

## ORIGINAL PAPER

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# Social environment factors associated with suicide attempt among low-income African Americans: The protective role of family relationships and social support

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**Abstract** *Background* Suicide and suicide attempts are important public health concerns, and recent decades have witnessed a rising rate of suicide among African Americans. A history of prior attempts is a leading risk factor for completed suicide. Further research is needed into the social environment risk factors for suicide attempt among African Americans. This study focused on two important dimensions of the social environment, family relationships and social support, as well as an important person-level risk factor – depressive symptoms. *Method* Data were obtained from a case-control study of 200 African American men and women aged 18–64 years, who sought services at a large, urban, public hospital. Odds ratios adjusted for significant sociodemographic differences between groups (aORs) were calculated for environment risk factors for suicide attempt among the cases and controls. The role of depressive symptoms was also studied. *Results* Lower levels of family adaptability and family cohesion increased the relative rate of suicide attempt in the sample. The aOR associated with the lowest quartile of family adapt-

ability was 3.90, and the aORs associated with the first and second quartiles of family cohesion were 8.91 and 5.51, respectively. Lower levels of social embeddedness and social support increased the relative rate of suicide attempt in our sample. The aOR associated with the first and second quartiles of social embeddedness were 5.67 and 4.93, respectively, and the aOR associated with the lowest quartile of social support was 6.29. A mediating role of depression was discovered when depressive symptoms were entered into the logistic regression models. *Conclusions* Our findings indicate that social environment factors including deficits in family functioning and social support are associated strongly with suicide attempts among low-income African American men and women seeking treatment in a large, urban hospital. Thus, better family functioning and social supports can be considered protective factors in this population. The presence of depressive symptoms, a well-known risk factor for suicide attempts and suicide, appears to mediate the association between social environment factors and suicide attempt.

**Key words** suicide – suicide attempt – family functioning – social support – social cognitive theory – risk and protective factors

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## Introduction

Suicide represents an important public health concern in the United States (U.S.) (U.S. Department of Health and Human Services 1999). According to the National Center for Health Statistics of the Centers for Disease Control and Prevention (CDC), suicide was the eighth leading cause of death in the U.S. in 1998, accounting for 30,575 deaths, or 1.3% of total deaths (Anderson 2001). It is estimated that for every completed suicide, there are between eight and 25 suicide attempts, and the rate of suicide attempts may be increasing (Brickman and Mintz 2003). Data from the National Comorbidity Survey reveal a 13.5% prevalence of reported lifetime sui-

dal ideation and a 4.6% lifetime prevalence of suicide attempt (Kessler et al. 1999). Recent decades have witnessed a rising rate of suicide among African American populations (Shervington 2000). For example, between 1980 and 1995, the rate of suicide more than doubled among African American youth between the ages of 15 and 19 years (Satcher 1998). In 1999, suicide was the seventh leading cause of death among African Americans aged 10–14 years, the third leading cause of death among those 15–24 years old, the sixth leading cause of death among those 25–34 years old, and the ninth leading cause of death among those 35–44 years old (Anderson 2001). A recent study documenting prevalences of suicide attempt among 1,157 economically disadvantaged African Americans in Baltimore, Maryland revealed lifetime, last-year, and 6-month prevalence rates for suicide attempt of 5.3%, 1.2%, and 0.4%, respectively (Ialongo et al. 2002).

The study of suicide attempts is important because a history of prior attempts is a leading risk factor for completed suicide. For example, Tejedor and colleagues (1999) have shown that the number of previous attempts decreases survival time and increases the risk of reattempts. In addition to suicidal ideation and suicide attempts, a variety of risk factors for suicide have been documented, including male gender, older age, the presence of physical illness, a poor social network, marital conflict, poor family functioning, interpersonal losses, mental disorders, and substance abuse (Heikkinen et al. 1994; Joe and Kaplan 2001; Tejedor et al. 1999). Depression is an important risk factor for suicide attempt and suicide, as documented by multiple previous studies (Conwell et al. 2000, 2002; Hintikka et al. 2001; Nock and Kazdin 2002).

A variety of social influences interact to shape the risk for suicide, in addition to individual-level characteristics such as depression, hopelessness, and anxiety. Within the field of sociology, there is a rich tradition in the study of social relations of suicide (Maris 1997), including the impact of social isolation, stress, and negative life events on suicide risk. Environment-level risk factors, such as those related to the family environment and the social environment, include: interpersonal losses (such as separation/divorce or death); conflict, abuse, or interpersonal violence; relationship discord or marital distress; lack of a social support network; and stressful life events (such as job problems, financial trouble, legal difficulties, or drop in social status) (Heikkinen et al. 1994; Langhinrichsen-Rohling et al. 1998; Mann et al. 1999; Mina and Gallop 1998; Wagner 1997).

The risk factors associated with suicide among African Americans in particular remain poorly understood (Joe and Kaplan 2001), and the social risk factors associated with suicidal behavior within the African American community also have yet to be fully elucidated. Of the few social risk factors identified, limited economic resources, residing in areas with high rates of income inequality, exposure to violence, and access to

firearms appear to place African Americans at higher risk for suicidal behavior (Joe and Kaplan 2001). Higher levels of family cohesion and family support have been shown to be associated with lower levels of suicidal ideation among African American college students (Harris and Molock 2000). Among African American women, risk factors for suicide attempt include psychological distress, symptoms of posttraumatic stress disorder, substance abuse, hopelessness, relationship discord, intimate partner violence, history of childhood maltreatment, low levels of social support, aggression, maladaptive coping strategies, lower religiosity/spirituality, and lower ethnic identity (Nisbet 1996; Kaslow et al. 1998, 2000a, b, 2002, 2004). For African American men, social risk factors have also been identified, including marital disruption, residing in an environment with occupational and income inequalities between African Americans and Caucasian Americans, and lack of church attendance (Joe and Kaplan 2001).

Research on family and social risk factors for suicide can be facilitated by the use of thoroughly developed theories and models of health behavior. Specifically, two conceptual frameworks, Social Cognitive Theory (SCT) and Social Support Theory, help to take into account the family and social aspects of suicide risk. Such models may also be useful in the development of interventions to reduce the risk of suicidality.

SCT synthesizes a wide array of emotional, cognitive, and behavioral understandings of health behaviors and behavioral change (Bandura 1986). SCT, which had its origins in social learning theory, explains behavior in terms of a triadic model in which personal factors and environmental factors interact with behavior – a dynamic interaction that has been termed *reciprocal determinism* (Bandura 1978). The “environment” implicated in SCT consists of those factors that may affect behavior that are physically external to the person. Such factors may provide opportunities or create barriers, and the social context is, therefore, an important component of one’s environment. While some attention has been given to the person-level factors that influence suicidality among African American populations (psychological distress or symptoms, hopelessness, maladaptive coping skills, aggression and impulsivity, lower levels of spirituality and religiosity, the presence of psychiatric disorders, and lower levels of ethnic identity; Kaslow et al., 2004), the social environment factors that may contribute to suicide risk have been understudied, especially in African American and other minority populations. Following the model put forth by SCT, suicide attempt can be conceived of as a maladaptive health behavior that is determined by both person-level factors, such as depressive symptoms, and by environment-level factors, such as deficits in family functioning and social support.

Other behavioral science models that highlight the social environment include the ecological approaches that emphasize social networks and social support. The term *social network* refers to the set of personal contacts

and social relationships that provide functions including *social support* (Israel and Rounds 1987). Such social support may serve as a key psychosocial protective factor that provides resilience in the context of stress, reducing vulnerability for a variety of negative health outcomes (Cassel 1976). Resources in the areas of social networks and social support, at both the individual and community levels, may have direct health-enhancing effects and may diminish the negative effects of stressors (Glanz et al. 1997). Having someone to provide help or emotional support may be a protective factor in the face of negative consequences of illness or stressful situations (Sherbourne 1998). Social support is a subjective and personal experience, and the perception of social support may be as important as the actual support received.

We sought to explore some of the social environment variables that may serve as risk factors for suicide attempt among low-income, urban African Americans, using data from a case-control study. Specifically, this analysis focused on two important dimensions of the social environment – family relationships and social support. We hypothesized that, compared to nonattempters (controls), African American suicide attempters would report lower levels of family cohesion and family adaptability, as well as lower levels of social embeddedness and social support. Furthermore, we hypothesized that, even after controlling for significant demographic and social factors, these social environment variables would be associated with outcome status (suicide attempters vs. nonattempters). We also explored the association between these social environment variables and suicide attempt while considering an important person-level variable, depressive symptoms. It was predicted that depressive symptoms would be another independent, strong risk factor for suicide attempt.

## Subjects and methods

### Participants

Data for these analyses were obtained from a case-control study designed to examine the person and environment risk factors for suicide attempt among African American men and women aged 18–64 years, who sought services at a large, urban, public hospital in the southeastern U. S. The research protocol was approved by the Emory University Institutional Review Board and the Grady Health System Research Oversight Committee prior to study initiation. Participants provided written informed consent, and screening measures were administered to determine eligibility. Questionnaires were administered verbally by trained research assistants due to low levels of functional literacy in this population. Each participant was reimbursed \$25 for participation. The sample ( $n = 200$ ) consisted of 100 cases and 100 controls. Cases included 50 men and 50 women who were being seen by medical or psychiatric services within 24 hours after a suicide attempt, and the control group included 50 men and 50 women with no history of suicidal behavior who were seeking medical care in an urgent care clinic within the same hospital.

Of the 128 people referred for the attempter group, 28 (21.9%) were excluded due to: refusal to participate ( $n = 20$ , 15.6%), inability to complete the protocol due to acute psychosis ( $n = 3$ , 2.3%), significant cognitive impairment based on the Mini-Mental State Examina-

tion ( $n = 2$ , 1.6%), and other non-specific reasons ( $n = 3$ , 2.3%). Of the 116 people approached to participate in the control group, 16 (13.8%) were excluded due to: refusal to participate ( $n = 8$ , 6.9%), a history of at least one prior suicide attempt ( $n = 6$ , 5.2%), significant cognitive impairment ( $n = 1$ , 0.9%), and other non-specific reasons ( $n = 1$ , 0.9%). Among the 100 attempters, 65% had attempted suicide previously. Overdose was the most common method of attempting suicide (64.6%). Risk-rescue ratings (Weissman and Worden 1972) indicated low to moderate suicide attempt lethality. Scores on the Suicide Intent Scale (Beck et al. 1974) indicated that the attempters' levels of intent with regard to circumstances and lethality were low to medium.

### Materials

A *Demographics Data Sheet* was completed for each participant. Data gathered on this form included age, educational level, relationship status, number of children, current employment, monthly household income, homelessness, past criminal conviction, gun ownership, past psychiatric or substance abuse treatment, current medications, and number of visits to a doctor in the last year.

The *Family Adaptability and Cohesion Evaluation Scale (FACES II)* is a 30-item self-report questionnaire completed with reference to one's family of origin (Olson et al. 1985). The scale was derived from the initial 50-item FACES II, after administration of the latter to 2,412 individuals in a national survey (Olson et al. 1985). These researchers used factor analysis and reliability analysis to reduce the original scale to 30 items. Participants are asked to "describe your family" for each of 30 statements on a 5-point Likert scale. Responses range from 1 ("almost never") to 5 ("almost always") for each item. Eight of the items are reverse-scored. Sixteen of the items assess family cohesion (how emotionally bonded family members are to one another), and the other 14 items assess family adaptability (ability of a family system to change its power structure, role relationships, and rules in response to situational and developmental stress). Higher scores indicate higher levels of family functioning. The internal consistency of the full scale has been demonstrated to be adequate, with a Cronbach's internal consistency reliability coefficient ( $\alpha$ ) of 0.90; the cohesion and adaptability subscales are also reliable, with Cronbach's  $\alpha$  values of 0.78–0.88. In the present study, the two subscale scores were used as measures of family adaptability and family cohesion, with possible scores ranging from 14 to 70 and 16 to 80, respectively. The Cronbach's internal consistency reliability coefficient ( $\alpha$ ) for the total FACES II (30 items) was 0.91, and the Cronbach's  $\alpha$ s for the family adaptability subscale and family cohesion subscale were 0.74 and 0.90, respectively.

The *Social Embeddedness Scale* (originally called the *Louisville Social Support Scale*) is a 10-item scale that assesses social embeddedness, including the extent and closeness of the respondent's social network and degree of satisfaction with the support provided by that social network (Norris and Murrell 1987). The instrument includes questions about relatives, friends, best friends, neighbors, and social organizations. Each item is scored on a scale from 1 to 4, and two items are reverse-scored. Cronbach's internal consistency  $\alpha$  and test-retest reliability have been shown to be 0.82 and 0.70, respectively (Norris and Murrell 1987). In the research presented herein, a summation of all item responses was used as a measure of social embeddedness. Possible scores range from 10 to 40, with higher scores indicating higher degrees of perceived social support. The Cronbach's  $\alpha$  for the 10-item Social Embeddedness Scale was 0.70 in the present study.

The *Medical Outcomes Study (MOS) Social Support Survey* consists of 19 short, simple items designed for use in patient populations (Sherbourne and Stewart 1991). The instrument measures perceived emotional and physical elements of social support, and was developed based on a review of available support measures. To decrease respondent burden, social support is measured without regard to the source (e.g., whether the support comes from family, friends, community, or others). Items describe a supportive stance and participants respond on a Likert scale from 1 ("none of the time") to 5 ("all of the time"). Dimensions of the scale include emotional/informational support, tangible support, positive social interaction, and affectionate support. Reliability and validity have been studied among a sample of 2,987 patients who completed enrollment questionnaires

for the MOS (Sherbourne and Stewart 1991). High convergent and discriminant validity of items was documented, supporting the dimensionality of the measures. Multitrait and confirmatory factor analyses support the scoring of the four subscales, but data also support the use of an overall index that combines the 19 items. Cronbach's internal consistency reliability coefficient ( $\alpha$ ) was shown to be 0.97 for the overall index, and the 1-year stability coefficient was 0.78 (Sherbourne and Stewart 1991). In the present study, the total score was used as a measure of overall social support. Possible scores range from 19 to 95, with higher scores indicating higher degrees of perceived social support. We found the Cronbach's  $\alpha$  for the MOS Social Support Survey (19 items) to be 0.97 in our sample.

The 21-item *Beck Depression Inventory-II (BDI-II)* is one of the most widely utilized measures of depressive symptoms (Beck et al. 1996). The scale has a 2-week time frame, and scores can range from 0 to 63 with higher scores indicating more depressive symptoms. A number of studies have documented the internal consistency, test-retest reliability, and construct validity of the scale among various populations (Al-Musawi 2001; Coles et al. 2001; Kojima et al. 2002). The BDI-II was found to have a Cronbach's  $\alpha$  of 0.95 in our sample.

### ■ Analysis

Descriptive statistics were computed for a number of demographic, social, and clinical variables for the sample of participants. To assess the comparability of suicide attempters and controls, these variables were examined for significant differences between groups using  $\chi^2$  tests. The group means of the four environment risk factor scores (family adaptability, family cohesion, social embeddedness, and social support) were computed, and differences in means between cases and controls were assessed using independent samples Student's *t*-tests. Crude odds ratios (cORs) and corresponding confidence intervals (CIs) were calculated for environment risk factors for suicide attempt among the cases and controls. Scores for environment risk factors were categorized into quartiles as described below.

To assess for potential confounding associations, the social and clinical characteristics that were found to be significantly different between the two groups were used as independent variables in independent samples *t*-tests comparing means of the environment risk factors of interest. Logistic regression analyses were then used to obtain adjusted odds ratios (aORs) and corresponding CIs for the lowest three quartiles of each of the potential social environment risk factors (family cohesion, family adaptability, social embeddedness, and social support), controlling for social and clinical covariates that were found to be significantly related to both exposure (environment risk factors) and outcome (case/control status). Additionally, the total BDI-II score was then entered into these four logistic regression models to assess for an independent association between depressive symptoms and suicide attempt, controlling for the social environment risk factors.

To aid in interpretability of results, the continuous measures of the social environment risk factors were divided into quartiles, with each of the lower quartiles being compared to the highest quartile in the computation of cORs and aORs. This was accomplished by creating three dummy variables ("first", "second", and "third") for each of the four exposure variables of interest, such that everyone in the first quartile would get a "1" on the variable called "first" while all others would get a "0", everyone in the second quartile would get a "1" on the variable called "second" while all others would get a "0", and everyone in the third quartile would get a "1" on the variable called "third" while all others received a "0". These three categories were then compared to the fourth quartile, since this quartile represents the lowest risk category (highest levels of family functioning or social embeddedness/support). aORs were obtained in four logistic regression models that contained significant covariates and the three lowest quartiles for the social environment variable of interest. An overall logistic regression model was built, containing significant covariates and total scores for the FACES II, the Social Embeddedness Scale, and the MOS Social Support Survey. For this overall model, which assessed the relative importance of the social environment variables, continuous scores of the rating scales were used, because entering all quartile-level variables into the model resulted in insufficient power.

Additional models that included total BDI-II score were built for each of the social environment risk factors. Because entering total BDI-II score into each of the four logistic regression models resulted in the aORs for the four social environment variables becoming non-significant (while the total BDI-II score was strongly significant in each model), further analyses were conducted to examine a possible mediational role of depressive symptoms. Sobel's test was used to assess the indirect effect of the independent variable on the dependent variable via the mediator (Sobel 1982).

Observations with missing values were not included in analyses. The significance level for all findings was set at  $\alpha = 0.05$ . All analyses were conducted using the SPSS (11.0) software.

## Results

Cases (suicide attempters) and controls (nonattempts) were compared with reference to a number of basic demographic characteristics, including age, educational level, relationship status, children, current employment status, and monthly household income. As shown in Table 1, the two groups were not significantly different on any of these demographic variables, as assessed by  $\chi^2$  tests. That is, in terms of demographics, the cases and controls were overall very similar. Descriptive statistics confirm that the sample represents a socioeconomically disadvantaged population. Only 25% and 33% of cases and controls, respectively, had attained an educational level beyond high school, and only 25.3% and 19.8% of the cases and controls, respectively, received an income of more than \$2,000 per month.

Several social and clinical characteristics were also compared, including homelessness, past criminal conviction, gun ownership, past psychiatric or substance abuse hospitalization or treatment, current medications, and number of visits to a doctor in the last year. Three of these variables were significantly different between the two groups (Table 2), based upon  $\chi^2$  tests. The cases had a higher percentage of homeless individuals (23%, compared to 11.2% in the control group;  $\chi^2 = 4.83$ ,  $df = 1$ ,  $p = 0.03$ ). The cases also had a higher percentage of individuals with a past criminal (misdemeanor or felony) conviction (57.6%, compared to 40.4% in the control group;  $\chi^2 = 5.84$ ,  $df = 1$ ,  $p = 0.02$ ). As expected, the group of cases had a higher percentage of individuals with past psychiatric or substance abuse hospitalization or treatment (58.6%, compared to 17.2% in the control group;  $\chi^2 = 36.08$ ,  $df = 1$ ,  $p < 0.001$ ). The other social and clinical characteristics that were examined (gun ownership, currently taking medicines, number of visits to a doctor in the last year) were not significantly different between the two groups. Variables found to be statistically significant based on the  $\chi^2$  tests were later included in logistic regression analyses to determine independent associations with suicide attempt status and to calculate aORs.

Bivariate (unadjusted) statistical analyses were conducted to examine differences in mean scores between cases and controls for the four environment risk factors of interest (family adaptability, family cohesion, social embeddedness, and social support). As shown in Table 3,

**Table 1** Comparisons of demographic characteristics of cases (n = 100) and controls (n = 100): African American men and women aged 18–64 years seeking treatment at a large, urban, public hospital

Variable	Cases (suicide attempters) Frequency (%)	Controls (non-attempters) Frequency (%)	$\chi^2$	p-value
Age				
18–30	53 (53.0)	37 (37.4)	6.08	0.11
31–40	29 (29.0)	33 (33.3)		
41–50	14 (14.0)	20 (20.2)		
51–64	4 (4.0)	9 (9.1)		
Educational level				
≤9 <sup>th</sup> Grade	16 (16.0)	19 (19.0)	6.05	0.11
10 <sup>th</sup> –11 <sup>th</sup> Grade	39 (39.0)	23 (23.0)		
12 <sup>th</sup> Grade	20 (20.0)	25 (25.0)		
> 12 <sup>th</sup> Grade	25 (25.0)	33 (33.0)		
Relationship status				
Single, never married, or dating but not cohabitating	56 (56.0)	58 (58.0)	0.31	0.86
Married or cohabitating but not married	19 (19.0)	16 (16.0)		
Separated, divorced, or widowed	25 (25.0)	26 (26.0)		
Children				
No	36 (36.0)	35 (35.0)	0.02	0.88
Yes	64 (64.0)	65 (65.0)		
Currently employed				
No	60 (60.0)	54 (54.5)	0.61	0.44
Yes	40 (40.0)	45 (45.5)		
Monthly household income				
≤\$249	13 (13.7)	5 (5.2)	9.76	0.08
\$250–499	11 (11.6)	6 (6.3)		
\$500–999	25 (26.3)	30 (31.3)		
\$1,000–1,999	22 (23.2)	36 (37.5)		
≥\$2,000	24 (25.3)	19 (19.8)		

**Table 2** Comparisons of select social and clinical characteristics of cases (n = 100) and controls (n = 100): African American men and women aged 18–64 years seeking treatment at a large, urban, public hospital

Variable	Cases (suicide attempters) Frequency (%)	Controls (non-attempters) Frequency (%)	$\chi^2$	p-value
Homeless				
No	77 (77.0)	87 (88.8)	4.83	0.03
Yes	23 (23.0)	11 (11.2)		
Past criminal conviction				
No	42 (42.4)	59 (59.6)	5.84	0.02
Yes	57 (57.6)	40 (40.4)		
Gun ownership				
No	95 (95.0)	89 (89.9)	1.86	0.17
Yes	5 (5.0)	10 (10.1)		
Past psychiatric or substance abuse hospitalization or treatment program				
No	41 (41.4)	82 (82.8)	36.08	< 0.001
Yes	58 (58.6)	17 (17.2)		
Currently taking medicine				
No	52 (52.0)	61 (63.5)	2.67	0.10
Yes	48 (48.0)	35 (36.5)		
Number of visits to doctor in the last year				
0	13 (13.5)	7 (7.1)	5.75	0.06
1–3	36 (37.5)	53 (53.5)		
> 3	47 (49.0)	39 (39.4)		

**Table 3** Means and standard deviations (SDs) of scores for family and social risk factors of interest, independent samples *t*-test comparisons of means between attempters and controls

Variable	Attempters Mean (SD) n	Controls Mean (SD) n	t	df	p
Family adaptability	38.77 (8.84) n = 100	43.73 (8.27) n = 100	4.10	198	< 0.001
Family cohesion	45.28 (12.57) n = 100	55.62 (13.05) n = 100	5.71	198	< 0.001
Social embeddedness	21.32 (4.22) n = 99	25.04 (4.93) n = 100	5.71	197	< 0.001
Social support	59.28 (20.85) n = 98	75.71 (17.71) n = 99	5.96*	189	< 0.001

\* Equal variances not assumed for this comparison due to statistically significant Levene's test for equality of variances

mean scores for each of these four measures were strongly statistically significantly different, with the control group scoring higher on each measure. The mean score for family adaptability among cases was 38.77, compared to 43.73 in the controls (mean difference = 4.96,  $t = 4.10$ ,  $df = 198$ ,  $p < 0.001$ ). The mean score for family cohesion among cases was 45.28, compared to 55.62 in the controls (mean difference = 10.34,  $t = 5.71$ ,  $df = 198$ ,  $p < 0.001$ ). The mean social embeddedness score among the cases was 21.32, compared to 25.04 in the controls (mean difference = 3.72,  $t = 5.71$ ,  $df = 197$ ,  $p < 0.001$ ). The mean score for social support among the cases was 59.28, compared to 75.71 in the controls (mean difference = 16.43,  $t = 5.96$ ,  $df = 189$ ,  $p < 0.001$ ).

cORs were calculated for the first, second, and third quartiles for each environmental risk factor of interest (Table 4). The cOR for exposure to the first quartile

(compared to the highest quartile) of *family adaptability* for cases compared to controls was 5.30 (95% CI = 2.24, 12.57). The cORs for exposure to the first and second quartiles (compared to the highest quartile) of *family cohesion* for cases in relation to controls were 12.00 (95% CI = 4.64, 31.02) and 5.80 (95% CI = 2.42, 13.88). The cORs for exposure to the first quartile and second quartile (compared to the highest quartile) of *social embeddedness* for cases compared to controls were 7.25 (95% CI = 2.94, 17.89) and 4.56 (95% CI = 2.04, 10.20). The cOR for exposure to the first quartile (compared to the highest quartile) of *social support* for cases compared to controls was 9.12 (95% CI = 3.68, 22.61). These unadjusted cORs indicate a strong association between exposure to lower levels of family adaptability/cohesion and social embeddedness/support and suicide attempt (case) status.

Confounders are variables that are associated with both the outcome (case vs. control status) and the exposure (environment risk factors of interest), and controlling for confounding (obtaining adjusted estimates) reduces or corrects the bias in the estimates of the true exposure-outcome relationships. To assess for potential confounding associations, the social and clinical variables that were found to be significantly associated with control/case status (homelessness, past criminal conviction, and past psychiatric or substance abuse treatment) were studied in relation to the environment risk factors of interest. As shown in Table 5, these covariates were generally significantly associated with the environment risk factors. They were, therefore, controlled for in the logistic regression models used to obtain aORs.

As shown in Table 6, aORs were calculated with logistic regression models that controlled for the three significant covariates (homelessness, history of conviction, and history of psychiatric/substance use treatment). Controlling for these significant covariates had only a minimal effect in reducing the cORs described previously. Specifically, after adjustment, among cases the odds of scoring in the lowest quartile of family adaptability were 3.9 times the odds among controls. Similarly, the aORs for exposure to the lowest quartiles of family cohesion, social embeddedness, and social support were 8.91, 5.67, and 6.29, respectively. These

**Table 4** Crude odds ratios (cORs) for environment risk factors for suicide attempt in 100 suicide attempters and 100 controls

Quartile	cOR	95% CI
Family adaptability		
1 <sup>st</sup> Quartile	5.30*	2.24, 12.57
2 <sup>nd</sup> Quartile	1.90	0.88, 4.12
3 <sup>rd</sup> Quartile	2.33*	1.06, 5.16
4 <sup>th</sup> Quartile	Reference group	
Family cohesion		
1 <sup>st</sup> Quartile	12.00*	4.64, 31.02
2 <sup>nd</sup> Quartile	5.80*	2.42, 13.88
3 <sup>rd</sup> Quartile	4.32*	1.84, 10.17
4 <sup>th</sup> Quartile	Reference group	
Social embeddedness		
1 <sup>st</sup> Quartile	7.25*	2.94, 17.89
2 <sup>nd</sup> Quartile	4.56*	2.04, 10.20
3 <sup>rd</sup> Quartile	1.97	0.90, 4.29
4 <sup>th</sup> Quartile	Reference group	
Social support		
1 <sup>st</sup> Quartile	9.12*	3.68, 22.61
2 <sup>nd</sup> Quartile	2.32	0.97, 5.09
3 <sup>rd</sup> Quartile	1.06	0.48, 2.44
4 <sup>th</sup> Quartile	Reference group	

\* Statistically significant odds ratio ( $p < 0.05$ )

**Table 5** Associations between environment risk factors and three social/clinical characteristics found to be significantly different between cases and controls (assessment for possible confounding associations)

Environment risk factor	Covariate		t	df	p
	Mean (SD)	Mean (SD)			
<b>Family adaptability</b>					
Homelessness	Yes: 39.76 (8.99)	No: 41.51 (8.89)	1.04		0.30
Past conviction	Yes: 39.73 (8.21)	No: 42.68 (9.38)	2.35	196	0.02
Past psychiatry/ substance use treatment	Yes: 38.84 (8.92)	No: 42.82 (8.58)	3.12		< 0.01
<b>Family cohesion</b>					
Homelessness	Yes: 44.06 (13.31)	No: 51.67 (13.61)	2.98		< 0.01
Past conviction	Yes: 49.18 (13.31)	No: 51.66 (14.33)	1.27	196	0.21
Past psychiatry/ substance use treatment	Yes: 46.15 (13.10)	No: 53.19 (13.59)	3.58		< 0.001
<b>Social embeddedness</b>					
Homelessness	Yes: 19.85 (4.34)	No: 23.82 (4.75)	4.49		< 0.001
Past conviction	Yes: 22.36 (4.97)	No: 24.05 (4.82)	2.42	195	0.02
Past psychiatry/ substance use treatment	Yes: 21.64 (4.33)	No: 24.12 (5.11)	3.50		< 0.01
<b>Social support</b>					
Homelessness	Yes: 52.24 (19.73)	No: 70.68 (19.85)	4.93		< 0.001
Past conviction	Yes: 61.28 (21.21)	No: 73.65 (19.14)	4.28	193	< 0.001
Past psychiatry/ substance use treatment	Yes: 60.72 (20.82)	No: 72.07 (19.86)	3.81		< 0.001

**Table 6** Adjusted odds ratios (aORs): logistic regression analyses of social environment risk factors for suicide attempt in 100 suicide attempters and 100 nonattempts, controlling for significant sociodemographic differences between groups (homelessness, history of conviction, and history of psychiatric/substance use treatment)

Sample quartile	$\beta$	SE	aOR	95% CI
<b>Family adaptability</b>				
1 <sup>st</sup> Quartile	1.36	0.49	3.90*	1.51, 10.10
2 <sup>nd</sup> Quartile	0.64	0.44	1.90	0.80, 4.48
3 <sup>rd</sup> Quartile	0.58	0.46	1.79	0.73, 4.40
4 <sup>th</sup> Quartile	Reference group			
<b>Family cohesion</b>				
1 <sup>st</sup> Quartile	2.19	0.53	8.91*	3.15, 25.25
2 <sup>nd</sup> Quartile	1.71	0.49	5.51*	2.11, 14.42
3 <sup>rd</sup> Quartile	1.43	0.48	4.20*	1.64, 10.74
4 <sup>th</sup> Quartile	Reference group			
<b>Social embeddedness</b>				
1 <sup>st</sup> Quartile	1.74	0.52	5.67*	2.06, 15.63
2 <sup>nd</sup> Quartile	1.60	0.47	4.93*	1.97, 12.37
3 <sup>rd</sup> Quartile	0.42	0.45	1.53	0.64, 3.68
4 <sup>th</sup> Quartile	Reference group			
<b>Social support</b>				
1 <sup>st</sup> Quartile	1.84	0.52	6.29*	2.26, 17.49
2 <sup>nd</sup> Quartile	0.57	0.45	1.76	0.73, 4.23
3 <sup>rd</sup> Quartile	-0.43	0.48	0.65	0.25, 1.68
4 <sup>th</sup> Quartile	Reference group			

\* Statistically significant odds ratio ( $p < 0.05$ )

aORs indicate a strong association between the environment risk factors and case/control status even after controlling for three potential confounders. An apparent dose-response relationship emerged, in the expected direction, among the estimates of aORs for the

different quartiles for each of the social environment variables.

It may be the case that social environment variables are statistically significant predictors, but that their accuracy is low. To examine the accuracy of classification of attempters vs. controls, sensitivities and specificities were calculated for the significant social environment variables, using 2x2 tables. These values are shown in Table 7. Because the predictive value positive (probability that a person with a positive test is a true positive) and predictive value negative (probability that a person with a negative test is a true negative) are dependent upon the prevalence of the condition in the population for which the test is used, and because our case-control study had an artificial "prevalence" of suicide attempt of 50%, we used the estimate by Ialongo and colleagues (2002) to estimate the predictive values in our similar population. That is, they reported the 6-month prevalence of suicide attempt among 1,157 economically disadvantaged African Americans in Baltimore, Maryland to be 0.4%. Thus, assuming a population of 10,000, there

**Table 7** Sensitivities and specificities of significant social environment variables in relation to suicide attempt

Significant social environment variable	Sensitivity	Specificity
Family adaptability – first quartile	31%	88%
Family cohesion – first quartile	33%	89%
Family cohesion – second quartile	29%	80%
Social embeddedness – first quartile	29%	90%
Social embeddedness – second quartile	31%	83%
Social support – first quartile	40%	91%

would be 40 suicide attempts over the course of 6 months. Based on our sensitivity (29%) and specificity (90%) for the lowest quartile of social embeddedness, 12 attempters would score in the lowest quartile (true positives), 28 attempters would not score in the lowest quartile (false negatives), 8,965 nonattempters would not score in the lowest quartile (true negatives), and 995 nonattempters would score in the lowest quartile (false positives). In this scenario (prevalence of 0.4%), the predictive value positive would be only approximately 1%.

When all social environment variables were entered into a single logistic regression model simultaneously, social embeddedness was found to remain significant, indicating that this aspect of the social environment might carry the most weight for intervention purposes. In this overall model, rating scale scores were entered as continuous variables rather than as quartiles, because of insufficient power to determine the relative importance of the different variables in the model when all quartiles were entered together. Before building this overall model, social environment variables were screened for collinearity by examining correlation matrices. The FACES II total score was used rather than the family adaptability and family cohesion subscales because of significant collinearity between these two scales ( $r=0.74$ ,  $p<0.001$ ). A correlation matrix with total FACES II score, total Social Embeddedness Scale score, and total MOS Social Support Survey score revealed correlation coefficients of less than 0.70 ( $r=0.51$ – $0.63$ ).

Because the exposure OR in a case-control study estimates the risk odds ratio (ROR), and since the risk of the outcome is of much more interest than the risk of exposure, these ORs can be interpreted in the context of risk for suicide attempt. The case-control study conducted herein is an incidence density type case-control study, and the aORs that were derived from the logistic regression model therefore estimate the relative rate (rate ratio) of suicide attempt between the different exposure levels. For example, among our sample of low-income African Americans, the rate of suicide attempt is increased by nearly ninefold among those scoring in the lowest quartile of family cohesion, and by about sixfold among those scoring in the lowest quartile of social support.

When the person-level risk factor of interest (depressive symptoms as measured by the BDI-II) was entered into each of the four logistic regression models, the aORs for the four social environment variables became non-significant, while the total BDI-II score was strongly significant ( $p<0.001$ ) in each model. We found that the BDI-II score was correlated with each of the social environment variables. The Pearson correlation coefficients for total BDI-II score and family adaptability, family cohesion, social embeddedness, and social support were  $-0.34$ ,  $-0.46$ ,  $-0.44$ , and  $-0.49$ , respectively. Each of these correlations was statistically significant ( $p<0.001$ ). Given that in each model there were large changes in the magnitude of the model coefficients and aORs, it is unlikely that this effect is the result of a

change in model power related to the addition of the BDI-II variable. For example, the  $\beta$ -coefficient for the first quartile of social support was 1.84 in the model without the BDI-II (aOR = 6.29, CI = 2.26, 17.49), which dropped to  $\beta = 0.64$  in the model containing the depressive symptoms score (aOR = 1.90, CI = 0.55, 6.52). These findings indicate a mediational role for depressive symptoms in the association between the social environment risk factors and suicide attempt. This mediation was further tested with Sobel's test, which tests the significance of the indirect effect. This is equivalent to testing whether or not the drop in the total effect is significant upon inclusion of the mediator in the model (Holmbeck 2002). In each of the four logistic regression models, the indirect effect for the lowest quartile was significant (for the lowest quartile of family adaptability,  $z = 4.58$ ,  $p < 0.001$ ; for the lowest quartile of family cohesion,  $z = 4.94$ ,  $p < 0.001$ ; for the lowest quartile of social embeddedness,  $z = 4.13$ ,  $p < 0.001$ ; and for the lowest quartile of social support,  $z = 5.29$ ,  $p < 0.001$ ).

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## Discussion

In the area of family functioning, we found that lower reported levels of both family adaptability and family cohesion, measured with the FACES II questionnaire, increased the relative rate of suicide attempt in our sample. The aOR associated with the lowest quartile of family adaptability was 3.90, and the even stronger aORs associated with the first and second quartiles of family cohesion were 8.91 and 5.51, respectively. These findings are consistent with the limited previous research on the family environment in relation to suicidality among African Americans. Harris and Molock (2000) assessed family cohesion using the cohesion subscale of the Family Environment Scale, which evaluates the extent to which family members are concerned, committed, and supportive. They found a significant inverse relationship between suicidal ideation and family cohesion among African American college students. Among African American women, Kaslow and colleagues (2000a) found that women who attempt suicide have more negative ratings of both their family of creation and their family of origin than do demographically matched women with no history of suicidal behavior. Lower family adaptability and cohesion also have been found to be important risk factors among African American adolescents (Summerville et al. 1994).

In the area of social support, we found that lower reported levels of both social embeddedness and social support, measured with the Social Embeddedness Scale and the MOS Social Support Survey, respectively, increased the relative rate of suicide attempt in our sample. The aOR associated with the first and second quartiles of social embeddedness were 5.67 and 4.93, respectively, and the aOR associated with the lowest quartile of social support was 6.29. Again, these findings are consistent with prior reports. Using the Perception

of Support Inventory, Harris and Molock (2000) assessed perceived support from family and peers, and found that suicidal ideation among their sample was inversely correlated with family support. Thompson and colleagues (2002) reported that, among African American women, the association between self-efficacy and suicide attempt is partially accounted for by the mediating roles of perceived social support from family and friends. Other studies support the notion that seeking emotional support in friends and family members is a protective factor against suicide in African Americans (Nisbet 1996; Gibbs 1997; Kaslow et al. 1998). Prior research indicates that social factors such as being separated/divorced/widowed, lack of social integration, and substance abuse increase the risk for suicidal behaviors among African Americans (Stack 1996; Gibbs 1997; Jones 1997; Juon and Ensminger 1997).

While the importance of these risk factors is indicated by the magnitude of the aORs, the issue of the diagnostic accuracy of these variables remains to be determined. Based on previous data on the prevalence of suicide attempt in a similar population, we estimated the predictive value positive of one of the strongest aORs, the first quartile of social embeddedness. Our estimation revealed that given the relatively low short-term prevalence of suicide attempt, the predictive value positive of a single social environment risk factor is extremely low. These measures may, therefore, not be particularly useful in accurately identifying cases for intervention – though they are statistically significant predictors, their diagnostic accuracy is likely low.

We found a mediating role of depressive symptoms in the association between the social environment variables and suicide attempt. The mediator function of a third variable represents the generative mechanism through which the focal independent variable is able to influence the dependent variable of interest (Baron and Kenny 1986). A mediating role is supported by the findings that: (1) the independent variables (social environment variables) are associated with the outcome, (2) the mediator (depression) is associated with the outcome, (3) the independent variables are associated with the mediator, and (4) when the independent variable and the mediator are entered into the model, the association between the independent variable and the outcome is no longer significant. Conditions one and two were assessed with independent samples *t*-tests and logistic regression models. The third condition was assessed with Pearson correlation coefficients. The final condition was met when BDI-II score was entered into the logistic regression models that contained the social environment variables. Given that in each model there were large changes in the magnitude of model coefficients and aORs, it is unlikely that this effect is the result of a change in model power with the inclusion of the additional variable (BDI-II). The significance of the mediated effect was also demonstrated statistically, using Sobel's test. This indicates that depressive symptoms function as a mediator since this variable accounts for

the relation between the predictor and the outcome. That is, in the pathway toward suicide attempt among our African American sample, the family and social environment deficits of those individuals in the lowest quartiles of family functioning and social embeddedness/support may have led to depressive symptoms, which in turn were associated with suicide attempt. This may indicate that interventions should focus at the more basic level of family and social environment in addition to the more proximal risk factor of depressive symptoms in the pathway toward suicide attempt.

Taken together, our findings and similar prior research indicates that suicidal behavior should be conceptualized using comprehensive theoretical models that incorporate socioenvironmental factors in addition to intrapersonal characteristics. SCT, which posits that the person, the environment, and behavior are intimately interrelated (Bandura 1978), provides a framework for understanding suicidal behavior, and for developing interventions to address the suicidality. Similarly, theories of social networks and social support (Israel and Rounds 1987) provide an important foundation for research into the risk factors and protective factors associated with suicidality. Following the model put forth by SCT, it might be hypothesized that suicide attempt is determined by both person-level factors, such as depressive symptoms, and by the environment-level factors such as deficits in family functioning and social support; and that both sets of factors are independent predictors. However, we found evidence of a mediational role of depressive symptoms in the association between the social environment risk factors and suicide attempt.

Several potential methodological limitations should be considered when interpreting the results of this research. First, the use of a case-control study design confers certain limitations. The use of clinic-based controls, rather than community controls could lead to biased estimates of effect measures because the exposure prevalence (e. g., family characteristics and social supports) of controls might not reflect that of members of the true study base (low-income African Americans in the southeastern U. S.). However, such a bias, if present, is likely to bias toward the null, leading to underestimation, rather than exaggeration, of measures of association. Also, due to the case-control design, data were collected based on retrospective self-report, which may create certain limitations. Second, responses to the researcher-administered questionnaires may have been affected by an element of social desirability, though this is likely to have created non-differential error, not associated with case or control status. Third, as is the case with most cross-sectional observational studies, any inferences about causality must be made with caution. However, as described below, our findings indicate that several criteria for establishing causality are, in fact, met. Fourth, since our primary interest in this analysis was to study family and social environment factors associated with suicide attempt, no formal diagnostic information was gathered. Our regression analyses adjusted for several social

variables that were significantly different between cases and controls, but we did not control for other potential confounders, including impulsivity and substance abuse. However, prior research suggests that the increase in risk for suicide attributable to socioenvironmental risk factors may be comparable to that for diagnostic factors (Gould et al. 1996). Finally, given the demographic characteristics of our sample, generalization to dissimilar populations should be avoided. Also, we were unable to assess potential selection biases due to lack of data on non-participants.

Despite these limitations, this research contains several important strengths. First, several factors support the notion that the family and social environment variables that we studied may play a causal role in the path toward suicide attempt. The strength of the association between the predictor variables and the suicide attempt outcome is fairly impressive. Even after adjusting for the effect of several covariates, the aORs reported herein indicate a strong association. The consistency criterion is met – as described above, our findings are consistent with previous research results. Although the temporality of the associations cannot be established, it is unlikely that perceptions of the family environment and perceived social support would have changed in the hours/day from the time of the suicide attempt until the interview. Another factor that supports a possible causal association is the apparent dose-response relationship that emerged among the estimates of ORs. For example, the aORs from the regression model for family cohesion were: 4.20, 5.51, and 8.91, for the third, second, and first quartiles, respectively; and the aORs in the regression model for social embeddedness were: 1.53, 4.93, and 5.67, respectively. Another advantage of this research design is the use of a relatively large sample of participants, from an understudied population – low-income African Americans. Given the increasing incidence of suicide attempt and completion in this population (Shervington 2000), and the likelihood that different risk factors may be present in different populations, this research provides specific data on our population of interest. Such research is necessary for the development of culturally competent preventive interventions at the clinical and community levels.

Strengthening family functioning and social supports may reduce depressive symptoms and ultimately reduce the risk of suicide among African Americans, though specific recommendations for preventive interventions are limited by the lack of scientifically tested interventions in African Americans (Joe and Kaplan 2001). Our findings indicate that social embeddedness may be a particularly important aspect of the social environment in relation to protection from suicide attempt. Alienation from family and fragmentation of social support may be important risk factors for suicide in African American populations that have traditionally held the family environment in high regard. Culturally competent interventions that promote family functioning and the development of more supportive social en-

vironments may reduce the risk of suicide attempt and completed suicide. Clinicians who assess depressed patients and those with current or past suicidality should be aware of the associations found in this research. These findings may have implications for intervention not only at the clinical level, but also at the community level.

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## Conclusions

Suicide is an important public health problem in the U. S., and, as of 1999, suicide was among the nine leading causes of death for African Americans in all age categories from 10 to 44 years. Elucidation of risk factors and protective factors for suicidality among African Americans will facilitate the development of culturally competent preventive interventions. SCT and theories pertaining to social support are helpful in guiding suicide risk factor research and interventions aimed at preventing suicide. Our findings indicate that social environment factors, including low levels of family functioning and social support, are associated strongly with suicide attempts among low-income African American men and women seeking treatment in a large urban hospital. Our findings also indicate that this association is mediated by depressive symptoms.

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