Manuscript Details

Manuscript number	JAD_2018_2513_R1
Title	Social Support from Friends and Depression among African Americans: The Moderating Influence of Education
Article type	Research Paper

Abstract

Background: This cross-sectional study examined the association between various characteristics of friendships and 12-month major depressive disorder (MDD) and whether these associations vary by education level among African Americans. Methods: The analytic sample included 3,434 African American respondents drawn from the National Survey of American Life: Coping with Stress in the 21st Century. Logistic regression analyses were performed to test the associations between friendship characteristics (i.e., frequency of contact, subjective closeness, receipt of support, provision of support) and 12-month MDD. Interaction terms between education and each of the four friendship variables were used to test whether these associations varied by education level. Analyses adjusted for sociodemographic factors and chronic health problems. Results: Frequency of contact and subjective closeness were negatively associated with 12-month MDD. An interaction between education and contact indicated that contact was negatively associated with MDD among high education respondents but unrelated to MDD among low education respondents. The interactions between education and receipt of support and education and provision of support demonstrated that receipt and provision of support were negatively associated with MDD among high education respondents but was positively associated with MDD among low education respondents. Limitations: Given the cross-sectional design, it is not possible to make causal inferences. Conclusion: This investigation provides an important first step to understanding within-group differences in how social relationships function as both a risk and protective factor for MDD among African Americans.

Keywords	depression; socioeconomic status; social support; friendship; education
Corresponding Author	Ann Nguyen
Corresponding Author's Institution	Case Western Reserve University
Order of Authors	Ann Nguyen, Quenette Walton, Courtney Thomas, Dawne Mouzon, Harry Taylor
Suggested reviewers	Ryon Cobb, Amanda Woodward, Carl Bell, Karen Lincoln

Submission Files Included in this PDF

File Name [File Type]

Cover letter.docx [Cover Letter]

Response to reviewers.docx [Response to Reviewers]

SES support depression-highlights.docx [Highlights]

SES support depression-abstract.docx [Abstract]

SES support depression-title.docx [Title Page (with Author Details)]

2nd submission - SES support depression-manuscript.docx [Manuscript File]

Figure 1-frequency of contact.docx [Figure]

Figure 2-receipt of support.docx [Figure]

Figure 3-provision of support.docx [Figure]

Table 1 - sample characteristics.docx [Table]

Table 2 - bivariate analysis.docx [Table]

Table 3.docx [Table]

SES support depression-conflict of interest.docx [Conflict of Interest]

SES support depression-author statement.docx [Author Statement]

To view all the submission files, including those not included in the PDF, click on the manuscript title on your EVISE Homepage, then click 'Download zip file'.

February 19, 2019

Drs. P. Brambilla and J.C. Soares
Editors-in-Chief
Journal of Affective Disorders

RE: "Social Support from Friends and Depression among African Americans: The Moderating Influence of Education" (Manuscript number: JAD_2018_2513)

Dear Drs. Brambilla and Soares:

The manuscript has been revised in accordance with the suggestions from the anonymous reviewers. My co-authors and I appreciate the thoughtful attention and the constructive critique. We have endeavored to be forthcoming and cooperative in incorporating this critique in the preparation of the revised manuscript.

We have numbered each criticism raised by the Reviewer. We indicate by section name and page number where specific changes have been made within the text of the manuscript. New and revised texts are highlighted in yellow.

Overall, comments from the two Reviewers were particularly helpful in sharpening the manuscript. New material has been incorporated into the manuscript and tables.

Thank you for the opportunity to revise this manuscript, which is being considered for publication in the Journal of Affective Disorders.

Reviewer 2

1. The article raises an extremely important issue, the role of social support and friendship in depression etiology among African-Americans. The findings are highly relevant as they highlight that protective effects are subject to educational attainment. These are fascinating aspects worth publishing but I would like to make some considerations that could help to improve the paper

Thank you for noting the strengths of this manuscript.

2. Abstract: Please mention that it is a cross-sectional study. I am surprised to read about limitations in the abstract.

We have indicated in the abstract that this is a cross-sectional study. We included a discussion of limitations in the abstract in accordance with the Journal of Affective Disorders' guidelines.

3. It would be interesting to discuss the effect size and the magnitude of differences between groups.

Thank you for bringing this to our attention. We have included pseudo R squareds in Table 3 to demonstrate effect size. Additionally, we conducted bivariate analyses to examine group differences between respondents who did not qualify for a 12-month MDD diagnosis and respondents who did quality for a diagnosis. This information is presented in Table 2, and we have revised the Results section to reflect this additional analysis (p. 7).

4. I would like to read the authors' thoughts on why they selected education. As the discussion is centered on resources, investigating interaction effects with income would make a lot of sense. Further, educational attainment is strongly influenced by neighborhood, family history, city area lived in, childhood and experiences etc; these are also factors that influence the likelihood to develop depression and should be acknowledged in the paper.

Reviewer 2 brings up a great point. Of the varied socioeconomic indicators that were available (e.g., family income, occupation, education), we selected education for this analysis for several reasons. Education precedes income and occupation. For this reason, it is believed that education drives most of the relationship between SES and mental and physical health. In fact, this is well documented by Mirowsky and Ross (2003). Lastly, we decided not to examine occupation in this analysis, as this indicator of SES would exclude individuals who do not work, which would disproportionately affect women who have never worked outside of the home. We have included this rationale in the manuscript at the end of the Introduction section (p. 4).

We have included in the limitations section of the paper a discussion of confounding factors we were unable to control for in the current analysis (e.g., family and neighborhood contexts, childhood experiences) (p. 13).

5. since the study is cross-sectional, depression might affect contact frequency and help seeking behavior and this could be another explanation for the results. How does this differ between low and high educated people?

Thank you for noting this. The revised manuscript now includes a discussion of resource mobilization in the Discussion section (p. 11). The resource mobilization framework suggests that when an individual experiences hardship, they are likely to reach out to their social networks to marshal the necessary supports for coping with these problems. Additionally, the individual's support network may initiate assistance to the individual if they notice that the individual is in distress. In the present analysis, it may be that respondents with less education who were suffering from depression were reaching out to their friends for help coping with their depressive symptoms; moreover, their friends may have noticed mood and behavioral changes in the respondents and mobilized around them to help them cope with their depressive symptoms.

In ancillary analyses not discussed in the manuscript, we found that there were no educational differences in the frequency of contact with friends and receipt of support from friends among

respondents who qualified for a 12-month MDD diagnosis. We are unaware of any studies that have examined educational differences in resource mobilization.

6. reasons for the interaction effect might also be related to the cause of depression; the accumulation of risk factors might be higher in low educated than high educated people so that social support might not be sufficient to overcome the effect of these risk factors among people with low education

This is a great point. The revised manuscript now includes an explanation in the Discussion section of how individuals with less education are more likely to accumulate more risk factors (e.g., chronic stressors) for depression that cannot be offset by friendship support (pp. 10-11).

7. I would like to know how years of education are distributed among people with and without depression (mean, std, range)

This information is now reflected in Table 2. We did not find that individuals who qualified for a diagnosis significantly differed from those who did not qualify for a diagnosis in years of educational attainment.

Reviewer 3

1. This study is an analysis of data from the National Survey of American Life, which is based on a sample of African American respondents. The goal of the study is to look for statistical interactions between four aspects of social support and level of education in determining the prevalence of MDD. The analysis, in the end, focuses on three aspects of social support: frequency of contact and receipt and provision of social support. This decision is apparently made because the model two interaction with closeness has an upper confidence limit of 1.0, which seems a bit arbitrary. The interaction with closeness is the same, essentially, as the other indicators.

We did not report or interpret the interaction between subjective closeness X education because its p-value was .05. Since we used an alpha level of .05 (i.e., $p<.05$), this interaction did not achieve significance at the specified alpha level.

2. An interaction is consistently identified, and it is very dramatic, including a reversal of the direction of effect. The interpretation of it is also quite interesting, especially the resource mobilization hypothesis, which might lead to a course of action quite different than a more naïve interpretation of the results. However, the authors are reticent to speculate about clinical or public health implications of their findings, choosing instead to argue conservatively that longitudinal studies are needed. I think this is reasonable.

Thank you for noting this.

3. Justification for the study is provided by a brief review of literature making the point that the association of social support with health outcomes is not simple, and that prior studies have

identified a lack of positive benefits, or even suggested harms, among low SES groups. Something that is missing from the discussion is reference to differing dimensions of social support. E.g. emotional closeness may not have the same benefits in people of low SES – whose needs may be more prominent in the area of instrumental social support. The receipt and provision of instrumental support "…help you out" is assessed by the questions contained in the survey, but the topic is not introduced to the reader at all – the current introduction treats social support as a unitary construct.

Thank you for bringing this to our attention. We have added a paragraph that identifies and describes the four types of social support—emotional, instrumental, appraisal, and informational. We have also included a discussion of the relevance and importance of instrumental support among individuals of lower SES. These new texts are in the Introduction section (pp. 1-2)

4. Another issue with the general approach of the study is its timeliness. The data source is approaching 20 years old. Although it is a historical dataset, it is a well-known and well-regarded study, with a response rate in a population-representative sample that has been difficult for more recent studies to achieve. Taylor series expansion is used to address design effects. However, it must be acknowledged that, typical of multi-purpose surveys, the measures of some variables are somewhat crude – not least of which is the social support measurement, which is done with 4 items rather than a validated social support scale. This limitation is not mentioned in the "limitations" section.

Thank you for noting the significance, importance, and strengths of the NSAL despite the age of the data set. The data was collected in 2001-2003, which may limit the generalizability of the current findings. However, the NSAL includes the most comprehensive collection of survey items on friendship support and psychiatric disorders among a nationally representative sample of African Americans.

Reviewer 3 brings up a good point regarding the measurement of friendship dimensions. We have revised the limitation section to include this measurement limitation (p. 13). We have also suggested that future research should use multi-item scales to assess the multiple dimensions of friendships (i.e., subjective closeness, frequency of contact, receipt of social support, provision of social support).

5. I agree with the authors decision to categorize education in order to depict the interaction graphically in the Figures. The coefficients for interaction terms from continuous variables in logistic regression models is very difficult to interpret.

Thank you for noting this.

6. My main concern with the paper concerns a lack of transparency about the logistic regression modeling. The social support item responses are a series of categories, which might have been represented in the model using indicator variables – allowing the model to produce a fitted value for each level of social support and its interaction with education. Instead, without justification, the authors have treated social support as a continuous variable (at least, I am guessing so since there is a single interaction term in their models whereas treating it as

a series of categories would have needed to be tested in aggregate by a likelihood ratio test for several interaction terms) without any justification for doing so. This is a concern since it imposes a strong log-linear assumption (that the log odds of depression is a linear function of the modelled covariates) and risks erroneous fitted values. Yet, no indication of the fit of the model is provided in the manuscript – I don't think the manuscript can be published without some attempt to convince the reader that imposition of the strong (albeit unarticulated) assumption is justified.

The friendship characteristics (i.e., subjective closeness, frequency of contact, receipt of support, provision of support) are measured using a Likert-type scale (1 to 7 for frequency of contact and 1 to 4 for subjective closeness, receipt of support, and provision of support). Although Likert-type scales are technically ordinal in nature, a number of scholars have found that Likert-type variables can be treated as approximately continuous variables (Johnson & Creech, 1983; Lubke & Muthén, 2004; Norman, 2010; Sullivan & Artino Jr, 2013; Zumbo & Zimmerman, 1993). In these instances, a Likert-type variable is considered an ordinal approximation of a continuous variable and thus analysis strategies that are used for continuous variables are applied to Likert-type variables. This is a common practice in the psychiatric and social sciences that is well documented (Assari & Lankarani, 2018; Cross, Nguyen, Chatters, & Taylor, 2018; Mouzon, Taylor, Keith, Nicklett, & Chatters, 2016; Taylor, Forsythe-Brown, Taylor, & Chatters, 2014). In fact, this treatment of a Likert-type variable as a continuous variable can be found in several articles recently published in the Journal of Affective Disorders (see (Domènech-Abella, Mundó, Haro, & Rubio-Valera, 2019; Li, Jiang, & Zhang, 2019; Lin et al., 2019; Nyberg, Rajaleid, Westerlund, & Hammarström, 2019). We have added this explanation to the Methods section (p. 5). We have also included pseudo R squareds in Table 3 to provide evidence of model fit. The pseudo R squareds for the five models presented in Table 3 ranged from .15 to .16. These values represent good model fit (McFadden, 1977). Further, we conducted ancillary analyses with all four friendship variables treated as categorical variables and found that the pseudo R squareds for these models were very similar to the pseudo R squareds presented in Table 3. This suggests that the treatment of the friendship variables as continuous variables had no effect on the fit of the estimated models.

7. In the third "highlight" I think it would be better to say that the benefits of friendship are modified by education, since stratification is an analysis procedure rather than an interpretive one.

We have revised the third highlight. It now reads, "The benefits of friendships are modified by education level."

8. It is odd to list education as a "controlled" variable when the analysis is focused on interactions involving education. It is a different thing to say that education was included as a main effect when education by social support interactions are also included in the model and saying that it was "controlled."

We have revised the Methods section, so that education is not listed as a control variable for the multivariate analyses with education X friendship interactions. In the baseline model (i.e., the

model without education X friendship interactions), education was included as a control variable (p. 6).

9. "….an iterative regression-based multiple imputation approach" is a vague description for a scientific journal. Is this referring to MICE?

The imputed family income and education variables were computed by researchers of the National Survey of American Life and not by the authors of this manuscript. This is a variable that is available within the public data set. However, we were unable to find documentation on the imputation procedures for these variables beyond what we have already provided in the manuscript. As far as we can tell, this information is not publicly available. In an effort to be as forthcoming as possible, we have provided several links below to websites that have information relevant to the NSAL. We have thoroughly searched these websites and were not able to find information on the imputation procedures the NSAL researchers used for the family income and education variables.

https://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/190
https://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/20240/version/8

10. I don't think it is right to say, in the discussion, that education is "an indicator of SES" – SES is a composite, usually, of education, income and sometimes occupational prestige. This study examines education, not SES.

Reviewer 3 is correct in noting that SES is a composite variable. Commonly, SES is assessed using an index, and frequently, education, income, occupation, and occupational prestige are components of an SES index (Mueller & Parcel, 1981). These components or items in an index are referred to as indicators (Blalock, 2017). For this reason, education, income, occupation, and occupational prestige are referred to in the SES literature as indicators of SES (Mueller & Parcel, 1981). To maintain consistency with established terminology in the field, we also referred to education as an indicator of SES in this paper. However, we understand that the phrasing, "…education, an indicator of SES" could seem to suggest that education is an equivalent measure of SES, which, as Reviewer 3 noted, is inaccurate. We have changed the wording of this sentence, as well as a similar sentence in the introduction section for clarity (p. 4 and p. 9).

11. Beyond Wheaton et al., there is a literature stemming from evolutionary biology/psychology that hypothesizes that mobilization of social support is an adaptive feature of depression and one of the reasons for its evolutionary persistence.

We appreciate the suggestion to examine resource mobilization in the evolutionary psychology literature. After a thorough literature search, we believe that we have identified the theory to which Reviewer 3 was referring—Social Navigation Hypothesis. We have added a discussion of this theory in explanation of our findings in the Discussion section (p. 11).

References

Assari, S., & Lankarani, M. M. (2018). Secular and religious social support better protect Blacks than Whites against depressive symptoms. *Behavioral Sciences, 8*(5), 46.

Blalock, H. M. (2017). *Measurement in the social sciences*: Routledge.

Cross, C. J., Nguyen, A. W., Chatters, L. M., & Taylor, R. J. (2018). Instrumental social support exchanges in African American extended families. *Journal of Family Issues, 39*(13), 3535-3563. doi:10.1177/0192513x18783805

Domènech-Abella, J., Mundó, J., Haro, J. M., & Rubio-Valera, M. (2019). Anxiety, depression, loneliness and social network in the elderly: Longitudinal associations from The Irish Longitudinal Study on Ageing (TILDA). *Journal of affective disorders, 246*, 82-88. doi:https://doi.org/10.1016/j.jad.2018.12.043

Johnson, D. R., & Creech, J. C. (1983). Ordinal measures in multiple indicator models: A simulation study of categorization error. *American Sociological Review*, 398-407.

Li, C., Jiang, S., & Zhang, X. (2019). Intergenerational relationship, family social support, and depression among Chinese elderly: A structural equation modeling analysis. *Journal of affective disorders, 248*, 73-80. doi:https://doi.org/10.1016/j.jad.2019.01.032

Lin, X., Lu, D., Huang, Z., Chen, W., Luo, X., & Zhu, Y. (2019). The associations between subjective and objective cognitive functioning across manic or hypomanic, depressed, and euthymic states in Chinese bipolar patients. *Journal of affective disorders, 249*, 73-81. doi:https://doi.org/10.1016/j.jad.2019.02.025

Lubke, G. H., & Muthén, B. O. (2004). Applying multigroup confirmatory factor models for continuous outcomes to Likert scale data complicates meaningful group comparisons. *Structural Equation Modeling, 11*(4), 514-534.

McFadden, D. (1977). Quantitative methods for analyzing travel behavior of individuals: Some recent developments. In D. A. Hensher & P. R. Stopher (Eds.), *Behavioural travel modelling* (pp. 279-318). London: Croom Helm.

Mirowsky, J., & Ross, C. E. (2003). *Education, social status, and health*. New York: Walter de Gruyter, Inc.

Mouzon, D. M., Taylor, R. J., Keith, V. M., Nicklett, E. J., & Chatters, L. M. (2016). Discrimination and psychiatric disorders among older African Americans. *International Journal of Geriatric Psychiatry*.

Mueller, C. W., & Parcel, T. L. (1981). Measures of socioeconomic status: Alternatives and recommendations. *Child Development*, 13-30.

Norman, G. (2010). Likert scales, levels of measurement and the "laws" of statistics. *Advances in health sciences education, 15*(5), 625-632.

Nyberg, A., Rajaleid, K., Westerlund, H., & Hammarström, A. (2019). Does social and professional establishment at age 30 mediate the association between school connectedness and family climate at age 16 and mental health symptoms at age 43? *Journal of affective disorders, 246*, 52-61. doi:https://doi.org/10.1016/j.jad.2018.12.027

Sullivan, G. M., & Artino Jr, A. R. (2013). Analyzing and interpreting data from Likert-type scales. *Journal of graduate medical education, 5*(4), 541-542.

Taylor, R. J., Forsythe-Brown, I., Taylor, H. O., & Chatters, L. M. (2014). Patterns of emotional social support and negative interactions among African American and black Caribbean extended families. *Journal of African American Studies, 18*(2), 147-163.

Zumbo, B. D., & Zimmerman, D. W. (1993). Is the selection of statistical methods governed by level of measurement? *Canadian Psychology/Psychologie canadienne, 34*(4), 390.

Reviewer 2

1. The article raises an extremely important issue, the role of social support and friendship in depression etiology among African-Americans. The findings are highly relevant as they highlight that protective effects are subject to educational attainment. These are fascinating aspects worth publishing but I would like to make some considerations that could help to improve the paper

Thank you for noting the strengths of this manuscript.

2. Abstract: Please mention that it is a cross-sectional study. I am surprised to read about limitations in the abstract.

We have indicated in the abstract that this is a cross-sectional study. We included a discussion of limitations in the abstract in accordance with the Journal of Affective Disorders' guidelines.

3. It would be interesting to discuss the effect size and the magnitude of differences between groups.

Thank you for bringing this to our attention. We have included pseudo R squareds in Table 3 to demonstrate effect size. Additionally, we conducted bivariate analyses to examine group differences between respondents who did not qualify for a 12-month MDD diagnosis and respondents who did quality for a diagnosis. This information is presented in Table 2, and we have revised the Results section to reflect this additional analysis (p. 7).

4. I would like to read the authors' thoughts on why they selected education. As the discussion is centered on resources, investigating interaction effects with income would make a lot of sense. Further, educational attainment is strongly influenced by neighborhood, family history, city area lived in, childhood and experiences etc; these are also factors that influence the likelihood to develop depression and should be acknowledged in the paper.

Reviewer 2 brings up a great point. Of the varied socioeconomic indicators that were available (e.g., family income, occupation, education), we selected education for this analysis for several reasons. Education precedes income and occupation. For this reason, it is believed that education drives most of the relationship between SES and mental and physical health. In fact, this is well documented by Mirowsky and Ross (2003). Lastly, we decided not to examine occupation in this analysis, as this indicator of SES would exclude individuals who do not work, which would disproportionately affect women who have never worked outside of the home. We have included this rationale in the manuscript at the end of the Introduction section (p. 4).

We have included in the limitations section of the paper a discussion of confounding factors we were unable to control for in the current analysis (e.g., family and neighborhood contexts, childhood experiences) (p. 13).

5. since the study is cross-sectional, depression might affect contact frequency and help seeking behavior and this could be another explanation for the results. How does this differ between low and high educated people?

Thank you for noting this. The revised manuscript now includes a discussion of resource mobilization in the Discussion section (p. 11). The resource mobilization framework suggests that when an individual experiences hardship, they are likely to reach out to their social networks to marshal the necessary supports for coping with these problems. Additionally, the individual's support network may initiate assistance to the individual if they notice that the individual is in distress. In the present analysis, it may be that respondents with less education who were suffering from depression were reaching out to their friends for help coping with their depressive symptoms; moreover, their friends may have noticed mood and behavioral changes in the respondents and mobilized around them to help them cope with their depressive symptoms.

In ancillary analyses not discussed in the manuscript, we found that there were no educational differences in the frequency of contact with friends and receipt of support from friends among respondents who qualified for a 12-month MDD diagnosis. We are unaware of any studies that have examined educational differences in resource mobilization.

6. reasons for the interaction effect might also be related to the cause of depression; the accumulation of risk factors might be higher in low educated than high educated people so that social support might not be sufficient to overcome the effect of these risk factors among people with low education

This is a great point. The revised manuscript now includes an explanation in the Discussion section of how individuals with less education are more likely to accumulate more risk factors (e.g., chronic stressors) for depression that cannot be offset by friendship support (pp. 10-11).

7. I would like to know how years of education are distributed among people with and without depression (mean, std, range)

This information is now reflected in Table 2. We did not find that individuals who qualified for a diagnosis significantly differed from those who did not qualify for a diagnosis in years of educational attainment.

Reviewer 3

1. This study is an analysis of data from the National Survey of American Life, which is based on a sample of African American respondents. The goal of the study is to look for statistical interactions between four aspects of social support and level of education in determining the prevalence of MDD. The analysis, in the end, focuses on three aspects of social support: frequency of contact and receipt and provision of social support. This decision is apparently made because the model two interaction with closeness has an upper confidence limit of 1.0, which seems a bit arbitrary. The interaction with closeness is the same, essentially, as the other indicators.

We did not report or interpret the interaction between subjective closeness X education because its *p*-value was .05. Since we used an alpha level of .05 (i.e., *p*<.05), this interaction did not achieve significance at the specified alpha level.

2. An interaction is consistently identified, and it is very dramatic, including a reversal of the direction of effect. The interpretation of it is also quite interesting, especially the resource mobilization hypothesis, which might lead to a course of action quite different than a more naïve interpretation of the results. However, the authors are reticent to speculate about clinical or public health implications of their findings, choosing instead to argue conservatively that longitudinal studies are needed. I think this is reasonable.

Thank you for noting this.

3. Justification for the study is provided by a brief review of literature making the point that the association of social support with health outcomes is not simple, and that prior studies have identified a lack of positive benefits, or even suggested harms, among low SES groups. Something that is missing from the discussion is reference to differing dimensions of social support. E.g. emotional closeness may not have the same benefits in people of low SES – whose needs may be more prominent in the area of instrumental social support. The receipt and provision of instrumental support "…help you out" is assessed by the questions contained in the survey, but the topic is not introduced to the reader at all – the current introduction treats social support as a unitary construct.

Thank you for bringing this to our attention. We have added a paragraph that identifies and describes the four types of social support—emotional, instrumental, appraisal, and informational. We have also included a discussion of the relevance and importance of instrumental support among individuals of lower SES. These new texts are in the Introduction section (pp. 1-2)

4. Another issue with the general approach of the study is its timeliness. The data source is approaching 20 years old. Although it is a historical dataset, it is a well-known and well-regarded study, with a response rate in a population-representative sample that has been difficult for more recent studies to achieve. Taylor series expansion is used to address design effects. However, it must be acknowledged that, typical of multi-purpose surveys, the measures of some variables are somewhat crude – not least of which is the social support measurement, which is done with 4 items rather than a validated social support scale. This limitation is not mentioned in the "limitations" section.

Thank you for noting the significance, importance, and strengths of the NSAL despite the age of the data set. The data was collected in 2001-2003, which may limit the generalizability of the current findings. However, the NSAL includes the most comprehensive collection of survey items on friendship support and psychiatric disorders among a nationally representative sample of African Americans.

Reviewer 3 brings up a good point regarding the measurement of friendship dimensions. We have revised the limitation section to include this measurement limitation (p. 13). We have also

suggested that future research should use multi-item scales to assess the multiple dimensions of friendships (i.e., subjective closeness, frequency of contact, receipt of social support, provision of social support).

5. I agree with the authors decision to categorize education in order to depict the interaction graphically in the Figures. The coefficients for interaction terms from continuous variables in logistic regression models is very difficult to interpret.

Thank you for noting this.

6. My main concern with the paper concerns a lack of transparency about the logistic regression modeling. The social support item responses are a series of categories, which might have been represented in the model using indicator variables – allowing the model to produce a fitted value for each level of social support and its interaction with education. Instead, without justification, the authors have treated social support as a continuous variable (at least, I am guessing so since there is a single interaction term in their models whereas treating it as a series of categories would have needed to be tested in aggregate by a likelihood ratio test for several interaction terms) without any justification for doing so. This is a concern since it imposes a strong log-linear assumption (that the log odds of depression is a linear function of the modelled covariates) and risks erroneous fitted values. Yet, no indication of the fit of the model is provided in the manuscript – I don't think the manuscript can be published without some attempt to convince the reader that imposition of the strong (albeit unarticulated) assumption is justified.

The friendship characteristics (i.e., subjective closeness, frequency of contact, receipt of support, provision of support) are measured using a Likert-type scale (1 to 7 for frequency of contact and 1 to 4 for subjective closeness, receipt of support, and provision of support). Although Likert-type scales are technically ordinal in nature, a number of scholars have found that Likert-type variables can be treated as approximately continuous variables (Johnson & Creech, 1983; Lubke & Muthén, 2004; Norman, 2010; Sullivan & Artino Jr, 2013; Zumbo & Zimmerman, 1993). In these instances, a Likert-type variable is considered an ordinal approximation of a continuous variable and thus analysis strategies that are used for continuous variables are applied to Likert-type variables. This is a common practice in the psychiatric and social sciences that is well documented (Assari & Lankarani, 2018; Cross, Nguyen, Chatters, & Taylor, 2018; Mouzon, Taylor, Keith, Nicklett, & Chatters, 2016; Taylor, Forsythe-Brown, Taylor, & Chatters, 2014). In fact, this treatment of a Likert-type variable as a continuous variable can be found in several articles recently published in the Journal of Affective Disorders (see (Domènech-Abella, Mundó, Haro, & Rubio-Valera, 2019; Li, Jiang, & Zhang, 2019; Lin et al., 2019; Nyberg, Rajaleid, Westerlund, & Hammarström, 2019). We have added this explanation to the Methods section (p. 5). We have also included pseudo R squareds in Table 3 to provide evidence of model fit. The pseudo R squareds for the five models presented in Table 3 ranged from .15 to .16. These values represent good model fit (McFadden, 1977). Further, we conducted ancillary analyses with all four friendship variables treated as categorical variables and found that the pseudo R squareds for these models were very similar to the pseudo R squareds presented in Table 3. This suggests that the treatment of the friendship variables as continuous variables had no effect on the fit of the estimated models.

7. In the third "highlight" I think it would be better to say that the benefits of friendship are modified by education, since stratification is an analysis procedure rather than an interpretive one.

We have revised the third highlight. It now reads, "The benefits of friendships are modified by education level."

8. It is odd to list education as a "controlled" variable when the analysis is focused on interactions involving education. It is a different thing to say that education was included as a main effect when education by social support interactions are also included in the model and saying that it was "controlled."

We have revised the Methods section, so that education is not listed as a control variable for the multivariate analyses with education X friendship interactions. In the baseline model (i.e., the model without education X friendship interactions), education was included as a control variable (p. 6).

9. "....an iterative regression-based multiple imputation approach" is a vague description for a scientific journal. Is this referring to MICE?

The imputed family income and education variables were computed by researchers of the National Survey of American Life and not by the authors of this manuscript. This is a variable that is available within the public data set. However, we were unable to find documentation on the imputation procedures for these variables beyond what we have already provided in the manuscript. As far as we can tell, this information is not publicly available. In an effort to be as forthcoming as possible, we have provided several links below to websites that have information relevant to the NSAL. We have thoroughly searched these websites and were not able to find information on the imputation procedures the NSAL researchers used for the family income and education variables.

https://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/190
https://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/20240/version/8

10. I don't think it is right to say, in the discussion, that education is "an indicator of SES" – SES is a composite, usually, of education, income and sometimes occupational prestige. This study examines education, not SES.

Reviewer 3 is correct in noting that SES is a composite variable. Commonly, SES is assessed using an index, and frequently, education, income, occupation, and occupational prestige are components of an SES index (Mueller & Parcel, 1981). These components or items in an index are referred to as indicators (Blalock, 2017). For this reason, education, income, occupation, and occupational prestige are referred to in the SES literature as indicators of SES (Mueller & Parcel, 1981). To maintain consistency with established terminology in the field, we also referred to education as an indicator of SES in this paper. However, we understand that the phrasing, "…education, an indicator of SES" could seem to suggest that education is an equivalent

measure of SES, which, as Reviewer 3 noted, is inaccurate. We have changed the wording of this sentence, as well as a similar sentence in the introduction section for clarity (p. 4 and p. 9).

11. Beyond Wheaton et al., there is a literature stemming from evolutionary biology/psychology that hypothesizes that mobilization of social support is an adaptive feature of depression and one of the reasons for its evolutionary persistence.

We appreciate the suggestion to examine resource mobilization in the evolutionary psychology literature. After a thorough literature search, we believe that we have identified the theory to which Reviewer 3 was referring—Social Navigation Hypothesis. We have added a discussion of this theory in explanation of our findings in the Discussion section (p. 11).

References

Assari, S., & Lankarani, M. M. (2018). Secular and religious social support better protect Blacks than Whites against depressive symptoms. *Behavioral Sciences, 8*(5), 46.

Blalock, H. M. (2017). *Measurement in the social sciences*: Routledge.

Cross, C. J., Nguyen, A. W., Chatters, L. M., & Taylor, R. J. (2018). Instrumental social support exchanges in African American extended families. *Journal of Family Issues, 39*(13), 3535-3563. doi:10.1177/0192513x18783805

Domènech-Abella, J., Mundó, J., Haro, J. M., & Rubio-Valera, M. (2019). Anxiety, depression, loneliness and social network in the elderly: Longitudinal associations from The Irish Longitudinal Study on Ageing (TILDA). *Journal of affective disorders, 246*, 82-88. doi:https://doi.org/10.1016/j.jad.2018.12.043

Johnson, D. R., & Creech, J. C. (1983). Ordinal measures in multiple indicator models: A simulation study of categorization error. *American Sociological Review*, 398-407.

Li, C., Jiang, S., & Zhang, X. (2019). Intergenerational relationship, family social support, and depression among Chinese elderly: A structural equation modeling analysis. *Journal of affective disorders, 248*, 73-80. doi:https://doi.org/10.1016/j.jad.2019.01.032

Lin, X., Lu, D., Huang, Z., Chen, W., Luo, X., & Zhu, Y. (2019). The associations between subjective and objective cognitive functioning across manic or hypomanic, depressed, and euthymic states in Chinese bipolar patients. *Journal of affective disorders, 249*, 73-81. doi:https://doi.org/10.1016/j.jad.2019.02.025

Lubke, G. H., & Muthén, B. O. (2004). Applying multigroup confirmatory factor models for continuous outcomes to Likert scale data complicates meaningful group comparisons. *Structural Equation Modeling, 11*(4), 514-534.

McFadden, D. (1977). Quantitative methods for analyzing travel behavior of individuals: Some recent developments. In D. A. Hensher & P. R. Stopher (Eds.), *Behavioural travel modelling* (pp. 279-318). London: Croom Helm.

Mirowsky, J., & Ross, C. E. (2003). *Education, social status, and health*. New York: Walter de Gruyter, Inc.

Mouzon, D. M., Taylor, R. J., Keith, V. M., Nicklett, E. J., & Chatters, L. M. (2016). Discrimination and psychiatric disorders among older African Americans. *International Journal of Geriatric Psychiatry*.

Mueller, C. W., & Parcel, T. L. (1981). Measures of socioeconomic status: Alternatives and recommendations. *Child Development*, 13-30.

Norman, G. (2010). Likert scales, levels of measurement and the "laws" of statistics. *Advances in health sciences education, 15*(5), 625-632.

Nyberg, A., Rajaleid, K., Westerlund, H., & Hammarström, A. (2019). Does social and professional establishment at age 30 mediate the association between school connectedness and family climate at age 16 and mental health symptoms at age 43? *Journal of affective disorders, 246*, 52-61. doi:https://doi.org/10.1016/j.jad.2018.12.027

Sullivan, G. M., & Artino Jr, A. R. (2013). Analyzing and interpreting data from Likert-type scales. *Journal of graduate medical education, 5*(4), 541-542.

Taylor, R. J., Forsythe-Brown, I., Taylor, H. O., & Chatters, L. M. (2014). Patterns of emotional social support and negative interactions among African American and black Caribbean extended families. *Journal of African American Studies, 18*(2), 147-163.

Zumbo, B. D., & Zimmerman, D. W. (1993). Is the selection of statistical methods governed by level of measurement? *Canadian Psychology/Psychologie canadienne, 34*(4), 390.

Highlights

- Among respondents with high education, contact and receipt and provision of social support to friends protected against depression.

- Among respondents with low education, contact and receipt and provision of social support to friends were either unrelated to or associated with greater odds of depression.

- The benefits of friendships are modified by education level.

- African Americans with less education are less likely to benefit from their friendships.

Abstract

Background: This cross-sectional study examined the association between various characteristics of friendships and 12-month major depressive disorder (MDD) and whether these associations vary by education level among African Americans.

Methods: The analytic sample included 3,434 African American respondents drawn from the National Survey of American Life: Coping with Stress in the 21st Century. Logistic regression analyses were performed to test the associations between friendship characteristics (i.e., frequency of contact, subjective closeness, receipt of support, provision of support) and 12-month MDD. Interaction terms between education and each of the four friendship variables were used to test whether these associations varied by education level. Analyses adjusted for sociodemographic factors and chronic health problems.

Results: Frequency of contact and subjective closeness were negatively associated with 12-month MDD. An interaction between education and contact indicated that contact was negatively associated with MDD among high education respondents but unrelated to MDD among low education respondents. The interactions between education and receipt of support and education and provision of support demonstrated that receipt and provision of support were negatively associated with MDD among high education respondents but was positively associated with MDD among low education respondents.

Limitations: Given the cross-sectional design, it is not possible to make causal inferences.

Conclusion: This investigation provides an important first step to understanding within-group differences in how social relationships function as both a risk and protective factor for MDD among African Americans.

Keywords: depression; socioeconomic status; social support; friendship; education

Social Support from Friends and Depression among African Americans: The Moderating
Influence of Education

Ann W. Nguyen, Ph.D.
Case Western Reserve University

Quenette L. Walton, Ph.D.
University of Houston

Courtney Thomas, Ph.D.
University of California Los Angeles

Dawne M. Mouzon, Ph.D.
Rutgers University

Harry Owen Taylor, M.P.H., M.S.W.
Washington University in St. Louis

Author Note
Correspondence concerning this article should be addressed to Ann W. Nguyen, Jack, Joseph and
Morton Mandel School of Applied Social Sciences, Case Western Reserve University, 11235
Bellflower Rd, Cleveland, OH 44106. Email: nguyena@case.edu; phone: 216-368-1347.

Introduction

Based on data from 2016 (the most recently available data), roughly 5% of Black Americans (1.4 million people) experienced depression in the past 12 months, and only six out of 10 Black Americans who met criteria for depression received treatment in the past year (Center for Behavioral Health Statistics and Quality, 2017). This reflects very high rates of unmet need in this population. Moreover, despite having lower prevalence of depression, African Americans are more likely than non-Hispanic Whites to experience persistent disorder trajectories, or those lasting 2 years or longer (Breslau et al., 2005).

Social relationships are important sources of social support. Social support is comprised of four different types or dimensions—emotional, informational, appraisal, and instrumental (House, 1981). Emotional support includes empathy, concern, and affection. Informational support is the provision of advice and guidance, and appraisal support includes providing information that is helpful for self-evaluation. Instrumental support is the provision of tangible assistance, such as financial aid, childcare, and transportation. Research has indicated that each support type has differing effects on health and well-being (Östberg and Lennartsson, 2007; Sarason et al., 1996; Schwarzer and Leppin, 1991; Viswesvaran et al., 1999). However, findings in this area have been equivocal, with some studies indicating that instrumental support is a stronger predictor of health and well-being (Östberg and Lennartsson, 2007; Schwarzer and Leppin, 1991) and other studies indicating that emotional support is more important for health and well-being (Sarason et al., 1996; Viswesvaran et al., 1999). Regardless of these mixed findings, instrumental support is particularly important for individuals of lower socioeconomic status (SES). Individuals from lower SES backgrounds lack financial resources, and often must rely on assistance from family and friends (Gerstel, 2011; Sarkisian and Gerstel, 2004). Thus,

instrumental support is critical for individuals who lack the financial means to access formal services (e.g., daycare programs, professional in home care of older adults). For instance, Henly and Lyons' (2000) found that low income working mothers relied mostly on family, friends, and neighbors for childcare rather than on daycare centers.

Unsurprisingly, social support is a critical stress coping resource for African Americans, who are more likely to rely on informal rather than formal sources of help for when dealing with serious personal problems (Woodward et al., 2010). Prior research has shown that social relationships can protect against depression. A number of studies on depression among African Americans have found that positive family and church ties can protect against depression and depressive symptoms (Artinian et al., 2006; Chatters et al., 2015; Lincoln and Chae, 2012). For example, an investigation of depressive symptoms among African American adults found that more frequent support from family was predictive of fewer depressive symptoms (Lincoln et al., 2005). Taylor et al.'s (2015) study of major depressive disorder (MDD) found that subjective closeness to relatives protected against 12-month and lifetime MDD.

Preliminary evidence suggests that SES and social relationships can interact in their effects on health. Some research in this area has found that the protective effects of social support on health are stronger among individuals with high SES (Antonucci et al., 1999; Fagundes et al., 2012; Gorman and Sivaganesan, 2007; Krause, 1997). These studies have demonstrated that social support is associated with lower risk for hypertension and mortality and higher levels of self-rated health among high SES individuals. That is, those from higher SES backgrounds benefit most from the protective qualities of social support, and some studies have even found that the social support-health connection was nonexistent among those from lower SES backgrounds. Conversely, some studies have found that social support's protective qualities

are stronger among individuals of low SES (Brummett et al., 2003; North et al., 2008). Yet, additional empirical evidence has demonstrated that social support is predictive of worse, rather than better, health outcomes among individuals with low SES. For instance, some examinations of these associations have found that social support was predictive of greater risk for hypertension (Gorman and Sivaganesan, 2007), poor health (Antonucci et al., 1999), and mortality (Krause, 1997) among low SES respondents.

Taken together, these studies suggest that support does not function similarly for individuals from low and high SES backgrounds with regards to health. However, the exact nature of the link between social support, and more broadly social relationships, and health varies by SES is equivocal, with some studies indicating that social support is more beneficial for high SES individuals and other studies indicating the opposite (i.e., social support more beneficial for low SES individuals). A few studies have even indicated that social support is predictive of poorer health outcomes among low SES individuals.

Much of the research on the connection between social relationships and mental and physical health (including many of the studies previously described) do not distinguish between the different relationship sources (e.g., family, friends, church members). Among the studies that do differentiate sources, most of these studies examine family relationships. Consequently, knowledge on how nonkin relationships influence depression is very limited. Another knowledge gap in the literature is the dearth of information on the moderating effects of SES on the relation between social relationships and depression. No study, to our knowledge, has examined this topic specifically in African Americans. Consequently, we do not know if social relationships function differently in relation to depression at varying SES levels for African Americans. To bridge these knowledge gaps, we examined how multiple aspects of friendships

(i.e., subjective closeness, frequency of contact, receipt of support, and provision of support) are associated with 12-month MDD in a nationally representative sample of African American adults. A second aim of this study is to determine whether the association between friendships and 12-month MDD varies by education level, one of several SES indicators. Among indicators of SES, education is a strong indicator for several reasons. Education precedes income and occupation. For this reason, researchers have found that education drives most of the relationship between SES and mental and physical health (Mirowsky and Ross, 2003). Additionally, education is argued to be a better SES indicator than occupation because occupation does not account for individuals who do not work, which would disproportionately affect women who have never worked outside of the home.

Methods

Sample

The African American sample for the current analyses was drawn from the National Survey of American Life (NSAL), conducted by the Program for Research on Black Americans at the University of Michigan's Institute for Social Research. The African American sample is a national probability sample of households located in the 48 coterminous states with at least one Black adult aged 18 or older who did not identify ancestral ties in the Caribbean. The data collection was conducted from February 2001 to June 2003. Researchers completed 6,082 interviews with individuals aged 18 or older, including 3,570 African Americans, 891 non-Hispanic Whites, and 1,621 Blacks of Caribbean descent. The overall response rate was 72.3% (see Jackson et al., 2004 for a more detailed discussion of the NSAL sample) (Jackson et al., 2004). The NSAL data collection was approved by the University of Michigan Institutional Review Board.

Measures

       Friendship characteristics. Subjective closeness to friends was assessed by the question, "How close do you feel towards your friends?" Response categories ranged from *very close* (4) to *not close at all* (1). Frequency of contact with friends was measured by the question, "How often do you see, write or talk on the telephone with your friends?" Possible response categories ranged from *everyday* (7) to *never* (1). Social support from friends was assessed by the question, "How often do your friends help you out?" Provision of support to friends was measured by the question, "How often do you help out your friends?" Response categories for these two support questions ranged from *very often* (4) to *never* (1). Although these four friendship variables were measured with Likert-type scales, in accordance with conventions in the behavioral sciences, these variable were treated as continuous variables in the analysis. Likert-type variables can be treated as approximately continuous variables because they are considered ordinal approximations of a continuous variable (Johnson and Creech, 1983; Lubke and Muthén, 2004; Sullivan and Artino Jr, 2013; Zumbo and Zimmerman, 1993).

      12-month MDD. The DSM-IV World Mental Health Composite International Diagnostic Interview (WMH-CIDI), a fully structured diagnostic interview, was used to assess12-month MDD. The mental disorders sections used for the NSAL are slightly modified versions of those developed for the World Mental Health project initiated in 2000 (World Health Organization, 2004) and the instrument used in the National Comorbidity Survey-Replication (Kessler and Ustün, 2004).

      Education and control variables. Education (years of formal education) was measured as a continuous variable. The multivariate analysis controlled for gender, age, family income, region, marital status, and number of chronic health conditions. For the baseline regression

model (without education X friendship interactions), education was included as a control variable. Gender was dummy coded (1 = *male*, 2 = *female*). Age (in years) and family income (in dollars) were assessed continuously. Due to skewness, the log of family income was used in multivariate analyses. Missing data for family income and education were imputed using an iterative regression-based multiple imputation approach incorporating information about age, sex, region, race, employment status, marital status, home ownership, and nativity of household residents. Region was coded to differentiate respondents who resided in the South, Northeast, North Central, and West. Marital status was coded to differentiate respondents who were married or cohabiting, separated, divorced, widowed, and never married. Number of chronic health conditions was measured by reports from respondents of the number of doctor-diagnosed physical conditions.

Analysis strategy

We used logistic regression to test the association between friendships and 12-month MDD and the moderating effects of education on this association. We constructed interaction terms between education and each of the four friendship variables (i.e., subjective closeness, contact, receipt of support, and provision of support) to test the moderating effects of education. These interaction terms were individually tested in separate logistic regression models. Significant interactions are depicted using predicted probabilities of 12-month MDD. Although education was treated as a continuous variable in the multivariate analysis, it was depicted categorically (low vs. high education) in the figures for ease of interpretation. The low and high education groups are represented by respondents with an educational attainment level of 1.5 standard deviation below and above the mean, respectively. All analyses were conducted using Stata 15 which uses the Taylor expansion approximation technique for calculating the complex

design-based estimates of variance. All statistical analyses accounted for the complex multistage clustered design of the NSAL sample, unequal probabilities of selection, nonresponse, and poststratification to calculate weighted, nationally representative population estimates and standard errors.

Results

Table 1 presents the distribution of the study variables. The sample was comprised of slightly more women (56%) than men, and the average age of respondents was 43 years. Approximately two out of five respondents were either married or cohabiting with a partner, and about one third of respondents reported having never married (32%). The majority of respondents resided in the South (56%). On average, respondents reported one chronic health condition previously diagnosed by a doctor. The average educational attainment level was 12.3 years. Overall, respondents reported moderate to high levels of subjective closeness, contact, receipt of support, and provision of support to friends. The frequency of receipt and provision of support were similar, indicating reciprocity in supportive exchanges. The 12-month prevalence of MDD in this sample was 6.7%.

The bivariate analysis (Table 2) indicated that respondents who qualified for a 12-month MDD diagnosis differed from respondents who did not qualify for a 12-month MDD diagnosis on gender, age, family income, region, marital status, number of chronic health conditions, and provision of support to friends. Among those who qualified for a diagnosis, there was a larger proportion of women, individuals who resided in the North Central region of the U.S., and individuals who were separated or never married. Overall, respondents who qualified for an MDD diagnosis were younger, had lower family income, and more chronic health conditions. These respondents also reported providing support to friends more frequently than respondents

Table 3 presents the logistic regression analyses for 12-month MDD. Model 1, which assessed the main effects of the friendship variables on 12-month MDD, indicates that subjective closeness and frequency of contact were negatively associated with 12-month MDD. Respondents who reported higher levels of subjective closeness and contact with friends had lower odds of meeting criteria for MDD within the previous 12 months.

Models 2 through 5 tested the moderating effects of education on the relation between the various aspects of friendship and 12-month MDD. The statistically significant interaction between education and frequency of contact (Figure 1) revealed that at the lowest levels of contact, respondents in the high education group had a greater probability of 12-month MDD than respondents in the low education group. However, as contact increased, the probability of meeting criteria for MDD within the previous 12 months substantially decreased for respondents in the high education group. For respondents in the low education group, there was virtually no association between frequency of contact and 12-month MDD. Thus, at the highest level of contact, respondents in the low education group had a higher probability of 12-month MDD.

The statistically significant interaction between receipt of support and education (Figure 2) indicated a similar pattern. At the lowest level of support, individuals in the high education group had a higher probability of 12-month MDD. As support increased, the probability of 12-month MDD substantially decreased for respondents in the high education group. However, for respondents in the low education group, there was a positive association between support and 12-month MDD. In other words, for respondents in the low education group, as support increased, so did the probability of meeting criteria for MDD. As a result, at the highest level of support, respondents in the low education group had a greater probability of MDD.

Similar to the previous interactions, the interaction between support provision and education (Figure 3) showed that at the lowest level of support provision, respondents in the high education group had a higher probability of MDD, but as the provision of support increased, the probability of 12-month MDD decreased among respondents in the high education group. In contrast, the probability of 12-month MDD increased with provision of support among respondents in the low education group. Consequently, at the highest level of support provision, individuals in the low education group had a higher probability of MDD than individuals in the high education group.

Discussion

The purpose of this study was to advance knowledge on the influence of friendships on MDD among African Americans and how this association is stratified by education, one of several indicators of SES. Studies that have examined the effects of social relationships on depression tend not to differentiate between sources of relationships, and those that do tend to focus primarily on family relationships. Thus, little is known about the role of friendships in depression and how friendships function at different levels of education. Findings from the analysis revealed new insights that extends prior research on the connection between social relationships and depression among African Americans.

The results revealed that contact and subjective closeness to friends protected against MDD. These findings are consistent with previous research, which has found that positive relationship qualities can protect against depression as well as a range of psychiatric problems, such as posttraumatic stress disorder, suicidality, and psychological distress (Chatters et al., 2018; Levine et al., 2015; Nguyen et al., 2016). The current findings suggest that friendships are important stress coping resources for African Americans that can protect against depression and

mitigate depressive symptoms. In fact, in certain contexts, friendships can have a greater impact on a person's mental health than family relationships (Helliwell and Putnam, 2004; Pinquart and Sörensen, 2000). Unlike family relationships, which are ascribed associations, friendships are voluntary associations. This means that individuals can more easily disengage from unsatisfactory friendships than they can from unsatisfactory family relationships. Consequently, friendships are often of higher quality than family relationships.

In the current investigation, more frequent contact with friends and receiving more frequent support from friends protected against MDD but only for respondents with more years of formal education. In contrast, for respondents with fewer years of formal education, contact with friends was unrelated to MDD, and receiving support from friends was associated with a higher odds of meeting criteria for MDD. These findings are in line with some extant studies on physical health that have documented weaker to no protective effects of social support among individuals with fewer years of education and of low SES (Fagundes et al., 2012; Gorman and Sivaganesan, 2007) and positive associations between social support and poor physical health among individuals of low SES (Gorman and Sivaganesan, 2007; Krause, 1997). Friend contact may not protect against depression for respondents with less education due to the quality of these friendships. Prior research has found that individuals with lower SES tend to be less satisfied with their social relationships and the subjective quality of their relationships is sometimes lower (Krause, 1997). Given these characteristics, respondents in the low education group may not have been able to effectively garner the benefits of their friendships as their counterparts in the high education group were able to. Moreover, the lack of association between contact and MDD among individuals with less education may reflect the limited access to resources and greater exposure to chronic stressors among these individuals. Individuals with less education are likely

10

to lack the social and economic resources to which individuals with more education have access and are more likely to experience a greater number of chronic stressors, such as material hardship, that are also risk factors for depression. Given the combination of attenuated stress coping resources and greater exposure to chronic stressors, friends may not be sufficient coping resources for respondents with fewer years of formal education.

The positive association between receiving support and depression among respondents with less education may reflect resource mobilization. The resource mobilization framework (Wheaton, 1985) suggests that when an individual experiences hardship, they are likely to reach out to their social networks to marshal the necessary supports for coping with these problems. Additionally, the individual's support network may initiate assistance to the individual if they notice that the individual is in distress. In the present analysis, it may be that respondents with less education who were suffering from depression were reaching out to their friends for help coping with their depressive symptoms; moreover, their friends may have noticed mood and behavioral changes in the respondents and mobilized around them to help them cope with their depressive symptoms. This pattern of findings is in accord with resource mobilization studies that have found positive associations between social support and psychological distress and suicidality (Nguyen et al., 2017; Nguyen et al., 2016). This finding is also consistent with the Social Navigation Hypothesis (Watson and Andrews, 2002), which posits that when an individual is struggling and is in distress, they may consequently develop depression. This depressive response is considered adaptive, as depressive symptoms are likely to be noticed by members of the individual's social network, who would then mobilize support around the individual and help them cope with their depressive symptoms as well as the initial stressors that precipitated the depression.

Findings related to providing support to friends indicated that overall support provision had no influence on depression. However, when this association was examined within the context of educational attainment, the data revealed that while giving support protected respondents with high education against depression, support provision was related to increased odds of depression among low education respondents. The negative association between giving support and depression is consistent with the few studies that have examined the health effects of providing support. These studies demonstrate that providing support to others is beneficial to one's health and well-being (Brown et al., 2003; Krause, 2006; Krause et al., 1992). Specifically, these studies have found that providing support was associated with fewer depressive symptoms, higher levels of well-being, and even reduced mortality. Providing support to friends can bolster one's sense of self-efficacy, self-worth, and purpose, which are related to improved mental and physical health.

However, providing support to friends may not be as beneficial for individuals with less education, as the act of providing support could be perceived as stressful for these individuals, who are likely to have fewer resources. Thus, among respondents with low education, providing support to friends may become an additional stressor with which they must cope and could contribute to their increased odds for depression. Krause and Shaw's investigation of support provision and well-being among older adults identified a similar pattern (2000). They found that among respondents with high education, providing support was associated with higher self-esteem, while among respondents with low education, providing support was associated with lower self-esteem.

Limitations

The current findings should be interpreted within the context of the study's limitations. First, given the cross-sectional design, it is not possible to make causal inferences. For example, we are unable to definitively conclude whether receiving social support leads to lower odds of depression or vice versa. Future studies should use prospective data to determine the temporal ordering of these variables. Second, because the NSAL only surveyed community-dwelling adults, the current findings are not generalizable to institutionalized and homeless individuals. Third, measures of friend relationships were self-reported, which are subjected to recall and social desirability biases. Additionally, each dimension of friend relationships (i.e., subjective closeness, frequency of contact, receipt of support, and provision of support) were assessed using a single item rather than a scale. Future research should assess these relationship dimensions using multi-item scales, as they tend to be more stable, reliable, and precise. Lastly, this analysis did not control for childhood family and neighborhood contexts and experiences, which can influence both educational attainment and depression risk. Prospective analyses examining education and depression should account for these confounding factors.

Conclusion

Despite these limitations, the present analysis is the first to examine the association between multiple aspects of friendships and 12-month MDD among a nationally representative sample of African Americans and how these associations vary by level of education. This study contributes to the literature on the link between social relationships and psychiatric disorders, as few extant studies have examined how contact, subjective closeness, and provision of support within friendships relate to specific disorders. Most studies in the area tend to focus on the receipt of support, which, albeit an important aspect of relationships, is only one of many aspects. Taken together, these findings demonstrate that the benefits of friendships are stratified

by education level, and African Americans with fewer years of education are less likely to benefit from their friendships than African Americans with more years of formal education. These findings underscore the complexity of social support as a possible intervening process in depression. The results suggest that friendships are qualitatively different at varying levels of education, and the various aspects of friendships function differently in relation to depression at low levels of education. Although prior research indicates that, generally, social contact and receipt and provision of support protects against psychiatric illnesses, we have demonstrated that these associations are more nuanced and must be examined within the context of education and SES. This in-depth investigation provides an important first step to understanding within-group differences in how social relationships function as both a risk and protective factor for MDD among African Americans.

References

Antonucci, T.C., Ajrouch, K.J., Janevic, M., 1999. Socioeconomic status, social support, age, and health. Age 40, 60-93.

Artinian, N.T., Washington, O.G.M., Flack, J.M., Hockman, E.M., Jen, K.C., 2006. Depression, stress, and blood pressure in urban African-American women. Prog. Cardiovasc. Nurs. 21, 68-75.

Breslau, J., Kendler, K.S., Su, M., Gaxiola-Aguilar, S., Kessler, R.C., 2005. Lifetime risk and persistence of psychiatric disorders across ethnic groups in the United States. Psychol. Med. 35, 317-327.

Brown, S.L., Nesse, R.M., Vinokur, A.D., Smith, D.M., 2003. Providing social support may be more beneficial than receiving it: Results from a prospective study of mortality. Psychol. Sci. 14, 320-327.

Brummett, B.H., Barefoot, J.C., Vitaliano, P.P., Siegler, I.C., 2003. Associations among social support, income, and symptoms of depression in an educated sample: The UNC Alumni Heart Study. Int. J. Behav. Med. 10, 239-250.

Center for Behavioral Health Statistics and Quality, 2017. 2016 National Survey on Drug Use and Health: Detailed tables. Substance Abuse and Mental Health Services Administration, Rockville, MD.

Chatters, L.M., Nguyen, A.W., Taylor, R.J., Hope, M.O., 2018. Church and family support networks and depressive symptoms among African Americans: Findings from the National Survey of American Life. Journal of Community Psychology.

Chatters, L.M., Taylor, R.J., Woodward, A.T., Nicklett, E.J., 2015. Social support from church and family members and depressive symptoms among older African Americans. American Journal of Geriatric Psychiatry 23, 559-567.

Fagundes, C.P., Bennett, J.M., Alfano, C.M., Glaser, R., Povoski, S.P., Lipari, A.M., Agnese, D.M., Yee, L.D., Carson III, W.E., Farrar, W.B., 2012. Social support and socioeconomic status interact to predict Epstein-Barr virus latency in women awaiting diagnosis or newly diagnosed with breast cancer. Health Psychol. 31, 11-19.

Gerstel, N., 2011. Rethinking families and community: The color, class, and centrality of extended kin ties. Sociological Forum 26, 1-20.

Gorman, B.K., Sivaganesan, A., 2007. The role of social support and integration for understanding socioeconomic disparities in self-rated health and hypertension. Soc. Sci. Med. 65, 958-975.

Helliwell, J.F., Putnam, R.D., 2004. The social context of well-being. Philosophical Transactions-Royal Society of London Series B Biological Sciences 359, 1435-1446.

Henly, J.R., Lyons, S., 2000. The negotiation of child care and employment demands among low -income parents. Journal of Social Issues 56, 683-706.

House, J.S., 1981. Work stress and social support. Addison-Wesley Educational Publishers Inc, Reading, MA.

Jackson, J.S., Torres, M., Caldwell, C.H., Neighbors, H.W., Nesse, R.M., Taylor, R.J., Trierweiler, S.J., Williams, D.R., 2004. The National Survey of American Life: A study of racial, ethnic and cultural influences on mental disorders and mental health. Int. J. Methods Psychiatr. Res. 13, 196-207.

Johnson, D.R., Creech, J.C., 1983. Ordinal measures in multiple indicator models: A simulation

    study of categorization error. Am. Sociol. Rev., 398-407.

Kessler, R.C., Ustün, T.B., 2004. The world mental health (WMH) survey initiative version of

    the world health organization (WHO) composite international diagnostic interview

    (CIDI). Int. J. Methods Psychiatr. Res. 13, 93-121.

Krause, N., 1997. Received support, anticipated support, social class, and mortality. Res. Aging

    19, 387-422.

Krause, N., 2006. Church-based social support and mortality. J Gerontol B Psychol Sci Soc Sci

    61, S140-S146.

Krause, N., Herzog, A.R., Baker, E., 1992. Providing support to others and well-being in later

    life. J. Gerontol. 47, P300-P311.

Krause, N., Shaw, B.A., 2000. Giving social support to others, socioeconomic status, and

    changes in self-esteem in late life. J Gerontol B Psychol Sci Soc Sci 55, S323-S333.

Levine, D.S., Taylor, R.J., Nguyen, A.W., Chatters, L.M., Himle, J.A., 2015. Family and

    friendship informal support networks and social anxiety disorder among African

    Americans and Black Caribbeans. Soc. Psychiatry Psychiatr. Epidemiol. 50, 1121-1133.

Lincoln, K.D., Chae, D.H., 2012. Emotional support, negative interaction and major depressive

    disorder among African Americans and Caribbean Blacks: Findings from the National

    Survey of American Life. Soc. Psychiatry Psychiatr. Epidemiol. 47, 361-372.

Lincoln, K.D., Chatters, L.M., Taylor, R.J., 2005. Social support, traumatic events, and

    depressive symptoms among African Americans. J Marriage Fam 67, 754-766.

Lubke, G.H., Muthén, B.O., 2004. Applying multigroup confirmatory factor models for continuous outcomes to Likert scale data complicates meaningful group comparisons. Struct Equ Modeling 11, 514-534.

Mirowsky, J., Ross, C.E., 2003. Education, social status, and health. Walter de Gruyter, Inc., New York.

Nguyen, A.W., Chatters, L.M., Taylor, R.J., Aranda, M.P., Lincoln, K.D., Thomas, C.S., 2017. Discrimination, serious psychological distress, and church-based emotional support among African American men across the life span. The Journals of Gerontology: Series B.

Nguyen, A.W., Taylor, R.J., Chatters, L.M., Taylor, H.O., Lincoln, K.D., Mitchell, U.A., 2016. Extended family and friendship support and suicidality among African Americans. Soc. Psychiatry Psychiatr. Epidemiol., 1-11.

North, R.J., Holahan, C.J., Moos, R.H., Cronkite, R.C., 2008. Family support, family income, and happiness: A 10-year perspective. J. Fam. Psychol. 22, 475-483.

Östberg, V., Lennartsson, C., 2007. Getting by with a little help: The importance of various types of social support for health problems. Scandinavian Journal of Public Health 35, 197-204.

Pinquart, M., Sörensen, S., 2000. Influences of socioeconomic status, social network, and competence on subjective well-being in later life: A meta-analysis. Psychol. Aging 15, 187-224.

Sarason, I.G., Sarason, B.R., Brock, D.M., Pierce, G.R., 1996. Social support: Current status, current issues, In: Spielberger, C.D., Sarason, I.G. (Eds.), Stress and Emotion: Anxiety, Anger and Curiosity. Taylor & Francis, Washington, D.C., pp. 3-27.

Sarkisian, N., Gerstel, N., 2004. Kin support among Blacks and Whites: Race and family organization. Am. Sociol. Rev. 69, 812-837.

Schwarzer, R., Leppin, A., 1991. Social support and health: A theoretical and empirical overview. Journal of social and personal relationships 8, 99-127.

Sullivan, G.M., Artino Jr, A.R., 2013. Analyzing and interpreting data from Likert-type scales. J. Grad. Med. Educ. 5, 541-542.

Taylor, R.J., Chae, D.H., Lincoln, K.D., Chatters, L.M., 2015. Extended family and friendship support networks are both protective and risk factors for major depressive disorder and depressive symptoms among African-Americans and Black Caribbeans. J Nerv Ment Dis 203, 132-140.

Viswesvaran, C., Sanchez, J.I., Fisher, J., 1999. The role of social support in the process of work stress: A meta-analysis. J. Vocat. Behav. 54, 314-334.

Watson, P.J., Andrews, P.W., 2002. Toward a revised evolutionary adaptationist analysis of depression: the social navigation hypothesis. J. Affect. Disord. 72, 1-14.

Wheaton, B., 1985. Models for the stress-buffering functions of coping resources. J. Health Soc. Behav. 26, 352-364.

Woodward, A.T., Chatters, L.M., Taylor, R.J., Neighbors, H.W., Jackson, J.S., 2010. Differences in professional and informal help seeking among older African Americans, Black Caribbeans and non-Hispanic Whites. Journal of the Society for Social Work and Research 1, 124.

World Health Organization, 2004. Prevalence, severity, and unmet need for treatment of mental disorders in the world health organization world mental health surveys. JAMA 291, 2581-2590.

Zumbo, B.D., Zimmerman, D.W., 1993. Is the selection of statistical methods governed by level of measurement? Canadian Psychology/Psychologie canadienne 34, 390.

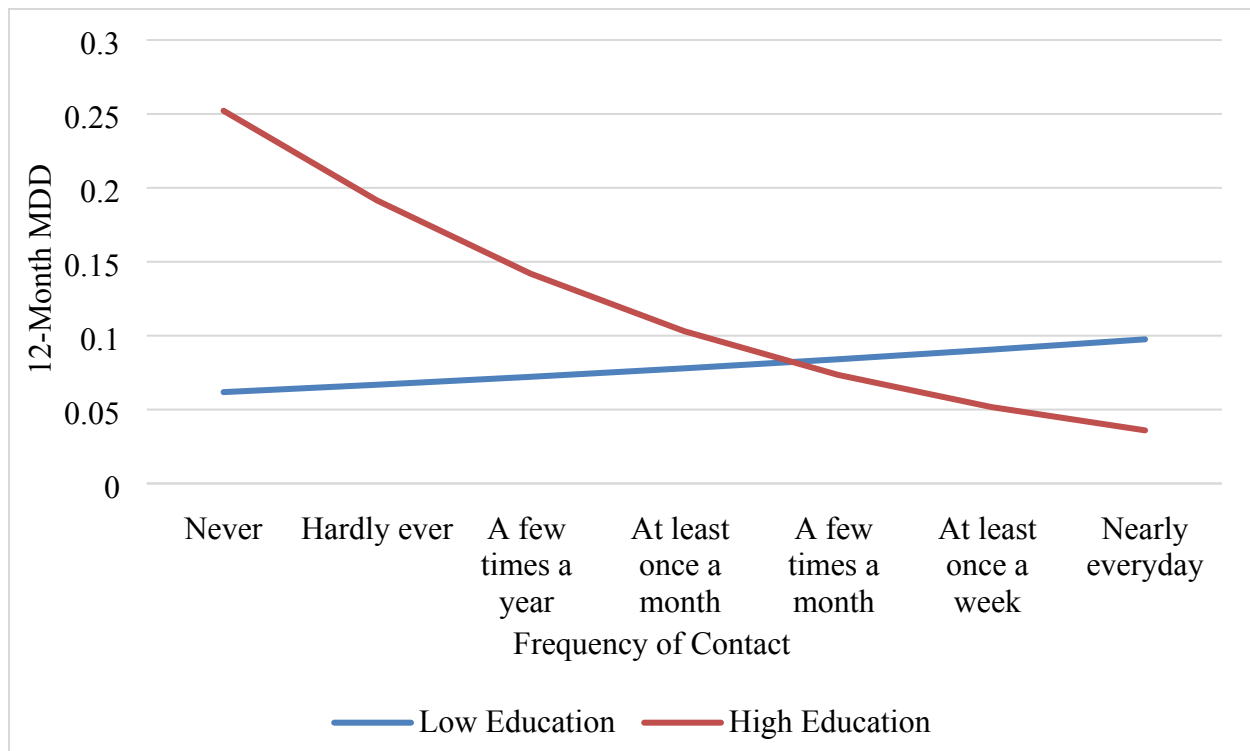*Figure 1.* Predicted probability of 12-month MDD by frequency of contact and education among African Americans.
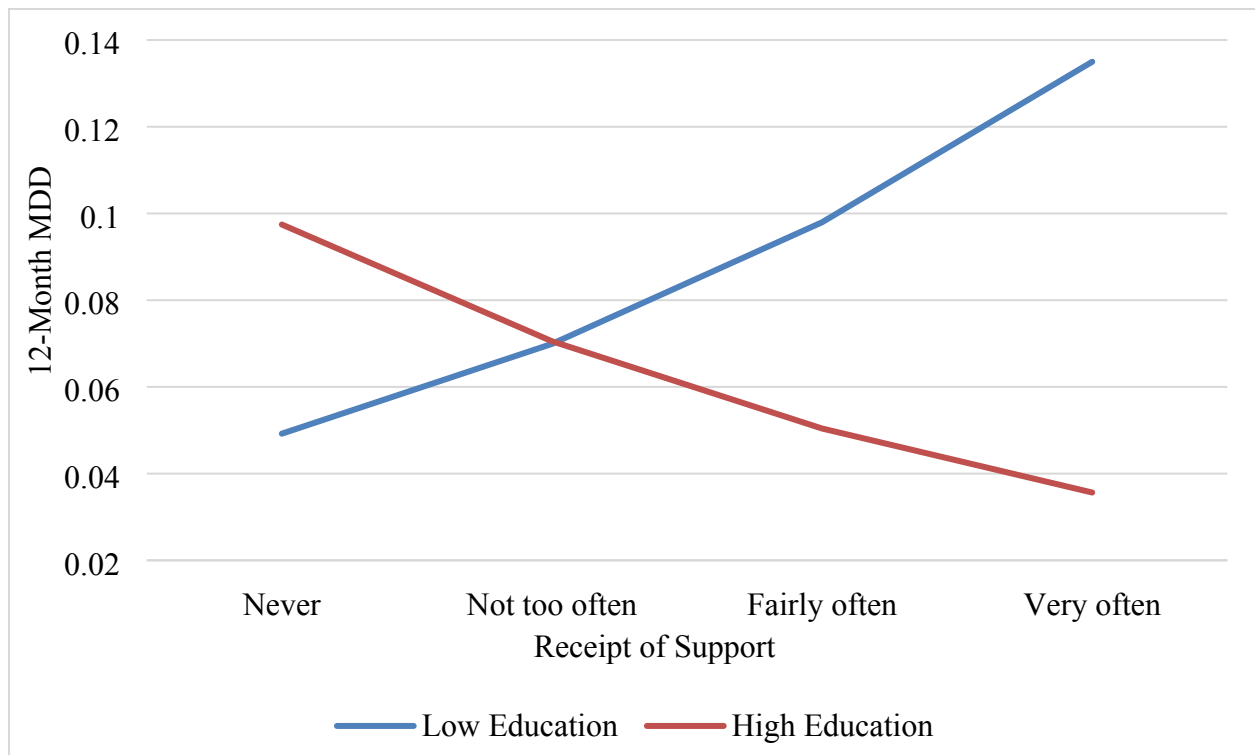
Figure 2. Predicted probability of 12-month MDD by receipt of support and education among African Americans.
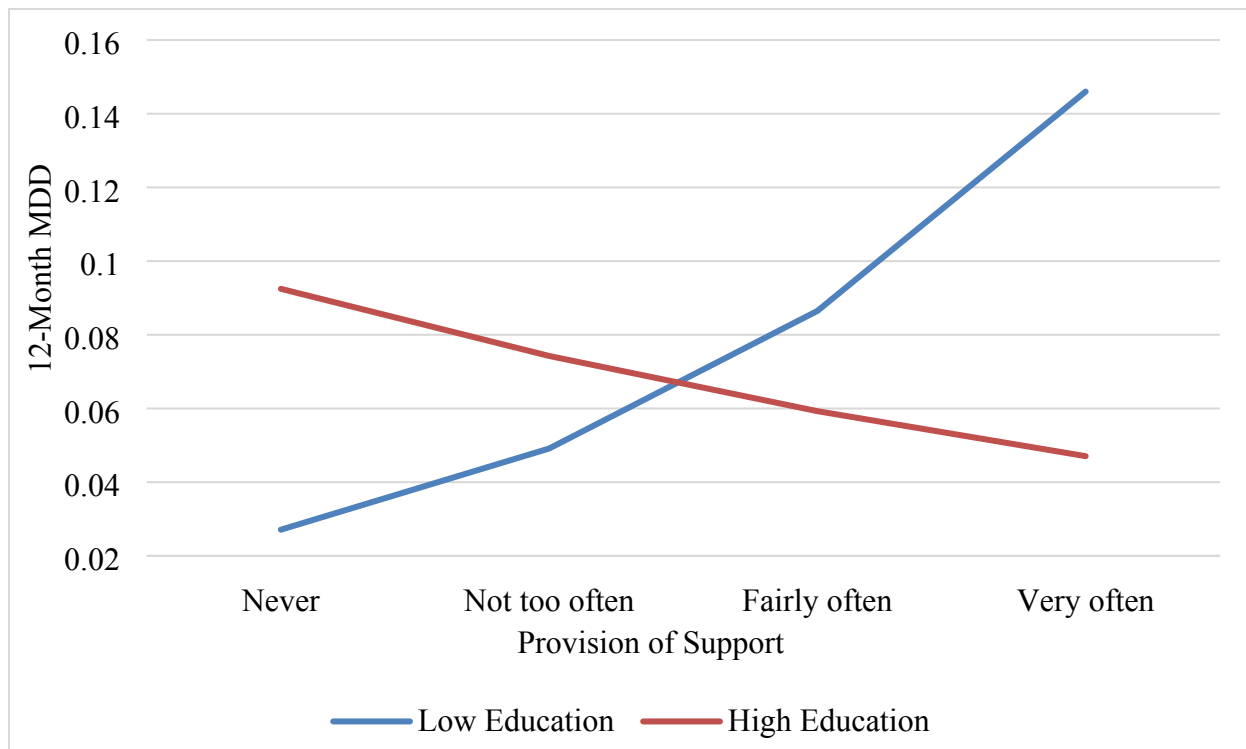
Figure 3. Predicted probability of 12-month MDD by provision of support and education among African Americans.

Table 1

Demographic Characteristics of the Sample and Distribution of Study Variables

	% (Mean)	N (SD)	Range
Gender			
Male	44.03	1,271	
Female	55.97	2,299	
Age	43.15	16.32	18-93
Education	12.30	2.58	0-17
Family Income	32,037.15	32,687.94	0-520,000
Region			
South	56.24	2,330	
Northeast	15.69	411	
North Central	18.81	595	
West	9.25	234	
Marital Status			
Married/Cohabiting	41.65	1,220	
Separated	7.16	286	
Divorced	11.75	524	
Widowed	7.89	353	
Never Married	31.55	1,170	
Number of Chronic Conditions	1.33	1.62	0-13
Subjective Closeness to Friends	3.29	.77	1-4
Frequency of Contact with Friends	5.74	1.62	1-7
Receipt of Support from Friends	2.52	.98	1-4
Provision of Support to Friends	2.78	.94	1-4
12-Month MDD			
Yes	6.70	228	
No	93.30	3206	

Note: Percentages and N are presented for categorical variables and Means and Standard Deviations are presented for continuous variables. Percentages are weighted and frequencies are unweighted.

Table 2
Bivariate Analysis of Sociodemographic Characteristics and 12-Month MDD

	12-Month MDD		
	Yes	No	Test
Gender, *n* (%)			16.16***
Male	54 (30.94)	1163 (44.94)	
Female	174 (69.06)	2043 (55.06)	
Age, *M* (*SD*)	38.91(12.87)	43.16 (16.43)	14.66***
Education, *M* (*SD*)	12.03 (2.56)	12.34 (2.57)	3.06
Family Income, *M* (*SD*)	27073.13 (34850.96)	32470.65 (32795.59)	5.72*
Region, *n* (%)			6.02**
South	121 (41.60)	2131 (57.86)	
Northeast	35 (19.90)	369 (15.85)	
North Central	55 (28.04)	492 (16.85)	
West	17 (10.46)	214 (9.45)	
Marital Status, *n* (%)			7.08***
Married/Cohabiting	50 (26.69)	1131 (42.87)	
Separated	32 (13.67)	244 (6.76)	
Divorced	31 (10.81)	470 (11.62)	
Widowed	21 (6.79)	314 (7.81)	
Never Married	94 (42.04)	1039 (30.94)	
Number of Chronic Conditions, *M* (*SD*)	1.92 (1.96)	1.29 (1.59)	32.52***
Subjective Closeness to Friends, *M* (*SD*)	3.21 (.86)	3.30 (.77)	2.94
Frequency of Contact with Friends , *M* (*SD*)	5.61 (1.72)	5.76 (1.61)	1.71
Receipt of Support from Friends, *M* (*SD*)	2.55 (1.00)	2.52 (.99)	.21
Provision of Support to Friends, *M* (*SD*)	2.97 (.93)	2.77 (.93)	9.19**

Note: Percentages, presented within parentheses, are weighted and frequencies are un-weighted.
* *p* < 0.05; ** *p* < 0.01; *** *p* < 0.001.

Table 3
Multivariable weighted logistic regressions for 12-month MDD among African Americans (N=3,434)

	OR (CI)				
	Model 1	Model 2	Model 3	Model 4	Model 5
Subjective Closeness	.77 (.63-.95)*	2.00 (.72-5.53)	.80 (.66-.98)*	.78 (.64-.96)*	.75 (.61-.92)**
Frequency of Contact	.89 (.82-.97)*	.89 (.82-.98)*	1.85 (.97-3.53)	.88 (.81-.96)**	.90 (.82-.98)*
Receipt of Support	1.05 (.82-1.33)	1.06 (.83-1.34)	1.03 (.81-1.29)	3.45 (1.62-7.37)**	1.07 (.83-1.39)
Provision of Support	1.26 (.93-1.69)	1.23 (.91-1.68)	1.29 (.96-1.73)	1.27 (.95-1.71)	5.06 (1.87-13.69)**
Subjective Closeness*Education	--	.92 (.85-1.00)	--	--	--
Frequency of Contact*Education	--	--	.94 (.89-.99)*	--	--
Receipt of Support*Education	--	--	--	.90 (.85-.96)**	--
Provision of Support*Education	--	--	--	--	.89 (.82-.97)**
Gender					
Men[a]	1.00	1.00	1.00	1.00	1.00
Women	1.67 (1.17-2.37)**	1.69 (1.18-2.42)**	1.65 (1.15-2.36)**	1.69 (1.18-2.40)**	1.65 (1.14-2.39)**
Age	.96 (.95-.98)***	.96 (.95-.98)***	.96 (.95-.98)***	.96 (.95-.98)***	.96 (.95-.98)***
Education	.95 (.87-1.03)	1.22 (.91-1.64)	1.34 (.96-1.88)	1.22 (1.03-1.45)*	1.34 (1.04-1.73)*
Family Income	1.13 (.91-1.41)	1.12 (.90-1.39)	1.12 (.90-1.40)	1.11 (.90-1.38)	1.10 (.88-1.38)
Marital Status					
Married/Cohabiting[a]	1.00	1.00	1.00	1.00	1.00
Separated	2.34 (1.22-4.51)*	2.39 (1.24-4.61)*	2.43 (1.25-4.74)*	2.39 (1.24-4.61)*	2.46 (1.25-4.82)*
Divorced	1.79 (.99-3.25)	1.79 (.98-3.24)	1.90 (1.05-3.43)*	1.81 (.99-3.31)	1.79 (.98-3.26)

Widowed	1.76 (.72-4.28)	1.72 (.68-4.35)	1.85 (.78-4.35)	1.83 (.77-4.34)	1.73 (.66-4.56)
Never Married	1.55 (.96-2.48)	1.54 (.95-2.50)	1.56 (.97-2.57)	1.54 (.95-2.49)	1.56 (.96-2.53)
Region					
South[a]	1.00	1.00	1.00	1.00	1.00
Northeast	1.62 (1.13-2.33)*	1.62 (1.12-2.35)*	1.67 (1.14-2.44)*	1.63 (1.12-2.37)*	1.70 (1.19-2.42)**
North Central	2.22 (1.52-3.24)***	2.23 (1.53-3.25)***	2.31 (1.64-3.26)***	2.33 (1.62-3.34)***	2.23 (1.52-3.27)***
West	1.52 (.79-2.91)	1.53 (.81-2.91)	1.54 (.80-3.01)	1.52 (.79-2.90)	1.51 (.80-2.85)
Number of Chronic Health Conditions	1.36 (1.21-1.54)***	1.35 (1.20-1.53)***	1.36 (1.21-1.54)***	1.36 (1.20-1.54)***	1.36 (1.19-1.55)***
Pseudo R^2	.15	.15	.16	.16	.16

OR = Odds Ratio, CI = Confidence Interval. [a]Reference Category. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Conflict of Interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

Author Statement

Contributors

AWN designed the study and conducted the statistical analysis. AWN, QLW, CT, and DMM

wrote the manuscript. HOT assisted with the preparation and proof-reading of the manuscript.

All authors have approved the final manuscript.