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Association Between Social Support and PHQ-4 Score at a Student-Run Free Clinic

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Abstract

Background: Student-run free clinics (SRFCs) can provide quality mental health care to low-income and uninsured populations who are at a greater risk of depression. Evidence demonstrates the association between social support and severity of depression, but this relationship has not been analyzed in an SRFC. Thus, we assessed the association between social support and depressive symptoms.
Methods: We used electronic health records data for patients from 2013-2020 (n=2,501 patients). The dependent variable was severity of depression symptoms as determined by scores on the patient health questionnaire-4 (PHQ-4). Higher PHQ-4 scores correspond to increased severity of depression. The main predictor was the patient's social support, which was defined by their employment status, marital status, and the number of individuals in their household. We conducted a multinomial regression model to control for other patient-level factors (i.e. race, sex, and age).
Results: When controlling for other factors, patients with higher social support scores had lower odds of scoring a 4 on the PHQ-4 (Odds ratio [OR]=0.838, 95% Confidence interval (CI)=0.770-0.912). When examining specific social support sources, when compared to patients who reported being not-married, those who were married had lower odds of scoring a 4 on the PHQ-4 (OR=0.578, 95% CI=0.401-0.833). Compared to patients who reported being employed, those who were unemployed had greater odds of scoring a 4 on the PHQ-4 (OR=2.323, 95% CI=1.766-3.055). We observed no significant differences in PHQ-4 by the number of people in the household.
Conclusion: Patients with greater social support were associated with fewer depressive symptoms. Specifically, employment status and marital status may be larger contributors to a patient's social support. Our results allow SRFCs to offer interventions such as investing in social work programs and community partnerships that offer professional development and employment opportunities to patients.

Introduction

In 2019, depression was one of the most common mental health disorders in America, with approximately 19.4 million United States adults experiencing a major depressive episode.[1] As an increasing number of Americans are diagnosed with depression annually,[2] there is a growing number of studies documenting a substantial number of patients that are unable to receive treatment.[3,4] Researchers have documented how depression may affect various aspects of patients' lives, such as lower employment rates, job productivity, and disrupted family function.[5–7] Unfortunately, prior research has shown that low-income populations observe challenges in receiving access to mental health care.[8–10]

Free clinics may help bridge this access gap for

this underserved group.[11] As of 2010, 30% of free clinics offered mental health care in addition to routine health services.[11] These free clinics may also offer mental health consultations and counseling.[8,12–17] Although traditional modes of treatment (i.e., medications, professional counseling) have been shown to be beneficial,[18–21] supplementing these interventions with other types, such as lifestyle changes, may improve overall treatment outcomes.[22,23]

Researchers have targeted improving social support and/or developing social skills as one particular area of lifestyle improvement.[24–26] Increased social support for patients is often critical for management of depressive symptoms and can lead to better treatment outcomes.[27] To date, social support intervention studies have focused on patients with insurance with only a few studies examining low-income populations. However, these low-income populations may experience unique barriers to developing and sustaining a strong social support net. For instance, studies have found that low-income populations may be less likely to have employment and may also experience other non-financial barriers that are associated with poor mental health.[28,29] Taken together, how social support is experienced by low-income populations and other population types may differ due to these systemic challenges. Studies that are focused on low-income populations may offer insights on how to best tailor social support interventions towards these populations.

To address this gap, our study will examine the association of social support and the severity of depressive symptoms among a free clinic population that is predominantly uninsured, after controlling for other factors. Our study may benefit free clinic leaders who are optimizing their delivery of mental health care services.

Methods

Our reporting of this study was guided by the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) guideline.[30]

Study Site and Participants

This study occurred at a student-run free clinic network (SRFC) in Northern Central Florida that provides walk-in and appointment-based primary care and specialty care services, such as mental health. This protocol was reviewed and approved by the institutional review board at the University of Florida.

The study site sees approximately 2,000 patients annually. Approximately 3.76% of these patients reported experiencing homelessness. Our sample included all patients who used the primary care clinics that had self-reported responses to questions on clinic intake forms from January 2013 to February 2020 inclusive. 23.6% of all recorded visits between January 2013 and February 2020 were eligible for this study.

Data Source

We used electronic health records data, which includes visit-level demographic factors and self-reported answers to routine screening tools. These self-reported data were initially captured via patients' intake forms that were administered during the clinic visit.

Variables

Our dependent variable was patients' total PHQ-4 score, which measured the severity of their depressive symptoms. This questionnaire is a validated approach to provide physicians with a baseline overview of the patient's mental health, and the adapted yes-no questions used in the clinics are defined below.[31,32]

1. During the past 2 weeks, have you often been bothered by feeling little interest or pleasure in doing things?
2. During the past 2 weeks, have you often felt down, depressed, or hopeless?
3. During the past 2 weeks, have you frequently been bothered by feeling worried or anxious most of the time?
4. During the past 2 weeks, have you had an anxiety attack with sudden feelings of fear or panic?

Our primary independent variable was social support, which was proxied through marital status, employment status, and number of people in the household. We selected these constructs because they often have been previously used in assessing social support and have established associations with our outcome variable.[33–38] We also wanted to understand how different forms of

social support influence our outcome measure.

We consolidated the 'single', 'separated', 'divorced', and 'widowed' options into a "not married" group for analysis. The 'not employed' and 'retired' options were consolidated into an "unemployed" group. The number of people living in the patient's household (including patient) was defined by a self-reported number. We summed the total number of affirmative responses to each of the PHQ-4 questions to measure the severity of depression. Therefore, the subject's severity of depression was assumed to increase with each affirmative answer. To calculate the social support metric, a point was assigned based on the aforementioned distinctions in the categories of marital status, employment, and the number of people living in the household (including the patient). Each distinction that qualified as having social support was awarded a point with each person in the household counting as a point. The novel point system allowed statistical analyses to be conducted to determine if the total social support score was a predictor for the subjects' severity of depressive symptoms.

Analytical Approach

We descriptively reported our sample characteristics. For variable selection for the multivariable models, we used a theory-based approach and included all available variables documented in the literature to influence depression outcomes.[36–42] We assessed for whether social support was independently associated with PHQ-4 scores, after controlling for race/ethnicity, sex, and age, by conducting two multinomial logistic regression models.[43] The first model treated social support as a total score as outlined in the "Variables" section. In the second model, we treated social support as two dichotomous variables (e.g., married vs. not married and employed vs. unemployed) and one ordinal variable (number of people in household). Six observation points with missing data were removed from the analysis using complete-case analysis; however, two outliers were omitted in the regression models that involved errors in intake form reporting on the "number of people in household variable" used to calculate social support total score.

We reported the adjusted odds ratio (OR), 95% confidence interval (CI), and *p*-value using PHQ-4=0 as a reference group. $P<0.05$ was interpreted as significant. All analyses were completed in SPSS Statistics (Version 26, IBM, Armonk, NY).

Results

Our sample size consisted of 2,501 patients. As shown in Table 1, most patients were White (38.0%) and female (58.1%), with the mean patient age as 40.54 (standard deviation=15.19). Moreover, most patients reported themselves as not-married (75.6%), employed (50.8%) and had two people in their household (29.6%) including themselves. In addition, on the PHQ-4, 28.4% answered affirmatively to the PHQ-Anhedonia question, 32.5% answered affirmatively to the PHQ-Depression question, 35.5% answered affirmatively to the PHQ-Worry Question, and 20.9% answered affirmatively to the PHQ-Anxiety question.

As shown in Table 2, when controlling for other factors, we observed those with higher social support scores had lower odds of scoring a 4 on the PHQ-4 (OR=0.838, 95% CI=0.770-0.912). In terms of other demographic variables, Table 2 shows that compared to those that reported being white, those who reported being Black/African American (OR=0.387, 95% CI=0.286-0.525), Hispanic/Latinx (OR=0.302, 95% CI=0.207-0.441) and Other (OR=0.218, 95% CI=0.117-0.407) had lower odds of scoring a 4 on the PHQ-4. Additionally, Table 2 shows that compared to patients who reported being female, those who reported being male had lower odds of scoring a 4 on the PHQ-4 (OR=0.534, 95% CI=0.409-0.697) and those that reported having a higher age had lower odds of scoring a 4 on the PHQ-4 (OR=0.987, 95% CI=0.979-0.996).

As shown in Table 3, the three proxy variables that make up the social support score had varied findings. Compared to patients who reported being not-married, those who were married had lower odds of scoring a 4 on the PHQ-4 (OR=0.578, 95% CI=0.401-0.833) when controlling for other factors. Compared to patients who reported being employed, those who were unemployed had greater odds of scoring a 4 on the PHQ-4 (OR=2.323, 95% CI=1.766-3.055). Lastly, we observed no statistically significant differences in PHQ-4 by number of people in the household. Consistent with our finding in our first model (Table 2), we continued to find similar results for demographic variables in the second model (Table 3). Table 3 shows that compared to those reported being white, those who reported being

Table 1. Sample Characteristics

Characteristics	Frequency, n (%)
Marital Status	
Not Married	1,890 (75.6%)
Married	611 (24.4%)
Employment Status	
Unemployed	1,230 (49.2%)
Employed	1,271 (50.8%)
Number of People in Household	
1	547 (21.9%)
2	740 (29.6%)
3	514 (20.6%)
4	373 (14.9%)
5	188 (7.5%)
6	88 (3.5%)
7	27 (1.1%)
8	13 (0.5%)
9 or more	11 (0.4%)
PHQ-4: Anhedonia	
No	1,791 (71.6%)
Yes	710 (28.4%)
PHQ-4: Depression	
No	1,688 (67.5%)
Yes	813 (32.5%)
PHQ-4: Worry	
No	1,612 (64.5%)
Yes	889 (35.5%)
PHQ-4: Anxiety	
No	1,978 (79.1%)
Yes	523 (20.9%)
Race/Ethnicity	
White	951 (38.0%)
Black/African American	783 (31.3%)
Hispanic/Latinx	574 (23.0%)
Other*	193 (7.7%)
Sex	
Female	1,453 (58.1%)
Male	1,048 (41.9%)
Age (in years), mean (SD)	40.5 (15.2)
Total	2,501 (100%)

**Due to low cell sizes, patients who were Native American, Asian, Pacific Islander, and Other were grouped into one category for the analysis*
PHQ-4 Patient Health Questionnaire 4; SD: standard deviation; percentages may not sum to 100% due to rounding

Black/African American (OR=0.373, 95% CI=0.274-0.506), Hispanic/Latinx (OR=0.296, 95% CI=0.202-0.434) and Other (OR=0.225, 95% CI=0.120-0.423) had lower odds of scoring a 4 on the PHQ-4. Table 3 also showed that compared to those that reported being female, those who reported being male had lesser odds of scoring a 4 on the PHQ-4 (OR=0.536, 95% CI=0.409-0.702) and that those who reported having a higher age had lower odds of scoring a 4 on the PHQ-4 (OR=0.984, 95% CI=0.975-0.993).

We assessed for responder bias through a separate logistic regression model (not shown) and found respondents to the PHQ-4 were more likely to be of Hispanic or Black/African American race, unemployed, and of younger age.

Discussion

This study assessed the association between social support and severity of depressive symptoms among patients of a SRFC. Overall, we found that social support had a nuanced association with severity of depressive symptoms. Our results suggest greater social support was associated with lower odds of achieving the highest score on the PHQ-4 when controlling for other factors. Our second model suggests that marital status and employment status may be larger drivers of perceived social support compared to the number of people living in the household. Additional differences in PHQ-4 scores were observed by race/ethnicity, sex, and age. We provide implications for practice below.

Our finding that those who were married showed lower odds of achieving the highest score on the PHQ-4 was consistent with previous studies that have reported positive associations between being married and better mental health.[36,44] Other studies have also reported a positive association especially if the marriage is perceived by the individuals as healthy and functional.[45] However, those who were unemployed showed higher odds of reporting the highest score on the PHQ-4. This finding was consistent with other studies that have documented a positive association between unemployment and depression.[38,46,47] Although free clinics provide medical care to patients, there is increasing recognition among free clinic leaders on the impact that

Table 2. Adjusted parameter estimates from the multinomial logistic regression analysis for the association between total social support score and PHQ-4 scores

Characteristic	Outcome (Ref: PHQ-4 score=0)	Odds Ratio	95% CI	p-value
Social Support Total Score	PHQ-4=1	0.938	(0.870, 1.011)	0.095
	PHQ-4=2	0.964	(0.889, 1.046)	0.382
	PHQ-4=3	0.953	(0.878, 1.034)	0.245
	PHQ-4=4	0.838	(0.770, 0.912)	<0.001
Race/Ethnicity (Ref: White)				
Black/African American	PHQ-4=1	0.775	(0.577, 1.042)	0.091
	PHQ-4=2	0.597	(0.435, 0.821)	0.001
	PHQ-4=3	0.472	(0.343, 0.649)	<0.001
	PHQ-4=4	0.387	(0.286, 0.525)	<0.001
Hispanic/Latinx	PHQ-4=1	0.752	(0.540, 1.048)	0.092
	PHQ-4=2	0.554	(0.386, 0.795)	0.001
	PHQ-4=3	0.459	(0.321, 0.658)	<0.001
	PHQ-4=4	0.302	(0.207, 0.441)	<0.001
Other*	PHQ-4=1	0.526	(0.316, 0.876)	0.013
	PHQ-4=2	0.306	(0.163, 0.575)	<0.001
	PHQ-4=3	0.289	(0.157, 0.530)	<0.001
	PHQ-4=4	0.218	(0.117, 0.407)	<0.001
Sex (Ref: Female)				
Male	PHQ-4=1	0.733	(0.572, 0.940)	0.014
	PHQ-4=2	0.737	(0.562, 0.967)	0.028
	PHQ-4=3	0.628	(0.478, 0.824)	0.001
	PHQ-4=4	0.534	(0.409, 0.697)	<0.001
Age				
	PHQ-4=1	0.996	(0.988, 1.005)	0.391
	PHQ-4=2	0.997	(0.988, 1.006)	0.485
	PHQ-4=3	0.992	(0.983, 1.000)	0.062
	PHQ-4=4	0.987	(0.979, 0.996)	0.005

**Due to low cell sizes, patients who were Native American, Asian, Pacific Islander, and Other were grouped into one category for analysis*
PHQ-4: Patient Health Questionnaire; CI: confidence interval

social determinants of health (e.g., employment status) can have on patient outcomes.[48–51] For instance, some free clinics have implemented social work programs and other community partnerships to assist interested patients in accessing job skill development programs and employment opportunities.[8,14,16,52] Interestingly, we found no statistically significant differences

Table 3. Adjusted parameter estimates from the multinomial logistic regression analysis for the association between three social support variables and PHQ-4 scores

Characteristic	Outcome (Ref: PHQ-4 score=0)	Odds Ratio	95% CI	p-value
Marital Status (Ref: Not Married)				
Married	PHQ-4=1	0.799	(0.586, 1.090)	0.157
	PHQ-4=2	0.880	(0.630, 1.228)	0.451
	PHQ-4=3	0.717	(0.507, 1.013)	0.059
	PHQ-4-4	0.578	(0.401, 0.833)	0.003
Employment Status (Ref: Employed)				
Unemployed	PHQ-4=1	1.004	(0.776, 1.298)	0.979
	PHQ-4=2	1.330	(1.006, 1.759)	0.045
	PHQ-4=3	1.464	(1.109, 1.932)	0.007
	PHQ-4=4	2.323	(1.766, 3.055)	<0.001
Number of People in Household				
	PHQ-4=1	0.953	(0.873, 1.040)	0.277
	PHQ-4=2	1.010	(0.921, 1.108)	0.834
	PHQ-4=3	1.029	(0.940, 1.108)	0.539
	PHQ-4=4	0.934	(0.851, 1.026)	0.153
Race/Ethnicity (Ref: White)				
Black/African American	PHQ-4=1	0.769	(0.572, 1.034)	0.082
	PHQ-4=2	0.593	(0.432, 0.815)	0.001
	PHQ-4=3	0.452	(0.328, 0.623)	<0.001
	PHQ-4=4	0.373	(0.274, 0.506)	<0.001
Hispanic/Latinx	PHQ-4=1	0.765	(0.549, 1.067)	0.115
	PHQ-4=2	0.544	(0.378, 0.783)	0.001
	PHQ-4=3	0.452	(0.315, 0.649)	<0.001
	PHQ-4=4	0.296	(0.202, 0.434)	<0.001
Other*	PHQ-4=1	0.543	(0.325, 0.906)	0.485
	PHQ-4=2	0.304	(0.161, 0.573)	<0.001
	PHQ-4=3	0.294	(0.159, 0.542)	<0.001
	PHQ-4=4	0.225	(0.120, 0.423)	<0.001
Sex (Ref: Female)				
Male	PHQ-4=1	0.739	(0.576, 0.948)	0.017
	PHQ-4=2	0.742	(0.565, 0.974)	0.031
	PHQ-4=3	0.635	(0.483, 0.835)	0.001

	PHQ-4=4	0.536	(0.409, 0.702)	<0.001
Age	PHQ-4=1	0.998	(0.990, 1.007)	0.672
	PHQ-4=2	0.995	(0.986, 1.005)	0.326
	PHQ-4=3	0.990	(0.981, 1.000)	0.044
	PHQ-4=4	0.984	(0.975, 0.993)	0.001

We assessed for responder bias through a separate logistic regression model (not shown) and found respondents to the PHQ-4 were more likely to be of Hispanic or Black/African American race, unemployed, and of younger age.
[*]Due to low cell sizes, patients who were Native American, Asian, Pacific Islander, and Other were grouped into one category for analysis
PHQ-4: Patient Health Questionnaire 4; CI: confidence interval

in PHQ-4 scores by the number of people living in the household. Even when this variable was treated as binary in a separate analysis, (the number of people in a household ≤ 5 OR > 5) we saw no changes in significance to either of the multinomial models. This suggests that marital and employment status may be larger contributors toward an individual's depressive symptoms than the number of individuals living in the household in a population of patients without insurance. This finding differs from literature which suggests living with more individuals is associated with lower rates of depression.[37] We believe that this difference may be partly explained by the fact that a portion of free clinic populations are experiencing homelessness,[11] and may experience social support differently than those with stable housing.[53] This idea is reinforced by previous studies that have found that about one-third of people experiencing homelessness are isolated from their families,[54] around one-quarter do not have friends for support,[55,56] and two-thirds were found to have no confiding relationships.[54] Put together, these specific factors may help to explain why we did not find significance between the number of people in the household and our outcome measure.

Our models suggest that patients who reported their race as Black/African American, Hispanic/Latinx, or 'other' showed lower odds of receiving the maximum score on the PHQ-4. This finding is consistent with prior research that has shown a similar trend in the odds of reporting depression.[39,57] Researchers have documented the presence of mental health stigmatization within racial minorities..[58–60] For instance, one qualitative study found that Hispanic populations reported reasons for not seeking therapy as negative impressions and fear of invasion, embarrassment, denial, or pride as barriers to mental health service (MHS) utilization.[59] This sentiment is common among other minority populations who view common mental disorders as falling outside of societal and cultural expectations and often isolate themselves from those suffering from such diseases. However, studies involving Hispanic populations showed that participants would be more likely to utilize MHS if their primary care provider suggested it, and that if there was a need for MHS, they would be more inclined to seek help from a Spanish-speaking professional.[59] These findings point towards a greater need for language and cultural concordance between patients and mental health professionals. SRFCs can address this by increasing the lingual and racial/ethnic diversity of their staff members, while maintaining quality, which may strengthen trust in mental health services and reduce stigma. In order to further improve the quality of care for all patients, clinicians and volunteers can engage in motivational interviewing by asking questions such as "Help me understand your opinion of mental health services?". Initiating patient-centered conversations may improve patient engagement with chronic care management,[61] which may hold implications for mental health interventions. In addition to these individual-level interventions, SRFCs can also partake in community-level engagements, such as integrating community members and members of varying religious/spiritual practices in treatment and provisioning services at non-clinical settings like churches or neighborhoods.[62]

Our findings should be interpreted with limitations. First, data came from one free clinic network, which may not generalize to other free clinics or care settings. Second, we proxied for social support with available data (i.e., marital status,

unemployment status, and number of people in the household). However, it is unclear if this approach is robust enough to capture the diverse range of interactions patients may have. For instance, a parent who lives in a single-parent household with multiple small children may have differing perceptions of social support when compared to those living in a two-parent household with fewer children. Further research is needed in identifying the different phenotypes of social support that patients attending free clinics may experience. We also were unable to account for the quality of social relationships that patients have. For instance, one could theoretically have greater social support from fewer, high-quality relationships when compared to greater, low-quality relationships.[63] Additionally, other social support questionnaires, such as the Multidimensional Scale of Perceived Social Support, may offer more detailed information regarding the specific interactions involving patient relationships (e.g., "Who can you count on when you need help?", "Who accepts you totally, including both your worst and best points?").[64–66] Future studies should examine how these elements of social support may influence the severity of depressive symptoms.

Conclusion

This study aimed to further understand the predictive capabilities of social support and its underlying components on the severity of depressive symptoms as reported by the PHQ-4 scale among patients at a SRFC. We observed that patients with higher levels of social support had lesser odds of scoring a high PHQ-4 score. Specifically, employment status and marital status may be larger contributors to a patient's social support, which may influence their mental health. The results of this study allow clinicians at SRFCs to better understand a patient's mental health condition and offer treatment options that align with the patients' social support needs outside the clinical setting.

Disclosures

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