07	−.08	.02	−.04	−.06	−.07	−.05	.08***	–			
15. Father age	−.14**	.01	−.11*	−.04	−.04	.00	−.06	.11**	-.02	−.03	.01	.04	.04	.79***	–		
16. Adolescent gender (1 = Male)	.06	−.03	.05	.18***	-.16**	.13**	−.07	.17***	.24***	−.31***	.17*	.19**	.04	.03	.05	–	
17. Family of origin (1 = 2-parent)	−.10*	−.23***	−.10*	−.16***	−.14**	−.03	−.14**	−.05	−.11	−.09	−.03	−.14*	.13***	.07	.17**	−.03	–

*$p < .05$, **$p < .01$, ***$p < .001$.

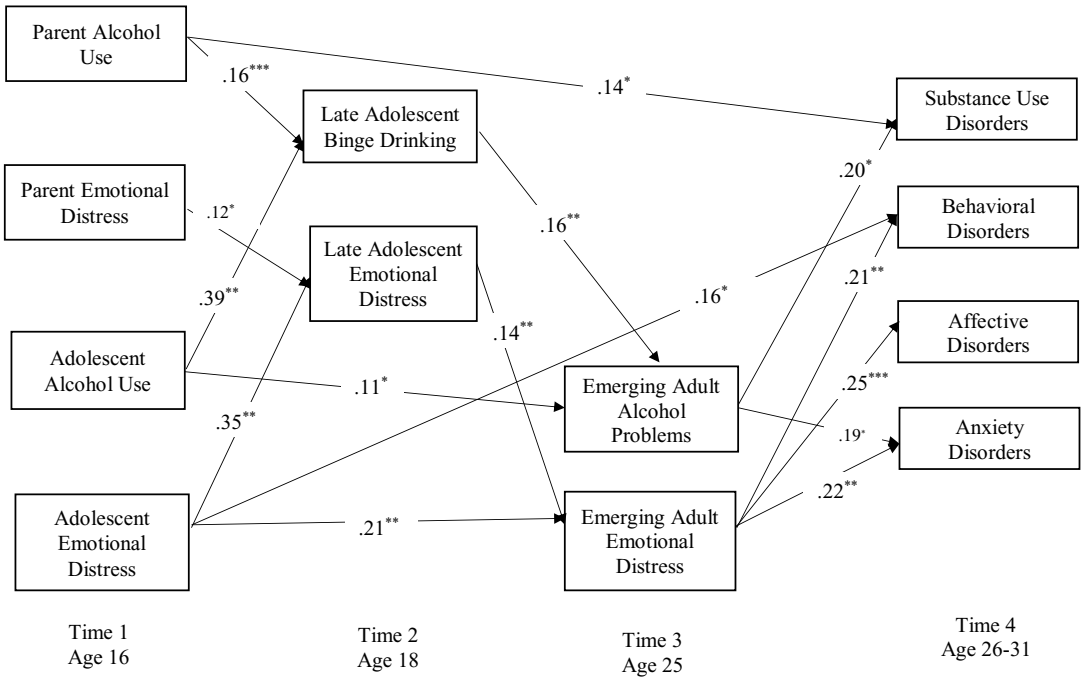

Figure 2. Statistical model. *$p < .05$, **$p < .01$, ***$p < .001$. *Notes*. Model fit: AIC = 15,195.71, BIC = 15,856.36. This model controls for mother age, father age, per capita income, and family of origin. Only statistically significant beta coefficients and log odds coefficients (both standardized) are shown in the model.

respectively. *Behavioral Disorders.* For a one-unit increase in emotional distress at age 16 and at age 25, the log odds of meeting criteria for a behavioral disorder increased by .16 ($OR = 1.76$, $SE = .27$, $p < .05$) and .21 ($OR = 2.54$, $SE = .31$, $p < .01$) respectively. *Affective Disorders.* For a one-unit increase in emotional distress at age 25, the log odds of meeting criteria for an affective disorder increased by .21 ($OR = 2.93$, $SE = .28$, $p < .001$) between the ages of 26 and 31. *Anxiety Disorders.* Emotional distress and alcohol problems at age 25 were significantly associated with meeting criteria for an anxiety disorder between the ages of 26 and 31. For example, a one-unit increase in emotional distress at age 25 was associated with an increase of .22 in the log odds of meeting criteria for an anxiety disorder ($OR = 2.55$, $SE = .27$, $p < .01$), and a one-unit increase in alcohol problems at age 25 was associated with an increase of .19 in the log odds of meeting criteria for this disorder ($OR = 1.67$, $SE = .21$, $p < .05$).

There was only one pathway in the full model that differed significantly by gender. The loglikelihood of the fixed logit two-class structure model was –7,430.908. After freeing each pathway in the model, the pathway from emotional distress at age 16 to alcohol problems at age 25 was significant for males ($b = .23$, $SE = .11$, $p < .01$) but not for females ($b = -.07$, $SE = .08$, $p = .263$). The loglikelihood of this model was −7,426.119. A chi-square difference of 4.789 with one degree of freedom results in a significant difference between the fully fixed model and the current ($p < .05$).

Indirect effects

We examined the significance of the full indirect pathways in the model from Time 1 to Time 4 utilizing M*plus* v8 (see Table 3). 95% bias-corrected confidence intervals were examined for significance. *SUD.* There was a significant indirect effect from parent alcohol use through drinking at age 18 and 25, as well as from adolescent alcohol use at age 16 through the same set of drinking measures at age 18 and 25 to SUD at Time 4. *Behavioral Disorders.* The only full indirect pathway in the model from Time 1 to Time 4 behavioral disorders was from adolescent emotional distress to behavioral disorders at Time 4 by way of emotional distress at Times 2 and 3. *Affective Disorders.* Parent and adolescent emotional distress at Time 1 were indirectly related to affective disorders between ages 26 and 31 via emotional distress at ages 18 and 25. *Anxiety Disorders.* Finally, both parent and adolescent drinking at Time 1 were indirectly related to anxiety disorders at Time 4 through drinking behaviors at Times 2 and 3. Similarly, both parent and adolescent emotional distress at age 16 were indirectly associated with anxiety disorders between the ages of 26 and 31 via emotional distress at ages 18 and 25.

Discussion

The present investigation examined associations between alcohol use and emotional distress in adolescence to predict mental health disorders in adulthood, as well as problem drinking and emotional distress in young adulthood to help explain these associations. This study adds to the literature showing mixed findings in terms of the relation between early distress and problem drinking and the connection with mental health in adulthood. According to Pedrelli et al. (2016), it is important to extend such findings to middle adulthood as drinking in adolescence and young adulthood may occur for reasons outside of distress, and there is evidence the association between distress and alcohol may lessen over time. Results showed clear pathways from parent alcohol use and adolescent alcohol use, as well as parent and adolescent emotional distress to mental health disorders 10 years later. Parent alcohol use was significantly related to late adolescent binge drinking, which was associated with alcohol problems in emerging adulthood, and then to both SUD and anxiety disorders in adulthood. Moreover, parent alcohol use was also directly related to SUD in adulthood. Similarly, adolescent alcohol use was significantly related to both

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Table 3. Indirect effects

Model pathway	Estimate	95% CI
Parent alcohol use → Binge drinking age 18 → Alcohol problems age 25 → Substance use disorders	.000	(.000, .023)
Parent alcohol use → Binge drinking age 18 → Alcohol problems age 25 → Anxiety disorders	.005	(.000, .020)
Parent emotional distress → Emotional distress age 18 → Emotional distress age 25 → Affective disorders	.025	(.000, .089)
Parent emotional distress → Emotional distress age 18 → Emotional distress age 25 → Anxiety disorders	.021	(.001, .082)
Alcohol use age 16 → Binge drinking age 18 → Alcohol problems age 25 → Substance use disorders	.032	(.000, 128)
Alcohol use age 16 → Binge drinking age 18 → Alcohol problems age 25 → Anxiety disorders	.032	(.001, .129)
Emotional distress age 16 → Emotional distress age 18 → Emotional distress age 25 → Behavioral disorders	.037	(.001, .113)
Emotional distress age 16 → Emotional distress age 18 → Emotional distress age 25 → Affective disorders	.043	(.004, .110)
Emotional distress age 16 → Emotional distress age 18 → Emotional distress age 25 → Anxiety disorders	.037	(.005, .109)

Notes. CI = Confidence Interval. Only significant indirect effects for pathways through all four time points are shown.

SUD and anxiety disorders through late adolescent binge drinking and alcohol problems in emerging adulthood.

Results regarding emotional distress showed parent distress related to both affective and anxiety disorders through emotional distress in late adolescence and emerging adulthood. Relatedly, adolescent emotional distress was associated with distress in both late adolescence and emerging adulthood, which then related to behavioral, affective, and anxiety disorders. There was also a significant direct effect from adolescent emotional distress to behavioral disorders in adulthood. This direct pathway may contribute to the lack of association between parent emotional distress in adolescence and behavioral disorders in adulthood. Additionally, we found that parent emotional distress in adolescence indirectly related to behavioral disorders in adulthood by way of emotional distress in late adolescence and emerging adulthood. Overall, findings illustrate specific alcohol and emotional distress pathways from adolescence to adulthood. Alcohol use only related to further alcohol problems that led to both substance use and anxiety disorders in adulthood. Emotional distress was only associated with distress in late adolescence and emerging adulthood, then related to behavioral, affective, and anxiety disorders which is in line Derogatis's (1994) definition of distress (i.e., anxiety, hostility, and depression).

Results are consistent with those that find an association between drinking patterns over time and SUD and mood disorders in adulthood (Diggs & Neppl, 2018; Englund et al., 2008; Ruiz et al., 2020). However, our findings also show that alcohol use from adolescence to emerging adulthood specifically related to anxiety, rather than to affective or behavioral disorders. This is more in line with studies that find no association with alcohol use in the younger years to meeting criteria for depressive disorders in adulthood (see Pedrelli et al., 2016). For emotional distress, results are consistent with an earlier study demonstrating that distress experienced in adolescence was not associated with problem drinking in adulthood (Crum et al., 2008), and those that find heavy drinking may lead to mood disorders but not mood disorders leading to heavy drinking (Fergusson et al., 2013; Pedrelli et al., 2016). There are likely both genetic and environmental explanations for these significant pathways. For example, there could be genetic explanations for individual behavior as well as continuity of problem behavior that is genetically transmitted across generations (Loehlin et al., 2005). It could also be that in line with the Social Learning Theory, children emulate these specific behavior patterns from their parents into adulthood (Conger et al., 2003).

Earlier research has also shown mixed findings in terms of gender differences in the association between alcohol use and emotional distress (see Pedrelli et al., 2016). Results from the current study found limited effects of gender on these associations. One reason could be the rural nature of the sample. For example, there is evidence that rural young adults drink at higher rates (Friesen et al., 2022) and may be at a greater risk for substance use problems than those from more urban areas (Martin et al., 2019; Rueter et al., 2007). Indeed, a large majority of the adolescents in the current study experienced a high prevalence of SUD with many continuing this behavior into adulthood (Rueter et al., 2007). This is consistent with trends regarding geographic location that show Midwesterners report a higher rate of drinking compared to Southern and Northeastern counterparts (Dixon & Chartier, 2016). Moreover, results from the current study are also consistent with the Iowa Risk Behavior Survey which found that for youth in Iowa, males (25.5%) and females (26.0%) had similar rates of current alcohol use (Center for Disease Control and Prevention, 2019).

There are limitations worth noting. First, due to the first time point beginning in adolescence, other risk mechanisms may exist prior to this time that influence pathways, as well as the possibility of reverse causation. Second, the sample is limited in terms of racial and ethnic diversity, though in late adolescence, Whites' use of alcohol is significantly higher than African American or Hispanic use (Johnston et al., 2017). Furthermore, data were mainly collected in the 1990s, and research suggests there has been a decrease in adolescent alcohol use since then, but underage drinking among Midwestern, non-urbanized, adolescents are still of high concern and continues to have adverse consequences (Diggs & Neppl, 2018). Indeed, according to the Iowa Youth Survey, adolescents in Iowa report alcohol problems such as binge drinking rates higher than national averages (Hershberger et al., 2017). Finally, emotional distress was broadly defined as anxiety, depression, and hostility. This may be distinct from other studies that measure depressive symptoms, for example as those outlined by Pedrelli et al. (2016). Measuring specific anxiety, depressive, or behavioral symptoms in adolescence and young adulthood would have further illustrated their unique associations with specific mental health disorders in adulthood.

Ultimately, results of the current study help elucidate the mechanisms through which risky behaviors experienced in the family of origin have lasting effects into adulthood. Adolescence is a critical time for youth, thus it is imperative to determine potential preventative measures in adolescence that can target family and

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individual risk factors that relate to later mental health disorders. Findings highlight the importance of preventing alcohol use and emotional distress in adolescence, as they are associated with meeting criteria for mental health disorders in adulthood. In sum, the current study used a prospective, longitudinal community-based design with a rural sample to examine adolescent predictors of psychiatric disorders in adulthood, and the mediating role of alcohol use and emotional distress in emerging adulthood. Results suggest that parent and adolescent alcohol use as experienced in adolescence has a strong influence on problem drinking, and leads to substance use and anxiety disorders in adulthood. Moreover, emotional distress in adolescence leads to distress in emerging adulthood and to meeting criteria for behavioral, affective, and anxiety disorders in adulthood. More broadly, results help to disentangle the role of alcohol use and emotional distress on these associations. Addressing these issues in adolescence can prevent the long-term consequences that accompany problem drinking and poor mental health later in life.

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Conflicts of interest. None.

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