Relations Among Suicidality, Recent/Frequent Alcohol Use, and Gender in a Black American Adolescent Sample: A Longitudinal Investigation

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Objective: Examine longitudinally select factors that may contribute to suicide ideations and attempts in adolescents. **Method:** Using a multiple cohort research design, surveys were administered to a longitudinal sample of Black American adolescents aged 11–18 years. **Results:** Two logistic growth models were tested with the probability of a suicide ideation ($n = 977$) and identified suicide attempt ($n = 457$) as the outcome variables and the recency and frequency of alcohol use and gender as the predictor variables. The recency and frequency of alcohol use was significantly related to suicide ideations and identified attempts in both females and males. These findings were differentiated based on the age effects for recency and frequency of alcohol use. More recent and frequent alcohol use among younger adolescents exacerbated probabilities of suicide ideations and identified suicide attempts compared to older adolescents. **Conclusion:** Results indicate that early systematic assessment of suicidal behavior and alcohol use in Black American adolescents can inform developmentally and culturally responsive prevention and intervention efforts. © 2015 Wiley Periodicals, Inc. J. Clin. Psychol. 71:544–560, 2015.

Keywords: Black American youth; suicide behaviors; alcohol use; gender; poor families; longitudinal studies

Suicide is the third leading cause of death for adolescents (Centers for Disease Control and Prevention [CDC], 2012; National Center for Health Statistics, 2010). Clinical studies have demonstrated a range of risk and protective factors that are associated with suicidality and outcomes in adolescent populations (Cash & Bridge, 2009; Joe, Baser, Breeden, Neighbors, & Jackson, 2006; Moscicki, 1995; Nock, 2009). The vast number of factors purportedly linked with suicide in children and adolescents underscores the complexity of developing and testing effective and efficacious assessments, preventions, and treatments (Cash & Bridge, 2009; Joe & Bryant, 2007; Gould, Greenberg, Velting, & Shaffer, 2003; Miller & Glinski, 2000). Importantly, clarifying antecedents and outcomes of suicide behaviors that are developmentally and culturally relevant or unique for racially/ethnically diverse populations is an area that is often understudied (Joe et al., 2006; Joe, Baser, Neighbors, Caldwell, & Jackson, 2009; Joe, Canetto, & Romer, 2008; Merchant, Kramer, Joe, Venkataraman, & King, 2009).

According to the Surgeon General, demographic and cultural factors likely play a pivotal role in determining which populations may be at the greatest risk for suicide behavior (United States Department of Health and Human Services, 1999). For example, in adult samples, White American single men tend to be at a greater risk for completing suicide than other populations (e.g., White American married men and Black American women; American Psychiatric Association [APA], 2003). Findings evidenced in adult studies can be informative to studies focused on adolescents. Until these associations are empirically investigated, it remains less clear the extent to which similarities in findings exist across the lifespan.

Toward this end, several scholars have noted that the clarification of demographic factors uniquely relevant to *adolescent suicide* also merits attention (Hutch-Bocks, Kerr, Ivey, Kramer, & King, 2007; Joe, 2006a,b; Joe & Marcus, 2003; Nock, 2009; Wadsworth, Kurbin, & Herting, 2014). Although demographic factors are not modifiable, population-specific information can help direct the formation of developmentally and culturally responsive preventions and interventions (Cash & Bridge, 2009; Hooper, 2010; Wadsworth et al., 2014). In addition to the possible importance of demographic factors, most adolescents who engage in suicide behaviors are more likely to have persistent mental health concerns (e.g., substance use; Garlow, Purselle, & Heninger, 2007; Jones, 1997) as well.

Theoretical Framework

Much of the empirical literature investigating suicide behaviors in adolescent populations is underpinned by systems theory (e.g., ecological or family systems theory). Family systems theory has long been used to understand adolescent development, attachment strategies, coping mechanisms, factors related to psychological stress, and mental health disorders (Lohman & Jarvis, 2000; Rothbaum, Rosen, Ujiie, & Uchida, 2002). A significant strength of using family systems theory in both clinical practice and research is that it considers (a) the associations among individuals' multiple systems (e.g., parental, adolescent, school, community) and current symptoms (Wood, 1993; Wood, Klebba, & Miller, 2000), (b) the bidirectionality and complexity of relationships and behavior (Fisher & Weihs, 2000), and (c) the correlation between behaviors and environment and psychological conditions in family members from different generations (Hooper & Crusto, 2013; Wood, 1993).

In addition, family systems theory considers multiple levels and systems rather than just the individual system in making sense of behaviors, health conditions, growth, and distress (e.g., suicidailty; Fisher & Weihs, 2000; Joe, 2006b). Finally, a family systems approach to understanding adolescent outcomes enables researchers and providers to consider the implications and inclusions of demographic and cultural factors (gender, race, and socioeconomic status) and their influence on family members' symptomatology (Compton, Thompson, & Kaslow, 2005; Fitzpatrick, Piko, & Miller, 2008; Goldston et al., 2008). Importantly, absent from the literature is a clear cultural-specific theory that has underpinned studies on adolescent suicidiality.

Therefore, focusing on individual-level factors, the present study uses a systems theoretical framework to underpin our study. Specifically, we consider the implications of demographic factors (race, gender, and age) and alcohol use on self-reported suicide ideations and suicide attempts in a Black American adolescent sample living in a high-poverty context. Borrowing from O'Carroll and colleagues (1996), the present study defines suicide ideations as "any self-reported thoughts of engaging in suicide related behavior"; suicide attempts are "potentially self-injurious behavior with a nonfatal outcome" (p. 247).

The next section considers the empirical literature on suicide behavior in adolescents. Specifically, we provide a brief review of the link among race, gender, and mental health functioning (e.g., substance use disorders) and suicide behaviors in adolescents, which informed the present exploratory study.

Brief Literature Review

Race, Gender, and Suicide Behaviors

Demographic factors such as race/ethnicity, gender, age, socioeconomic status, and select mental health conditions are often reported as important variables to consider when investigating suicide (CDC, 2012; Joe et al., 2008; Nock, 2009; Nock et al., 2013; Wadsworth et al., 2014), although studies that focus on these factors—in particular, how race may serve as a significant predictor—have been limited (Joe, Baser, Neighbors, Caldwell, & Jackson, 2009). Toward this

end, it remains less clear whether the oft-cited associations in epidemiological and cross-sectional studies can be replicated in samples comprising Black American adolescents (Beck, Steer, & Brown, 1997; Fitzpatrick et al., 2008; Goldsmith, 2002; Joe et al., 2009; Shain, 2007). Some studies have shown greater rates of suicide behavior in Black American adolescents than their White American counterparts (Greening & Stoppelbein, 2002), whereas other studies have shown lower or similar rates of suicide behavior among Black American adolescents compared to White American adolescents (Joe, Clarke, Ivey, Kerr, & King, 2007; Merchant et al., 2009; Nock et al., 2013; Saluja et al., 2004).

Several explanations have been proffered as to why suicide behaviors and outcomes (e.g., deaths) among Black Americans appear varied or have changed in recent times (Cash & Bridge, 2009; Joe et al., 2009; Wadsworth et al., 2014). Empirical research has suggested that these inconsistent findings may be a function of recent changes in rates of suicide completions among Black American males (Cash & Bridge, 2009; Joe et al., 2009). For example, several studies conducted by Joe and colleagues (e.g., Joe, 2006a) provide some empirical support that the increase in the availability and use of firearms may account for the rise in rates of suicide among Black American adolescents, in particular, Black American males.

Wadsworth and colleagues (2014) outline in their review of the literature several cultural specific changes that may help explain these perceived changes in rates of suicide behaviors among Black American adolescents. They describe how various factors at multiple levels may be involved in and related to disparate outcomes. At the individual level, changes such as criminal activity, access to and use of firearms, and possible incarceration are discussed. At the family level, issues related to family violence and high levels of poverty and adversity are proffered as possible explanations for the changes in suicide behavior.

Finally, at a broader ecological level, Wadsworth and colleagues (2014) summarized experiences related to discrimination, race-related adversity, and living in select geographical regions that may contribute to differences in suicide rates and behavior. Results from Wadsworth and colleagues' (2014) empirical study supported some of these long discussed explanations in the literature. However, no support was found for the commonly cited relation between access to firearms and suicide behaviors in their urban Black American male sample.

Other scholars and researchers have suggested that the changes in suicide rates may be explained by how suicide behaviors are measured and the extent to which those measures are culturally valid (Chu et al., 2013; Joe & Bryant, 2007). For example, some investigators have used well-established questionnaires that have gone through a series of validation and refinement studies; others have used single-item questions to assess suicide behaviors. Some researchers have used structured interview questions extracted from commonly used surveys (e.g., Youth Risk Behavior Surveillance System Survey and Composite International Diagnostic Interview), and some have relied on clinical judgment. These differences in measurements used in empirical studies may account for differences seen in all populations as well as in Black American adolescent samples.

Although findings related to race have been inconsistent, constant trends related to gender have appeared in the literature (Cash & Bridge, 2009; Joe, 2006a; Joe et al., 2009; Miller & Glinski, 2000; Nock et al., 2013). In one comprehensive epidemiological study, Joe (2006a) found differences in suicide trends based on age and gender. After his examination of suicide-related deaths over 28 years (i.e., 1981–2009), Joe (2006a) concluded that males' rates of suicide accounted for differences in and changes of rates of suicide among Black Americans. In other words, while rates of suicide in Black American adolescent females have remained fairly consistent over time, rates of suicide in Black American adolescent males have continued to rise.

Another consistent finding evidenced in the empirical literature is the differential effects of gender on nonfatal and fatal suicide behavior. In most adolescent samples, similar to adult samples, females appear to report higher levels of suicide ideations *and* attempts (Blum et al., 2000; Fitzpatrick et al., 2008; Greening & Stoppelbein, 2002; Joe, 2006a; Nock et al., 2013); males typically have higher rates of suicide completions (Wang et al., 2013). Some research has pointed toward an age and race effect related to gender and suicide behaviors and outcomes, including different prevalence rates and behaviors based on the combined effects of (a) age and gender and (b) age and race (see Miller & Glinski, 2000).

Substance Use and Suicide Behaviors

Based on cross-sectional and epidemiological studies, substance use and abuse disorders have been posited as a serious risk factor for suicide completion in all populations, including adolescents (APA, 2003; Joe et al., 2007). Alcohol and drug use have often been linked with increased odds of suicide attempts and completions in both adult and youth samples (Aseltine, Schilling, James, Glanovsky, & Jacobs, 2009). Whether this significant relation differs based on other demographic factors (e.g., race/ethnicity and gender) is less clear.

In one recent study, Aseltine and colleagues (2009) examined age-related alcohol use and suicide behaviors. In their large sample of adolescents (N = 32,217) aged 11–19 years, they found heavy alcohol use to be significantly related to suicide attempts. Importantly, this association was differentiated based on age; the association was stronger among younger adolescents (2.6 times more likely to report a suicide attempt) than among older adolescents (1.2 times more likely to report a suicide attempt). Miller and Glinski (2000) discussed the implications of alcohol and substance use in adolescent suicide behavior. They suggested in their review that alcohol and other substances appear to be present at the time of suicide behavior in up to 54% of adolescent cases.

There may be a cluster of factors unique to or disproportionately high in Black American adolescents that may foretell increased rates of suicidality compared to other youth; alcohol use may be one of those risk factors. More specifically, Black American adolescents living in high-poverty communities may be at a greater risk for suicidality and alcohol use than other adolescents. For example, Jones (1997) found that Black American adolescents who expressed suicidality used alcohol to a greater extent than those Black American youth who did not express suicidality. In Lyon, Benoit, O'Donnell, and Getson's (2000) study comprising Black American youth, they found that substance abuse was one of the strongest predictors of suicide attempts.

Suicide Ideations and Suicide Attempts in Adolescents

With relevance to the present study, several scholars have described the importance of determining the extent to which unique correlates and outcomes exist for individuals who report suicide ideations, suicide attempts, and suicide completions (Beautrais, Joyce, & Mulder, 1996; Horowitz et al., 2001; Nock et al., 2013) and to what extent potential differences represent unique demographic patterns (e.g., gender patterns; Wadsworth et al., 2014). Similarly, scholars have underscored the likely utility of determining whether these populations are unique or whether they represent overlapping and similar characteristics (Horowitz et al., 2001). The value of understanding the idiosyncrasies of each group and the later effects of their behavior (repeated attempts, coping strategies, and protective factors) is critical.

Importantly, nonfatal suicide behaviors occur far more frequently than fatal suicide behaviors (i.e., suicide completions) in adolescents (Goldsmith, 2002; Nock et al., 2013). Differences among adolescents who exhibit suicidal ideations and nonfatal suicide behaviors and adolescents who complete suicide attempts could indeed inform prevention and interventions relevant to each group (Horowitz et al., 2001). Undoubtedly, suicide continues to be a significant public health issue for adolescents (McCullumsmith, Clark, Perkins, Fife, & Cropsey, 2013; Shain, 2007). The present study is unique in that it allows for the study of various suicide behaviors over time. Nock (2009) contended that "fine-grained studies" that go beyond investigating correlates of suicide, suicide attempts, and suicide ideations are needed (p. 237).

The Present Study

The present study goes beyond previous studies by exploring the relations among and combined effects of commonly reported risk and demographic factors of suicide in adolescents over time. The present study thereby adds to the literature base in three important ways. First, we explore the relation between important risk factors and a significant public health problem: adolescent suicide ideations and behavior (i.e., suicide attempts). Second, the present study comprises

Table 1
Distribution of Observations by Age

Age	11	12	13	14	15	16	17	18
Ideations	458	527	594	629	628	563	494	348
Identified attempts	215	269	288	303	307	277	236	159

a large sample of an understudied population— Black American adolescents living in high-poverty communities (Wadsworth et al., 2014). Third, this study's longitudinal design allows for the study of suicidality over time, with an analysis that capitalizes on the repeated measures aspect of that design. Each individual in the study is her or his own control, which helps to eliminate the possible influence of unmeasured variables.

The importance of the present study's longitudinal study cannot be overstated. Notwithstanding the limitations, the longitudinal growth curve analysis (described in detail in the Planned Analysis section) will lend greater credibility to the conclusions that could be put forward with a cross-section design. Analysis of each individual's self-reports of suicidality over time reduces the likelihood that unmeasured factors are responsible for the observed outcomes (or effects). Each person would have those unmeasured characteristics at each time point. Consequently, the longitudinal design allows for better separation of the effects of age from the effects of other characteristics that may have gone unmeasured. More technically, the fixed effects part of the analysis that consider the relation between age and the outcome variables is essentially an aggregation of adolescent trajectories, whereas the random effects provide insight into how the observed relation is due to individual trajectories. This approach will add to the findings evidenced in other fine-grained studies.

Based on the extant literature, we examined the effects of gender and recent/frequent alcohol use on suicide ideation and identified suicide attempts among Black American adolescents in a southern region of the United States. We hypothesized that (a) adolescents with more recent/frequent use of alcohol will have higher probabilities of suicide ideations and identified suicide attempts; (b) females will have higher probabilities of suicide ideations and identified suicide attempts over time than their male counterparts; and (c) males—irrespective of age—will be more affected by more recent/frequent alcohol use; that is, with more recent/frequent self-reported alcohol use, males will have greater probabilities of suicide ideations and identified suicide attempts than their female counterparts.

Method

Sample

The current sample of adolescents is derived from the Mobile Youth Survey (MYS), a 14-year longitudinal study primarily of Black American adolescents living in low-income neighborhoods in a southern region of the United States. The entire MYS data set comprises youth aged 9–19 years. The data were collected annually between 1998 and 2011. Relatively few observations were obtained for ages 9, 10, and 19; thus, these ages were excluded from the present study. As this is a longitudinal study, we have limited our sample (hereafter termed the MYS sample) to adolescents who participated in at least 2 years of the MYS study, resulting in a total of 4,017 adolescents with two or more observations between the ages of 11 and 18. Two subsamples were created that were limited to the inclusion of only adolescents who had reported either a suicide ideation or a suicide attempt. Without limiting the sample in this way, the longitudinal logistic growth model would have been unable to be estimated.

Of the 4,017 adolescents in the MYS sample, 24% ($n = 977$) report having a suicide ideation. This sample comprised proportionately more females than males: 59% ($n = 572$) and 41% ($n = 405$), respectively. The distribution of observations at each biological age is reported in Table 1. Of the 4,017 adolescents in the MYS sample, 11% ($n = 457$) have been identified as having

a suicide attempt. The distribution of observations in the sample across all biological ages is shown in Table 1. The sample comprised slightly more females than males, 56% ($n = 256$) and 44% ($n = 201$), respectively.

Both subsamples were comprised entirely of self-identified Black American youth, all of whom had qualified to receive free lunch at some point during their participation in the study. The mean household income was $6,276 (Bolland, Lian, & Formichella, 2005), and 73% of the residents in these neighborhoods lived below the poverty level.

Procedure

The MYS study is a multiple cohort design in which new cohorts are added each year and tracked thereafter. A brief procedure section appears here; for full details regarding the methodology and sampling procedures, see Bolland et al. (2013). The MYS research team identified homes where youths between the ages of 10 and 18 resided. Youths within 3 months of their 10th or 18th birthday were allowed to participate, yielding a sample of youth aged 9 to 19 years. Investigators attempted to contact each of these eligible participants and his or her parent or adult caregiver using community fliers and door-to-door visitation. Once contacted, the youth and his or her adult caregiver were informed about the purpose of the survey, and the youth was invited to participate.

Informed assent and consent were obtained from all participants and their parents or caregivers. After youths and their caregivers agreed to participate, a group administration of the survey was scheduled. The questions were read aloud to groups of 20 to 30 participants, and they were asked to mark their answer to each question in the survey booklet. Participants who required individual attention were assisted one on one; however, most participants completed the survey independently. The study procedure was completed in approximately one hour. Each participant received $10 as compensation prior to 2005 and $15 thereafter (Bolland, 2007).

Measures

Suicidal ideation. Suicidal ideation was measured by the following single-item self-report question: "In the past year, did you seriously think about killing yourself?" Dichotomous responses of "yes" and "no" were recorded.

Identified suicide attempt. Suicide attempt was measured by the following single-item self-report question: "Have you ever tried to kill yourself?" The adolescents reported dichotomous responses of "yes" and "no." As this single item does not have a temporal component (i.e., it does not measure the previous year), identification of a suicide attempt was achieved when adolescents answered a "no" in the year preceding a "yes" response. In this way, a suicide attempt in the previous year is inferred by the responses of the participants. For example, if a respondent reported a "no" response at age 11, a "no" response at age 12, then a "yes" response at age 13, then the identified suicide attempt occurred in the year between ages 12 and 13. This distinction in this variable measurement is important to identify the year in which the suicide attempt occurred. If a response of "yes" is recorded at age 14 but we have no previous data on this measure from the same participant, then the suicide attempt could have occurred at any age before 14.

Recent/frequent alcohol use. Recent/frequent alcohol use was measured using a composite of three questions: (a) "Have you ever drunk alcohol?"; (b) "During the past month (30 days), did you drink alcohol?"; and (c) "During the past week (7 days), did you drink alcohol?" For the first question, respondents were asked to indicate "no" or "yes." For the second and third questions, respondents were asked to record a single answer of "no," "yes, just once," or "yes, more than once" for each question. Rather than create a summative scale, the three questions were combined into a single 5-point recency and frequency scale. The scale was created using the response patterns of these three items.

Recency and frequency of alcohol consumption was measured based on how recent the alcohol use was and on how frequent the recent alcohol consumption was. This scale does not measure the amount of alcohol consumed, rather how often any alcohol is consumed. The scale is interpreted as follows: 0 (*have never drunk alcohol*), 1 (*have drunk alcohol, but not in the past month*), 2 (*have drunk alcohol once in the past month*), 3 (*have drunk alcohol once in the past week*), and 4 (*have drunk alcohol multiple times in the past week*). Higher scores reflect more recent and frequent use. Reliability was found to be acceptable for the current study data, with a Cronbach's alpha equal to .78. Additionally, a 5-week test-retest reliability of the items was conducted using a similar sample of 49 respondents in different public housing neighborhoods in Alabama. The consistency was high within the reliability study (consistency = .92; Bolland, 2007).

Age and gender. Given that we were analyzing the variables over time, the actual age in years of the adolescent was used. Ages ranged from 11 to 18, with age centered at 11 for ease of model parameter interpretability. Gender was also included as a dichotomous variable in the analyses (0 = male and 1 = female).

Analysis Plan

The study modeled two dichotomous variables—the propensity to experience a suicidal ideation or to have an identified suicide attempt—based on the age of the adolescent. In our model of suicide ideations, it is important to remember that our sample was limited to all subjects reporting at least one suicide ideation; therefore, we are modeling the propensity of a suicide ideation to occur at a particular age. Similarly, in our second analysis, our sample was limited to all participants reporting an identified suicide attempt, to model the propensity for a suicide attempt, meaning the propensity for adolescents to attempt suicide at a particular age. Additionally, all measures were collected longitudinally (from 11 to 18 years of age). Given the nature of our research questions and our data, a logistic growth model was used for the analyses. The traditional form of the logit transformation in regression is as follows:

$$\pi_{ij} = \frac{\exp\left(\alpha + \beta x_{ij}\right)}{1 + \exp\left(\alpha + \beta x_{ij}\right)}$$

Next, the hierarchical portion of the model was added. The model shown below is the logistic unconditional growth model, with age as the slope parameter to indicate change over time. Due to the small sample size, the random effects for the intercept and the slope were not able to be estimated. Only the residual variance was estimated for each model. This model is called the unconditional growth model, because change over time reflects only time, not any other factor. The unconditional growth model is as follows, using Singer and Willett's (2003) notation:

$$\text{logit}\left(\pi_{ij}\right) = \alpha_{0i} + \beta_{1j}\, TIME_{ij} + \varepsilon_{ij}$$

$$\alpha_{0i} = \gamma_{00}$$

$$\beta_{1i} = \gamma_{10}$$

where *i* is the subject and *j* is time.

After fitting the unconditional growth model, recent/frequent alcohol use was added to the level 1 model as a time-varying covariate, and gender is added to the level 2 model as main effects as well as interaction terms. Adding these two variables into the model creates differing effects for the intercept and growth over time for the two genders, based on recent/frequent

alcohol use, and based on both gender and recent/frequent alcohol use. The final full model parameterization is as follows:

$$\text{logit}\left(\pi_{ij}\right) = \alpha_{0i} + \beta_{1j}\ TIME_{ij} + \beta_{2j}\ ALCOHOL_{ij} + \beta_{3j}\ TIME_{ij} * ALCOHOL_{ij} + \varepsilon_{ij}$$

$$\alpha_{0i} = \gamma_{00} + \gamma_{01} Gender_i$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11} Gender_i$$

$$\beta_{2i} = \gamma_{20} + \gamma_{21} Gender_i$$

$$\beta_{3i} = \gamma_{30} + \gamma_{31} Gender_i$$

This model was used for both analyses: (a) once with suicidal ideations as the response variable, and (b) once with identified suicide attempt as the response variable. The full factorial model was initially fit, with nonsignificant parameters removed in a backwards selection procedure. All analyses were conducted using proc glimmix in SAS software, Version 9.3 using full information maximum likelihood.

Results

Preliminary Analysis

Prior to analyzing the models, descriptive measures for the adolescents who experienced an identified suicide attempt ($n = 457$) were obtained. In this sample, we found that only 26% ($n = 118$) of the participants in the MYS experienced suicidal ideations prior to their suicide attempt. Most of the adolescents, 74% ($n = 339$), did not report suicide ideations prior to reporting a suicide attempt.

The proportion of females ($n = 256$) experiencing suicidal ideations prior to a suicide attempt was 27% ($n = 70$), whereas 24% ($n = 48$) of the males ($n = 201$) experienced suicidal ideations prior to a suicide attempt. These two proportions were not significantly different, $\chi^2(1) = 0.71$, $p = .40$. Mean levels of recent/frequent alcohol use did not differ between those who experienced suicidal ideations prior to their suicide attempt and those who do not experience suicidal ideations prior to their suicide attempt, $F(1, 2025) = 0.60$, $p = .44$. The mean levels of recent/frequent alcohol use of those who experienced a suicidal ideation prior to their suicide attempt was 1.54 (SD = 1.76), whereas those who did not had a mean of 1.47 (SD = 1.79).

Suicide Ideation

This analysis modeled the probability of experiencing a suicide ideation at a particular age, because the sample ($n = 977$) included only adolescents who reported having at least one suicide ideation. The overall unconditional growth model indicated that age was a significant predictor of a suicide ideation, $\gamma = -0.06$, $t(3253) = -3.92$, $p < .001$. Table 2 presents the model estimates. Upon taking the logit transformation on the estimates, the propensity to have a suicide ideation was shown to decrease with age. The probability of a suicidal ideation was around 40% at age 11 and decreased to 31% by age 18.

Next, recent/frequent alcohol and gender were factored into the model. Both were found to have significant effects on the propensity to have a suicide ideation. Table 2 displays all significant parameter estimates. First, the significant parameter for recent/frequent alcohol use, $\gamma = 0.25$, $t(3158) = 6.65$, $p < .001$, indicated that increased recency/frequency of alcohol use increased the propensity to have a suicide ideation. Of any two adolescents with identical ages and gender, the adolescent with more recent/frequent alcohol use were more likely to experience a suicide ideation. Gender also significantly affected the adolescent's propensity to experience a suicide ideation, $\gamma = 0.22$, $t(3158) = 3.19$, $p = .001$. Among adolescents at any given age who have identical recency/frequency of alcohol use, females were more likely than males to

Table 2

Logistic Growth Model Parameter Estimates for Suicidal Ideation Models

Effect	Unconditional growth			Final model		
	Estimate	Odds ratio	*SE*	Estimate	Odds ratio	*SE*
Intercept	-0.399^{***}	0.67	0.060	-0.753^{***}	0.47	0.086
Gender				0.215^{**}	1.24	0.067
Alcohol				0.246^{***}	1.28	0.037
Age	-0.060^{***}	0.94	0.016	-0.070^{***}	0.93	0.021
Age*Alcohol				-0.017^{*}	0.98	0.009
Variance (residual)	1.000^{***}		0.022	1.001^{***}		0.022
Deviance	18275.12			18005.84		

Note. SE = standard error. $n = 977$.

$^{*}p < .05.$ $^{**}p < .01.$ $^{***}p < .001.$

experience a suicide ideation. Given that all of the participants reportedly have experienced a suicidal thought, this finding highlights that females were more consistently experiencing suicidal thoughts beginning at a young age. The propensity for males appears to be less repetitive. Males may have experienced a suicidal thought at a certain age, but it was more likely not to be present the next year; whereas suicidal thoughts remained constant with female adolescents over time.

A significant interaction between age and recent/frequent alcohol use, $\gamma = -0.02$, $t(3158) = -1.98$, $p = .048$, points to a differential change over time between adolescents with different levels of recent/frequent alcohol use. The probabilities over time are displayed in Figure 1, plotted
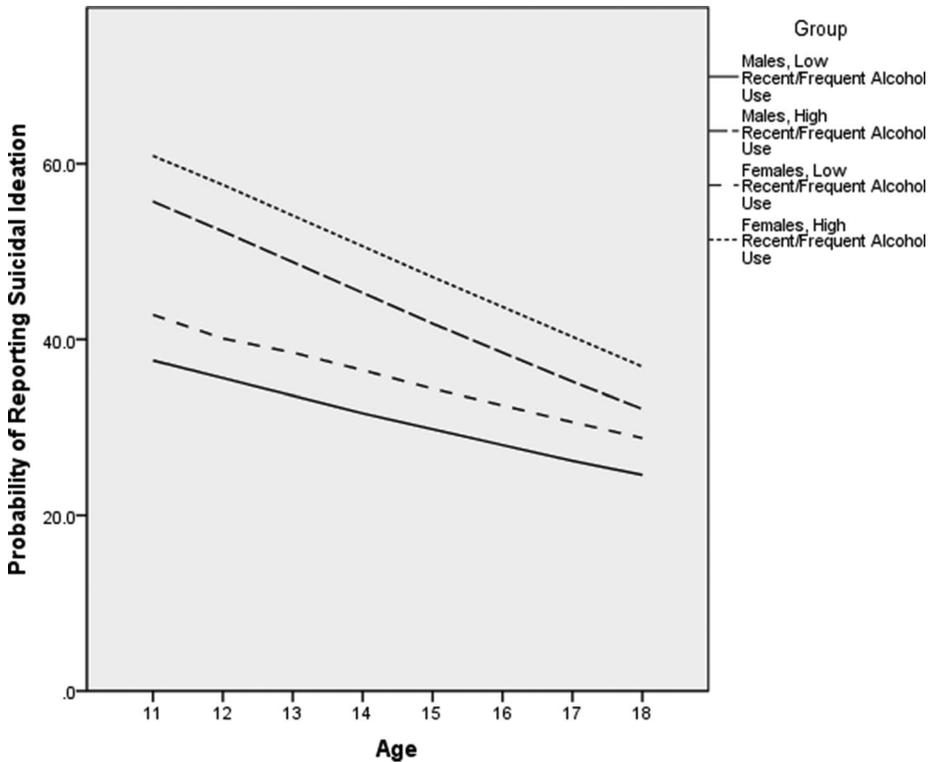

Figure 1. Predicted probabilities of suicide ideation based on recency/frequency of alcohol use and gender ($n = 977$).

Table 3
Frequencies of Multiple Suicide Ideations Based on Gender

	Gender	
	Female	Male
1 ideation	391 (68%)	325 (80%)
2 ideations	125 (22%)	66 (16%)
3 or more ideations	56 (10%)	14 (4%)
Total	572 (58%)	405 (41%)

Table 4
Logistic Growth Model Parameter Estimates for Identified Suicide Attempt Models

	Unconditional growth			Final model		
Effect	Estimate	Odds ratio	SE	Estimate	Odds ratio	SE
Intercept	-1.612^{***}	0.20	0.106	-1.888^{***}	0.15	0.136
Alcohol				0.688^{**}	1.99	0.212
Age	0.107^{***}	1.11	0.025	0.148^{***}	1.16	0.034
Age*Alcohol				-0.040^{**}	0.96	0.014
Variance (residual)	0.996		0.031	0.993		0.031
Deviance	9452.75			9352.99		

Note. SE = standard error. $n = 725$.
$*p < .05. **p < .01. ***p < .001.$

for both genders with both low recent/frequent alcohol use and high recent/frequent alcohol use. The propensity to experience a suicide ideation decreased more rapidly for adolescents exhibiting more recent/frequent alcohol use than for those with less recent/frequent alcohol use. Stated another way, the effects of recent/frequent alcohol use were exacerbated in young adolescents, but these effects appeared to become less severe as adolescents aged. The propensity to experience a suicidal ideation at age 18 does not differ much between those with more versus less recent/frequent alcohol use. However, at age 11, the probability was magnified with more recent/frequent alcohol use. In this plot, the gender effect is present, with parallel, yet higher lines for females as compared to males, indicating higher probabilities of suicide ideations overall for females, consistently across all ages. Gender did not interact with recent/frequent alcohol use.

To confirm our findings regarding gender differences in the likelihood of reporting multiple ideations, the frequency of ideations between the two genders were compared and significant gender differences were found, $\chi^2(2) = 21.59$, $p < .001$. Frequency counts for both genders are shown in Table 3. The percentage of adolescents experiencing multiple suicide ideations was significantly higher for females, 32% ($n = 181$), than for males, 20% ($n = 80$). Similarly, 10% ($n = 56$) of female adolescents reported experiencing 3 or more years of suicide ideations, compared to 4% ($n = 14$) of males. There was a clear pattern of a larger percentage of females experiencing multiple suicide ideations.

Suicide Attempts

This analysis modeled the propensity of an identified suicide attempt at a particular age, as all adolescents in the sample ($n = 457$) had identified suicide attempts. The propensity to attempt suicide was found to be significantly affected by age in the unconditional growth model, $\gamma = 0.11$, $t(1596) = 4.21$, $p < .001$. Full model estimates are reported in Table 4. The propensity to have an identified suicide attempt increased with age, from 16% at age 11 to 30% at age 18.
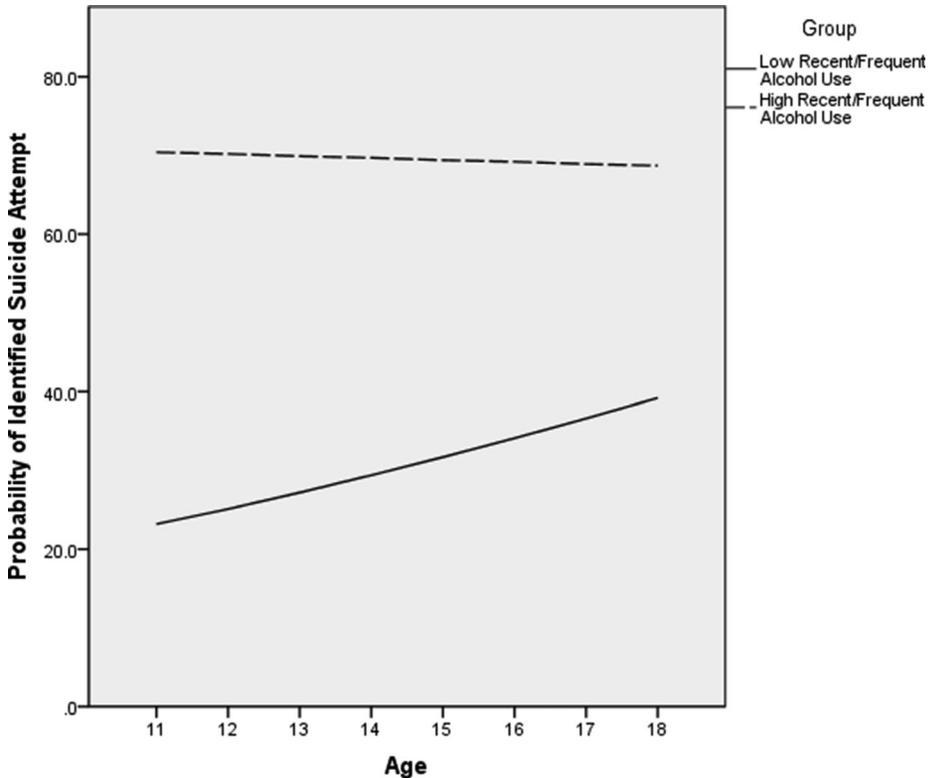
Figure 2. Predicted probabilities of identified suicide attempt based on recent/frequent alcohol use (*n* = 457).

Both recency and frequency of alcohol use and gender were added to the unconditional growth model, with significant estimates displayed in Table 4. Recent/frequent alcohol use was a significant factor in the probability of an identified suicide attempt. Increased recency and frequency of alcohol use significantly increased the propensity of an identified suicide attempt, $\gamma = 0.69$, $t(1567) = 3.25$, $p = .001$. Assuming equal age, adolescents with more recent/frequent alcohol use were more likely to have an identified suicide attempt. The probability of an identified suicide ideation increased as the adolescent aged, $\gamma = 0.15$, $t(1567) = 4.41$, $p < .001$.

Additionally, the effect of recent/frequent alcohol use was exacerbated for young adolescents. A significant age and recency and frequency of alcohol interaction, $\gamma = -0.04$, $t(1567) = -2.83$, $p = .005$, indicated that at a younger age, adolescents consuming alcohol more recently and frequently had an increased propensity to have an identified suicide attempt. The probability of an identified suicide attempt decreased with age among adolescents with more recent/frequent alcohol use, yet it increased among adolescents with less recent/frequent alcohol use. That is, the propensity for attempting suicide is magnified among young adolescents with high recency and frequency of alcohol use. Although more recent/frequent alcohol use increased the likelihood of an identified suicide attempt among older adolescents, this differential was not as magnified. Gender was not found to be significantly related to the propensity to have an identified suicide attempt, nor did it interact with age or alcohol use.

Full model estimates are shown in Figure 2, with estimates separated by low recency and frequency of alcohol use and high recency and frequency of alcohol use. Adolescents with high recency and frequency of alcohol use had a relatively high probability of an identified suicide attempt, with this probability remaining constant across all ages. Adolescents with low recency and frequency of alcohol use had a lower probability of an identified suicide attempt, with this probability increasing as they age. The differential in probabilities was greater at younger

ages, indicating that a greater recency and frequency of alcohol use at a younger age was more detrimental than at an older age.

Discussion

Adolescent suicide is an important and escalating public health concern. Risk factors (e.g., recent/frequent alcohol use) that may be ameliorated or reduced as well as demographic factors (e.g., gender, age, race) that should be considered are all important areas for investigation. Nock and Kessler's (2006) assertion related to adult samples is relevant and applicable to adolescent samples as well: "Identifying specific risk factors for different types of suicide related outcomes is necessary to improve the accuracy of the prediction of such outcomes" (p. 620). The present study addressed this recommendation by examining a longitudinal sample of Black American adolescents, aged 11 to 18 years, and identified specific risk factors unique both to individuals who report suicide ideations and to individuals who report suicide attempts. Specifically, the present study examined the relations among suicide ideations and attempts, recency and frequency alcohol use, and gender in a Black American adolescent sample.

As expected, females reported greater frequency of suicide ideations over time than males. This finding is consistent with Blum and colleagues' (2000) finding that females carried a higher risk for suicidal ideations irrespective of age. Similarly, Fitzpatrick and colleagues (2008) found that females were more likely to report suicide ideations than male adolescents in a primarily Black American adolescent sample. Compounding this finding is the result that females were more likely to report multiple suicidal ideations than males. Similarly, females in this sample were particularly vulnerable to repeated suicidal ideations, indicating a increased likelihood for psychological distress.

Fitzpatrick and colleagues (2008) also noted an age effect for both suicide ideations and attempts; older adolescents self-reported greater rates of ideations and attempts than younger adolescents. Similarly, in the present MYS sample, we found age-based differences. Our results are consistent with Fitzpatrick and colleagues with regard to attempts, but different in that suicide ideations were more likely at a younger age in our sample. Beautrais (2001) underscored the importance of differentiating between individuals who attempt suicide and those who complete suicide. Beautrais as well as others (e.g., Horowitz et al., 2001) suggested there are similarities and differences in the risk factors based on types of suicidal behaviors in adult samples. Although the present study assessed for differences based on ideation and attempts, differences based on ideations, attempts, and completions could be relevant for adolescent samples as well and ought to be explored in future longitudinal studies.

In our second main finding, recent/frequent alcohol use was uniquely related to suicide ideation. Greater recent/frequent alcohol use was related to higher reports of suicide ideation. A significant interaction between age and recent/frequent alcohol use emerged, indicating that recent/frequent alcohol use affected rates of suicide ideation over time. Younger adolescents' reports of suicide ideations are differentiated by recent/frequent alcohol use, whereas older adolescent reports of suicide are high irrespective of recent/frequent alcohol use. That is, higher recent/frequent alcohol use increases the probability of a self-reported suicide ideation among younger adolescents but not among older adolescents. Reports of suicide ideations among older adolescents are not affected by recency and frequency of alcohol use.

In our third main finding, partial support was found for our hypothesis; alcohol use—but not gender—was related to suicide attempts over time. In these data, as age increased, the likelihood of reporting a suicide attempt increased. In addition, alcohol use made a unique contribution in explaining suicide attempts. In particular, higher alcohol use was related to increased reports of suicide attempts. High alcohol use at a younger age was found to have a greater effect on suicide attempts than at an older age. This finding was inconsistent with our study hypothesis, as the probability of a suicide attempt for gender was found to be nonsignificant in the model of suicide attempts.

Adolescent alcohol use has been linked to many negative social and health outcomes in both adolescence and early adulthood (e.g., Griffin, Bang, & Botvin, 2010; Maldonado-Molina, Jennings, & Komro, 2010). The present study extends this to both suicide attempts and ideations.

More recent/frequent alcohol use at a young age will increase the likelihood of an adolescent experiencing both of these negative events. Clinicians should pay particular attention to alcohol use in young adolescence, especially during a time period that is particularly prone to suicide attempts. Rohde, Lewinsohn, Klein, Seeley, and Gau (2012) found that suicide attempt rates were significantly higher during adolescence than in emerging adulthood.

Taken together, we found partial support for our study hypotheses. However, the present study has some strengths that should be considered when interpreting these findings. A major strength of the study is that commonly examined factors with significant relations described in the empirical literature were explored in a longitudinal design. For example, the importance of demographics relative to suicide behaviors has been evidenced in the literature (Joe et al., 2009). However, those investigations have been limited by the cross-sectional nature of the designs and by samples primarily limited to White Americans (Joe et al., 2008). Of significance, the use of longitudinal analyses allows researchers to analyze the effects of demographic variables on a single adolescents' development across multiple ages, rather than infer developmental changes from relationships found at various ages from different adolescents. This component of longitudinal analysis leads to greater credibility in the conclusions derived from the present study.

The present study found similarities and differences that have long been reported in the literature. For example, alcohol and drug use have also been proffered as an important risk factor for suicide behavior (Beautrais, 2001, 2003; Beautrais et al., 1996; Beck et al., 1997), but few studies have explored the association over time. Similar to age effects found by Aseltine and colleagues (2009), the present study points to the implication of age or developmental stage for this oft-reported relation between alcohol use and suicide behavior. In our tested models, gender was mostly relevant for suicide ideations, suggesting the effects and salience of gender on the assessment, intervention, and treatment process.

Limitations and Directions for Future Research

The results of the present study extend the research and clinical literature about suicide in adolescents. However, the results of the study also generate additional questions. Consequently, the findings must be considered in conjunction with five important limitations.

A first limitation is our focus on only individual-level factors to explain outcomes related to adolescents' suicidal thoughts and behaviors. For example, the present study did not directly examine parental, familial, and environmental constructs. Numerous unmeasured factors (e.g., parents' or caregivers' knowledge of adolescents' suicide ideations and attempts, family members' mental health or history of suicide attempts, or family members' serious medical conditions) may better explain outcomes regarding suicidality in the present sample (Freudenstein et al., 2011; Joe et al., 2007). Future research should consider factors that are relevant to and interact with the ecology and psychology of the family system and individual system (Ayyash-Abdo, 2002; Beck et al., 1997; Fitzpatrick et al., 2008; Hooper et al., 2010; Miller & Glinski, 2000). Racism, discrimination, and individual, familial, and community violence may be important factors to include in future research as well (Goldston et al., 2008).

The sample itself serves as a second limitation of the study. The sample lacked racial diversity and was derived from one state in the southeastern part of the United States. Therefore, the findings from the present study may not be generalizable to other racial, ethnic, and cultural groups living in other regions of the United States. In a seminal review of risk and protective factors associated with suicide behaviors and outcomes among Black Americans, Beck (1997) asserted that living in a southern region of the United States served as a protective factor.

Joe and colleagues' (2009) findings also added empirical support for the proposition that geography may play a role in suicide outcomes and behaviors. In their study, Joe and colleagues found that living in northern regions of the United States was related to suicide outcomes (ideations and attempts). Of significance, living in southern regions of the United States could serve as a protective *or* risk factor. For example, relevant issues of the South might include residential stability, racism, discrimination, social and kinship ties, religion, and gun ownership (see Wadsworth et al., 2014). Future research should consider a longitudinal study design that

includes a representative sample of racially and geographically diverse adolescents and families in U.S. households. Future researchers could use a geographical information systems approach to investigate regional and community-level risk and protective factors regarding suicide (Rezaeian, Dunn, St. Leger, & Appleby, 2007).

In a third limitation, phenomena explored in the present study were self-rated and self-assessed. The participant's ability to recall and accurately report historical information may have introduced bias and error into the data, thereby attenuating the results of the study. The study findings may have differed if data were derived from multiple sources. Related to assessment of suicide ideations and attempts is the importance of determining the extent to which the adolescent who made a suicide attempt intended to die. The present study did not measure this important aspect of suicide (Nock & Kessler, 2006).

Future studies should consider multiple reporters for sources of data (e.g., teachers, parents, mental health care providers, and physicians), multiple methods (e.g., official records and self-report), and the extent to which the individual who engaged in suicide-related behavior had an intention of killing him/herself. Some researchers have suggested that in adult samples, it is useful to differentiate between individuals with an intent to die (e.g., suicide attempt) and those without an intent to die (e.g., suicide gestures; see Miller & Glinski, 2000; Nock & Kessler, 2006). Exploring this difference in an adolescent sample may also be useful for prevention, intervention, and treatment efforts.

A fourth limitation concerns assessment. Specifically, several of our study constructs were derived from and thus measured with a single item. Given that the outcome variables were assessed using a single item rather than multiple items, the reliability or stability of these items could be in question, although other studies have used single-item assessments to determine suicidal behaviors (see Joe et al., 2006; Taylor, Chatters, & Joe, 2011). The use of instruments such as the Suicide Probability Scale (Cull & Gill, 1982) or the Ask Suicide Screening Questions (Horowitz et al., 2012) may have yielded different findings.

Finally, we did not assess for psychiatric disorders. Given the substantial literature that supports the link between select mental health disorders and suicide behavior (Shaffer et al.,1996), future studies should also include assessment of both present and lifetime history of mental health and comorbid medical conditions (Hooper, 2010). It is well known that the presence of a mental health disorder often increases the odds of suicide attempts and completions (CDC, 2007; Shaffer et al., 1996). However, Brown, Jewell, Stevens, Crawford, and Thompson (2012) found that being female is a more robust predictor of suicide outcomes than a diagnosis of major depressive disorder.

Joe and colleague (2009) also suggested that mental health providers must be aware of various correlates and predictors of suicide behavior in addition to Diagnostic and Statistical Manual of Mental Disorders diagnoses. Nonetheless, researchers must continue to assess the extent to which these long observed relations between mental health disorders and suicide outcomes exist in Black American adolescents, as well as adolescents in other racial and cultural groups (Beck et al., 1997; Joe et al., 2009; Nock, 2009).

Conclusion

Adolescents are an important population for suicide prevention. Knowledge of key demographic and risk factors is paramount. The present exploratory study indicates that alcohol use exacerbates suicide ideation and attempts during young adolescence among the MYS longitudinal sample of Black American adolescents living in high-poverty communities. However, as adolescents age, alcohol has a smaller negative effect. Younger adolescents who reported alcohol use had a greater likelihood of also experiencing suicide ideations and attempts as compared to older adolescents. Thus, although alcohol is a significant risk factor for all adolescents, the effect is greater for younger adolescents. As the Surgeon General contended, demographics must be considered when examining suicidality as well (United States Department of Health and Human Services, 1999). In addition to age, gender was associated with some of the relations among predictor and outcome variables in our study. Females self-reported greater rates of suicide ideation, but not attempts, than males.

Given these findings, in conjunction with previous studies, we recommend that clinical psychologists, physicians, psychiatrists, social workers, and other mental health care providers screen for suicide and alcohol use in all adolescents who present with psychological, physical, and emotional distress (Shain, 2007). Clinical psychologists should pay particular attention to young adolescents exhibiting signs of alcohol use/abuse and female adolescents with the potential for severe psychological depressive symptoms, including suicidal ideations. Researchers ought to continue to explore culturally based protective and risk factors for adolescents and determine how they might inform they might generate culturally relevant theories on suicidality.

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