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Intergenerational Continuity in Alcohol Misuse: Maternal Alcohol Use Disorder and the Sequelae of Maternal and Family Functioning

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Abstract

Early onset of alcohol use is associated with a host of detrimental outcomes. As such, understanding the complex etiology of early onset alcohol use for prevention purposes is an important goal. Specific environmental stressors within the family (i.e., financial stress, negative parental wellbeing, and negative family climate) heighten the risk of early onset alcohol use; however, the extent to which these factors are set in motion by prior maternal history of alcohol misuse has yet to be investigated. We used prospective, longitudinal data from 385 mother-child dyads to examine the link between a maternal alcohol use disorder and her child's early onset of alcohol use through the sequelae of maternal financial strain, maternal depressive symptoms, maternal excessive alcohol use, and negative family climate. Results indicate that a maternal alcohol use disorder itself, and the confluence of a maternal alcohol use disorder, subsequent financial strain, and depressive symptoms produce a negative family climate. In turn, a negative family climate increases the likelihood of alcohol use by the age of 15 among offspring. Moreover, we demonstrate that the cascade of consequences on maternal and family functioning linking a maternal alcohol use disorder to her child's early onset of alcohol use is proximal in nature, unfolding concurrently rather than in yearly spans of time. We discuss the implications of these findings with respect to the etiology of early onset alcohol use (and extant theoretical models) and prevention programming.

Keywords

Family Climate; Intergenerational Continuity of Alcohol Misuse; Early Onset Alcohol Use; Maternal Influence

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Introduction

The early onset of alcohol use has widespread negative implications for individuals and society at large (World Health Organization [WHO], 2014). Most individuals begin using alcohol during adolescence, with peak use occurring during late adolescence and the transition to adulthood (National Institute on Drug Abuse [NIDA], 2017). Yet, the consequences of adolescent alcohol use, particularly early onset alcohol use, endure well into adulthood. For instance, adolescents who experience onset of alcohol use before the age of 15 are more likely to experience future alcohol dependence (King & Chassin, 2007; NIAAA, 2006). Further, early adolescent alcohol consumption is associated with a higher risk for concurrent and future mental health strain, interpersonal stress, diminished work capacity, and premature death in later years (see Marshall, 2014 for a review).

Prevention of early onset alcohol use is arguably the most effective means to mitigate these negative consequences. In order to adequately develop prevention programming, though, the etiological origins of the early onset of alcohol use are needed. Extant etiological studies of adolescent alcohol use utilizing various theoretical frameworks identify risk and protective factors for the early onset of alcohol across a variety of domains (e.g., individual, peer, school, and environment), but the familial context appears to be particularly informative (Visser, De Winter, & Rijneveld, 2012). For instance, a parental history of alcohol misuse is one of the most robust predictors of early onset alcohol use in offspring (Chassin et al., 2016; Salvatore et al., 2015; Windle et al., 2008). Poor family functioning is also a significant risk factor for the early onset of alcohol use (for a review see Chassin et al., 2016). In this study, we focus on the familial context and explore the sequelae resulting from a maternal history of alcohol misuse, including reduced maternal and family functioning that may ultimately increase the risk for a child's early onset of alcohol use. In doing so, we query whether these processes unfold concurrently or over a lag in time. The sum of these efforts are meant to inform extant theory and identify targets for prevention programming.

Maternal Alcohol Misuse and Family Functioning

Alcohol misuse and dependence aggregates within families (e.g., McGue & Iacono, 2004; Sher, 1997). Moreover, parental alcohol misuse, particularly maternal alcohol misuse, is a key risk factor for a child's early initiation of alcohol use (e.g., Salvatore et al., 2015; Windle et al., 2008). However, much less is known about the mechanisms by which a parent's alcohol misuse impacts their children's use (i.e., age of onset). One dominant perspective is the genetic underpinning accounting for intergenerational continuity in alcohol use and misuse (e.g., Dick & Agrawal, 2008; Rose, Dick, Viken, & Kaprio, 2001; Schuckit, Smith, & Danko, 2009). However, even after accounting for genetics, there is still a large proportion of variance in intergenerational alcohol misuse that remains unexplained. One avenue of focus is the mediating role of parent and family functioning. In particular, parents with a history of alcohol misuse are less likely to prosper in their economic, social, and family spheres (Sher, Walitzer, Wood & Brent; 1991; see also, Hussong, Jones, Stein, Baucom, & Boeding, 2011), each of which may perpetuate alcohol misuse anew among the next generation. The latter, in particular, demonstrates the strongest link to adolescent problem behavior as children raised in a negative family climate characterized by high family

conflict, low family warmth, and poor family management (Martin et al., 2015; 2018) are less likely to develop effective self-control and are more likely to engage in problem behaviors such as alcohol use (Barnow, Schuckit, Lucht, John, & Freyberger, 2002; Catanzaro & Laurent, 2004; Moos & Moos, 2009; Skeer et al., 2009).

The Family Stress Model (Conger & Conger, 2002) provides one framework for understanding the role of parenting and family functioning in the etiology of adolescent problem behavior. Specifically, it proposes a link between financial hardship, problem behaviors among parents, and the family climate to the outcome of adolescent problem behavior (e.g., alcohol use). According to the Family Stress Model, economic pressure experienced by a parent may heighten parental risk of experiencing distress, often manifesting in problem behaviors (e.g., excessive substance use or mental anguish; e.g., Butterworth, Rodgers, & Windsor, 2009; Popovici & French, 2013). In turn, parental problem behaviors may negatively affect parenting and overall family functioning (i.e., family climate). Family climate, in turn, plays a significant role in predicting child and adolescent problem behavior, including alcohol use (see Chassin, 2016 for a review).

Extant research verifies the utility of these pathways in the etiology of adolescent problem behavior (e.g., Diggs, 2018; for a detailed review see Masarik & Conger, 2017). For instance, family economic pressure is related to increased child externalizing behaviors through parental distress and negative parenting (Neppl et al., 2016). Martin, Conger, and Robins (2018) identified an etiological path between family economic pressure and adolescent substance use in grade 11 (including cigarette, alcohol and marijuana use) through parental distress and poor parenting. Notably, though, no known research has attempted to integrate these etiologic pathways into the explication of intergenerational alcohol misuse. This is noteworthy given that numerous studies document a relationship between problem alcohol use and subsequent financial instability (either through a selection effect or interrupted educational and employment trajectories; see Thavorncharoensap et al., 2009 for a review). Moreover, financial hardships originating from one's family of origin are often exacerbated by problem alcohol use (see Jones & Sumnall, 2016 for a review). As such, the inclusion of a parental alcohol use disorder as a (potential or partial) source for the negative cascade of individual parent and familial environmental factors that promote adolescent alcohol use is a novel endeavor. Not only does this approach expand upon an existing theoretical framework to account for adolescent antisocial behavior, but it also further illuminates potential mechanisms that may account for intergenerational continuity of problem alcohol use.

Current Study

Using prospective, longitudinal data, we examine the role of a mother's history of an alcohol use disorder on individual functioning and negative family processes (see Figure 1) and examine whether or not these constructs account for intergenerational continuity in problem alcohol use (i.e., child early onset alcohol use). The goals of this endeavor are twofold. First, we seek to assess whether or not the consequences of a maternal alcohol use disorder on individual and family functioning can account for intergenerational alcohol misuse. Second, we aim to assess the timing of how these processes unfold - that is, whether they are

contemporaneous in effect or they lag over time. In doing so, we highlight two additional considerations relevant to this research. We focus on a racially diverse, urban population at an elevated risk for antisocial behavior. As such, our parent-child dyads are disproportionately represented by single-parent (maternal) households; such applications of intergenerational continuity in alcohol misuse are limited within existing research, despite the importance of considering the generalizability of etiological models (Nielsen, Haun, Kartner, & Legare, 2017). Stemming from restrictions associated with the sample of interest, we also focus on mother-child dyads only. We note, though, that there is a clearly delineated importance of the mother-child relationships in the context of intergenerational continuity for problem behaviors, namely alcohol misuse (Chassin et al., 2016; Connell & Goodman, 2002). With these concerns in mind, we present the following hypotheses in line with the model presented in Figure 1.

Hypothesis 1: A maternal history of an alcohol use disorder is associated with greater maternal financial strain when the child is nine years old.

Hypothesis 2: Maternal financial strain at child age nine sets off sequelae of maternal behaviors (depressive symptoms and excessive alcohol use) that promote a negative family climate.

Hypothesis 3: There is an indirect effect of a maternal history of an alcohol use disorder on negative family climate through maternal financial strain, maternal depressive symptoms, and maternal heavy alcohol use during the offspring's late childhood.

Hypothesis 4: Negative family climate increases the risk for early onset alcohol use in the child.

Hypothesis 5: There is an indirect effect of a maternal history of an alcohol use disorder on a child's early onset alcohol use through maternal financial strain, maternal problem behaviors, and negative family climate during the offspring's late childhood.

Method

Data

The sample for this analysis is drawn from the Rochester Intergenerational Study (RIGS), the intergenerational extension of the Rochester Youth Development Study (RYDS). The RYDS data is comprised of a birth cohort of 1,000 adolescents (25% of the population), which is representative of the 7th and 8th grade public school population in Rochester, New York in 1988. The study was initially funded by the Office of Juvenile Justice and Delinquency Prevention as a study of adolescent development and involvement in delinquent activities. Therefore, adolescents at high risk for antisocial behavior were overrepresented by oversampling males and adolescents who resided in high-crime areas based on police arrest data for 1987. These adolescents are referred to as "G2" or Generation 2. Their primary caregiver is referred to as "G1." G2 participants averaged 13.6 years of age at the start of the study, 73% were male, 68% were Black, 17% were Hispanic, and 15% were non-Hispanic White. The sample represented the full socioeconomic spectrum found in an urban

population (Farnworth, Thornberry, Krohn, & Lizotte, 1994), but poor families were overrepresented as a result of the sampling scheme (33% of the head of households were unemployed at the start of the study and 40% received welfare assistance). Adolescent participants in RYDS were followed from adolescence to adulthood, and completed three phases of semi-annual (1988–1992; Phase I), annual (1994–1996; Phase II) and biannual (2003–2006; Phase III) interviews. Further details about the study are reported by Thornberry Henry, Krohn, Lizotte, and Nadel (2018).

Beginning in 1999, the intergenerational component of RYDS began. The oldest biological child of G2, “G3” or Generation 3, is the focus of RIGS. In each year since 1999, G3s were enrolled in RIGS when he or she turned two years of age. Both G2, and G3’s other primary caregiver (OCG) if G2 was a male, completed annual interviews since the inception of RIGS or beginning when G3 turned two years old (continuing until the child turns 18/turned 18). G3 completed annual interviews once he/she turned eight. Data collection is ongoing. All data collection procedures were approved by the University at Albany’s Institutional Review Board.

Sample

Currently, there are prospective, longitudinal data for 539 G2/G3 parent-child dyads.¹ Of all RIGS mother-child dyads, 427 met the minimum criteria for analysis as we excluded dyads in which the biological mother did not participate in the study, G3 was born after 2001 (because children were not yet old enough to have the early onset of alcohol use measured), and dyads for which a mother’s history of an alcohol use disorder status was not measured. Additional restrictions on the sample included needing to ensure temporal order between all constructs and removing mother-child dyads with missing data on any of the endogenous variables in the path model. The final analytic sample includes 385 G2/G3 parent-child dyads (see Analytic Plan for more details). Of the mothers included in this analysis, 147 or 38% participated in RYDS (238 are OCG-G3 dyads). The children were relatively evenly split by sex. Approximately 66% of children identified as Black, 8% identified as non-Hispanic White, and the remainder identified as Hispanic (17%), or mixed/other race/ethnicity (9%).

Measures

Treatment.—Mothers’ history of an alcohol use disorder was measured between 2004 and 2011 using the Computerized Diagnostic Interview Schedule Version IV (CDIS-IV). The CDIS- IV is based on the Diagnostic and Statistical Manual, Edition Four (DSM-IV) criteria for lifetime alcohol abuse and dependence. Based on information from the first administration of the CDIS- IV and any subsequent administration prior to the child age of nine, mothers who met the criteria for lifetime alcohol abuse or dependence were assigned a 1; those who did not meet the criteria for lifetime abuse or dependence were assigned a 0. Among the final sample of mother-child dyads, 11% of mothers had a history of an alcohol use disorder.

¹The RIGS has an 8% (family) attrition rate since the start of the study. Additional analyses confirm that as of Year 17 of the RIGS, the retained G2 participants are representative of the original G2 population in 1988 (see Thornberry et al., 2018)

Mediators.—All potential mediators were taken from mother and child interviews when the child was age nine, 10 and 11, respectively. *Maternal financial strain* was measured by maternal self-reported difficulty to obtain necessities such as housing, food, and other basic goods in the last year (for a full list of items see Appendix A). The seven items (Yes = 1, No = 0) were summed to create a cumulative indicator of financial strain (U.S. Bureau of Labor Statistics, 2018). The average number of unique financial hardships reported by mothers in the past year in our final sample ranged from 0.93 – 0.98 ($SD = 1.48 – 1.59$) across G3 ages nine to 11.

Maternal depressive symptoms were measured using a modified version of the Center for Epidemiologic Studies Depression scale (CES-D; Radloff, 1977). Mothers self-reported depressive symptoms in the last week (e.g., “During the past week, how often did you feel depressed?”) with values ranging from 1 (Never) to 5 (Always). Nineteen of the original 20 items in the CES-D were included in RIGS interviews (one item was deemed not relevant to the sample population by the principal investigators based on pilot testing; $\alpha = 0.92$).² The scale of maternal depressive symptoms is the average of all nineteen items, with higher values indicating more or more frequent depressive symptoms. In our final sample of mothers, the average score for depressive symptoms ranged from 1.82 – 1.85 ($SD = 0.60 – 0.64$) across G3 age nine to 11.

Mothers’ excessive alcohol use was assessed from maternal self-reported responses of “Yes” or “No” to two items regarding excessive alcohol use in the past year: “Have you had five or more drinks at one sitting?” and “Have you gotten drunk?” (Yes = 1, No = 0). If a mother answered “Yes” to having more than five drinks at one sitting in the past year, she was asked how many times she had consumed five or more drinks in one sitting. If the mother responded “Yes” she had been drunk in the past year, she was asked how many times she had been drunk since the date of the last interview. We combined the reported frequency from each of these measures to form one frequency measure, as the correlation between the two variables was quite high ($r = 0.96$). The average number of days that a mother reported excessive drinking ranged from 0.48 – 0.50 ($SD = 0.96 – 0.98$) between G3 age nine and 11, or less than one day in each year. Notably, between 74 – 78% of mothers did not engage in any excessive drinking in a given year across G3 age nine to 11. Due to extreme right-skew, we added a constant of one and took the natural log.

To measure a *negative family climate*, we relied on the Social Control Model of Substance Use (Martin et al., 2015), which posits that a family climate consists of three domains: family conflict, family (mother-child) warmth, and family management. Although RIGS did not include specific scales for each of these subconstructs or a global construct of family climate, we utilized various items from subscales available in RIGS that ask about the current state of family practices and attitudes (and not necessarily those in the past year) to measure these subconstructs. To address the construct of *family conflict*, we included a mean score of conflict with the child as currently perceived by the mother and a mean score of conflict currently perceived by the child. Specific measures regarding conflict were

²The item, “I felt that I could not shake off the blues even with help from my family and friends” was omitted, as many participants were unfamiliar with the phrase, “shake off the blues.”

derived from the Conflict Tactics Scale (Straus, 1979). We also included a mean scale representing current maternal perceptions of parenting as a hassle, created by the principal investigators of RIGS. To address *mother-child warmth*, we included a mean scale of maternal attachment to child and a mean scale of child attachment to mother, based on the Index of Parental Attitudes (Hudson, Wung, & Borges, 1980). Additionally, we included a mean scale of maternal involvement with child. Finally, to address *family management*, we included mean scales of current maternal knowledge regarding child activities, current maternal supervision of the child, and current practices related to harsh/inconsistent discipline, respectively. We present all of the items included in each of the subscales and psychometric properties for each subscale in Appendix A. Furthermore, we also provide the means of each subscale as a function of both maternal alcohol use disorder status and child early onset alcohol use in Appendix B to further demonstrate their relevance to our conceptual model.

To create our measure of negative family climate at the given age, scales were reverse-coded, if necessary, so that higher scores reflect a more negative family climate (high household conflict as reported by the mother and child, higher perceptions of parenting as a hassle, lower maternal attachment to child, lower child attachment to mother, lower maternal involvement with child, little importance for knowledge of child activities, low levels of maternal supervision, and high levels of harsh/inconsistent discipline). We standardized each of the nine previously described scales and took the average to form our measure of *negative family climate* ($\alpha = 0.70$). The average score for negative family climate across G3 age nine to 11 is between -0.02 and -0.04 ($SD = 0.96 - 0.99$).

Outcome.—*Child's early onset of alcohol use* was based on child self-report information. At age eight, G3 reported if he or she had ever used alcohol (“drink beer, wine or hard liquor without your parent’s permission”) and if he or she had, at what age they started. In each subsequent interview, G3s reported if he or she had used alcohol (without parent’s permission) in the past year. With this information, a binary indicator of the age of onset of alcohol use was created, whereby respondents were coded 1 if they initiated use before their age 15 interview (completed as close as possible to one’s 15th birthday) and 0 if they had not begun to consume alcohol by the age of 15. Alcohol use before age 15 was selected because previous research has identified problematic outcomes when onset occurs by this age (Odgers et al., 2008), and it is in line with standards set by the Substance Abuse and Mental Health Services Administration (2015) for early uptake. Among our final sample of adolescents, 17% engaged in early onset alcohol use.

Control variables.—We also included an array of control variables relevant to specific path estimates in our analytic model (see Table 1). These include a binary indicator of the child’s sex (0 = Female and 1 = Male); a series of dummy coded variables representing the child’s race/ethnicity (Black and White; Hispanic/Other serves as the reference group); a binary indicator of whether or not G3 lived with both biological parents at age eight (0 = No and 1 = Yes); a continuous measure of the child’s birth year;³ the arrest rate (per 1,000

³Child’s birth year, which is highly correlated with maternal age at birth ($r = 0.96$), was used instead of maternal age at birth of child due to a non-trivial number of cases ($N = 22$) with missing data on this measure.

people based on Rochester, NY Police Records) of the neighborhood where the original RYDS participant resided at the start of RYDS because it was a sampling parameter; and a binary indicator of whether the mother was an original RYDS participant (0 = No and 1 = Yes). Descriptive statistics for all variables as a function of mother's history of alcohol use disorder are presented in Table 1.

Analytic Plan

Prior to testing our hypotheses, we performed a series of sensitivity analyses in order to ensure temporal order before assessing the conceptual model itself. We first identified the earliest age at which maternal alcohol abuse or dependence symptoms began (based on CDIS-IV questioning and yearly self-reported alcohol use) in order to ensure that a maternal alcohol use disorder occurred prior to the measurement of the remaining constructs in the proposed causal model (i.e., child age nine). Based on information from the CDIS-IV diagnostic interview and yearly reports of maternal alcohol use, there were 11 mothers for whom we could not ensure that alcohol abuse/dependence occurred prior to the measurement of financial strain, maternal depressive symptoms, maternal excessive alcohol use and negative family climate at child age nine.⁴ Additionally, there was a subset of children who engaged in alcohol use prior to the age of 11, the last age when our mediators were measured ($N=20$). These 31 mother-child dyads were thus removed from our final analytic sample.⁵

To address our hypotheses, we first performed descriptive analyses and confirmed bivariate correlations between our covariates of interest. We then built our analytic model in a series of steps using MPlus 8.1 (Muthén & Muthén, 1992–2017). Given the ambiguity as to whether the sequelae of events resulting from maternal financial strain operate more contemporaneously or are lagged in effect (i.e., affect individual and family functioning in the following year), we estimated a mediation model with contemporaneous and longitudinal mediation with three waves of data (child ages nine, 10 and 11) in order to provide a more accurate representation of change over time in our mediators. Importantly, we included autoregressive pathways to control for each construct assessed in the year prior (financial strain, maternal excessive alcohol use, maternal depressive symptoms, and a negative family climate) in order to account for stability in constructs (MacKinnon & Fairchild, 2009). We also allowed the residuals for maternal excessive alcohol use and maternal depressive

⁴Efforts were also made to ensure temporal order between the potential mediators, even though these constructs at each age were derived from the same yearly interview. In some cases, based on question wording, it is unlikely that the constructs may reciprocally influence one another at each child age because the question asks about what happened in the past year (e.g., financial strain, maternal excessive alcohol use), what occurred in the past two weeks (i.e., maternal depressive symptoms), and current assessments of family functioning (e.g., current feelings toward mother/child, current supervision of child, current discipline strategies, and current levels of conflict with mother/child). For instance, maternal depressive symptoms in the past two weeks would not cause financial strain in the past year (although it could be lagged depressive symptoms from the previous year leading to subsequent financial strain, which we control for). Similarly, current family climate would not cause excessive alcohol use in the past year (again, this is why we control for prior family climate and excessive alcohol use). Additionally, current family climate would not cause financial strain in the past year (nor is there a theoretical reason to suspect that family climate would predict financial difficulty). It is also unlikely, although possible, that current perceptions of negative family climate cause maternal depressive symptoms in the past two weeks. Still, question wording would suggest otherwise. The one path estimated where it is not possible to ensure temporal order is financial strain in the past year and maternal excessive alcohol use in the past year. We further discuss these potential issues with temporal order in the limitations.

⁵Additional analyses were performed that included 1) the mother-child dyads for whom we could not ensure that the maternal history of an alcohol use disorder occurred prior to the measurement of financial strain and 2) the mother-child dyads where child onset of alcohol use was prior to the age of 11. Nonetheless, we present the more conservative results with the limited sample where we are confident in temporal order.

symptoms to covary at each age. Notably, we did not constrain structural paths to be consistent over time given that the effects of maternal financial strain and/or maternal functioning may differentially affect negative family climate across child age. All variables were specified as manifest variables (and continuous covariates were standardized prior to inclusion to assist in interpretation).

Next, we regressed maternal financial strain at child age nine on a maternal history of alcohol use disorder and relevant controls (i.e., child birth year, which is a proxy for maternal age at birth, community arrest rate, and maternal participation in RYDS) in order to assess if and how a maternal alcohol use disorder activates the proposed sequelae of maternal and family functioning that we predict promotes the early onset of alcohol use. We then regressed a child's early-onset of alcohol use on each mediator assessed at age 11, a maternal history of alcohol use disorder, and relevant controls (i.e., child gender, child race/ethnicity, child living with both biological parents, child birth year, community arrest rate and maternal participation in RYDS). Our ultimate outcome of interest, child onset of alcohol use prior to the age of 15, was modeled as a categorical (binary) variable. As such, a Weighted Least Squares Means and Variances (WLSMV) adjusted robust estimator was used to estimate the model, which is appropriate for categorical outcomes (Muthén & Asparouhov, 2002). Missing data on all endogenous variables were accounted for using the WLSMV estimator, but 11 additional cases were removed from the final analytic sample as a result of missing data on exogenous variables (all 11 cases were lost due to missing information on whether or not G3 lived with both biological parents at age eleven).^{6,7} As such, our final analytic model was estimated for 385 mother-child dyads.

Based on the final estimated model, we assessed model fit using the Root Mean Square Error of Approximation (RMSEA; Brown & Cudeck, 1993), the Comparative Fit Index (CFI; Hu & Bentler, 1999), and the Standardized Root Mean Square Residual (SRMSR). We then tested the significance of specific indirect effects, the total indirect effect, and the total effect of a maternal alcohol use disorder on negative family climate at child age eleven using the 'Model Indirect' command in MPlus. Additionally, we tested the significance of the total indirect effect, specific indirect effects and total effects of a maternal alcohol use disorder on a child's early onset of alcohol use. All total and indirect effects were further examined using bias-corrected bootstrapped confidence intervals ($N = 1,000$).

Results

Descriptive Statistics

Table 1 provides descriptive statistics for all covariates as a function of mothers' alcohol use disorder status. With respect to our proposed mediators—maternal financial strain, maternal depressive symptoms, maternal excessive alcohol use, and negative family climate—mothers

⁶Additional analyses were performed where we used modal imputation to include mother-child dyads where there was missing data regarding whether or not G3 lived with both biological parents. We also re-estimated the model without this covariate. The results were similar in direction and significance.

⁷The WLSMV estimator allows for missing data on endogenous variables, including our ultimate outcome of interest. Therefore, we reran our path model and excluded mother-child dyads where there was missing data regarding child onset of alcohol use ($N = 7$). The results did not differ.

with a history of an alcohol use disorder experienced significantly higher levels of financial strain at child age nine, 10 and 11 ($p < .01$), engaged in more frequent excessive alcohol use at child age nine, 10 and 11 ($p < .01$), exhibited more frequent depressive symptoms at child age nine, 10 and 11 ($p < .01$), and experienced a more negative family climate at each child age (nine to 11; $p < .01$). Mothers with history of an alcohol use disorder were also more likely to have their child consume alcohol prior to the age of 15 ($p < .05$), as 29% of mothers who had an alcohol use disorder also had a child who experienced early onset alcohol use compared to 16% of mothers who did not have a history of an alcohol use disorder. With respect to our control variables, children with mothers who had a history of an alcohol use disorder were more likely to be non-Hispanic White than children who had a mother without a history of an alcohol use disorder ($p < .01$). There were no significant differences in child's sex, the proportion of children who were Black, the proportion of children who were living with both biological parents at age eight, the child's birth year, the community arrest rate, and maternal participation in RYDS.

Mediation Analysis

After confirming significant ($p < .05$) bivariate relationships between the focal paths in the model (see Table 2), we used mediation analysis to assess our proposed conceptual model. Recall, we argue that extant theory is unclear as to whether or not these processes unfold more contemporaneously (close in time) or if the effect of each proposed construct takes time to affect subsequent constructs in our proposed model. As such, we estimated both cross-sectional and longitudinal mediating pathways in our model. Our model fit was deemed acceptable by current standards (Brown & Cudeck, 1993; Hu & Bentler, 1999; Kenny, 2014). Figure 2 presents the significant paths. We first report the results regarding contemporaneous mediating pathways before discussing the longitudinal mediation pathways.

In line with *H1*, Figure 2 demonstrates that a mother's history of an alcohol use disorder is directly associated with maternal financial strain when her child was nine, net of controls. Also consistent with our conceptual model and *H2*, maternal financial strain as reported when the child was nine is associated with increased depressive symptomology among mothers at child age nine which, in turn, is related to a negative family climate assessed at child age nine. Notably, maternal financial strain assessed at child age nine also exerts a direct, positive effect on negative family climate at child age nine. The cross-sectional path between maternal financial strain, maternal depressive symptoms and a negative family climate was replicated at child age 10. Interestingly, at child age 11, financial strain was related to increased maternal depressive symptoms, however maternal depressive symptoms were not associated with a negative family climate. Conversely, maternal excessive alcohol use was associated with a negative family climate at child age 11. Contrary to *H2*, maternal financial strain was unrelated to maternal excessive alcohol use at each child age.

With respect to longitudinal mediation paths, we fail to find any evidence to support our proposed conceptual model regarding mediators (maternal financial strain, maternal excessive alcohol use, maternal depressive symptoms, and negative family climate). In other words, financial strain at age nine is unrelated to maternal excessive alcohol use and

depressive symptoms assessed a year later, when accounting for prior levels of maternal excessive alcohol use and depressive symptoms, respectively. Similarly, maternal excessive alcohol use and maternal depressive symptoms are unrelated to negative family climate assessed a year later when controlling for negative family climate in the previous year. In sum, it does not appear that the year lag between interviews is appropriate for the assessment of the proposed conceptual model.

With respect to *H3*, there is a total effect of a maternal history of alcohol use disorder on negative family climate assessed at age 11, and this relationship is entirely indirect (see Table 3). Moreover, four significant specific-indirect paths were identified (see Table 4 Panel A). Notably, three of the four identified specific indirect paths included pathways from a maternal alcohol use disorder to negative family climate at age 11 through maternal financial strain *and* maternal depressive symptoms, which is consistent with our proposed model. We also identified a specific indirect path between a maternal alcohol use disorder and negative family climate through maternal financial strain only.

Figure 2 also demonstrates support for *H4* as a negative family climate assessed at child age 11 increases the likelihood of early onset alcohol use among offspring. Finally, in regard to *H5*, we found that the relationship between a maternal alcohol use disorder and the early onset of alcohol use by a child was entirely indirect. We identified four specific indirect pathways between a maternal alcohol use disorder and the early onset of alcohol use by a child (see Table 4 Panel B). These specific indirect paths were identical to the specific indirect paths linking a maternal alcohol use disorder to negative family climate except that they also include a relationship between negative family climate at age 11 and a child's early onset of alcohol use. As such, we find support for *H5* as there is an indirect relationship between a maternal alcohol use disorder and the early onset of alcohol use by her child through maternal financial strain, maternal depressive symptoms and negative family climate.

Alternative Model Specifications

Two alternative model specifications were tested to further examine the relationships between the constructs of interest. First, we re-examined the conceptual model and only examined contemporaneous (cross-sectional) relationships between maternal behaviors and a negative family climate (all assessed at age 10), which is similar to existing research evaluating the Family Stress Model (e.g., Diggs & Neppl, 2018). In this specification, the direct regression path between a maternal alcohol use disorder and financial strain at child age nine was significant ($b = 0.92$, $se = 0.16$, $p < .01$), as were the regression paths between maternal financial strain at child age nine and maternal depressive symptoms at child age 10 ($b = 0.35$, $se = 0.06$, $p < .01$) and maternal excessive alcohol use at child age 10 ($b = 0.23$, $se = 0.04$, $p < .01$). The regression path between maternal depressive symptoms (but not maternal excessive alcohol use) and negative family climate at child age 10 was also significant ($b = 0.56$, $se = 0.05$, $p < .01$). Moreover, the direct path between negative family climate at child age 10 and a child's early-onset of alcohol use was significant ($b = 0.22$, $se = 0.08$, $p < .01$). Finally, there were significant total and total indirect effects of a maternal alcohol use disorder on a child's early onset of alcohol use ($b = 0.04$, $se = 0.02$, $p < .05$; the

total effect was entirely indirect), and we identified a specific-indirect effect from a maternal alcohol use disorder on a child's early onset of alcohol use through financial strain, maternal depressive symptoms and negative family climate ($b = 0.04$, 95% CI [0.01 – 0.12]).

The second alternative model was a fully recursive model that allowed all paths between all constructs to be estimated. Even with the addition of these cross paths, the direct regression path between a maternal alcohol use disorder and financial strain at child age nine remained significant ($b = 0.81$, $se = 0.25$, $p < .01$). The direct path between financial strain at child age nine and all other covariates assessed at child age nine were also significant (maternal excessive alcohol use: $b = 0.15$, $se = 0.08$, $p < .05$; maternal depressive symptoms: $b = 0.31$, $se = 0.07$, $p < .01$; and negative family climate: $b = 0.18$, $se = 0.07$, $p < .01$). Moreover, the direct path between negative family climate at age 11 and the early onset of alcohol use by a child was significant ($b = 0.24$, $se = 0.12$, $p < .05$). Similar to our main results, the total indirect effect of a maternal alcohol use disorder on the early onset of alcohol use was significant ($b = 0.18$, 95% CI [0.04–0.35]).

Discussion

The present study focused on intergenerational continuity in alcohol misuse. Drawing heavily from the Family Stress Model (Conger & Conger, 2002), which proposes that parental financial stability, wellbeing (assessed through internalizing and externalizing problem behavior), and the family climate affect child involvement in antisocial behaviors, this work examined the mechanisms by which a mother's history of an alcohol use disorder affects her child's early onset of alcohol use. In line with our hypotheses, a mother's history of an alcohol use disorder was, indeed, associated with subsequent financial strain. In turn, financial strain was related to elevated depressive symptoms (but not heavy alcohol use) among mothers, and a negative family climate. Finally, a negative family climate was related to early onset alcohol use in her child. The sum of these individual paths generated an indirect effect of a maternal history of an alcohol use disorder on negative family climate and a child's early onset of alcohol use.

Our results provide support for the importance of the constructs in Conger and Conger's (2002) Family Stress Model in the study of intergenerational alcohol misuse and add nuance to their role in the etiology of child antisocial behavior in the form of early onset alcohol use. Notably, we adapted the model for the population at hand in which most mothers and offspring did not live with the child's biological father (or father figure). As such, we did not include constructs of paternal financial distress and paternal behavior in our conceptual model. This work offers important insight into the timing of the etiological processes that unfold within mother-child dyads with respect to the constructs of the Family Stress Model (Conger & Conger, 2002). While the model itself suggests a causal flow, it is not specific to the time lapses in this causal flow. The sum of our analytic efforts suggest that the ill effects of maternal financial strain on maternal internalizing behavior and family climate are more proximal (or immediate) in nature and tend to be enduring (given the stability in constructs across waves). One year (which is the length of time between interviews in the data used for this research) is too long of a lag to examine longitudinal effects of the constructs in the model. Finally, our results emphasize the importance of maternal internalizing behavior,

rather than externalizing behavior, as it appears to play a dominant role in family stress and family climate and subsequent adolescent antisocial behavior, which is consistent with existing research (Donovan & Molina, 2011).

Altogether, our results are informative regarding prevention and intervention for the ill effects of a maternal history of an alcohol use disorder. Programs designed for women with past or current alcohol use disorders should target financial consequences of the disorder, including transportation, housing, and/or employment stability. Programming should also attend to aspects of maternal psychological functioning that stem from financial strain, such as rumination and anxiety, which may hinder a mother's ability to cultivate a healthy family climate. Alcohol misuse programs that offer counseling and healthcare assistance (such as access to medical providers) can reduce depressive symptomology and thereby lessen long-term struggles faced by women with a past or current alcohol use disorder that may damage child socio-emotional functioning and increase the likelihood of involvement in problem behavior (Milligan et al., 2010; Taylor & Conger, 2017). Remarkably, many comprehensive treatment programs already operate in line with the proposed conceptual model, addressing economic strain and psychological distress that often occur prior to and/or as a result of an alcohol use disorder (e.g., Susan B. Anthony Recovery Center, 2018). We argue that these programs should also integrate family-based interventions that target parental relationships and parenting practices (Sword et al., 2012). If maternal health and functioning can improve, it is likely the consequences of a maternal alcohol use disorder on child antisocial behavior (through family discord) can be reduced.

While our findings affirm the link between a maternal alcohol use disorder and a child's early onset of alcohol use, we caution that these results should be interpreted within the appropriate cultural context (68% percent of mother-child dyads in this sample were Black). Neighborhood disadvantage, perceived discrimination, and the race-wealth gap are all negatively associated with positive parenting practices and antisocial behavior among children in Black families (e.g., Simons et al., 2016). Still, these results support the proposed conceptual model. It is possible, though, that the strength of the relationships observed may vary and the effects we observed are more muted given that Black mothers and offspring tend to be particularly resilient to financial strain (Becvar, 2013). Furthermore, cultural norms around alcohol use among minorities may also result in weaker effects (Zapolski, Pederson, McCarthy, & Smith, 2014). As such, we encourage further study of intergenerational continuity of alcohol misuse across racial/ethnic subgroups to determine if the relevance and strength of the pathways identified vary across this demographic.

Limitations and Future Directions

Our study drew upon a sample of mother-child dyads from one urban jurisdiction in the United States, which limits the generalizability of these results. However, studies of intergenerational continuity in alcohol misuse have been limited in their application to diverse samples (see Chassin, 2016 for a review). Nevertheless, these results extend knowledge regarding mechanisms of intergenerational alcohol misuse, and future research should improve upon this effort. Related, our outcome variable speaks to alcohol use *without parental permission*, and thus, our results do not extend to parent-child dyads in which

adolescent alcohol use occurs with their parent's permission. Unfortunately, sufficient information related to paternal alcohol use disorders was not available for all G3s in our dataset; thus, we were unable to account for the independent and synergistic effects of a paternal alcohol use disorder. Future work should also incorporate paternal influences on family functioning, given the influential role many fathers play in child-rearing and family management efforts, even when they do not reside in the same household as the child.

We also note some methodological limitations of this study. We removed mother-child dyads where constructs clearly violated temporal order, and thus, our results do not speak to the effect of maternal alcohol use disorders that occur after child age nine or the processes that lead to the onset of alcohol use prior to child age 11. Additionally, there is the potential for a reciprocal (unknown direction of influence) in one paths estimated in our model. It is possible that financial strain in the past year leads to maternal excessive alcohol use in the past year and/or vice versa. However, the relationship between these two constructs was not statistically significant when accounting for all other covariates; therefore, this potential limitation of unknown temporal order is not concerning. Finally, while we aligned our measures of family climate with existing theory (Martin et al., 2015), measures of family climate vary across studies. Further examination of family climate beyond measures available to us would benefit future work.

Additional avenues of inquiry also logically extend from this work. Although we could not account for any biological underpinnings to intergenerational alcohol misuse, the integration of a behavioral-genetic focus to our model (and the Family Stress Model, in general) would further strengthen the explanations of intergenerational continuity in problem alcohol use. Future research would also benefit from the application and extension of the constructs of the Family Stress Model to other forms of intergenerational continuity in problem behavior (e.g., drug use, criminal offending, and mental health disorders). Finally, 70% of mothers with history of an alcohol use disorder did *not* have a child who experienced an early onset of alcohol use. As such, future research should explore factors that promote intergenerational *discontinuity* in alcohol misuse in an effort to identify key predictors of resilience in children and assist in the formation of treatment and prevention programming.

Conclusion

This study contributes to a body of work examining the etiology of the early onset of alcohol use by incorporating a prospective, longitudinal focus to the understanding of problem alcohol use across generations. Theoretically, our results support the predictive power of financial strain, maternal internalizing symptomatology (depressive symptoms) and negative family climate in accounting for intergenerational continuity in problem behavior (Martin et al., 2015; Masarik & Conger, 2017). The identified adverse outcomes associated with maternal alcohol use disorder further demonstrate the critical need for continued empirical focus on the within-individual and intergenerational consequences of this and other health-risk behaviors. The results of this study, as well as other studies, should ultimately be used to inform effective interventions with the aim of reducing alcohol misuse and other problem behaviors.

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Points of view or opinions in this document are those of the authors and do not necessarily represent the official position or policies of the funding agencies.

Appendix. Negative Family Climate by Subconstructs

Appendix

Appendix A

Negative Family Climate $\alpha = 0.70$	
<i>Family Conflict</i>	
Maternal Report of Child Conflict $\alpha = 0.70$	<p>Responses: 1- yes, 0- no Sometimes children and adults have disagreements about things and they argue, fight or just get into a hassle with each other. Since [date of last interview] has this happened to you and child about...</p> <ol style="list-style-type: none"> 1. [child] fighting with [his/her] brothers or sisters? 2. [child] cleaning up [his/her] room? 3. [child] doing his/her homework? 4. [child] watching too much TV? 5. [child] getting into trouble at school? 6. [child] talking back to you? 7. [child] helping out around the house? 8. [child]'s bedtime? 9. [child] asking for money or other things? 10. Who [child] hangs around with? 11. Spending time together?
Perception of Parenting as a Hassle $\alpha = 0.79$	<p>Responses: 4- strongly agree, 3- agree, 2- disagree, 1-strongly disagree How much do you agree or disagree with the following statements:</p> <ol style="list-style-type: none"> 1. Taking care of [a child/children] means you are almost never able to do things that you like to do. 2. Taking care of [a child/children] causes more problems than you expected in your relationship with your [spouse/partner]. 3. Taking care of [a child/children] turned out to be more hassle than you had expected.
Child Report of Conflict $\alpha = 0.75$	<p>Responses: 1- yes, 0- no Sometimes children and adults have disagreements about things and they argue, fight or just get into a hassle with each other. During the past year — that is from you__th birthday until today - has this happened to you and father/mother about the following things?</p> <ol style="list-style-type: none"> 1. You fighting with your brothers or sisters? 2. Cleaning up your room? 3. Doing your homework? 4. You watching too much TV? 5. You getting in trouble at school? 6. Talking back to (him/her)? 7. You helping out around the house?

Negative Family Climate $\alpha = 0.70$	
	8. Your bedtimes 9. You asking for money or other things? 10. Who you hang around with? 11. Spending time together?
<i>Mother-Child Warmth</i>	
Maternal Attachment to Child $\alpha = 0.85$	Responses: 5- always, 4-often, 3-sometimes, 2-seldom, 1-never Thinking about [child], how often. 1. Would you say you get along with [child] ? * 2. Would you say that you do not understand [child]? 3. Would you say that [child] is too demanding? 4. Would you say that [child] interferes with your activities? 5. Would you say that [child] is terrific? * 6. Would you say that you feel violent toward child? 7. Would you say you feel very angry toward child? 8. Would you say that you feel proud of [child] ? * 9. Would you say that you wish [child] is more like other children? 10. Would you say [child] is well-behaved? 11. Would you say that you really enjoy [child]? *
Involvement with Child $\alpha = 0.80$	Responses: 5- always, 4-often, 3-sometimes, 2-seldom, 1-never How often... 1. Do you do things with [child] ? * 2. Do you talk to [him/her] about what [he/she] did during the day? * 3. Do you take [him/her] to visit friends or relatives? * 4. Do you celebrate family events like birthdays with [him/her]? * 5. Do you take [him/her] to a play-groundk, park, or a place to play? *
Child Attachment to Mother $\alpha = 0.80$	Responses: 3- a lot, 2- sometimes, 1- almost never 0- never How often. 1. Do you get along well with her? * 2. Do you feel that she understands you? * 3. Do you wish you had a different mother? 4. Does she get in the way of your activities? 5. Do you think she is terrific? * 6. Are you very angry with her? 7. Does she really bug you? 8. Do you like to be with her when you feel scared or worried about something? * 9. Does going to her for help just make things worse? 10. Does she make you feel a lot better when you go to her for help? *
<i>Family Management</i>	
Importance of Knowledge about Child $\alpha = 0.85$	Responses: 4- very important, 3-important, 2-not very important, 1- not important at all 1. How important is it to you to know if [child] is keeping out of trouble in school? * 2. How important is it to you to know where [child] is? * 3. How important is it to you to know who [child]'s friends are? * 4. How important is it to you to know what [child] is doing when [he/she] is not at home? *
Supervision $\alpha = 0.76$	Responses: 5- always, 4-often, 3-sometimes, 2-seldom, 1-never 1. When you are looking after [child], how often do you know where [he/she] is? 2. When you are looking after [child], how often do you know what [he/she] is doing? 3. When you are looking after [child], how often do you know who/what [he/she] is playing with? *
Harsh/Inconsistent Discipline $\alpha = 0.80$	Responses: 5- always, 4-often, 3-sometimes, 2-seldom, 1-never 1. When disciplining [child] how often do you lose your temper and raise your voice or yell at child? 2. When disciplining [child] how often do you spank [child]? 3. When disciplining [child] how often do you slap [him/her]? 4. When disciplining [child] how often do you use bad language or curse at [him/her]? 5. When disciplining [child] how often do you call [him/her] names? 6. When disciplining [child] how often do you tell [child] [he/she] is bad? 7. Once you have decided on a punishment, how often can [child] get out of it? 8. How often do you have to discipline [child] repeatedly for the same thing? 9. When [child] misbehaves how often do you threaten to do things that you know you won't actually do? 10. When you punish [child], how often does the kind of punishment depend on your mood?

* Reverse coded

Appendix

Appendix B

Family Climate Subscales by Mother's History of AUD Status and Child's Early Onset Alcohol Use Status, Respectively

	Range	Mothers with no History of Alcohol Use Disorder		Mothers with History of Alcohol Use Disorder		No Early Onset Alcohol Use among Child	
		Mean	sd	Mean	sd	Mean	sd
<i>Family Conflict</i>							
Child Conflict (G2)	0–1	0.11	0.15	0.20	0.20	0.12	0.16
Parenting as a Hassle (G2)	1–4	1.70	0.62	2.05	0.75	1.74	0.64
Household Conflict (G3)	0–1	0.07	0.13	0.08	0.20	0.06	0.13
<i>Mother-Child Warmth</i>							
Attachment to Child (G2)	1–5	4.52	0.46	4.27	0.44	4.52	0.46
Involvement with Child (G2)	1–5	4.11	0.59	3.92	0.67	4.13	0.60
Attachment to Mother (G3)	1–3	0.42	0.37	0.60	0.49	0.40	0.37
<i>Family Management</i>							
Child Knowledge (G2)	1–4	3.94	0.20	3.92	0.21	3.95	0.18
Supervision (G2)	1–5	4.72	0.41	4.54	0.53	4.71	0.43
Harsh/Inconsistent Discipline (G2)	1–5	1.95	0.53	2.23	0.49	1.94	0.54

Note. All subscales were standardized prior to taking the mean score. The subscales, attachment to child, involvement with child and child knowledge were reverse-coded prior to standardization.

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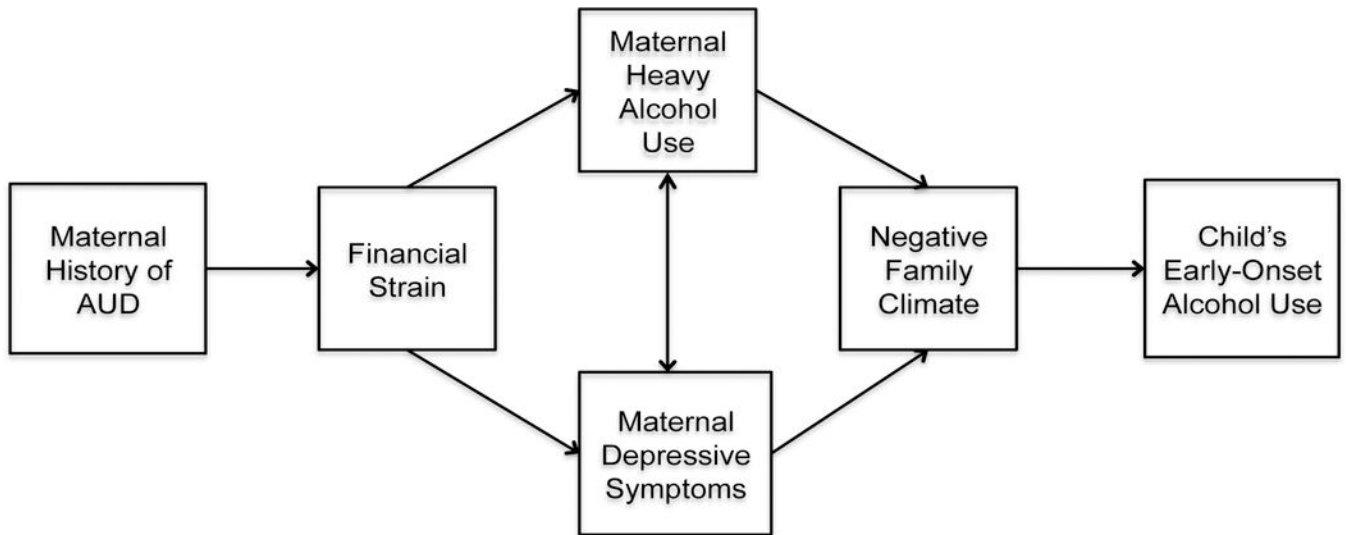


Figure 1. Proposed Conceptual Model
Note. AUD = Alcohol Use Disorder.

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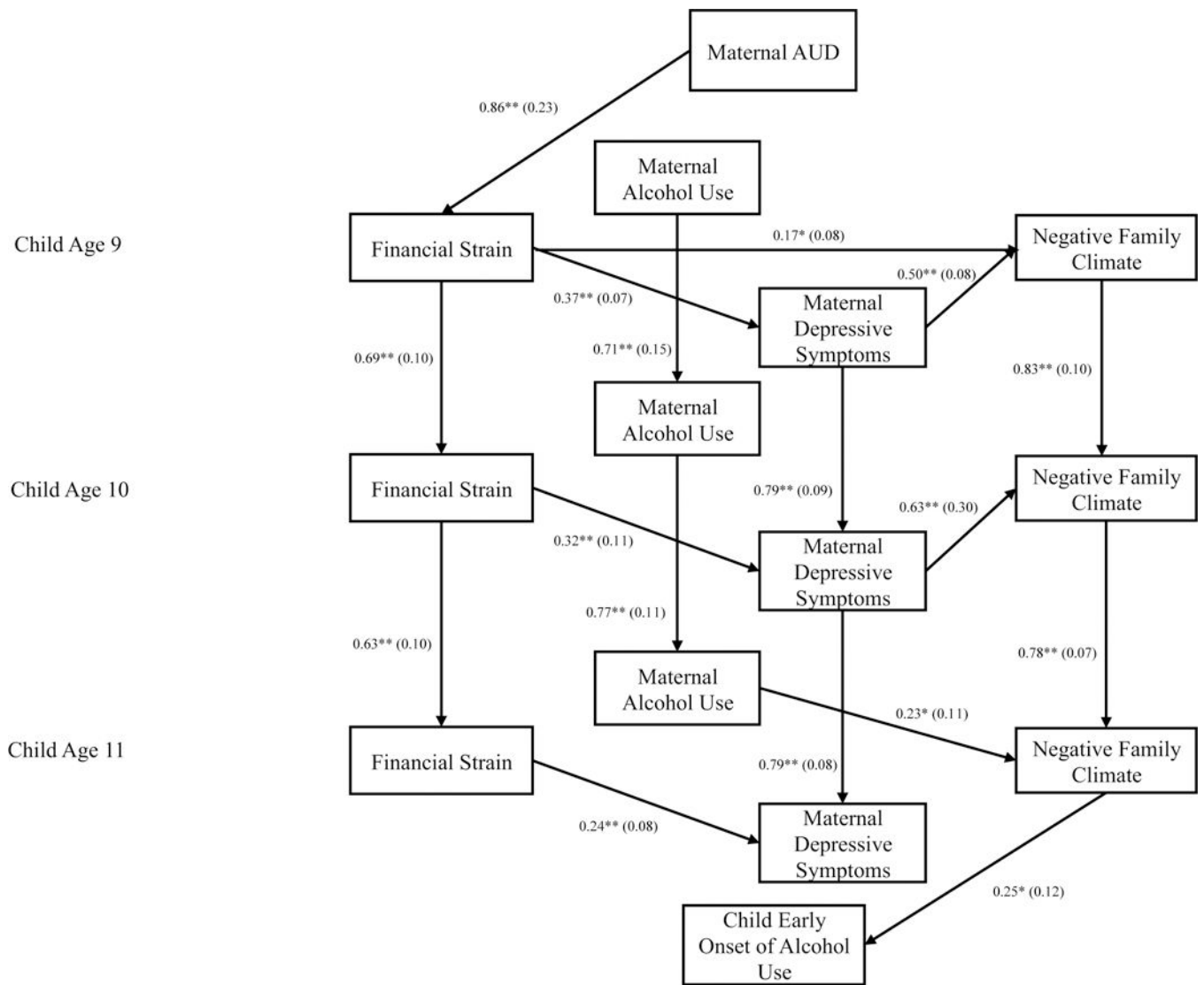


Figure 2. Autoregressive Mediation Model

Note. All non-binary measures were standardized prior to inclusion in the model; $\chi^2=182.42$, $df = 86$, $p < .001$; RMSEA = 0.05; CFI = 0.93; SRMR = 0.07; The residuals for maternal heavy alcohol use and maternal depressive symptoms were allowed to covary at each age; control variables when estimating all paths at each child age nine to 11 include child birth year, community arrest rate, whether both biological parents resided together (1 = Yes, 0 = No), and whether mom participated in Rochester Youth Development Study (RYDS; 1 = Yes, 0 = No; see Appendix for results); control variables when predicting the early onset of alcohol use by child include child gender (1 = Male, 0 = Female), child race/ethnicity (dummy variables for Black and White with other serving as the reference category), whether child lived with both biological parents at age 11, child birth year, community arrest rate and whether mom participated in RYDS.

* $p < .05$, ** $p < .01$ (two-tailed test)

Table 1. Descriptive Statistics by Mother’s Alcohol Use Disorder Status for Final Analytic Sample (N=385)

	Mothers with no history of Alcohol Use Disorder (N = 344)		Mothers with history of Alcohol Use Disorder (N = 41)	
	Mean/%	sd	Mean/%	sd
Maternal Financial Strain Age 9	.82**	1.51	1.69	2.12
Maternal Financial Strain Age 10	.80**	1.30	1.80	2.05
Maternal Financial Strain Age 11	.83**	1.44	1.75	2.06
Maternal Excessive Alcohol Use Age 9	.34**	.77	.76	1.24
Maternal Excessive Alcohol Use Age 10	.31**	.76	.98	1.35
Maternal Excessive Alcohol Use Age 11	.35**	.77	1.09	1.49
Maternal Depressive Symptoms Age 9	1.81**	.97	2.11	.59
Maternal Depressive Symptoms Age 10	1.79**	.59	2.15	.56
Maternal Depressive Symptoms Age 11	1.94**	.86	2.08	.69
Negative Family Climate Age 9	-.02	.52	.22	.65
Negative Family Climate Age 10	-.05	.53	.39	.64
Negative Family Climate Age 11	-.06	.51	.38	.62
Child Early-onset of Alcohol Use	16%*		29%	
<i>Control Variables</i>				
Child Gender				
Male	50%		41%	
Female (Reference)	50%		59%	
Child Race/Ethnicity				
Black Non-Hispanic	68%		56%	
White Non-Hispanic	7%**		22%	
Other (Reference)	25%		22%	
Both Biological Parents	18%		17%	
Child Birth Year	1994.29	3.11	1993.59	3.10
Community Arrest Rate	4.47	1.99	4.71	2.31

	Mothers with no history of Alcohol Use Disorder (N = 344)		Mothers with history of Alcohol Use Disorder (N = 41)	
	Mean/%	sd	Mean/%	sd
Maternal Participation in RYDS	38%		37%	

Note. Means vary from 316–344 for mothers with no history of alcohol use disorder; means vary from 36–41 for mothers with a history of alcohol use disorder; significance reflects results from t-test for difference in means or chi-squared tests for difference in proportions for each variable across maternal alcohol disorder status. RYDS = Rochester Youth Development Study.

* $p < .05$.

** $p < .01$ (two-tailed test)

Table 2.

Correlation Matrix

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	
1. Maternal History of Alcohol Disorder	1																					
2. Maternal Financial Strain Age 9	0.17**	1																				
3. Maternal Financial Strain Age 10	0.22**	0.55**	1																			
4. Maternal Financial Strain Age 11	0.18**	0.38**	0.52**	1																		
5. Maternal Excessive Alcohol Use Age 9	0.15**	0.21**	0.10	0.13*	1																	
6. Maternal Excessive Alcohol Use Age 10	0.24**	0.22**	0.21**	0.19**	.58**	1																
7. Maternal Excessive Alcohol Use Age 11	.25**	.19**	.18**	.15**	.61**	.61**	1															
8. Maternal Depressive Symptoms Age 9	.15**	.35**	.24**	.23**	.14*	.18**	.20**	1														
9. Maternal Depressive Symptoms Age 10	.19**	.23**	.32**	.26**	.06	.21**	.20**	.57**	1													
10. Maternal Depressive Symptoms Age 11	.16**	.14**	.23**	.31**	.15**	.25**	.27**	.51**	.60**	1												
11. Negative Family Climate Age 9	.14**	.36**	.29**	.23**	.19**	.20**	.26**	.48**	.41**	.37**	1											
12. Negative Family Climate Age 10	.19**	.32**	.33**	.27**	.10	.13*	.22**	.36**	.51**	.39**	.71**	1										
13. Negative Family Climate Age 11	.25**	.22**	.27**	.27**	.12*	.19**	.29**	.36**	.47**	.48**	.67**	.72**	1									
14. Child Early-onset Alcohol Use	.11*	.07	.10*	.09	.18**	.11*	.14**	.09	.11*	.09	.14**	.13*	.17**	1								
15. Male	-.05	-.01	-.06	-.11*	.02	-.04	.06	.01	-.07	-.04	.07	.03	.06	-.15**	1							
16. Black Non-Hispanic	-.08	.03	.04	.01	-.07	-.04	-.09	-.06	-.14**	.17**	-.04	-.07	-.11*	-.04	-.03	1						
17. White Non-Hispanic	.16**	-.08	-.05	-.06	.13*	.08	.15**	.04	.07	.06	-.02	-.03	.03	.15**	-.01	-.44**	1					
18. Both Biological Parents	-.01	-.15**	-.13*	-.13*	-.12*	-.15**	-.11*	-.13	-.08	-.07	.15**	-.10	-.10	-.04	.02	.12	.02	1				
19. Community Arrest Rate	.04	-.07	.01	.10	-.02	.03	-.01	-.04	.01	.06	.04	.07	.03	-.09	.03	.14**	-.29**	.02	1			
20. Child Birth Year	-.07	-.25**	-.16**	-.19**	-.11*	-.19**	-.13**	-.14**	-.04	-.01	-.27**	-.22**	-.16**	-.02	-.07	-.21**	.19**	.20**	-.10	1		
21. Maternal Participation in RYDS	-.01	-.03	.02	.03	.00	.03	.04	-.03	-.04	.03	-.02	.06	.02	-.02	.05	.20**	-.13**	-.08	.19**	-.27**	1	

Note. Sample sizes range from 358–385 due to listwise deletion for each pairwise correlation. RYDS = Rochester Youth Development Study.

* $p < .05$,

** $p < .01$ (two-tailed test)

Table 3. Total, Direct, and Indirect Effects Calculated from the Autoregressive Mediation Model (N=385)

Model	Total Effect (95% CI)	Direct Effect (95% CI)	Indirect Effect (95% CI)
AUD → NFC(11)	0.42** (0.16 – 0.71)	-	0.42** (0.16 – 0.71)
AUD → Early-onset	0.36 (-0.21 – 0.81)	0.18 (-0.38 – 0.64)	0.18* (0.03 – 0.35)

Note. Unstandardized total, direct and indirect effects are presented because all non-binary variables were standardized prior to inclusion in the autoregressive mediation model.

Indirect effects include the effect of AUD on NFC through mediators, financial strain (child ages 9–11), maternal depressive symptoms (child ages 9–11) and maternal excessive alcohol use (child ages 9–11); and the effect of AUD on early-onset through mediators, financial strain (child ages 9–11), maternal depressive symptoms (child ages 9–11) and maternal excessive alcohol use (child ages 911) and NFC (child ages 9–11).

Abbreviations. 95% CI = 95% Confidence interval based on 1,000 bootstrapped bias-corrected confidence intervals; AUD = maternal alcohol use disorder; NFC = negative family climate.

* $p < .05$,

** $p < .01$ (two-tailed test)

Table 4. Significant Specific-Indirect Effects from the Autoregressive Mediation Model (N = 385)

	Specific-indirect Effect (95% CI)
Panel A. AUD→NFC(11)	
AUD→FS(9)→DEP(9)→NFC(9)→NFC(10)→NFC(n)	(0.04 – 0.20)
AUD→FS(9)→FS(10)→DEP(10)→NFC(10)→NFC(11)	(0.02 – 0.33)
AUD→FS(9)→DEP(9)→DEP(10)→NFC(10)→NFC(11)	(0.04 – 0.36)
AUD→FS(9)→NFC(9)→NFC(10)→NFC(11)	(0.02 – 0.23)
Panel B. AUD → Early-onset	
AUD→FS(9)→DEP(9)→NFC(9)→NFC(10)→NFC(11)→Early Onset	(0.01 – 0.08)
AUD→FS(9)→FS(10)→DEP(10)→NFC(10)→NFC(11)→Early Onset	(0.00 – 0.10)
AUD→FS(9)→DEP(9)→DEP(10)→NFC(10)→NFC(11)→Early Onset	(0.00 – 0.11)
AUD→FS(9)→NFC(9)→NFC(10)→NFC(11)→Early Onset	(0.00 – 0.09)

Abbreviations: 95% CI = 95% Confidence interval based on 1,000 bootstrapped bias-corrected confidence intervals; FS = financial strain; AUD = maternal alcohol use disorder; AUD = maternal alcohol use disorder; ALC = maternal alcohol use; DEP = maternal depressive symptoms, NFC = negative family climate; (#) = age of child when construct measured.

* $p < .05$,

** $p < .01$ (two-tailed test)