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Depression, Smoking, and Ego-Centric Social Network Characteristics in Ohio Appalachian Women

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Abstract

Depression is a serious, costly, and debilitating disorder that is understudied in rural women. Studies show that depression is associated with low social integration and support, but few studies investigate the relationship between depression and social network characteristics. This study examined the associations among women from three Ohio Appalachian counties enrolled in a health study, which aimed to collect information for a future social network smoking cessation intervention. An address-based sampling method was used to randomly select and recruit 404 women. A cross-sectional survey and interview were used to collect information about demographic, psychosocial, behavioral factors, and ego-centric social network characteristics, which are variables derived from an individual (ego) and her first degree contacts (alters). The CES-D scale assessed depressive symptoms. A multivariable logistic regression analysis described the association between these factors and participants with depression (defined as CES-D ≥ 16). Higher network density, or greater number of relationships among alters divided by the total amount of alters, reduced the risk for depression (OR = 0.84, 95% confidence interval [CI] 0.73–0.95). Additionally, women with a high percentage of smoking alters were at greater risk for depression (OR = 1.19, 95% CI 1.02–1.39). Other factors associated with risk for depression included perceived stress score (OR = 1.34, 95% CI 1.24–1.45), loneliness score (OR = 1.37, 95% CI 1.05–1.80), and days with poor physical health (OR = 1.06, 95% CI 1.02–1.11). Findings suggest that psychosocial factors and social networks should be considered when addressing depression in clinical practice.

Keywords

Depression; mental health; social network characteristics; Appalachia

Depression is a serious, costly, and recurrent disorder leading to diminished quality of life, disability, morbidity, and mortality (Spijker et al., 2004). The prevalence of depression in the United States has increased rapidly and is a leading contributor to morbidity and disability

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(Compton, Conway, Stinson, & Grant, 2006). Depression prevalence, incidence, and morbidity are higher in women than men (Centers for Disease Control and Prevention [CDC], 2012; Lopez, Mathers, Ezzati, Jamison, & Murray, 2006; Vos et al., 2012).

Depression is a major public health problem and although it has been relatively well studied, research on women living in rural regions, such as Appalachia, is sparse (Thorndyke, 2005; Wewers et al., 2012). Women from Appalachian counties are more likely to be diagnosed with major depressive disorder than women from non-Appalachian counties (Zhang et al., 2008). Women living in rural areas are more likely than their urban counterparts to encounter factors associated with depression, including low educational attainment, low income, geographic and social isolation, poor health, health insurance type, and stressful events such as unemployment/underemployment or divorce or widowhood (Bruce, 2002; Hauenstein, 2003; Post et al., 2013). Additionally, there are numerous reviews demonstrating that depression is associated with demographic variables such as age, education, employment, and socioeconomic status (Bromet et al., 2011; Kaplan, Roberts, Camacho, & Coyne, 1987; Lehtinen & Joukamaa, 1994; Lorant et al., 2003). Depression also has been associated with psychosocial characteristics such as perceived social support, perceived stress, loneliness, social participation, and discrimination (Bromet et al., 2011; O'hara & Swain, 1996; Williams, Yan, Jackson, & Anderson, 1997).

Moreover, depression has been associated with risky health behaviors, such as alcohol abuse and smoking (Kessler, Chiu, Demler, & Walters, 2005). Depression has been identified as a risk factor for smoking in rural women (Post et al., 2013; Wewers et al., 2012). In addition, depressed smokers are less likely to achieve permanent cessation, as compared to non-depressed smokers (Anda et al., 1990). Further, it has been established that a greater number of smoking friends is associated with the inability to quit smoking (Hitchman, Fong, Zanna, Thrasher, & Laux, 2014).

Depression may be entwined with one's social environment (Gottlieb & Bergen, 2010). For example, perceived social support is highly correlated with depression and objective social support (George, Blazer, Hughes, & Fowler, 1989; Kendler, Myers, & Prescott, 2005; Paykel, 1994). Less is known about depression and the influence of social networks (Gottlieb & Bergen, 2010). Previous social network analyses have demonstrated that depression is associated with the following social network characteristics: (1) being on the periphery of a network, (2) having fewer social connections, and (3) having friends who are similarly depressed (Okamoto et al., 2011; Rosenquist et al., 2011; Schaefer, Kornienko, & Fox, 2011). Although previous literature has demonstrated that social network size is related to depression, other social network characteristics have not been closely examined (George et al., 1989). Further information that characterizes social networks among women, especially those living in rural areas is needed, as much of the current literature on social networks and mental health uses survey information on adolescents (Falci & McNeely, 2009; Huff, 2011; Ueno, 2005).

Social network analysis is the measurement and mapping of relationships between persons. Characterizing social networks may help researchers better understand human health behavior. For example, previous studies have examined the relationship between social

networks and HIV/STDs, substance abuse, obesity, and many more health outcomes (Christakis & Fowler, 2007; Morris, Levine, & Weaver, 2004; Valente, Gallaher, & Mouttapa, 2004). These analyses make it possible to understand how an individual fits within the overall structure of the social network, as a person's attitudes, beliefs, and behavior often are influenced by the person's network characteristics (Valente, 2012).

Egocentric methods involve collection of information solely from the participant, also known as the ego; data are not obtained directly from the peers, also known as alters, nominated by the ego (Rosenquist, Fowler, & Christakis, 2011). Egocentric networks can be measured to provide information about structural characteristics such as number of alters, density, External-Internal (EI) Ratio, and other standard metrics defined by the field of social network analysis (Valente, 2012). If clinicians are better able to understand the relationship between social network characteristics and health behavior, the nature of effective interventions that account for or leverage social context may become clearer (Valente, 2012).

In preparation for the future development and testing of a social network smoking cessation intervention among women in a rural setting, an examination of depression, social networks, and smoking was warranted. As such, the primary aim of this study was to examine the demographic, psychosocial, behavioral (i.e., smoking), and social network characteristics associated with depression among women residing in a rural region (i.e., Appalachian Ohio). These findings will assist to create a better understanding of risk factors for depression, especially in the social context of smoking. Because peers may have the capacity to expedite behavioral change, understanding the associations between depression, smoking, and social network characteristics may provide clinicians with strategies to deliver quality mental health services or promote health behavior change, such as addressing depression or quitting smoking (Valente, 2012).

Methods

Participants

Findings reported in this paper used data from Community Awareness Resources and Education (CARE) II, which is a National Cancer Institute funded Center of Population Health and Health Disparities (P50 CA105632-07). The study was approved by the University's Institutional Review Board. Participants were recruited from three socioeconomically and geographically representative Ohio Appalachian counties using a modified two-phase address-based sampling methodology (Brick, Williams, & Montaquila, 2011). In phase one, randomly selected households were mailed questionnaires requesting the names and phone numbers of all women 18 years or older in the household. A \$2 incentive was provided with the mailing. Upon return, a randomly selected eligible woman from each returned questionnaire was invited into the study (phase two). Eligibility criteria included: (1) female, (2) 18 or older, (3) resident of the selected county, and (4) willing to provide informed consent and complete the survey. If interested, the eligible woman was scheduled for an in-person interview with a trained staff member. All participants were compensated with a \$50 gift card.

Study Measures

Depression—The Center for Epidemiologic Studies Depression Scale (CES-D) is a 20-item scale that measures self-reported symptoms associated with depression within the past week (Radloff, 1977). Each item is scored on a 4-point scale from 0 to 3. Scores range from 0 to 60 with higher scores indicating more depressive symptoms. The CES-D is commonly used in epidemiological and observational studies and a score of 16 is considered a reliable and valid cut point for depressive symptoms (Lewinsohn, Seeley, Roberts, & Allen, 1997; Radloff, 1977). In this investigation, the CES-D Cronbach alpha estimate of reliability was 0.91.

Demographic, Psychosocial, and Behavioral Characteristics—Demographic characteristics included age (18–44, 45–64, 65 years), education (some college/college graduate, high school diploma/GED, less than high school), employment (full-time/part-time, retired, homemaker, disabled, other), insurance type (private, public, uninsured, other), and marital status (married/living with partner, divorced/widowed/separated, never married). Socioeconomic position was measured by the MacArthur Scale of Subjective Social Status and using a ladder image that asked participants to choose the rung on which they stood in relation to the general U. S. population (Giatti, Camelo, Rodrigues, & Barreto, 2012). Ladder rungs ranged from 0 to 10, with higher numbers denoting higher socioeconomic position.

Perceived social support was assessed using the Multidimensional Scale of Perceived Social Support (MSPSS) (Zimet, Powell, Farley, Werkman, & Berkoff, 1990), which measures perceived support from family, friends, and significant others. The scale contains 12 items that use a seven-point response (1 = very strongly disagree to 7 = very strongly agree). This scale has good reliability and validity (Zimet et al., 1990). In this study, the MSPSS Cronbach alpha was 0.94.

Perceived stress was measured using the Perceived Stress Scale (PSS) (Cohen, Kamarck, & Mermelstein, 1983), which is designed to measure if situations in life are perceived to be stressful over the last month. The measure includes a 14-item scale and uses a five-point response (0 = never to 4 = very often). It has been shown to be reliable and adequately valid (Cohen et al., 1983; Machulda, Bergquist, Ito, & Chew, 1998). A Cronbach alpha for the PSS was noted to be 0.86 in this study.

Loneliness was determined by the three-item Loneliness Scale (Hughes, Waite, Hawkley, & Cacioppo, 2004), which assessed how often the respondent felt a lack of companionship, was left out, and was isolated from others. This was measured on a three-point response (1 = never or hardly ever to 3 = often). The scale has demonstrated acceptable reliability and validity (Hughes, et al., 2004). In this study, the Loneliness Scale Cronbach alpha was 0.72.

The Social Participation Scale was used to ask participants if they, in the last year, participated in 13 activities – such as church, sports events, night club/entertainment, big gathering of relatives (Lindstrom, Moghaddassi, Bolin, Lindgren, & Merlo, 2003). The social participation score was created by totaling the number of activities each participant reported taking part in during the past year. The instrument has acceptable reliability and

validity (Lindstrom et al., 2003). The Social Participation Scale Cronbach alpha was estimated at 0.67 for this study.

The Everyday Discrimination Scale included nine items that assessed chronic, routine, and minor experiences of unfair treatment and was measured on a six-point response (0 = never to 5 = almost every day) (Williams et al., 1997). The questions were about being treated with less courtesy, treated with less respect than others, receiving poorer service, being perceived as dishonest, and other similar questions about perceived unfair treatment possible in everyday life. The scale has been shown to be internally reliable (Williams et al., 1997). The Cronbach alpha for the Everyday Discrimination Scale was noted to be 0.82.

Behavioral factors included smoking status (Never, Former, Current) based on the Center of Disease Control and Prevention's definition (CDC, 2009). Respondents who reported smoking over 100 cigarettes in their lifetime and currently smoked at least some days were considered *Current* smokers. Respondents who reported smoking 100 cigarettes in their lifetime, but did not currently smoke were considered to be *Former* smokers. Those who reported lifetime smoking of less than 100 cigarettes were categorized as *Never* smokers (CDC, 2009).

Alcohol abuse was measured using the CAGE questionnaire (Ewing, 1984). The questionnaire asks about cutting down on drinking, being annoyed by others criticizing drinking, feeling guilty for drinking, and drinking after waking up. Participants responded either 0 = no or 1 = yes, and the number of positive responses were totaled to create the scale score (Ewing, 1984). The CAGE questionnaire has been shown to be valid (Tate, 1993). The CAGE questionnaire had a Cronbach alpha of 0.67 in this study.

Poor physical health was quantified by asking participants to respond to the question, "Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?" (Moriarty, Zack, & Kobau, 2003). This question was extracted from the Healthy Days Measures scale, which assesses self-rated general health (Moriarty et al., 2003).

Social Network Characteristics—Ego-centric social network characteristics also were assessed. To identify network alters (i.e., ties), each participant was asked, "With whom do you spend the most time in daily activities? List up to nine people with whom you spend the most time on a normal day." The ego also was asked to report the following information about the alter: (1) first name; (2) smoking status (non-smoker or current smoker); (3) age (younger, older or same as ego); (4) education (more, less or same as ego); (5) current romantic or intimate partner (yes/no); and (6) which nominated alters knew each other (Thomson, in press). InFlow® software (Orgnet.com, 2009) was used to calculate structural statistics for each ego that included: absolute size, ego network density, effective size, EI ratio for smoking status, and percentage of smoking alters.

Absolute size is the number of alters (0–9) the participant identified. Density measures the ratio of ties that exist among the alters, relative to those that could possibly exist; a density of one indicates that all alters know all others, while zero indicates that all alters are

independent of one another. Effective size is the number of alters an ego has minus the redundancy of her connections, which can be thought of as alters that an ego would have had indirect access to if she was not directly connected to that alter (i.e., through another alter). Effective size is larger when an ego's alters are independent of one another; therefore, a larger effective size has an increased chance of providing unique, but also uncoordinated information or support to an ego. The EI ratio measures the extent to which an ego and her alters are dissimilar with respect to a given factor (Krackhardt & Stern, 1988). In this study, the EI ratio for smoking status estimated the extent to which alters had a dissimilar smoking status compared with an ego. A smoking EI ratio of -1 indicated that all alters have the same smoking status as the ego, while an EI ratio of 1 meant none were similar to the ego. Finally, percentage of smoking alters identified the proportion of smokers in the ego's network. Refer to Table 1 for detailed formulas and for example calculations.

Statistical Analysis

Participants were first categorized into two groups by their CES-D score (< 16 [i.e., not depressed]) or ≥ 16 [i.e., depressed]). Demographic, psychosocial, and behavioral covariates were chosen as potential independent variables based on their known association with depression. Descriptive statistics were calculated for the covariates, based on CES-D category. Simple logistic regressions were then calculated for each covariate with depression as the outcome. The simple logistic regressions that resulted in a p-value of less than 0.25 were considered in the multivariable logistic regression model (Hosmer & Lemeshow, 2004; Mickey & Greenland, 1989). A multivariable logistic regression model was fit with depression as the outcome. Stepwise variable selection strategy identified the variables independently associated with depression while controlling for other risk factors. The Hosmer-Lemeshow test determined fit of the final multivariable logistic model. All statistical analyses were conducted using STATA SE 12.1 (StataCorp, 2011).

Results

A total of 1950 randomly selected households received a letter asking them to list all women, age 18 and older, residing in their household. Of the 1950 households, 776 (44.4%) returned completed questionnaires; of these, 599 questionnaires contained eligible women 18 or older. Of the 599 questionnaires with eligible women, 408 (68.1%) enrolled in the study, with 404 completing the full interview, including the CES-D questionnaire. Response rates calculations were based on American Association for Public Opinion Research (AAPOR) response rates calculations (AAPOR, 2011).

Sample characteristics and logistic regression analyses

Seventy-one individuals (17.6%) were categorized as depressed (CES-D score ≥ 16) and 333 individuals (82.4%) as not depressed (CES-D score < 16). Table 2 provides demographic characteristics of the 404 participants, according to depression category. Two thirds of the sample was over the age of 45. The vast majority was White (98.2%). Most had greater than a high school education (55.0%) and some type of private insurance (51.7%). Education, employment, socioeconomic position, insurance type, and marital status were significantly ($p < 0.05$) associated with a CES-D score ≥ 16 .

Table 2 also displays analyses for psychosocial and behavioral factors, providing odds ratios (OR) and simple logistic regression significance tests for each covariate and depression. Perceived social support, perceived stress, loneliness, social participation, everyday discrimination, alcohol abuse, poor physical health, and smoking status were significantly associated ($p < .05$) with having a CES-D score suggestive of depression.

Table 3 describes the sample's social network characteristics along with ORs and significance tests for each characteristic from the simple logistic regression model. Absolute size of network, percent of smoking alters, and EI ratio were all significantly associated ($p < .05$) with having a CES-D score in the depressed category. Ego network density had a p value < 0.25 and was considered for the final adjusted main effects model. There was a correlation between density and absolute size ($r = 0.25$), and additionally, EI ratio smoking and percentage of smoking alters ($r = 0.49$); however there are no concerns of multicollinearity in the multivariate analyses.

The final adjusted main effects model contained the following variables: poor physical health, perceived stress, loneliness, ego network density, and percentage of smoking alters (Table 4). The model was a good fit (Hosmer Lemeshow Goodness of fit statistic = 4.26, $p = 0.83$), and had no multicollinearity concerns (variance inflation factor ranged from 1.02–1.38 for the 5 variables). No interaction terms were found to improve the model using AIC and BIC as indicators of best fit (Posada & Buckley, 2004).

Ego network density was a protective factor against depression (OR for 10% increase 0.84, 95% confidence interval [CI] 0.73–0.95). In other words, for every 10% increase in network density, the ego had a 16% decreased odds of being depressed. Additionally, a woman with a high percentage of smoking alters was at greater risk for being in the depressed category (OR for 10% increase of smokers 1.19, 95% CI 1.02–1.39), meaning for every 10% increase of smoking alters in the network, an individual's odds of being depressed increased by 19%. Other factors that were independently associated with depression in the multivariable logistic regression analysis included perceived stress score (OR 1.34 for 1 unit increase, 95% CI 1.24–1.45), loneliness score (OR 1.37 for 1 unit increase, 95% CI 1.05–1.80), and poor physical health (OR 1.06 for 1 unit increase, 95% CI 1.02–1.11).

Discussion

These results add to the body of literature recognizing depression as a significant problem among Appalachian Ohio women (Groot et al., 2007; Post et al., 2013). Approximately 18% of the sample had a CES-D score suggestive of depression, which is almost twice as high as current estimates of depression in the population of women in the United States (CDC, 2012).

This study contributes to the sparse literature examining the independent association of social network characteristics with depression, while controlling for other risk factors. Ego network density was negatively correlated with depression, consistent with previous work (Ueno, 2005). In particular, Falci and McNeely (2009) noted that females were observed to be at a higher risk of depressive symptoms when density is low. These authors hypothesized

that a network with high density is better able to provide social support to its members because social support can be more efficiently distributed among the members. Conversely, they noted that relatively less dense networks suggest less integration of potential support from all members of the network, including the ego, which may result in higher levels of depression for the ego. Further research is needed to clarify the contribution of network density to depression among rural women. It is important to consider that unlike previous research, egos were asked to identify individuals with whom most time is spent, as opposed to their friends or individuals to whom they felt closest. It is possible that in the current study, egos spent the most time with people such as coworkers, even if they were not necessarily as close with these individuals. In terms of intervention development, it may be plausible to intervene with depressed individuals' social support systems by encouraging stronger connections among alters (i.e., increase network density), which may facilitate a more integrated and distributed system of social support. This may also apply to the development of smoking cessation interventions, as depressed smokers who lack consistent social support may be at greater risk for relapse.

Percentage of smoking alters was positively associated with depression. This variable was found to be significant in the final model, whereas the ego's smoking status was not. Although previous literature has noted a relationship between persistent smoking and depression (Anda et al., 1990), this was not observed in our sample, possibly because of insufficient statistical power as a result of the small proportion of current smokers (20%). Percentage of smoking alters and ego's smoking status are correlated, and the model selection procedure chose percentage of smoking alters over ego's smoking status. There are several possible explanations for this unique result. Because the study collected a limited amount of information about the alters, the percentage of smoking alters might have been a proxy variable for some other alter characteristic that was not measured in an ego-centric analysis. Alternatively, it is plausible that both smokers and depressed individuals occupy the same position in social networks. Although this study only analyzed-ego centric networks, and did not include network centrality calculations (i.e., how close an ego is to the center of a complete network), previous research has indicated that depressed individuals tend to withdraw from friendships resulting in a position on the periphery of a social network (Schaefer et al., 2011). Similarly, smokers also tend to be on the periphery of networks (Christakis & Fowler, 2008). Therefore, peripherally located individuals with a higher chance of depression tend to have alters on the periphery of networks, who also are more likely to be smokers. The association between percentages of smoking alters and depression has yet to be described in the literature and should be investigated further in future studies.

Although the model selection procedure allowed for interaction terms, no significant interactions were revealed by this analysis. This null-finding could be because of a lack of statistical power. Ongoing work in this area should continue to consider the possibility of interactions among the factors explaining depression. In particular, social network variables that are likely to capture aspects of an individual's social capital—a potential intervention point—may moderate individual level risk factors for depression.

Perceived stress score, loneliness score, and poor physical health days were positively associated with the depression. These results have been noted in previous literature (Djukanovi , Sorjonen, & Peterson, 2015; Koenig et al., 1997; Lovibond & Lovibond, 1995; Sokratous, Merkouris, Middleton, & Karanikola, 2014). However, to our knowledge, no study assessing social network characteristics and depression controlled for these variables.

Previous studies of Appalachian Ohio have found CES-D scores suggestive of depression as high as 31% (Post et al., 2013). Compared to the current study, these higher estimates may be partially explained by recruitment methods. The current study used a population-based sampling frame; those who responded to our invitation were more educated, older, and wealthier, which is representative of those more likely to participate in survey research (Galea & Tracy, 2007). Conversely, Post et al. (2013) recruited women, many of whom were uninsured, from medical clinics.

There are some important limitations to this study. First, the social network data was egocentric meaning certain common social network variables, such as some centrality measures that require a complete network, could not be calculated. An ego-centric network approach resulted in ego's perception of the alters' characteristics; therefore, knowledge about the alters could be limited and biased. Additionally, this study does not examine the strength of ties between egos and alters as a covariate for depression. Another factor to be considered is the nature of a percentage calculation for the density and percent of smoking alter variables. When a participant has a smaller network, percentages may provide extreme, and perhaps misleading information about network characteristics. Furthermore, although a CES-D score 16 is suggestive of depression, it is a screening instrument for depression, not a diagnostic tool (Radloff, 1977; Roberts & Vernon, 1983). The generalizability of this study is limited due to the unique sample characteristics and location; further research on social network characteristics and depression should examine different demographic characteristics and locations. Finally, the cross-sectional nature of the data limits the ability to draw any causal inferences.

Conclusion

Ego network density, percentage of smoking alters, perceived stress, loneliness, and poor physical health are all independently associated with depression, after controlling for other risk factors. Although more research should be done, this study provides clinicians with information about risk for depression, especially the social network variable factors, and may facilitate their development in the delivery of quality mental health services and other health promoting behavior change interventions for women.

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Figure 1.

This figure depicts the social network of one chosen participant in the study. The white circle denotes the ego, a smoker in this example. The black circles denote smoking alters, and the grey circles denote nonsmoking alters. See Table 1 for example calculations of social network constructs.

Table 1**Ego-Centric Social Network Variable Formulas**

Social Network Construct	Description	Formula	Example calculations based on Figure 1
Absolute Size	The number of alters that the participant identified.	A	4
Alter tie count ^a	The number of ties among alters not including the ties between ego and each alter.	T	5
Density	Proportion of possible ties among ego's alters that were reported to be present.	$\frac{T}{\frac{A}{2}(A-1)}$	$\frac{5}{\frac{4}{2}(3)}=0.83$
Effective Size	A measure of unique information an ego is likely to obtain from her alters. If alters are well connected, they are more likely to share. If they are disconnected, they are likely to provide an ego with unique information (higher score).	$A - \frac{2T}{A}$	$4 - \frac{10}{4}=1.5$
EI Ratio for Smoking	The tendency for individuals to affiliate with others who are unlike themselves. E is the number of ties from ego to alters that are different than ego with respect to a given characteristic. I is the number of ego ties to like- alters. The score is bound between -1 (all alters are like ego with respect to smoking) and 1 (all alters are different than ego).	$\frac{E-I}{A}$	$\frac{2-2}{4}=0$
Percentage of Smoking Alters	Proportion of smokers in the ego's network. S is the number of smoking alters.	$\frac{S}{A}$	$\frac{2}{4}=0$

Note. Some formulas use terms defined in the construct's description.

^aThis construct is only included as a definition for use in other formulas in Table 1 and is not directly used in any analysis.

Table 2
Demographic, Psychosocial, Behavioral Characteristics of Participants Depression (n = 404)

Variable	Total		Not Depressed (CES-D <16) (n=333)		Depressed (CES-D ≥16) (n=71)		Simple Logistic Regression OR (95% CI) ^a	P
	n	%	n	%	n	%		
Age								0.28
18–44	132 (32.7)		108 (81.8)		24 (18.2)		1.00	
45–64	145 (35.9)		115 (79.3)		30 (20.7)		1.17 (0.65–2.13)	
65+	127 (31.4)		110 (86.6)		17 (13.4)		0.70 (0.35–1.37)	
Education								0.01
Some College/College								
Graduate	258 (63.9)		222 (86.0)		36 (14.0)		1.00	
High School								
Diploma/GED	122 (30.2)		96 (78.7)		26 (21.3)		1.80 (0.96–2.92)	
Less than HS	24 (5.9)		15 (63.5)		9 (37.5)		2.85 (1.51–9.08)	
Employment								<0.001
Full-time/ Part-time	194 (48.0)		166 (85.6)		28 (14.4)		1.00	
Not Employed								
Retired	102(25.2)		93 (91.2)		9 (8.8)		0.57 (0.26–1.27)	
Homemaker	53(13.1)		42 (79.2)		11 (20.8)		1.55(0.72–3.37)	
Disabled	29 (7.2)		12 (41.4)		17 (58.6)		8.40 (3.62–19.46)	
Other	26 (6.5)		20 (76.9)		6 (23.1)		1.78 (0.66–4.82)	
Socioeconomic Position								<0.001
10–7	139 (34.4)		126 (90.6)		13 (9.4)		1.00	
6–4	199 (49.3)		167 (83.9)		32 (16.1)		1.86 (0.93–3.68)	
3–1	66 (16.3)		40 (60.6)		26 (39.4)		6.30 (2.96–13.40)	
Insurance Type								0.001
Private	237 (58.8)		209 (88.2)		28 (11.8)		1.00	
Public	115 (28.5)		84 (73.0)		31 (27.0)		2.75 (1.56–4.87)	
Uninsured	45 (11.2)		36 (80.0)		9 (20.0)		1.87 (0.81–4.28)	
Other	6 (1.5)		3 (50.0)		3 (50.0)		7.46 (1.44–38.80)	

Variable	Total		Not Depressed (CES-D <16) (n=333)		Depressed (CES-D ≥16) (n=71)		Simple Logistic Regression OR (95% CI) ^a	P
	n	%	n	%	n	%		
Marital Status								
Married/ Living with Partner	290	(71.8)	257	(88.6)	33	(11.4)	1.00	<0.001
Divorced/ Widowed/ Separated	82	(20.3)	55	(67.1)	27	(32.9)	3.82 (2.12–6.87)	
Never Married	32	(7.9)	21	(65.6)	11	(34.4)	4.08 (1.81–9.21)	
Smoking Status								0.002
Never	231	(57.2)	203	(87.9)	28	(12.1)	1.00	
Former	92	(22.8)	73	(79.3)	19	(20.7)	1.89 (0.99–3.58)	
Current	81	(20.0)	57	(70.4)	24	(29.6)	3.05 (1.64–5.67)	
	Range		Σ	s	Σ	s		
Perceived Social Support	[20,84]		72.36	(10.30)	63.65	(12.47)	0.94 (0.92–0.96) ^b	<0.001
Perceived Stress	[0,47]		17.33	(6.01)	30.10	(6.70)	1.34 (1.26–1.44) ^b	<0.001
Loneliness	[3,9]		3.70	(1.07)	5.25	(1.69)	2.14 (1.76–2.61) ^b	<0.001
Social Participation Everyday	[0,11]		6.22	(2.30)	5.08	(2.46)	0.81 (0.73–0.91) ^b	<0.001
Discrimination	[0,40]		6.35	(5.32)	10.09	(7.67)	1.10 (1.05–1.15) ^b	<0.001
CAGE Alcoholism	[0,4]		0.18	(.56)	0.35	(0.85)	1.44 (1.01–2.02) ^b	0.04
Poor Physical Health Days	[0,30]		2.91	(6.50)	8.66	(10.27)	1.08 (1.05–1.11) ^b	<0.001

Note.

^a Simple logistic regression ORs of having CES-D defined depression (score of ≥16);^b Odds ratio for a 1 unit increase

Table 3

Social Network Characteristics of Participants by CES-D Group (n = 404)

Variable	Not Depressed (CES-D <16) (n=333)		Depressed (CES-D ≥16) (n=71)		Simple Logistic Regression OR (95% CI) ^a	P
	Range	$\bar{x}$	$\bar{x}$	s		
Absolute size ^b	[0,9]	6.68 (2.74)	5.96 (2.79)		0.91 (0.84–0.99) ^c	0.05
Density ^b	[0,100]	79.09 (28.02)	73.76 (31.64)		0.94 (0.87–1.02) ^d	0.16
Effective Size	[0.6,44]	1.97 (1.36)	2.13 (1.55)		1.08 (0.90–1.29) ^c	0.39
% Smoking Alters ^b	[0,100]	17.72 (20.34)	30.47 (29.55)		1.24 (1.12–1.38) ^d	<0.001
EI Ratio Smoking ^b	[–1,1]	–.55 (0.53)	–.33 (.63)		1.93 (1.25–2.96)	0.003

Notes:

^aSimple logistic regression ORs of having CES-D defined depression (score of ≥16);^bVariable with $p < 0.05$ that were considered for final multivariable model;^cOdds ratio for a 10% increase;^dOdds ratio for a 1 unit increase

Table 4

Multivariable Logistic Regression Model (n = 404)

Variable	Adjusted OR from Multivariable Logistic Regression Model (95% CI) ^a	P
Poor Physical Health	1.06 (1.02–1.11) ^b	0.007
Perceived Stress Scale	1.34 (1.24–1.45) ^b	<0.001
Loneliness Scale	1.37 (1.05–1.80) ^b	0.021
Ego Network Density	0.84 (0.73–0.95) ^c	0.008
% of Smoking Alters	1.19 (1.02–1.39) ^c	0.023

Notes:

^a Adjusted OR of having a CES-D defined depression (score of ≥ 16);^b Odds ratio for a 1 unit increase;^c Odds ratio for a 10% increaseHosmer-Lemeshow $\chi^2(8) = 4.26$ Prob > $\chi^2 = 0.83$