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Trajectories of Adolescent Alcohol Use: The Effect of Individual and Social Risk Factors by Race

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Abstract

This study examined racial differences across African American, Hispanic, and White participants in the impact that individual and social risk factors have on drinking behavior trajectories. Data from the National Longitudinal Study of Adolescent Health was used from 7–9th graders (N = 4,372). Participants reported on frequency of drinking across the four waves and risk factors at wave 1. Growth mixture modeling revealed four trajectories for alcohol use that included Abstainers, Early Starters, Late Starters, and De-Escalators. Social and individual indicators of risk were differently predictive of group membership to the problematic drinking trajectories. Differences across racial groups suggested that a lack of future orientation may be a salient risk factor for African American and Hispanic youth's alcohol use, and peer alcohol use may be a salient risk factor for White youth's alcohol use. The findings of this study suggest that there may be individual differences in risk factors that provide insight for prevention efforts.

Keywords

alcohol use trajectories; adolescence; race; risk factors; growth mixture modeling

Past research has described alcohol use as a pervasive problem behavior that typically develops during adolescence and can result in alcohol use disorders later on in life (Castellanos-Ryan, O'Leary-Barrett, & Conrad, 2013; Donovan, 2004). Prevention methods have become the focus of change for this public health problem. Prevention approaches for youth alcohol use are primarily universal with strategies directed towards normative drinking behaviors, which make them ideal methods to prevent alcohol use for the general population. However, some universal interventions might not address individual differences. By taking into account differences in developmental trajectories, and how they relate to risk and protective factors among youth, universal prevention programs can be tailored to address the problem more completely (Clark, Corneille, & Coman, 2013). Furthermore, research that examines these trajectories and risk factors across different racial/ethnic groups is needed to understand if prevention approaches work the same for youth from different cultural backgrounds (Chen & Jacobson, 2012).

The current study used data from the National Longitudinal Study of Adolescent Health (Add Health) to identify risk factors associated with different trajectories of alcohol use from adolescence through young adulthood and if these risk factors differed by race. Although there is a plethora of research examining risk and protection on alcohol trajectories, few studies consider trajectories into young adulthood or differences in risk based on racial background. The Add Health data set provides an excellent resource that can be utilized to examine trajectories of alcohol use into young adulthood, as the most recent data collection occurred when youth were in their mid-twenties to early thirties. Furthermore, Add Health assesses risk factors during adolescence that might impact those trajectories longitudinally and thus provides a unique data set to evaluate how risk factors experienced in adolescence impact drinking trajectories over 15 years. Thus, to contribute to the existing literature, this study had three aims that included (1) examining heterogeneity in trajectories of drinking behavior from early adolescence to early adulthood; (2) examining risk factors in individual and social domains associated with different trajectories of drinking behavior; and (3) examining whether there are racial/ethnic differences in the impact of risk factors on drinking behavior trajectories.

Adolescent Alcohol Use

Previous literature has characterized adolescence as a developmental period where individuals encounter life-altering changes across physical, social, and societal domains (Andrzejewski et al., 2011; Cauffman et al., 2010), which may lead to vulnerabilities for the onset of alcohol use related problems (Castellanos-Ryan et al., 2013). Researchers have been interested in understanding trajectories (i.e., sequence of behavioral continuities or changes that summarize the patterns of behaviors) of alcohol use during adolescence given both the normative nature of drinking and the association with alcohol related disorders. Longitudinal multi-wave studies allow for the depiction of both individual and group patterns of alcohol use in terms of developmental course or characteristics, as seen in variable and person-centered approaches (Brown et al., 2008). A variable centered approach focuses on the normative group trajectory whereas a person-centered approach examines the existence of common or multiple trajectory groups (Malmberg et al., 2012). Information obtained from variable centered approaches is important for informing prevention but may be limited in identifying different trajectories of alcohol use.

Past research supports using a person-centered approach to look at changes in alcohol use over-time. Trajectories identified during adolescence include: a no use or abstainers, low/rare use or experimenters, early accelerating use, late-accelerating use, decelerators who showed early high but decreasing use, and chronic users; with some variability across studies in the number of groups identified (Connell, Dishion, & Deater-Deckard, 2006; Dauber, Paulson, & Leiferman, 2011; Lansford et al., 2008). These findings highlight the importance of using a person-centered approach to identify trajectories of substance use; yet replication is needed to examine diversity in these trajectories from adolescence into young adulthood and identify different etiologies of these trajectories.

Risk Factors and Trajectories

Risk factors for alcohol use may include individual characteristics such as personality traits and future orientation (Sher, Jackson, & Steinley, 2011), as well as social influences such as parental engagement and peer influence (Lloyd & Anthony, 2003). The ecological systems theory, originally proposed by Bronfenbrenner (1977, 1979), has widely been accepted as an approach to guiding the development of contextual models and identification of risk and protective factors for a range of phenomena including adolescent substance use (Neal & Neal, 2013). One of the basic premises of the theory is that contexts, specifically microsystems, that adolescents come in contact with on a daily basis have strong influences on their development. Extensive research supports the use of a social ecological model to understand the influence of individual, peer, and parental domains on adolescent substance use (e.g., Connell, Gilreath, Aclin, & Brex, 2010). Specifically, both parent and peer interactions are important microsystems that may influence an adolescent's development (Neal & Neal, 2013) thus, the current investigation will examine the effect of a lack of parental engagement and peer alcohol use on adolescent alcohol use. Furthermore, the individual plays a direct role in the dynamic relationship between systems (Neal & Neal, 2013) therefore individual risk factors of impulsivity and a lack of future orientation will be examined in terms of alcohol use behavior. Although past research has identified that the above risk factors are associated with alcohol use, there is still a critical need to determine how these risk factors vary by behavioral trajectories (Cicchetti and Rogosch, 2002). For this reason, the current study will investigate the differential effects of risk factors from individual, peer, and parental domains on trajectories of alcohol use.

Individual Domain

Adolescents are more susceptible to impulsivity, novelty seeking, and youthful shortsightedness (Ernst, Daniele, & Frantz, 2011; Hardin & Ernst, 2009; Steinberg et al., 2009), which may decrease the likelihood to anticipate consequences and influence the likelihood of adolescents to engage in risk taking behavior. Two particularly important constructs during adolescence that impact alcohol use are future orientation and impulsivity. Research on adolescent substance use using a variable centered approach has supported that impulsivity and future orientation are important predictors of substance use (Chen & Vazsonyi, 2011). Furthermore, past research has suggested that impulsivity and future orientation are distinct constructs (McLure et al., 2004; Steinberg et al., 2009) that differentially predict alcohol use and other problem behaviors (Chen & Vazsonyi, 2011; Robbins & Bryan, 2004) making it particularly important to examine both in studies interested in alcohol use trajectories (Chen & Vazsonyi, 2011). Few studies have examined impulsivity and future orientation as predictors of variability in alcohol trajectories. Exceptions include Colder and colleagues (2002) who found that risk taking, of which impulsivity is highly correlated, was most strongly associated with a de-escalating trajectory of alcohol use from 7th to 12th grade and Chassin and colleagues (2002) who found that sensation seeking was a risk factor for heavier drinking trajectories that started early in adolescence suggesting that impulsivity and future orientation may place youth at risk for drinking trajectories marked by early frequent use. The current study expands on this work by examining both impulsivity and future orientation as predictors of trajectories of alcohol

use using a nationally representative data set uniquely suited to examine the effect of risk factors on health risk behaviors.

Social Domain

Interactions with parents and peers act as important socializations agents that shape adolescents' development, including drinking behaviors (Spijkerman, Eijnden, Vitale, & Engles, 2004; Tebes et al., 2011). Studies utilizing a variable centered approach suggest that supportiveness/warmth and regulation/control are related to decreased alcohol use in adolescents (Tebes et al., 2011; Mogro-Wilson, 2008). Few studies have employed a person centered approach but those that have found that negative parenting (e.g., lack of parental engagement or monitoring, lack of parental warmth) has the strongest association with trajectories of alcohol use marked by early heavy use (Becker et al., 2012; Chassin, Pitts, & Prost, 2002).

Variable centered research has indicated perception of peer use as a risk factor strongly associated with adolescent alcohol use (Carey, Borsari, Carey, & Maisto, 2006; Neighbors, Lindgren, Knee, Fossos, & DiBello, 2011). Studies utilizing a person-centered approach have also demonstrated that peer alcohol use is a risk factor for diverse trajectories of alcohol use from early adolescence to adulthood. Specifically, across different samples peer alcohol use has been associated with a greater risk of classification in a De-Escalator group (Connell et al., 2006), late accelerator group (Connell et al., 2006; Danielsson, Wennberg, Tengström, & Romelsjö, 2010) and early heavy using alcohol groups (Chassin et al., 2002; Wiesner, Silbereisen, & Weichold, 2008). Thus, we expect that peer influence will be associated with increased risk of classification in all drinking trajectories as compared to a non-use group but that the strongest effects will be seen for an early heavy drinking group.

Racial Differences

Race is an important characteristic that may expose youth to certain risk factors, which may affect their alcohol use trajectories (Chen & Jacobson, 2012; Rote & Taylor, 2014). According to the NSDUH, in 2011 White individuals were more likely than any other racial group to report current use of alcohol. In addition, 10.5 percent of black youths, 12.6 percent of Hispanic youths, and 14.6 percent of White youths reported current alcohol use (SAMHSA, 2012) suggesting that rates among these groups warrant investigation. In addition, these racial groups have also been the focus of previous studies utilizing national data sets as well as community samples, but generally those studies have not examined variability in trajectories of use that are associated with different risk factors. Thus, the current study contributes directly to previous research by framing our focus on African American, White, and Hispanic youth.

Research has examined typologies of alcohol use in diverse samples and found that alcohol use groups varied based on race and factors such as impulsivity, peer support, and family relationship quality (Dauber et al., 2011; Dauber, Hogue, Paulson, & Leiferman, 2009; Gibbons, et al., 2010). Specifically, research utilizing a community sample of early adolescents has demonstrated that impulsivity and sensation seeking may be stronger predictors of growth in alcohol use for White adolescents when compared to African

American youth (Pedersen, Molina, Belendiuk, & Donovan, 2012). Furthermore, Dauber and colleagues (2011) utilized the first two waves of Add Health to examine racial differences in risk factors, particularly peer influence and found that although both African American and White female adolescents were influenced by perceptions of peer drinking, White female adolescents demonstrated a stronger relationship between perceived peer drinking and their own drinking (Dauber et al., 2011). Our study extends this study by examining trajectories of drinking into young adulthood, as well as examining differences in the effect of covariates by race for males and Hispanic youth. Finally, racial differences in the effect of family influences on alcohol use have been observed when comparing White, African American and Hispanic adolescents. Generally, that research suggests that parenting has a stronger effect on alcohol use trajectories for African American youth (Dauber et al., 2011) and Hispanic youth (Becker et al., 2012) as compared to White youth. These studies, however, have not examined if the risk factors for different alcohol trajectories might vary based on race.

Current Study

Although previous research has provided insight to the problem of adolescent alcohol use, the problem persists, thus there is a need for further investigation to inform preventive approaches. Further investigation is required to identify heterogeneity in alcohol trajectories into adulthood as past research has predominately focused on adolescents and emerging adults. Moreover, research is needed to examine whether certain risk factors might be more or less salient for trajectories of alcohol use depending on someone's race. We have chosen to include distinct risk factors that span individual and social domains, as well as include risk factors that have rarely been examined (e.g., future orientation) as longitudinal predictors of alcohol use trajectories. Add health's data set is ideally suited to examine these topics, as the data set includes a nationally representative group of adolescents that have been followed from adolescence into young adulthood and assesses both individual and contextual risk factors during adolescence that might account for different trajectories of alcohol use concurrently and longitudinally. Furthermore, Add Health's design included oversampling youth from certain racial and ethnic minority families (e.g., highly educated, Cubans) making it particularly well-suited to examine racial differences as there are adequate numbers in subgroups to support comparisons by race. Although past research has utilized Add Health to examine drinking behaviors among different racial groups (e.g., Chen & Jacobson, 2011; Clark et al., 2013; Dauber et al., 2011), these studies have generally not focused on the differential effects of risk factors by race on drinking trajectories from early adolescence to young adulthood using growth mixture modeling. Extending this research into young adulthood is pertinent because by examining participant's alcohol use trajectories throughout young adulthood we can use a nationally representative data set to explore theoretical claims made in past research (O'Malley, 2004) that individuals may "mature out" of problematic drinking after the age of twenty-two due to assuming more adult roles such as employment, independent living, marriage, and parenthood. Thus, the researcher extends previous research with Add Health to examine the following hypotheses:

1. Trajectories of adolescent alcohol use as measured by frequency of alcohol use will include alcohol trajectories of abstainers, early accelerating use or early

starters, late-accelerating use or late starters, and early high but decreasing use or De-Escalators.

2. Individual and social risk factors will be differentially associated with trajectories of drinking. We expect that a lack of future orientation and impulsivity may have a particularly strong association with early high use but potentially decreasing patterns over time; whereas family and peer risk factors will be associated with membership in any of the problematic drinking trajectories.
3. There will be racial differences in the impact of individual and social risk factors on trajectories of alcohol use. Specifically, individual risk factors such as impulsivity will be more salient in White adolescents who exhibit problematic drinking trajectories. Whereas, lack of parental engagement will be more salient for Hispanic youth and African American youth who exhibit problematic drinking trajectories. Finally, peer influence will be a risk factor for all youth but, we expect that peer alcohol use will be a stronger predictor of alcohol use trajectories for White youth.

Methods

The current investigation conducted secondary analysis to examine data across four waves of the National Longitudinal Study of Adolescent Health (Add Health), a cohort-sequential study of the health and well-being of American adolescents. Add Health consists of a nationally representative sample of adolescents in grades 7th through 12th, which were initially assessed between 1994 and 1995 and followed with three in-home interviews (Wave 2 in 1996, Wave 3 from 2001–2002, and Wave 4 in 2008). For purposes of the current study, data from the four in-home interviews will be used.

Sample

The original sample of adolescents at Wave 1 (W1) who completed the in-home interviews consisted of 20,745 participants. At Wave 2 (W2) of the study only adolescents who were in 7th–11th grade at W1 of the study we assessed resulting in a sample of 14,738 and response rate of 76% of the W1 sample. During Waves 3 and 4 (W3, W4) attempts were made to contact the original W1 sample and 15,170 youth were interviewed at W3 (77.4% response rate) and 15,701 (80.27% response rate) youth were interviewed at W4 (Brownstein et al., 2011; Harris, 2013). For the current study, the sample was limited to adolescents in the 7–9th grade cohorts who completed all four waves of in-home interviews ($N = 4,372$, W1 $M = 14.44$ years of age, $SD = .99$) because early to middle adolescence is a particularly important time for the development of alcohol use (SAMHSA, 2011). Youth participating in the study were on average 15.35 years old ($SD = .99$) at W2 of the study, 20.29 years old ($SD = 1.05$) at W3 of the study and 27.31 years old ($SD = 1.02$) at W4 of the study. This sample was also restricted to youth who were White (72.7%), African American (14.8%) and Hispanic (12.5%). The sample was composed of 56.1% female adolescents. At W1, data collection occurred between 1994 and 1995 with adolescents and parents interviewed separately as part of the in-home sample. To obtain unbiased estimates of population parameters and standard

errors the current study utilized the wave IV sampling weights to define the sample, which included respondents who completed the in-home interview at W4, as well as all prior waves of data collection (Chen & Chantala, 2014). Further description of Add Health can be found in Bearman, Jones, and Udry (1997).

Measures

Race and ethnicity.—The demographic variables were collected during W1. The participants were asked to identify their ethnicity. Participants were asked “Are you of Hispanic or Latino origin?” and were provided response options including no, yes, whether they wanted to refuse, and if they felt they did not know. In addition, the participants were also asked to identify their race. Participants were asked, “What is your race? You may give more than one answer.” and were provided the following response options, White, Black or African American, American Indian or Native American, Asian or Pacific Islander, and other. For the current study, those who selected any Hispanic denomination were included in the Hispanic racial group, those participants who identified with non-Hispanic and White were included in the White group and those who identified with non-Hispanic and African American were included in the African American group. Race/Ethnicity was dummy coded such that White was the reference group (0).

Alcohol use.—In order to measure current frequency of alcohol use, the researcher recoded and collapsed responses to the question, “During the past 12 months, on how many days did you drink alcohol?” Response options were coded to reflect 0 (*no past year use*), 1 (*one or two days in the past year*), 2 (*one day per month in the past year*), 3 (*2 to 3 days per month in the past year*), 4 (*1 to 2 days per week or less in the past year*), 5 (*3 to 5 days per week or less in the past year*), and 6 (*daily, almost every day in the past year*) across the four waves of data collection. Higher values represented higher frequency of alcohol use.

Individual and social risk factors.—At W1, respondents were asked questions related to measures of future orientation. For instance, participants were asked, “On a scale of 1 to 5, where 1 is low and 5 is high, how likely is it that you will go to college?” In addition, participants were asked, “What do you think are the chances that . . . you will live to age 35.” where response options ranged from 1 (*almost no chance*) to 5 (*almost certain*). For the present study, these two items were recoded to represent risk, where the higher the score the greater amount of risk a respondent displayed for lack of future orientation (Chen & Vazsonyi, 2013).

Respondents also were asked questions related to impulsivity at W1. Participants were asked to indicate whether they agreed or disagreed with statements related to decision making processes such as “When making decisions, you generally use a systematic method for judging and comparing alternatives,” where response options ranged from 1 (*strongly agree*) to 5 (*strongly disagree*). For the present study, four items were used in a scale ($\alpha = .74$), where the higher the score the greater amount of risk a respondent displayed.

At W1, respondents were asked questions related to measures of perceptions of peer alcohol use. Specifically, participants were asked, “Of your 3 best friends, how many drink alcohol at least once a month?” with responses ranging from 0 (*no friends*) to 3 (*three friends*). For

the present study, we dichotomized each item to represent 0 (*no perceived peer use*) and 1 (*perceived one or more peer use*).

At W1, respondents were asked questions related to measures of parental engagement. Parents were asked to report how often statements such as, “You get along well with (him/her)”, would be true for five items related to parent and child relationships where responses ranged from 1 (*always*) to 5 (*never*). Higher scores indicated lower parental engagement ($\alpha = .64$). Similarly, at W1 participants were asked to report on items associated with perceived parental intimacy, caring, and warmth. For the present study, six items were averaged to assess lack of parental warmth ($\alpha = .79$). For example, youth were asked four items such as, “How close do you feel to your?” where response options ranged from 1 (*not at all*) to 5 (*very much*). In addition, youth were asked two similar questions such as, “Most of the time, your mother is warm and loving toward you” where response options ranged from 1 (*strongly agree*) to 5 (*strongly disagree*). The higher the score the greater amount of risk a respondent displayed for lack of parental warmth.

Analytic Strategy

Growth mixture modeling (GMM) was used to identify distinct groups of adolescents who vary in their trajectories of alcohol use over time (Jung & Wickrama, 2008). This group-based, semi-parametric approach assumed that the population was composed of a mixture of distinct groups defined by their developmental trajectories (Brook, Brook, & Zhang, 2014). Mplus software (Mplus Version 7.2; Muthén & Muthén, 2010) was used to estimate these GMM for developmental trajectories of alcohol use frequency. In addition, GMM with covariates was used to predict trajectories from early risk factors for each trajectory of alcohol use. Full information maximum likelihood (FIML) was applied for missing data in the estimation of the GMM classes.

Analysis consisted of a series of steps. The first step involved identifying the number of classes and the shape of trajectories (e.g., linear vs. quadratic models) for these classes over the course of the study. We initially estimated growth mixture models by estimating trajectories separately for each racial/ethnic group. Specifically, we estimated models for Hispanic, African American, and White youth separately to validate that the class structure was the same across the different groups (Muthén, October 2007). Classes were added incrementally beginning with a one-class model that assumed that there was no heterogeneity in trajectories. To evaluate the number of classes and the shape of trajectories, fit was assessed using Bayesian information criteria (BIC), entropy, and the Lo, Mendell, and Rubin Likelihood Test (LMR-LRT). More specifically, the model with the smallest absolute BIC value is selected, as well as a high entropy as entropy indicates the average classification accuracy of participants to classes and ranges from zero to one, thus higher scores close to one are better. Furthermore, the LMR-LRT tests the null hypothesis that a random sample has been drawn from a distribution with $k-1$ classes, with the alternative hypothesis being that the sample was drawn from a distribution with k classes. A low significance level indicates that the $k-1$ model has to be rejected in favor of a model with at least k classes. Thus, model selection criteria included minimizing the BIC, obtaining a

significant LMR-LMT, and obtaining a high entropy score (Becker et al., 2012; Capaldi, Feingold, Kim, Yoerger, & Washburn, 2013).

All models were estimated with covariates of age, race, and gender as part of the measurement model due to the impact these items would have on the measurement model, meaning that the covariates were allowed to impact the intercept, the slope, and class membership. All models also included AddHealth sampling weights. To test the impact of risk and protective factors on the growth trajectories an auxiliary command was used to estimate the impact of risk factors and interactions of race and risk factors on class membership (Asparouhov & Muthén, 2013). This approach allows risk and protective factors to be regressed on class membership without affecting the measurement model.

Results

Preliminary analyses of models by race suggested that across Hispanic, African American and White youth a 4-class quadratic model fit the data well for all groups. The quadratic models were selected based on the fit statistics, which overall indicated better fit. Additionally, theoretical and empirical background have suggested that alcohol use may be best modeled with quadratic change over time (e.g., both increases and decreases in use within a given trajectory) as opposed to strictly limiting change to be linear (e.g., same rate of change, either increasing or decreasing; Capaldi et al., 2013). Given that the measurement models were similar across racial groups the decision was made to run growth mixture models with the entire sample and not separately by race. This decision also was necessary because due to the complexity of the models we were estimating the auxiliary approach cannot be used when estimating models with the known class option (Muthen, September 2010).

For the entire sample, the 4-class quadratic model for frequency of alcohol use also exhibited the best fit when compared to other quadratic and linear models as indicated by a significant p-value, a decrease in BIC, and an increase in entropy (BIC=56201.33, $p<.04$, Entropy=.99; see Table 1). The four class model also provided a better fit than a five class model.

Frequency of Alcohol Use Model

In the 4 class-trajectory model for alcohol use (see Figure 1), Class 1 (De-Escalator, 5.2%) showed high and early onset levels of alcohol use that decreased over time; Class 2 (Adolescent Abstainers, 65.5%) showed very low initial rates of use throughout adolescence and minimal rates during young adulthood; Class 3 (Late Starters, 15.3%) showed low initial rates of use at the first two time points during adolescence and a moderate increase at W3 during early adulthood; and Class 4 (Early Starters, 13.9%) showed moderate initial rates of use at time one and small increases in use over time, with the highest rates at W4 (Figure 1).

The Effect of Controls on Class Membership

Multinomial logistic regression was used to examine the effect of gender, age, and race on class membership (e.g., categorical latent variables). For the controls, all comparisons are made to the Adolescent Abstainer group. Age increased the likelihood of being in the De-

Escalator group (OR = 1.80, $p < .001$), the Early Starter group (OR = 1.51, $p < .001$), and the Late Starters group (OR = 1.77, $p < .001$) compared to the Adolescent Abstainer group, such that the abstainer group was younger. Gender (OR = 1.77, $p < .001$) and being African American (OR = 0.45, $p < .001$) were significant indicators of Early Starter class membership when compared to the Abstainers group such that being female increased the likelihood and being African American decreased the likelihood of being in the Early Starter group. Being African American also decreased the odds (OR = 0.41, $p < .001$) of being classified in the Late Starter class when compared to the Adolescent Abstainers group.

Regression Indicators for Class Membership

Multinomial Regression analysis were estimated to examine the effect of individual, family, and peer predictors on risk of being classified in substance use classes with the reference class as Adolescent abstainers (Table 2). Results indicated that impulsivity and youth report of peer alcohol use increased the likelihood of membership to the Late Starters group when compared to the Adolescent Abstainers. Impulsivity, lack of parental engagement, and peer alcohol use increased the likelihood of membership to Early Starters group when compared to the Adolescent Abstainers. Finally, lack of future orientation and peer alcohol use increased the likelihood of membership to the De-escalating group when compared to the Adolescent Abstainers. In Table 2, additional analyses examining comparisons between other classes (e.g., the reference class is early starters) are presented to get a better sense of differential prediction of risk factors for all drinking trajectories. Generally, when comparing the other drinking classes results suggested that lack of future orientation and peer alcohol use were stronger predictors of classification in the De-Escalator group when compared to the Early or Late Starters.

Interactions of Race and Risk Factors on Class Membership

In addition, interaction effects of covariates and race were examined as predictors of class membership (Tables 3 & 4). Significant differences were found in the effect of risk factors on group membership for White and Hispanic youth (Table 3). Perhaps the most notable and consistent difference across racial groups was evidenced for the effect of parental engagement on drinking trajectories. Specifically, for White youth experiencing lower parental engagement was a risk factor (OR=1.86, $p < .05$) for classification into the De-Escalators group when compared to the Abstainers but for Hispanic youth, lower parental engagement decreased the odds of classification into this group when compared to the Abstainer group (OR=.46, $p < .05$). Lower parental engagement also decreased the risk of being classified in the Late Starter group when compared to the Abstainers group for Hispanic youth (OR=.53, $p < .05$) but was not significantly associated with risk or a lack of risk for White youth (OR= 1.19, $p = .26$). Finally, parental engagement was associated with decreased odds of classification into the De-Escalator class (OR=.26, $p < .01$) and the Late Starter class (OR=.29, $p < .05$) when compared to Early Starters for Hispanic youth but for White youth lower parental engagement was not associated with group membership in the De-Escalator class (OR=1.06, $p = .82$) and had a weaker association for Late Starters (OR=.68, $p < .05$). These results were contrary to expectations and suggest that higher parental engagement was associated with classification into one of the drinking trajectories for

Hispanic youth but generally for White youth higher parental engagement was associated with abstaining from alcohol use.

Significant interactions indicated that for African American youth peer alcohol use was less of a risk factor for classification into the Early Starter group as compared to the Adolescent Abstainer group ($OR=2.36, p<.001$) when compared to White youth ($OR=3.94, p<.001$) (See Table 4). Furthermore, peer alcohol use was less of a risk factor and non-significant for classification in the Late Starter group as compared to the Early Starter group for African American youth ($OR=.90, p=.37$) when compared to White youth ($OR=.59, p<.001$). For African American youth future orientation significantly decreased risk for classification in the Late Starter group as compared to the Early Starter group ($OR=.61, p<.01$) but this relationship was not significant for White youth ($OR=.90, p=.53$). Finally, African American youth who reported higher impulsivity were more likely to be classified in the De-Escalator group compared to the Late Starter group ($OR=2.14, p<.05$); this association was non-significant for White youth ($OR=1.19, p=.43$) suggesting that indicators of self-control may be more salient to African American youths' alcohol use than White adolescents' use. Taken together, these results suggest that peer alcohol use may be a more salient risk factor for White youth and individual factors associated with self-control may be more important factors associated with African American youth's drinking.

Discussion

The current investigation examined heterogeneity in trajectories of drinking behavior from early adolescence to early adulthood. The best fitting model for drinking was a 4-class quadratic model, which is similar to previous research. Overall, results suggested that for frequency of alcohol use social and individual indicators of risk were differently predictive of group membership and there was some evidence of racial differences in predictors of group membership. These results add to basic research on developmental pathways of alcohol use in adolescence by examining heterogeneity of trajectories into young adulthood and by providing different patterns of risk factors across racial groups and trajectories.

Findings confirmed hypotheses identifying four classes, which included Adolescent Abstainers, Late Starters, Early Starters, and De-Escalators. These groups are comparable to trajectories identified in previous research (Connell, et al., 2006; Huh, Huang, Liao, Pentz, & Chou, 2013). It is important to note that past research examining trajectories has predominately used samples of adolescents and emerging adults; whereas a strength of this study is that it follows youth into young adulthood. In addition, the researchers found that the estimated means at the final time point were similar for the three drinking classes, suggesting possible equifinality (Connell et al., 2006), meaning that although the participants exhibited different early experiences the resulting behavior lead to similar outcomes of alcohol use. This finding suggests that drinking trajectories that are followed longitudinally are more likely to become similar with increases in age. Tucker, Orlando, and Ellickson (2003) found similar tendencies in trajectories of adolescent binge drinking to converge over time and hypothesized the desire to "get back on the right track" to explain the change in behavior. Furthermore, The National Longitudinal Survey of Youth 1997 Cohort (NLSY97), a similar project to Add Health followed a group of adolescents born between

1980–1984 (U.S. Department of Labor, 2015a). and found that when youth were 26–31 years old 74% of respondents reported drinking an alcoholic beverage since the last interview in 2010 (U.S. Department of Labor, 2015b). The rate of past year drinking is comparable to findings in our sample, given that over time most youth's trajectories converged and nearly all groups reported low levels of alcohol use (infrequent drinking about once to a couple times a year) at W4 of the study. Although the majority of the Add Health sample may not display a concerning frequency of alcohol use at W4, research suggests that during young adulthood it is not only that individuals drink but also the way they drink, such as binge drinking, that puts them at high risk for alcohol-related problems (National Institute on Alcohol Abuse and Alcoholism (NIAAA), 2006). Future research should examine trajectories of drinking behavior, such as binge drinking, into late adulthood to compare functioning of these different trajectories.

Results confirmed that social indicators of risk were predictors of class membership for various drinking trajectories. When examining predictors of class membership, individuals with a lack of parental engagement were over one and a half times more likely to be classified into the Early Starting group. This finding is consistent with previous research conducted by Baxter, Bylund, Imes, and Routson (2009), that parental supportiveness and warmth were fundamental components of parenting styles, which affect alcohol use during adolescence. Individuals associated with deviant peers were over three and a half times as likely to be classified to the Early Starters group. Similar to the Early Starters group, individuals who reported that their friends drank were over five times as likely to be classified to the De-Escalating group and over two times as likely to be classified to the Late Starting group. In addition, the Early Starter, Late Starter, and De-Escalator groups were more likely to be older when compared to the Adolescent Abstainer group, which may explain why we are seeing an increase in drinking associated with deviant peers, as peer influence increases with age (Cleveland, Feinberg, & Jones, 2012).

Findings suggested that individual indicators of risk predict class membership. Individuals with a lack of future orientation were one and a half times more likely to be classified to the De-Escalating group when compared to the Adolescent Abstainers. Individuals who exhibited impulsivity were more likely to be classified to the Late Starter group and the Early Starter group when compared to the Adolescent Abstainers. It is interesting to note that individuals within the De-Escalating group when compared to the Abstainers only reported lower future orientation but not increased impulsivity. Future orientation and impulsivity may follow different developmental trajectories during adolescence (Steinberg et al., 2009) and this is perhaps why we see future orientation associated with decreasing use over time and impulsivity associated with more stable patterns that persist into adulthood. It will be important in future research to assess time varying covariates to better understand these findings.

Overall, results suggested that racial/ethnic differences of individual and social risk factors affected class membership of drinking trajectories. A lack of future orientation was a risk factor for classification into certain drinking trajectories for Hispanic youth and African American youth but not for White youth. Few studies have examined racial differences in the effect of future orientation on drinking. However, Kao's (2000) research has recognized that

future expectations are influenced by ethnic group membership and stereotypes, especially for future education orientation. Thus, it is plausible in the current study that African American and Hispanic youth may be more disposed to negative future orientation that is largely based on stereotypical images attached to their ethnic group, which may increase risk to engage in problematic drinking. Thus, additional research is needed to advance our knowledge of future orientation and its impact on drinking among different racial groups.

Among Hispanic youth, parental engagement appeared to function differently than it did among White youth in regards to reducing involvement in risky drinking behavior. Contrary to expectations, among Hispanic youth increased parental engagement was associated with increased likelihood that youth were classified in the De-Escalator group when compared to the Abstainer group. This finding contradicts previous research that high amounts of parental involvement function positively for Latino families (Mogro-Wilson, 2008). Although results are unexpected, Kerr's, Stattin's, and Ozdemir's (2012) research has recognized that adolescents who report risk behaviors may also report more monitoring by parents, especially when examined cross-sectionally. Thus, in the current study parents may have been exerting more control over those youth in the drinking classes as a response to decrease drinking behavior. This explanation does not explain why the association between increased parental engagement and classification in the drinking classes was only found for Hispanic youth. Unfortunately, few studies have examined ethnic differences in parenting behaviors and their effect on risk behavior (Racz & McMahon, 2011). However, it is possible that this added exertion of parental influence may have been used more as a deterrence strategy in Hispanic families given the concept of familialism is stronger in this culture. Furthermore, there is research that suggests that Hispanic youth may be more likely to conceal information from parents to keep harmony in their relationship (Tasopoulos-Chan, Smetana, & Yau, 2009), and as a result, parents may work even harder to try and maintain their relationship with their adolescent thus explaining why we see increased parental engagement among Hispanic youth in drinking groups. It is also important to recognize that the items used in the current study were likely developed based off cultural norms (e.g., individuation) associated with parental engagement in European American middle class adolescents and thus may have different meaning when used with Hispanic youth, calling into question if this measure has equivalent meaning across different ethnicities. Specifically, items on this scale are scored such that allowing adolescents' decision making power, trusting them, and not interfering in the child's behaviors are adaptive and indicate higher parental engagement. However, these behaviors are associated with the cultural values of independence and not interdependence. Past research has recognized that Hispanic families report being more controlling, allowing youth less autonomy, and being more interdependent than White families (Halgunseth, Ispa, & Rudy, 2006; Harwood et al., 2002) and it has been suggested that individuation may be detrimental in cultures where autonomy is valued less (Fuhrman & Holmbeck, 1995), thus calling into question the equivalence of this measure. In sum, these findings need to be replicated given the nature of the measure used and that there were only 34 Hispanic youth classified in the De-escalator group and the majority of those youth were male adolescents for whom gender expectations of drinking may be different (Wahl & Eitle, 2010).

As previously discussed, reported peer alcohol use, was a significant predictor of class membership. However, White youth who reported peer alcohol use were more likely than African American youth to be classified in the Early Starter trajectory when compared to Abstainers. This finding supports previous research conducted by Gibbons et al. (2010), who found that White adolescents were more susceptible to peer influence on drinking.

There are some limitations to note. Specifically, indicators of risk were only used from W1 of the Add Health data collection. Future research would benefit from using time-varying covariates across all waves. In addition, the sample for this particular study focused on adolescents in the 7–9th grade. In doing so, the young sample did not assess trajectories into adulthood as late as possible. Similarly, the current sample was limited to examine racial/ethnic differences within African American, White, and Hispanic sub-populations. Future research would benefit from expanding the examination of racial differences to include other demographic categories (e.g. Asian, American Indian or Alaska Native, and/or multi-racial). Finally, it should be noted that youth in the Add Health data set were generally born in the late 70s and 80s and experiencing adolescence in the mid-90s. Thus, findings from this cohort of youth may not generalize to youth born in other historical periods.

Overall, findings indicated the importance of examining heterogeneity of differential indicators of alcohol use and the associations between risk factors and alcohol trajectory classes, in order to understand patterns of drinking behavior. The findings of this study have implications for prevention and intervention efforts suggesting that individual differences, such as salient risk factors, may provide insight for different prevention efforts required for various subgroups. By understanding the trajectories of drinking behavior as predicted by individual and social risk factors, prevention may become more effective to reduce current alcohol use or the onset of adolescent alcohol use. For instance, for youth that exhibit risk factors such as impulsivity and future orientation, programs that address decision-making and build cognitive processes could be useful forms of intervention to decrease initial rates of alcohol use. However if universal prevention is the choice of approach, practitioners may consider focusing efforts toward perceptions of peer use. Furthermore, research findings suggest some support for addressing different risk factors among African American, Hispanic, and White youth; such as targeting peer influence particularly for White youth and family influences for Hispanic youth. Tailored selective and indicated interventions tend to focus on overall skill development (O’Connell, Boat, & Warner, 2009), which can build protective factors for various behavioral disorders through a single intervention. For instance, the Adolescent Transitions Program has been tailored to incorporate universal, selective, and indicated components delivered in a school setting and has demonstrated long-term sustainable effects on substance use among white and minority youth (O’Connell et al., 2009). In addition, research on preventative interventions cost-effectiveness has suggested that few universal interventions have been considered cost-effective while programs targeted to higher risk youth were among the interventions shown to be cost-effective (O’Connell et al., 2009), which is notable for funding purposes. Overall, this knowledge could guide individually tailored prevention recommendations.

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Figure 1.

Frequency of Alcohol Use 4-Class Quadratic Model Estimated Means

Note. Means for alcohol use are represented in the graph across waves.

Table 1.

Model Fit of Growth Mixture Model

No. of Classes	BIC	LMR LRT p-value	Entropy
Frequency of Alcohol Use Quadratic Model			
1	61410.07		
2	59485.27	.02	.94
3	57778.07	.000	.98
4	56201.33	.04	.99
5	56211.32	.06	.91

Table 2.

Odds Ratio Results from Multinomial Logistic Regression Models: Covariate Effects on Class Membership

	Late Starters ^a	Early Starters ^a	De-Escalators ^a	Late Starters ^b	De-Escalators ^b	De-Escalators ^c
Frequency of Alcohol Use						
Impulsivity	1.30 [*]	1.26 [*]	1.27	1.03	1.02	1.00
Lack of Future Orientation	1.04	1.02	1.60 ^{**}	1.02	1.57 ^{**}	1.54 ^{**}
Lack of Parental Engagement	1.04	1.67 ^{***}	1.40	0.63 ^{***}	0.84	1.34
Lack of Parental Warmth	1.16	1.23	1.34	0.93	1.08	1.15
Peer Alcohol Use	2.34 ^{***}	3.63 ^{***}	5.21 ^{***}	0.65 ^{***}	1.45 ^{***}	2.23 ^{***}

Note.

^{*}
p < 0.05,^{**}
p < 0.01,^{***}
p < 0.001.

Note:

^aReferent Class is Adolescent Abstainers^bReferent Class is Early Starters^cReferent Class is Late Starters.

Table 3. Odds Ratio Results from Multinomial Logistic Regression Models: Interaction Effects on Class Membership for Hispanic and White Youth

	Hispanic Youth						White Youth					
	Late Starters ^a	Early Starters ^a	De-Escalators ^a	Late Starters ^a	De-Escalators ^b	De-Escalators ^c	Late Starters ^a	Early Starters ^a	De-Escalators ^a	Late Starters ^b	De-Escalators ^b	De-Escalators ^c
Impulsivity	1.63	1.46	1.54	1.13	1.05	.93	1.21	1.28	1.45	.95	1.13	1.19
Lack of Future Orientation	1.70 [*]	1.11	2.44	1.54	2.23	1.45	.99	.92	1.35	1.07	1.47	1.36
Lack of Parental Engagement	.53 [*]	1.84	0.46 [*]	.29 [*]	.26 ^{**}	.90	1.19	1.73	1.86 [*]	.68 [*]	1.06	1.55
Lack of Parental Warmth	.58	3.06	.58	.19 [*]	.20	1.00	1.16	1.20	1.28	.97	1.07	1.09
Peer Alcohol Use	2.56 [*]	3.71	5.99	.68	1.62	2.32	2.36	3.94	5.58	.59	1.42	2.36

Note.

^{*} p < 0.05,
^{**} p < 0.01,
^{***} p < 0.001.

Note:

^aReferent Class is Adolescent Abstainers
^bReferent Class is Early Starters

^cReferent Class is Late Starters. ^{*} indicates that there was a significant interaction suggesting that the effect of the risk factor on class membership differed for Hispanic youth and White youth. . Log odds are presented separately for Hispanic and White youth but were obtained from the same analysis.

Table 4. Odds Ratio Results from Multinomial Logistic Regression Models: Interaction Effects on Class Membership for African American and White Youth

	African American Youth						White Youth					
	Late Starters ^a	Early Starters ^a	De-Escalators ^a	Late Starters ^b	De-Escalators ^b	De-Escalators ^c	Late Starters ^a	Early Starters ^a	De-Escalators ^a	Late Starters ^b	De-Escalators ^b	De-Escalators ^c
Impulsivity	1.49	.98	.70	1.54	.71	2.14 [*]	1.21	1.28	1.45	.95	1.19	1.19
Lack of Future Orientation	.80	1.25	2.03	.61 ^{**}	1.65	2.72	.90	.92	1.35	1.07	1.47	1.36
Lack of Parental Engagement	1.12	1.40	1.25	.79	1.13	1.17	1.19	1.73	1.86	.68	1.06	1.55
Lack of Parental Warmth	1.09	.91	1.14	1.21	1.25	1.03	1.16	1.20	1.28	.97	1.07	1.09
Peer Alcohol Use	2.16	2.36 ^{***}	4.01	.90 [*]	1.70	1.88	2.36	3.94 ^{***}	5.58 ^{***}	.59 ^{***}	1.42	2.36

Note.

* p < 0.05,

** p < 0.01,

*** p < 0.001.

Note:

^aReferent Class is Adolescent Abstainers

^bReferent Class is Early Starters

^cReferent Class is Late Starters. * indicates that there was a significant interaction suggesting that the effect of the risk factor on class membership differed for African American youth and White youth. Log odds are presented separately for African American and White youth but were obtained from the same analysis.