Greater Social Functioning Associated With Lower Depressive Symptomatology Among Black Belt African Americans Enrolled in the Southeastern Collaboration to Improve Blood Pressure Control Study

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ABSTRACT

Objective: In many populations, higher social functioning is associated with lower depressive symptomatology, which in turn is associated with improved cardiovascular health. This study aimed to establish an association between social functioning and depressive symptomatology, which has not yet been demonstrated in the African American Black Belt. This would be an important finding in a region with high cardiovascular morbidity.

Methods: This observational study used baseline data from 1,225 African American Black Belt residents with uncontrolled hypertension in the Southeastern Collaboration to Improve Blood Pressure Control (SEC) trial. Three Patient Reported Outcomes Measurement Information System (PROMIS) questionnaires—the emotional support, instrumental support, and social isolation questionnaires—and marital status assessed social functioning. The 8-item Patient Health Questionnaire assessed depressive symptomatology. Multivariable logistic regression models examined associations between social functioning and depressive symptomatology separately and then simultaneously. Data were collected from May 2017 to April 2021.

Results: Social functioning was higher than US-reported averages, and the prevalence of moderate to severe depressive symptomatology was low (20.8%) among primary care populations. In a separate model, lower emotional support, lower instrumental support, and increased social isolation were significantly associated with greater depressive symptomatology (odds ratio [OR] = 1.56, 95% Cl, 1.20–2.02; OR = 1.33, 95% Cl, 1.01–1.77; and OR = 2.39, 95% Cl, 1.81–3.16, respectively). In a simultaneous model, only increased perceived social isolation remained significantly associated with greater depressive symptomatology (OR = 2.24, 95% Cl, 1.67–3.00).

Conclusions: Greater social functioning is associated with lower depressive symptom burden in the Black Belt region. Future research into the directionality of this association could assist in the development of interventions to improve regional mental and cardiovascular health.

Trial Registration: ClinicalTrials.gov identifier: NCT02866669

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he rural, predominantly African American counties of the southeastern United States (a region known as the "Black Belt" due to its dark, rich soil) have among the highest rates of chronic hypertension, cardiovascular disease, and diabetes in the world.¹ In 2016, as many as 55% of hypertensive African Americans cared for in federally qualified health centers in this region had suboptimal blood pressure control.² Sparse regional health care has struggled to improve chronic disease outcomes, and cardiovascular mortality rates remain far higher than the national average.³ The Southeastern Collaboration to Improve Blood Pressure Control (SEC) is a trial underway in the Black Belt investigating covariate contributions to, and interventions for, this generalized poor cardiovascular health. Depression is one of the covariates under investigation.

Depression is associated with poor health in many populations, yet it remains an undertreated chronic health issue throughout the world.⁴⁻⁶ The directionality of this association has been challenging to define; however, it is hypothesized that depression negatively impacts cardiovascular health by inducing lower rates of physical activity and medication adherence as well as increased rates of smoking.^{5,7–9} The SEC study population is at particularly high risk for depression as it is African American, less financially resourced, and rural dwelling; all of these variables are associated with increased rates of depression.¹⁰⁻¹² Stigma toward psychiatric illness and sparse mental health resources throughout the region contribute to this risk.13

Due to the hypothesized causality between higher depressive symptomatology and worse cardiovascular outcomes, improving mental health in the Black Belt could correlate with improved cardiovascular health. Stigmatization of mental health care in the region necessitates a creative approach to improving depressive symptomatology; one possibility is optimizing social functioning. Social functioning has

Clinical Points

- Improved social functioning is associated with reduced depressive symptomatology among chronically hypertensive Black Belt African Americans.
- There is hypothesized causality between depressive symptomatology and poor health outcomes.
- Improving access to existing regional social support resources could improve depression and ultimately cardiovascular outcomes.

functional (social support) and structural (social proximity and/or isolation) elements, and it has been associated with lower rates of depressive symptomatology in many populations.^{10,11,14,15} The Black Belt population experiences geographic and logistical barriers to accessing social resources; those who are able to overcome such barriers may be better protected against depression and, by extension, cardiovascular morbidity.

The relationship between social functioning and depression among individuals at high risk for cardiovascular disease in the Black Belt, to the best of our knowledge, has not been directly investigated.¹⁶ In addition, the existing literature is limited in its applicability to the SEC population due to a lack of consensus on validated measures of social support and by nonuniform selection of depression scales, score cutoffs, and terminology (*depression* is often used interchangeably with the *DSM-5* diagnosis *major depression*).¹⁶ If an association is identified between improved social function and lower depressive symptomatology in the Black Belt, future research could establish causality between the 2 and explore new interventions to improve mental and physical health in this region.

Thus, the ultimate objective of this study was to evaluate the associations between depressive symptomatology and 4 measures of social functioning in African American Black Belt residents with chronically uncontrolled hypertension enrolled in the SEC trial. The SEC trial was registered at ClinicalTrials.gov (identifier NCT02866669). Baseline data at the time of enrollment were used for this cross-sectional observational study.

METHODS

The SEC trial compares 2 novel approaches to blood pressure control: a practice-level facilitated quality improvement strategy and a patient-level peer-delivered intervention. It aims to enroll 2,000 individuals aged 19–85 years with uncontrolled hypertension (mean systolic blood pressure over the previous year \geq 140 mm Hg and intake blood pressure \geq 140/90 mm Hg) from 69 primary care practices throughout North Carolina and the Alabama Black Belt. At the time of this analysis, 1,225 patients from 58 practices had been enrolled: 22 private practices, 27 federally qualified health centers, and 9 hospital affiliates contributing, respectively, 452 (36.9%), 595 (48.6%), and

178 (14.5%) patients. All participants provided written informed consent; the study was approved by separate IRB panels at the 4 participating academic institutions: Weill Cornell Medicine, University of Alabama at Birmingham, East Carolina University, and University of North Carolina at Chapel Hill. The analysis conducted in this article is a secondary analysis of baseline data from the SEC. Data were collected from May 2017 to April 2021.

To be enrolled in the SEC, patients needed to self-identify as African American, speak English, express willingness to work with a peer coach, and have a telephone. Exclusion criteria included plans to move out of the area within 2 years, advanced illness with limited life expectancy, pregnancy, and advanced kidney disease (eGFR < 45 mL/min). All subjects meeting the inclusion criteria at the time of data analysis were included in the final analysis.

Data

The outcome variable in this study was depressive symptomatology evaluated by the 8-item Patient Health Questionnaire (PHQ-8) screen with scores ranging from 0 to 24.17-20 As originally scaled, a total score of 0-4 indicates no depressive symptomatology, 5-9 mild, 10-14 moderate, 15-19 moderately severe, and 20-24 severe.¹⁷ These brackets are identical to those in the commonly used PHQ-9 scale (which includes a ninth question about suicidality); the developers of the PHQ-8 and PHQ-9 assert that, in population-based studies, this additional PHQ-9 question is rarely answered in the affirmative and even then often reflects false positive responses.^{20,21} As such, the same scoring brackets are used for the PHQ-8 and PHQ-9, both by the original developers and in the literature, for population studies among nonpsychiatric patients. Under these circumstances, a certain PHQ-8 score is not thought to represent more severe depression than the corresponding PHQ-9 score.²⁰⁻²³ As our study fit these criteria, we used the same scoring brackets as well. To ensure all groups were sufficiently populated in our analysis, moderate, moderately severe, and severe symptomatology were categorized together. A final score was assigned to correspond to "low" depressive symptomatology if it fell between 0 and 4, "mild" if between 5 and 9, and "moderate to severe" if ≥ 10 . There is a basis for this grouping of the higher scoring brackets of the PHQ-8 in the literature: a score ≥ 10 on the PHQ-8 was 100% sensitive for major depressive disorder in the original validation of this scale among nearly 200,000 individuals.²⁰ We also ran a sensitivity analysis to confirm that assessing the subgroups with PHQ-8 scores ≥ 10 individually did not impact the model significantly (Supplementary Table 1). This analysis shows that dividing our singular combined group with PHQ-8 scores ≥ 10 into 2 additional subgroups (PHQ-8 scores 10-14 characterized as "moderate" and those >14 characterized as "moderately severe and severe") did not impact the directionality of the models or the magnitude of the odds ratios.

The exposure variable (social functioning) was evaluated using 3 validated 4-question Patient Reported Outcomes

Table 1. Characteristics Among 1,225 Participants in the SEC Trial ^a				
		Low Social Isolation	High Social Isolation	
Characteristic	Total (N = 1,225)	(n=816) ^b	(n=409) ^b	P Value
Age, mean ± SD, y	57.6±11.7	58.5±12.0	55.9±11.1	<.001
Female, n (%)	750 (61.2)	479 (58.7)	271 (66.3)	.010
< High school education, n (%)	214 (17.6)	134 (16.6)	80 (19.7)	.18
< \$20,000 annual income, n (%)	575 (46.9)	346 (42.4)	229 (56.0)	<.001
Diabetes, n (%) ^c	507 (41.4)	333 (40.8)	174 (42.5)	.56
Baseline SBP, mean \pm SD, mm hg	156.2 ± 16.8	156.4±16.4	155.7±17.6	.48
Baseline DBP, mean \pm SD, mm hg	89.8±13.4	89.2±13.3	91.1±13.7	.018
PCS score, median (IQR)	41.9 (31.5-50.3)	44.8 (34.4-51.2)	36.2 (28.7-45.3)	<.001
MCS score, median (IQR)	50.3 (39.9–57.4)	53.5 (45.3–59.1)	40.7 (33.1-49.8)	<.001
Antidepressant use, n (%)	208 (17.0)	99 (12.1)	109 (26.7)	<.001
Insulin use, n (%)	183 (14.9)	124 (15.2)	59 (14.4)	.72
Total medication use, median (IQR)	11.0 (7.0–16.0)	10.0 (6.5–15.0)	12.0 (7.0–17.0)	<.001
Obese (BMI \geq 30 kg/m ²), n (%)	894 (74.0)	581 (72.4)	313 (77.3)	.065

^aKidney disease identified as moderate or severe renal disease (searched in laboratory results for eGFR < 60 cc/min) in participant chart review.

^bRaw scores from Patient Reported Outcomes Measurement Information System social isolation 4a short-item questionnaire translated to standardized *t* scores. A score of 50 represents the average for the US general population. Those with a social isolation score < 50 were defined as having low social isolation; participants with a score > 50 were defined as having high social isolation.

^cParticipants who responded "yes" to "Have you ever been told by a doctor or nurse that you have diabetes?" Abbreviations: BMI = body mass index, DBP = diastolic blood pressure, IQR = interquartile range, MCS = mental component summary, PCS = physical component summary, SBP = systolic blood pressure, SEC = Southeastern Collaboration to Improve Blood Pressure Control.

Measurement Information System (PROMIS) short-form social functioning scales as well as marital status (defined as married vs not). The first scale evaluated emotional support, the second instrumental support (tangible and/or logistical assistance), and the third social isolation (Cronbach α 0.9049, 0.8752, and 0.8482, respectively). To each question, subjects were asked to respond with "never," "rarely," "sometimes," "usually," or "always." A numerical value was attached to each of these answers, ranging from 1 (never) to 5 (always). Raw scores were translated to standardized t scores to allow comparison of our sample to the US population. A score of 50 represented the average US population's score with a standard deviation of 10 points. Values that fell above 50 were considered "high" and values that fell below 50 were designated as "low." All questionnaires in the study were interviewer administered, and no accommodations for limited literacy were necessary.

Covariates were baseline sociodemographic factors, comorbidities, medications, physical functioning, mental functioning, and body mass index (BMI). Sociodemographic factors included age (continuous), sex, income (<\$20,000, \ge \$20,000, and refused), and study site: University of Alabama at Birmingham, East Carolina University, and University of North Carolina at Chapel Hill.

Comorbidities included self-reported diabetes. Physical functioning and mental functioning were measured by the physical component summary (PCS) and the mental component summary (MCS) derived from the Short Form-12.²⁴ Lastly, we included insulin use and antidepressant medication use; insulin was included due to a hypothesized antidepressant effect.^{25,26}

Analysis

We first investigated the distribution of the social functioning exposures and then examined the magnitude

and statistical significance of the associations between these exposures and depressive symptomatology.

Our analysis explored whether having lower social functioning correlated with greater depressive symptomatology. We employed the Brants Wald assumption of proportional odds to generate proportional odds ratios (PORs) for the 3 PROMIS scales; this assumption dictates that the POR for exposure effect on the outcome variable (PHQ-8) is equivalent when considering the relationship between each adjacent outcome category. For example, considering PROMIS scores as continuous variables, the OR for having mild depressive symptomatology as opposed to low depressive symptomatology as PROMIS score decreases was assumed to be equivalent to the OR for having moderate to severe depressive symptomatology as opposed to mild depressive symptomatology as PROMIS score decreases.

We next analyzed the associations between the covariates and depressive symptomatology. Covariates with a P value <.2 were retained in the analysis. We used ordinal logistic regression to estimate crude data, then adjusted POR and 95% CI for each social functioning exposure and depressive symptomatology separately and then in aggregate. Covariates were then adjusted for in the following groups: (1) sociodemographic factors (age, sex, income, site), comorbidities, and medications (insulin, antidepressants); (2) physical functioning; (3) mental functioning; and (4) BMI. This resulted in 8 sets of 5 models: 1 set for each of the 4 social support dimensions, first in the separate and then again in simultaneous regressions. The crude separately modeled data are developed from bivariate analyses; all other analyses were multivariable and contained covariates. No multivariate analyses were performed.

For all analyses except covariate selection, statistical significance was determined by a 2-tailed P value < .05. All analyses used complete case. Of the sample, 4.5% were

Figure 1. Percent of Participants With Low (light gray), Mild (dark gray), and Moderate/Severe (black) Depressive Symptoms Among High Versus Low PROMIS Social Functioning and Marital Status Group^a

A. Emotional Functioning



B. Instrumental Functioning



C. Social Isolation

100 100 90 90 80 80 70 % Within Group 70 % Within Group 60 60 50 50 40 40 30 30 20 20 10 10 0 0 Not Married Low High Married Depressive Symptoms Depressive Symptoms (n = 816)(n = 452)(n = 773)(n = 409)248 (54.9%) Low (score of 0-4) 505 (61.9%) 100 (24.4%) Low (score of 0-4) 357 (46.2%) Mild (5-9) 235 (28.8%) 130 (31.8%) Mild (5-9) 128 (28.3%) 237 (30.7%) ≥ Moderate (10–24) 76 (9.3%) 179 (43.8%) ≥ Moderate (10–24) 76 (16.8%) 179 (23.2%)

D. Marital Status

^aRaw scores from PROMIS social isolation 4a short-item questionnaire translated to standardized t scores. A score of 50 represents the average for the US general population with SD of 10. Therefore, a score of 60 represents 1 SD above the mean, and 40 represents 1 SD below the mean. Abbreviation: PROMIS = Patient Reported Outcomes Measurement Information System.

missing information on social functioning, marital status, or depressive symptomatology, and 2% were missing information on covariates (Supplementary Figure 1).

RESULTS

Sample Characteristics

All 1,225 patients who met eligibility criteria for the SEC at the time of this analysis contributed data (Table 1). Of the participants, 816 (66.6%) fell below the national average for perceived social isolation and 409 were above it. The mean age of the sample was 57.6 years, with 61.2% women. Low education attainment (17.6% completed only high school), low income (46.9% with income < \$20,000), and diabetes (41.4%) were common. The study population was relatively obese (74% with BMI \ge 30 kg/m²). There were no significant differences in BMI, sex, education, blood pressure, or diabetes between the 2 groups. The more socially isolated

Table 2. Crude Bivariate Model of Proportional Odds Ratios for the Effect of Poor Social Functioning on Depressive Symptomatology Modeled Separately Among 1,225 Participants in the SEC Trial^a

Social Functioning Domain	n	Proportional Odds
		hatio (95% CI)
Low emotional functioning	450	2.63 (2.11-3.29)
Low instrumental functioning	317	2.79 (2.21-3.52)
High social isolation	409	2.62 (2.06-3.33)
Not married	773	1.55 (1.20–2.01)

^aRaw scores from Patient Reported Outcomes Measurement Information System social isolation, emotional, and instrumental function 4a shortitem questionnaire translated to standardized *t* scores. A score of 50 represents the average for the US general population. Those with a social isolation/functioning score < 50 were defined as having low social isolation/social functioning; participants with a score > 50 were defined as having high social isolation/social functioning.

Abbreviation: SEC = Southeastern Collaboration to Improve Blood Pressure Control.

Table 3. Proportional Odds Ratios (PORs) for the Effect of Poor Social Functioning on Depressive Symptoms Modeled Separately and Simultaneously Among 1,225 Participants in the SEC Trial^a

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		Crude	Model 1 ^b	Model 2 ^c	Model 3 ^d	Model 4
Social Functioning Domain	n	POR (95% CI)				
Social Functioning Domain Mod	deled S	eparately				
Low emotional functioning Low instrumental functioning High social isolation Not married	450 317 409 773	2.63 (2.11–3.29) 2.31 (1.82–2.94) 5.95 (4.67–7.58) 1.44 (1.15–1.79)	2.79 (2.21–3.52) 2.27 (1.76–2.92) 5.14 (4.01–6.59) 1.03 (0.81–1.31)	2.62 (2.06-3.33) 2.08 (1.60-2.69) 4.56 (3.54-5.88) 1.06 (0.82-1.36)	1.55 (1.20–2.01) 1.34 (1.01–1.78) 2.41 (1.83–3.17) 1.07 (0.82–1.40)	1.56 (1.20–2.02) 1.33 (1.01–1.77) 2.39 (1.81–3.16) 1.09 (0.83–1.43)
Social Functioning Domains Mo	deled s	Simultaneously				
Low emotional functioning Low instrumental functioning High social isolation Not married	450 317 409 773	1.48 (1.15–1.91) 1.14 (0.86–1.50) 4.90 (3.77–6.36) 1.26 (1.00–1.59)	1.68 (1.29–2.19) 1.19 (0.89–1.58) 4.08 (3.13–5.34) 0.92 (0.72–1.19)	1.68 (1.28–2.20) 1.14 (0.85–1.52) 3.68 (2.80–4.84) 0.97 (0.75–1.26)	1.25 (0.94–1.67) 0.99 (0.73–1.35) 2.26 (1.69–3.02) 1.02 (0.77–1.34)	1.26 (0.95–1.68) 0.98 (0.72–1.35) 2.24 (1.67–3.00) 1.04 (0.79–1.37)

^aRaw scores from Patient Reported Outcomes Measurement Information System social isolation, emotional, and instrumental function 4a short-item questionnaire translated to standardized *t* scores. A score of 50 represents the average for the US general population. Those with a social isolation/functioning score < 50 were defined as having low social isolation/social functioning; participants with a score > 50 were defined as having high social isolation/social functioning.

^bModel 1: sociodemographic factors (age, sex, income, site) + comorbidities (diabetes) + medication use (insulin, antidepressant use). ^cModel 2: model 1 + physical component summary score.

^dModel 3: model 2 + mental component summary score.

Abbreviation: SEC = Southeastern Collaboration to Improve Blood Pressure Control.

group tended to be older, have a lower income, have poorer PCS and MCS scores, and use more medications.

Figure 1 shows the distribution of PHQ-8 scores in relation to each measure of social functioning. Among these 1,225 participants, 49.4% had PHQ-8 scores 0–4, 30.0% 5–9, and $20.8\% \ge 10$. Table 2 shows the results of the crude bivariate association between each measure of social functioning and depressive symptomatology. Table 3 shows the 8 full multivariable model sets exploring the association between depressive symptomatology and various measures of social functioning. Table 3 includes the content of Table 2 to contextualize the original bivariate analysis.

Bivariate and Multivariable Analysis of Social Functioning Domains Modeled Separately

A crude bivariate analysis separately relating depressive symptomatology to social functioning domains revealed that lower emotional support, lower instrumental support, greater perceived social isolation, and being unmarried were all significantly associated with greater depressive symptomatology (OR = 2.63, 95% CI, 2.11-3.29; OR = 2.31, 95% CI, 1.82–2.94; OR = 5.95, 95% CI, 4.67–7.58; OR = 1.44, 95% CI, 1.15–1.79, respectively). After multivariable analyses characterized by full covariate adjustment, the ORs for lower emotional support, lower instrumental support, and greater social isolation were all attenuated but remained significantly associated with lower depressive symptomatology (OR = 1.56, 95% CI, 1.20-2.02; OR = 1.33, 95% CI, 1.01-1.77; and OR = 2.39, 95% CI, 1.81–3.16, respectively). For each of these relations, there was a notable diminution of the magnitude of the OR with entry of the PCS and then the MCS into the model. These ratios indicate that those with low emotional support, low instrumental support, and high social isolation had, respectively, 1.56, 1.33, and 2.39 times higher odds of demonstrating more pronounced depressive symptomatology when compared with those individuals with better social functioning. Being unmarried was no longer significantly

associated with increased depressive symptomatology in the fully adjusted analyses (OR = 1.09, 95% CI, 0.83–1.43).

Multivariable Analysis of Social Functioning Domains Modeled Simultaneously

When social functioning domains were modeled simultaneously in a multivariable analysis, lower emotional support and greater social isolation were significantly associated with greater depressive symptomatology (OR = 1.48, 95% CI, 1.15–1.91 and OR = 4.90, 95% CI, 3.77– 6.36, respectively). Neither low instrumental functioning nor being unmarried were significantly associated with greater depressive symptomatology in the crude model. After full covariate adjustment, only greater social isolation remained significantly associated with greater depressive symptomatology (OR = 2.24, 95% CI, 1.67–3.00). The greatest diminution of the magnitude of the OR was observed on inclusion of MCS score into the model. This finding indicates that individuals with high social isolation had 2.24 times higher odds of demonstrating more pronounced depressive symptomatology when compared with those individuals with lower social isolation.

DISCUSSION

The data show that among chronically hypertensive African Americans in the Black Belt, social functioning and depressive symptomatology are independently associated and that the most significant association is between social isolation and depressive symptomatology. When assessed alongside prior studies, the data also show that this population has higher PROMIS social functioning scores than the national average and that the prevalence of moderate to severe depressive symptomatology in this population is lower than that in other primary care populations.²⁷ These findings have important implications for the understanding of depressive symptomatology in this high-risk population. They also provide avenues for further research that could ultimately improve both mental health and cardiovascular outcomes throughout the Black Belt.

The strong association between social isolation and depressive symptomatology in the Black Belt is important given how geographically isolated the Black Belt population is. Thirteen of North Carolina's 27 Black Belt counties have population densities below the 50th state percentile and the national county mean.²⁸ Fourteen of Alabama's 17 Black Belt counties have population densities below the 50th state percentile; 16 have population densities falling below the national county mean.²⁸ Many counties in both states fall into the bottom national quartile for county population density.²⁸ Clearly, chronically ill individuals in the region face significant logistical hurdles to accessing social support. If future research is able to demonstrate that social isolation causally influences depressive symptomatology, then working to help Black Belt inhabitants feel less isolated could directly improve mental health. Such investigation is particularly important during the ongoing, isolating COVID-19 pandemic.

It is also important to note that for all domains of social functioning except marital status, out of all covariates the inclusion of the MCS covariate into the model corresponded with the largest single diminution of ORs. A hypothesis to explain this is the bidirectional interplay between depressed mood and mental functioning: reduced mental capacity contributes to depressed mood, and depression itself exerts a neurovegetative and amotivational effect on mental capacity. Individuals struggling with impaired mental functioning, in particular, will have difficulty accessing social support and remaining interconnected and will need assistance finding support networks, keeping track of appointments, arranging transportation, and manipulating technology for virtual communication. The inclusion of BMI into the model, dichotomized as obese or not obese, had no noteworthy impact on the overall model; this is likely because this study population is uniformly characterized by relatively high BMI.

Much has been made in this discussion of the geographic isolation faced by the inhabitants of the Black Belt and the implications of this finding for mental health in the region. Given this conversation, it is striking that most Black Belt respondents in this study scored better than the national average for emotional support, instrumental support, and perceived social isolation. This finding suggests that powerful social support resources do exist in this region; however, they are only available for those who are able to access them. These substantial resources could also explain why the rate of moderate to severe depressive symptomatology is found to be lower in the Black Belt population than in the general outpatient population (20.8% compared with 27.0%) despite the significant risk factors for depression within this population.²⁹ Substantial church communities are likely one such important social support resource.^{29–32}

That improved social functioning is associated with reduced depressive symptomatology is a profoundly relevant finding for the Black Belt community. This is a community with a pronounced cardiovascular disease burden that has remained high after decades of public health intervention. It is also a community of individuals with multiple strong risk factors for depressive symptomatology. Given existing wellestablished associations with hypothesized causality between depressive symptomatology and poor health outcomes, if causality can be established between reduced social functioning and depression, a potential avenue emerges for improving depressive symptomatology in the Black Belt. Helping individuals throughout the Black Belt access robust social support networks could lighten the burden of depression throughout the region, which could in turn affect transformative change in persistently poor cardiovascular outcomes.

A strength of this study is its scope: the sample size is over 1,000. It is the first study to explore the relationship between social functioning and depressive symptomatology in the Black Belt. One limitation of this study is its cross-sectional nature. Further work is needed to investigate the causal directionality between social isolation and depression—this article can only be the first step toward identifying positive interventions for this region. We also report findings on a trial population, which by definition consists of only those who agreed to participate. The generalizability of these findings should be considered when interpreting our findings. Finally, future studies can also more directly measure a potentially robust contribution of church communities to mental and physical health by including data on religiosity.

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Supplementary material: See accompanying pages.

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Supplementary material follows this article.

THE PRIMARY CARE COMPANION FOR CNS DISORDERS

Supplementary Material

Article Title:	Greater Social Functioning Associated With Lower Depressive Symptomatology Among Black Belt African Americans Enrolled in the Southeastern Collaboration to Improve Blood Pressure Control Study
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List of Supplementary Material for the article

- 1. Supplementary Table 1
- 2. Supplementary Figure 1

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Conicil Experiencing Domain	N	Full Model	
Social Functioning Domain		POR (95% CI)	
Social Functioning Domain Modeled Separately			
Low Emotional Functioning	450	1.53 (1.18,1.97)	
Low Instrumental Functioning	317	1.29 (0.98,1.69)	
High Social Isolation	409	2.31 (1.76,3.03)	
Not married	773	1.07 (0.82,1.40)	
Social Functioning Domains Modeled Simultaneously			
Low Emotional Functioning	450	1.25 (0.95,1.65)	
Low Instrumental Functioning	317	0.97 (0.72,1.30)	
High Social Isolation	409	2.17 (1.63,2.90)	
Not married	773	1.03 (0.79,1.35)	

Supplementary Table 1. Sensitivity Analysis Displaying Proportional Odds Ratios for the effect of Poor Social Functioning on Depressive Symptoms Categorized as Low, Mild, Moderate and Moderately Severe

Abbreviations: CI-Confidence Interval; POR-Proportional Odds Ratio; SEC- Southeastern Collaboration to Improve Blood Pressure Control

a. Raw scores from PROMIS social isolation, emotional, and instrumental function 4a short item questionnaire translated to standardized t-scores. Score of 50 represents average for the United States general population. Those with social isolation/ functioning score below 50 defined as having low social isolation/ social functioning, participants with a score above 50 defined has having high social isolation/ social functioning

Full model adjusting for Sociodemographic factors (age, gender, income, site), Comorbidities (diabetes), Medication use (insulin, anti-depressant use), Physical Component Summary Score, and Obesity

Supplementary Figure 1. Exclusion Cascade for Analysis of the Effect of Improved Social Functioning On Depressive Symptoms In the SEC Trial



a. Abbreviations: SEC- Southeastern Collaboration to Improve Blood Pressure Control