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## Social Integration and Suicide-related Ideation from a Social Network Perspective: A Longitudinal Study among Inner-City African Americans

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### Abstract

This study examined if social network density, as measured by the extent to which network members know each other, was associated with suicide-related ideation and plan approximately three years later. Eight hundred nineteen African Americans were interviewed at Wave 1 (1997–1999) and Wave 4 (2001–2003) of the Self-Help In Eliminating Life-Threatening Diseases (SHIELD) study, a HIV preventive intervention study in Baltimore, MD. Multinomial logistic regression models were used to compare risks of suicide-related ideation and plan at Wave 4 by Wave 1 density. Even after adjusting for baseline sociodemographic characteristics and depressive symptoms, individuals with lower level of density were three times more likely to report suicide-related ideation and plan in the past year at Wave 4. The findings reinforce the importance of social integration among inner-city African Americans from a social network perspective. Future research should examine the mechanisms associated with this relationship and other social network constructs.

### Introduction

Emile Durkheim, one of the founding fathers of sociology, proposed a causal association between social integration, a prolonged sense of not being interconnected to mainstream society, and suicide (Durkheim, 1951). Since then research has shown that social integration is also a robust protective factor for suicide-related behaviors that is associated with a range of suicide-related behavior, from ideation (Bearman & Moody, 2004; Juon & Ensminger, 1997), attempt (Dervic, et al., 2004; Juon & Ensminger, 1997; Magne-Ingvar, Ojehagen, & Traskman-Bendz, 1992) and death (Duberstein, et al., 2004; Kposowa, 2000; Stack, 2000) and is a possible target for the design of suicide prevention programs. The importance of social integration on suicide is reflected by recent CDC initiative on social connectedness as a strategy for suicide prevention (CDC, 2009). These studies in general have measured social integration using individual-level variables such as involvement in religious activities, marital status and residential stability (Dervic, et al., 2004; Juon & Ensminger, 1997;

Kposowa, 2000) or by using ecological-level variables such as percent married in a geographic area (Cutright, Stack, & Fernquist, 2007; Stack, 2000).

Social network is a micro-social structural level construct, which bridges individual-level and ecological-level constructs (Latkin & Knowlton, 2005). Social network theory helps to characterize the structural and functional aspects of one's social world by examining the web of social ties and the role of these ties in an individual's life (Berkman, Glass, Brissette, & Seeman, 2000; Heaney, Israel, Glanz, Rimer, & Lewis, 2002). A social network structure specifically examines the actual social ties, which provide an avenue in which these functional attributes enact (Berkman, et al., 2000). A person's network structure can be delineated using a personal network inventory, which generates names of individuals who the respondent has a relationship, interacts, or provides functional social support, e.g. perceived financial support. The social structure is operationalized through examination of these social ties, such as number of network members, density (i.e. how well do other members in the network know each other), frequency of contact with network members and the duration of these ties. Determining whether these social network constructs are associated with suicidal behavior will be a great improvement over the research on the link between social factors and suicide, as this measure provides a closer view of individual's social structure. This area may also improve the current understanding of the etiology of suicide-related behaviors and to identify modifiable protective factors that may be targeted for prevention and treatment (Neeleman, 2002). However, a social network approach to studying risk for suicide-related ideation and plan has not been conducted, in particular in inner-city samples with high rates of drug use and HIV risk.

Social integration from a network perspective can be operationalized by network density (Brissette, Cohen, & Seeman, 2000). Network density is the extent to which individuals within a social network know or interact with the other network members. Network density has been associated with number of other health outcomes such as HIV risk behavior (Costenbader, Astone, & Latkin, 2006; Latkin, Forman, Knowlton, & Sherman, 2003). Social integration, as measured by network density, may be important for suicide-related behaviors for several reasons. Having a denser network may foster better social monitoring processes and social norms (Berkman, et al., 2000). Social norms and social monitoring processes are risk regulators that can either constrain or motivate an individual to engage in certain behaviors (Glass & McAtee, 2006). Individuals who belong to a social structure that is highly fragmented may pose greater risk for suicide-related ideation than individuals in a less socially fragmented network structure, especially if individuals in highly fragmented networks lack the regulatory process which discourages one's inclination to engage in suicidal thoughts and behaviors (Neeleman, 2002). Additionally, according to the identity accumulation hypothesis (Thoits, 1983), an individual's sense of meaning of life fostered by social integration may serve as a protective factor for suicidal behavior. Despite the overwhelming number of findings that highlight the importance of social integration in risk for suicide-related ideation, studies examining this construct in its relationship to suicide-related ideation from a social network perspective are almost nonexistent.

This study is one of the first to capitalize on the social network inventory available from the NIDA-supported social network-oriented HIV preventive intervention study, the Self-Help In Eliminating Life-Threatening Diseases (SHIELD) study, to examine the relationship between social network measures of social integration and suicide-related ideation. Using a prospective longitudinal design, this study examines if network density is associated with suicide-related ideation three years later among a sample of inner-city African Americans residing in Baltimore, MD. We hypothesize that individuals with low network density would be more likely to report suicide-related ideation than those with higher network density.

## Methods

### Study Sample

The present study used the data from the baseline assessment of the Self-Help In Eliminating Life-Threatening Diseases (SHIELD) study, a network-based HIV prevention intervention study conducted in Baltimore, MD (Latkin, Sherman, & Knowlton, 2003). The SHIELD study was a randomized controlled behavioral intervention to examine and intervene on social contextual factors associated with HIV risk. Participants were recruited from communities with high rates of drug use by trained recruiters from 1997 to 1999 and were interviewed annually until 2004. Participants were eligible for the SHIELD study if they had at least weekly contact with drug users, were 18 years of age or older, were willing to conduct outreach education on HIV risk behavior reduction, were willing to bring in a risk network member for assessment, and were not recently enrolled in other HIV behavioral interventions. Among the 1,637 participants who completed the baseline visit, 1,546 (95%) were African-Americans. For this study, we focused on the baseline wave (Wave 1) (June, 1997 thru November, 1999), which included the network density measure, and Wave 4 (February, 2001 thru September, 2003), which included the suicide-related questions. Eight hundred forty nine African-Americans from Wave 1 were re-interviewed at Wave 4. After excluding 31 individuals who were missing on baseline demographics (n=14), density (n=13) or suicide-related ideation (n=2), the final sample for this study was 819. Participants remaining in the final sample were less likely to be homeless and female and more likely to have a main sexual partner than the original Wave 1 sample. Study procedures were reviewed and approved by the Committee on Human Research at the Johns Hopkins School of Public Health. All participants provided informed consent and were paid \$15 at the completion of the interview.

### Measures

**Social network structure**—The data on social networks were collected via the Personal Network Inventory, which is a modified version of the Arizona Social Support Inventory (Barrera & Gottlieb, 1981). This inventory has been shown to have good concurrent and predictive validity and internal consistency (Latkin, Mandell, Vlahov, Oziemkowska, & Celentano, 1996). The inventory helps generate the names (first and last initials) of individuals in each individual's network structure. The inventory initiates the process by asking individuals to name people in their lives who have provided or could provide various types of functional social support such as receiving material support (these were participants' network members). Then characteristics regarding these network members were asked such as their age, relationship to the participant, employment status, as well as drug use and perceived HIV status. At the end of the network inventory a matrix of the names of the network members was presented to the participants. Using this matrix, participants were asked which network member knows each other. The density of participant's social network, i.e. the proportion of network members who know each other, was derived by the number of network members who knew each other, divided by the total number of networks listed (the network size). Given the non-normal distribution of this variable, we categorized the proportions of network density into four categories as follows: 1) 25% or less, 2) 25–50%, 3) 50–75% and 4) 75% and above.

**Suicide-related ideation**—The questionnaire on suicide-related ideation was included at Wave 4 of the study and incorporated questions based on the Adult Suicide Ideation Questionnaire (Reynolds, 1991). To ease the interpretation of the findings and to be consistent with the nomenclature of suicide-related ideation (Silverman, 2007), we selected one item that clearly represents suicide-related ideation and three items representing suicide-related planning. Suicide-related ideation was assessed by the question, “Have you ever

thought about killing yourself?” Suicide-related plan consisted of three questions, “Have you thought about [how/when/where] you would kill myself?” Individuals were considered to have planned suicide if they responded affirmatively to any of the three questions. All response choices consisted of ‘never’, ‘yes, but not in the last year’, ‘at least once this year’, ‘at least once a month’, ‘at least twice a week’, and ‘at least once a day’. Responses beyond ‘at least once a month’ were rare; to avoid sparse cell size, we categorized ideation and plan into three categories: 1) within the past year, 2) over a year ago and 3) never. Lifetime attempt was assessed by asking ‘Has anyone in your family attempted suicide, including yourself?’ Individuals who responded affirmatively to this question were further asked who attempted suicide. Individuals were considered to have attempted suicide if they reported that they themselves attempted suicide.

**Depressive Symptoms**—Depressive symptoms were assessed using the Center for Epidemiologic Studies for Depression scale (CES-D) (Radloff, 1977). This scale has been shown to have high reliability and validity among community sample of HCV-infected injection drug users (Golub, et al., 2004). Participants were asked 20 items regarding their psychological well-being in the past two weeks. The possible answers of ‘none’, ‘some of the time’, ‘most of the time’ or ‘all the time,’ were given the score of 0, 1, 2, or 3, respectively. These 20 items were summed, with a total possible score of 60. The cutoff point of 16 was used to define moderate depressive symptoms (Mandell, Kim, Latkin, & Suh, 1999) and 23 to denote severe depressive symptoms (Husaini, Neff, Harrington, Hughes, & Stone, 1980).

**Sociodemographic**—Participants were asked a series of demographic questions. The demographic characteristics considered in this study were gender, race, education level (high school/GED or less than high school education), age, have a main sexual partner, unemployment in the past 6 months, homelessness in the past 6 months, imprisonment in the past 6 months, self-reported HIV status and drug use (heroin and/or cocaine) in the past 6 months.

## Analysis

Exploratory data analysis was conducted to examine missing data and potential outliers in the variables. Chi-square tests and Kruskal-Wallis non-parametric tests were used to compare demographic factors (e.g., age, gender, HIV status, drug use) and depressive symptoms across the four density levels (Table 1). Wave 1 characteristics were also compared across suicide-related ideation and plan assessed at Wave 4 (Table 2). Potential confounders were identified based on substantive knowledge and the characteristics that differed significantly ( $p < 0.05$ ) across the density levels and/or suicide-related ideation and plan. A univariate multinomial logistic regression and multivariate multinomial logistic regression adjusting for these potential confounders were then conducted to estimate the relationship between suicide-related ideation and plan on density levels using relative risk ratios (RRR). To examine if the relationship between suicide-related ideation and plan on network density is also potentially due to an increase in depressive symptoms at Wave 4, we also examined if density level was associated with depressive symptoms at Wave 4 using the CES-D scale and cutoff score consistent with Wave 1. Gender differences were also examined by including interaction term. All analyses were conducted using Stata version 10 (StataCorp, 2007).

## Results

Among the 819 individuals assessed at both Wave 1 and Wave 4, six percent ( $n=51$ ) reported having 25% or less network density, 24% ( $n=196$ ) reported 25–50%, 29% ( $n=267$ )

with 50–75% (29%) and 38% (n=311) individuals reported a dense network of 75% and above. Several baseline characteristics distinguished individuals across these density levels, namely female gender, having a main sexual partner, high school or greater education, homelessness in the past 6 months and HIV positive (Table 1). Specifically, females were more likely to have denser network, and individuals with high school or greater education, were homeless, had no main sexual partner or were HIV positive had lower dense network. Density level did not differ by age, unemployment, use of crack, cocaine, or heroin in the past 6 months, or level of depressive symptoms; density level marginally differed by imprisonment.

Table 2 compares suicide-related ideation and plan assessed at Wave 4 with Wave 1 characteristics. Fourteen percent of the participants (n=117) reported suicide-related ideation within the past year and 17% (n=138) over a year ago. Similarly, 11% (n=93) reported suicide-related plan within the past year and another 11% (n=94) reported planning over a year ago. Both suicide-related ideation and plan were significantly different across the density levels. Additionally, a greater proportion of females, HIV positive participants and high depressive symptoms reported past year suicide-related ideation, as well as past year suicide-related plan. Age was also associated with suicide-related plan. We also examined the percentage of past year plan among those who reported past year ideation [data not shown]. Over 69% of those who reported ideation in the past year also reported planning suicide in the past year. Nine percent (n=71) of the sample also reported a lifetime suicide attempt [data not shown].

The unadjusted and adjusted relationships between depressive symptoms and suicide-related ideation and plan assessed at Wave 4 across Wave 1 density levels are described in Table 3 and Table 4, respectively. In the unadjusted model, density levels were not associated with depressive symptoms at Wave 4. However, individuals with 25% or less network density, as compared to individuals who had 75% or more density level, were over two times more likely to report ideation over a year ago (RRR=2.48, 95%CI=1.17,5.26) and ideation within the past year (RRR=2.82, 95%CI=1.28,6.20), than never reporting ideation. Having a density network of 25–50%, as compared to high density (75% or above), was also associated with increased ideation over a year ago (RRR=1.75; 95%CI=1.07, 2.85), and 50–75% density level was also associated with increase in past year ideation (RRR=1.90; 95%CI=1.16, 3.10). A similar trend was observed with suicide-related plan; 25% or less density level, as compared to highest density, increased the risk of past year plan (RRR=3.05, 95%CI: 1.35, 6.99).

Even after adjusting for sociodemographic characteristics and depressive symptoms assessed at Wave 1, almost all relationships significant in the unadjusted model remained significant. Participants with 25% or less dense network, as compared to those with very high density level (75% and above), were over two times more likely to report ideation over a year ago (RRR=2.52; 95%CI=1.12, 5.65), as well as within the past year (RRR=3.09; 95%CI=1.30, 7.34) than to not report ideation in their lifetime. In addition, 25–50% density level was associated with increased ideation over a year ago (RRR=1.73; 95%CI=1.03,2.90), and 50–75% density level, as compared to those with 75% or above density level, had higher risk of ideation in the past year (RRR=1.81; 95%CI=1.09,3.00).

Lower levels of density were also associated with suicide-related plan. Participants with 25% or less density, as compared to those with 75% or above density, were three times more likely to report suicide-related plan within a past year than to not report a plan (RRR=3.02; 95%CI=1.27,7.43). Participants with 25–50% density level, as compared to high dense individuals, also had increased risk for planning suicide over a year ago (RRR=2.04; 95%CI=1.14, 3.67). High depressive symptoms were also associated with increased risk for

suicide-related ideation and plan in the adjusted models. Even in the adjusted model, density level at Wave 1 was not associated with depressive symptoms at Wave 4. However, females and those who reported depressive symptoms at Wave 1 were more likely to report depressive symptoms at Wave 4. Although stratified analyses suggested that the association between network density level and suicide-related ideation and plan were stronger in males than females, the interaction effects were not significant [data not shown].

## Discussion

This study strengthens previous findings that social integration, as assessed by social network density, is an important predictor for suicide-related ideation and plan among inner-city African Americans recruited from communities of Baltimore, MD. Consistent with prior literature on social integration on suicide risk (Duberstein, et al., 2004; Juon & Ensminger, 1997; Stack, 2000), individuals with lower density had higher risk for suicide-related ideation and plan over three years later, as compared to individuals with higher social network density. This association remained even after adjusting for other baseline predictors of suicide risk such as depressive symptoms. However, network density level was not associated with future depressive symptoms.

We found high rates of past year suicide-related ideation and plan, as well as high lifetime prevalence of suicide attempt in this sample of inner-city African Americans. Since participants were recruited from areas with high drug use activity, the majority of participants used heroin and cocaine in the past 6 months. Over 69% of individuals who reported ideation in the past year also reported planning suicide. The high rate of reporting plan among ideators in this population is particularly alarming, for this estimate was much higher than 34.6% estimated in the US sample of African Americans (Joe, Baser, Breedon, Neighbors, & Jackson, 2006). The life circumstances of impoverished inner-city residents are often unstable and stressful, and these individuals have a multitude of factors that increase their risk for psychological distress and suicide-related ideation, such as drug use (Johnson, Williams, Dei, & Sanabria, 1990), HIV/AIDS infection (CDC, 2002), violence (Goldstein, 1985), unstable social ties (Valente & Vlahov, 2001) and low resources (Johnson, et al., 1990). Stressful and disadvantaged neighborhood context has also been associated with psychological distress among these individuals, over and beyond the characteristics of individuals residing in these communities (Boardman, Finch, Ellison, Williams, & Jackson, 2001; Latkin & Aaron, 2003; Latkin, Curry, Hua, & Davey, 2007). Addressing mental health issues among inner-city residents is critical, given the important link between mental health and health behavior and high rates of psychological distress found in this population (Galea, et al., 2007). Few studies on suicide-related risks have been conducted among low-income African Americans, but several studies have noted the importance of social networks on suicide attempt among these individuals as well (Compton, Thompson, & Kaslow, 2005). In another study among low-income African Americans in Chicago, individual-level social integration, in particular residential mobility during adolescence and marital status in young adulthood, was also associated with lifetime suicide-related ideation and attempt (Juon & Ensminger, 1997).

Even within this generally high-risk group of individuals, individuals with especially low network density were at higher risk for ideation and plan. This group may represent a particularly marginalized group of individuals with low resources, both socially and financially. This was suggested by number of sociodemographic characteristics examined, for individuals with lowest density were more likely to be homeless and HIV positive and less likely to have a high school education or main sexual partner. Previous study have also suggested drug users with high suicide attempt rates were those who scored less on social functioning scale, had heavier drug use and more HIV risk taking behavior (Rossow &

Lauritzen, 1999), which supports the current findings that individuals with less dense network may comprise of individuals with an amalgamation of risk factors for suicide-related ideation. The finding of the lowest level of density was associated with increased risk for past year plan, highlights that this group is a particularly high-risk group of individuals that may need further attention.

Individuals with relatively high density level (50–75%) were also more likely to report past year suicide-related ideation, as compared to individuals with the highest density level (75% or above); however, individuals with second lowest density level (25–50%) had similar risk for ideation as individuals with the highest density level. This suggests that the relationship between network density and past year suicide-related ideation may not be a dose-response relationship, although additional research is needed to examine these relationships in more detail. Several related literature in social integration and mental health do suggest that higher density may not be linearly associated with decrease in suicidal behavior. Being in a dense network can also add role strain and responsibility to an individual (Goode, 1960), which has been conceptualized to also increase risk for mental health problems especially among individuals with low income (Kawachi & Berkman, 2001). Contrary to the literature on social integration and depressive symptoms, we found that network density level was not associated with depressive symptoms at Wave 4. The already high levels of depressive symptoms in this sample may have nullified the association between density and depressive symptoms. Interestingly, density remained significantly associated with suicide-related ideation and plan despite the lack of significance with depressive symptoms. The relationship between density and suicide-related ideation may potentially occur from a different pathway than increasing depressive symptoms in this population. Future research should examine closely other mediating factors that may relate network density and suicide-related ideation and plan such as social norms and drug use frequency.

The findings should be interpreted in the context of its limitations. Although we were able to delineate the temporality of the network density and suicide-related ideation by assessing them at different time points, there was substantial attrition between the Wave 1 and Wave 4 follow-up. Although the attrition rate was relatively low given the high-risk drug using sample, it limits the generalizability of the sample to those who remained in the study over a period of time and may have decreased study power. Suicide-related questions were not asked at Wave 1 and no details on past year attempt was available at Wave 4. Without suicide-related questions at Wave 1, it is more difficult to disentangle whether density level is actually predictive of ideation and plan or if it is associated with high baseline suicide-related ideation that persists over the years. We also did not have potential mediators such as norms and attitudes regarding suicide. The lack of social integration may affect individuals meaning of life as well (Thoits, 1983), and reasons for living have been shown to be a robust protective factor for suicide-related ideation and behavior (Linehan, Goodstein, Nielsen, & Chiles, 1983; Malone, et al., 2000). Future studies should examine such potential mediators in the relationship between social network density and suicide-related ideation.

Despite these limitations, this study was able to longitudinally examine the relationship between network density and suicide-related ideation and plan. The study was also conducted among underserved population at high risk for suicide-related ideation and behavior. Social integration was measured using a comprehensive social network inventory, which provided a unique perspective on the association between social integration and suicide-related behavior.

It would be important to collect and utilize existing data on social network inventory to further advance the field on psychosocial etiology of suicide-related ideation and behavior. This paper is one of the few to bridge the fields of social network and suicidology by

examining network density and its association with suicide-related ideation and plan. The study highlights the potential of examining social network and its relationship with suicide-related ideation in future studies. Future research should examine other social network constructs, including functional social support ties and network composition such as type of relations and strength of these ties, and to identify working mechanisms between network density and suicide-related ideation and plan.

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**Table 1**

Sample Characteristics by Network Density at Wave 1, SHIELD study (n=819)

	Density Level					p-value
	Overall	25% or less (n=51)	25– 50% (n=196)	50–75% (n=261)	75% and above (n=311)	
	n (%)	n (%)	n (%)	n (%)	n (%)	
Female gender	341 (42)	16 (31)	67 (34)	120 (46)	138 (44)	<b>0.02</b>
Age (Mean±SD)	39±7.2	40±6.1	39±7.3	38±7.4	39±7.1	0.12
HS or greater education	440 (54)	36 (71)	115 (59)	134 (51)	155 (50)	<b>0.02</b>
Have a main sexual partner	522 (64)	19 (37)	97 (49)	180 (69)	226 (73)	<b>&lt;0.001</b>
Unemployed in the past 6 months	700 (85)	40 (78)	165 (84)	221 (85)	274 (88)	0.24
Homeless in the past 6 months	170 (21)	26 (51)	63 (32)	44 (17)	37(12)	<b>&lt;0.001</b>
Imprisoned in the past 6 months	109 (13)	9 (18)	16 (8)	33 (13)	51 (16)	0.05
Self-report HIV positive	149 (18)	15 (29)	51 (26)	46 (18)	37 (12)	<b>&lt;0.001</b>
Drug use in the past 6 months	601 (73)	35 (69)	142 (73)	194 (74)	230 (74)	0.84
Depressive Symptoms						
Moderate	172 (21)	8 (16)	37 (19)	59 (23)	68 (22)	
High	300 (37)	19 (37)	72 (37)	98 (38)	111 (36)	0.87

Table 2

Sample Characteristics and Network Density at Wave 1 by Suicide Ideation and Plan at Wave 4, SHIELD study (n=819)

	Suicide Ideation				Suicide Plan			
	Never (n=564)	Over a year ago (n=138)	Within a past year (n=117)	p-value	Never (n=632)	Over a year ago (n=94)	Within a past year (n=93)	p-value
Network density	n (%)	n (%)	n (%)		n (%)	n (%)	n (%)	
75% or above	237 (42)	41 (30)	33 (28)	<b>0.01</b>	259 (41)	27 (29)	25 (27)	<b>0.02</b>
50–75%	170 (30)	46 (33)	45 (38)		197 (31)	29 (31)	35 (38)	
25–50%	129 (23)	39 (28)	28 (24)		142 (22)	31 (33)	23 (25)	
25% or less	28 (5)	12 (9)	11 (9)		34 (5)	7 (7)	10 (11)	
Female gender	213 (38)	66 (48)	62 (53)	<b>0.003</b>	248 (39)	45 (48)	48 (52)	<b>0.03</b>
Age (Mean±SD)	39±7.3	39±6.3	38±7.5	0.21	39±7.2	40±6.1	37±7.9	<b>0.03</b>
HS or greater education	301 (53)	83 (60)	56 (48)	0.14	337 (53)	59 (63)	44 (47)	0.10
Have a main sexual partner	361 (64)	83 (60)	78 (67)	0.54	406 (64)	57 (61)	59 (63)	0.79
Unemployed in the past 6 months	482 (85)	114 (83)	104 (89)	0.37	539 (85)	79 (84)	82 (88)	0.70
Homeless in the past 6 months	112 (20)	28 (20)	30 (26)	0.37	127 (20)	19 (20)	24 (26)	0.44
Imprisoned in the past 6 months	76 (13)	18 (13)	15 (13)	0.98	89 (14)	6 (6)	14 (15)	0.11
Used drugs in the past 6 months	414 (73)	100 (72)	87 (74)	0.94	467 (74)	70 (74)	64 (69)	0.57
Self-report HIV positive	86 (15)	32 (23)	31 (27)	<b>0.004</b>	99 (16)	22 (23)	28 (30)	<b>0.001</b>
Depressive Symptoms								
Moderate	117 (21)	27 (20)	28 (24)		136 (22)	16 (17)	20 (22)	
High	172 (31)	64 (46)	64 (55)	<b>&lt;0.001</b>	202 (32)	44 (47)	54 (58)	<b>&lt;0.001</b>

**Table 3**

Unadjusted Relationship between Network Density at Wave 1 and Depressive Symptoms, Suicide Ideation and Plan at Wave 4, SHIELD study (n=819)

	Depressive Symptoms		Ideation		Plan	
	Moderate vs. Low RRR (95%CI)	High vs. Low RRR (95%CI)	Over a Year Ago vs. Never RRR (95%CI)	Within a Past Year vs. Never RRR (95%CI)	Over a Year Ago vs. Never RRR (95%CI)	Within a Past Year vs. Never RRR (95%CI)
Network density (ref: 75% and above)						
50–75%	0.99 (0.63,1.55)	1.11 (0.72,1.70)	1.56 (0.98,2.49)	<b>1.90 (1.16,3.10) *</b>	1.41 (0.81,2.46)	<b>1.84 (1.07,3.18) *</b>
25–50%	0.76 (0.46,1.27)	1.00 (0.63,1.58)	<b>1.75 (1.07,2.85) *</b>	1.56 (0.90,2.69)	<b>2.09 (1.20,3.65) **</b>	1.68 (0.92,3.06)
25% or less	1.71 (0.83,3.53)	1.23 (0.56,2.67)	<b>2.48 (1.17,5.26) *</b>	<b>2.82 (1.28,6.20) *</b>	1.97 (0.80,4.88)	<b>3.05 (1.35,6.99) **</b>

\* p<0.05;

\*\* p<0.01;

\*\*\* p<0.001

Table 4

Adjusted Relationship between Network Density at Wave 1 and Depressive Symptoms, Suicide Ideation and Plan at Wave 4, SHIELD study (n=819)

	Depressive Symptoms		Ideation		Plan	
	Moderate vs. Low RRR (95%CI)	High vs. Low RRR (95%CI)	Over a Year Ago vs. Never RRR (95%CI)	Within a Past Year vs. Never RRR (95%CI)	Over a Year Ago vs. Never RRR (95%CI)	Within a Past Year vs. Never RRR (95%CI)
Network density (Ref: 75% and above)						
50–75%	0.94 (0.59,1.50)	1.06 (0.67,1.67)	1.52 (0.95,2.44)	<b>1.81 (1.09,3.00) *</b>	1.39 (0.79,2.44)	1.68 (0.96,2.94)
25–50%	0.78 (0.45,1.35)	1.10 (0.66,1.84)	<b>1.73 (1.03,2.90) *</b>	1.58 (0.88,2.84)	<b>2.04 (1.14,3.67) *</b>	1.58 (0.83,3.00)
25% or less	1.95 (0.87,4.37)	1.63 (0.68,3.95)	<b>2.52 (1.12,5.65) *</b>	<b>3.09 (1.30,7.34) *</b>	1.88 (0.72,4.90)	<b>3.02 (1.27,7.43) *</b>
Female gender	<b>2.29 (1.52,3.46) ***</b>	<b>1.88 (1.25,2.81) **</b>	<b>1.57 (1.05,2.35) *</b>	<b>1.72 (1.11,2.68) *</b>	1.54 (0.96,2.45)	1.51 (0.93,2.46)
Age	1.01 (0.98,1.04)	1.02 (0.99,1.04)	0.99 (0.97,1.02)	0.98 (0.96,1.01)	1.01 (0.98,1.05)	0.97 (0.94,1.00)
HS or greater education	1.04 (0.70,1.54)	<b>0.61 (0.41,0.89) *</b>	1.46 (0.98,2.17)	0.99 (0.65,1.51)	1.58 (0.99,2.52)	0.97 (0.61,1.53)
Have a main sexual partner	0.72 (0.47,1.11)	1.16 (0.76,1.80)	0.86 (0.56,1.30)	1.14 (0.71,1.82)	0.90 (0.55,1.47)	0.97 (0.59,1.62)
Homeless in the past 6 months	0.78 (0.47,1.30)	0.71 (0.43,1.17)	0.81 (0.49,1.33)	1.10 (0.66,1.83)	0.83 (0.47,1.49)	1.03 (0.59,1.78)
Self-report HIV positive	1.34 (0.81,2.23)	1.59 (0.99,2.57)	1.59 (0.99,2.55)	<b>1.90 (1.16,3.13) *</b>	1.54 (0.89,2.64)	<b>2.17 (1.29,3.66) **</b>
Depressive Symptoms (Ref: Low)						
Moderate	<b>2.67 (1.58,4.51) ***</b>	<b>2.72 (1.56,4.76) ***</b>	1.45 (0.85,2.48)	<b>2.72 (1.50,4.92) **</b>	1.09 (0.58,2.07)	<b>2.31 (1.18,4.53) *</b>
High	<b>3.64 (2.29,5.81) ***</b>	<b>6.22 (3.89,9.92) ***</b>	<b>2.38 (1.53,3.69) ***</b>	<b>4.02 (2.40,6.75) ***</b>	<b>2.10 (1.27,3.47) **</b>	<b>4.01 (2.26,7.09) ***</b>

\* p<0.05;

\*\* p<0.01;

\*\*\* p<0.001