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Correlates and Predictors of Depression and Anxiety Disorders in Graduate Students

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Abstract

Depression and anxiety are increasingly prevalent on college campuses; however, few studies have explored these disorders among graduate students. Purpose of this study was to examine prevalence, correlates and predictors of depression and anxiety among graduate students. This cross-sectional study used secondary data (N=4477) collected as part of the Healthy Minds Study. The Patient Health Questionnaire (PHQ) was used as the screening instrument. Multiple logistic regression examined the effect of demographic and social variables on the outcome of screening positive. Results showed 14.0% screened positive for depression, 9.5% for anxiety, 19.1% for either, and 4.4% for both. Depression correlates included: race/ethnicity, nationality, living situation, relationship status and finances growing up. Anxiety correlates included: sex, nationality, sexual orientation, and current finances. Validated predictors for depression were relationship status and finances growing up. Validated predictor for anxiety was identifying as lesbian, gay, bisexual, transgender or queer (LGBTQ), while being male and international status were protective. These findings suggest depression and anxiety are as prevalent among graduates as undergraduates and provide insight into the social and demographic influences of screening positive. Health educators can use these findings to inform policy and programming for graduate students that will provide an appropriate combination of services.

Introduction

Graduate students experience a host of unique challenges and stressors. Advanced academics, of course, are more demanding than undergraduate courses, and students are expected to excel in an academic environment that is less formally structured and supported, which places greater responsibility on graduate students to engage in independent learning. In addition to coping with the academic rigor and stress of graduate school, most graduate students also face substantial economic difficulties as they struggle to balance tuition, housing, living expenses, and, at times, childcare (Garcia-Williams, Moffitt, Kaslow, 2014; University of California Graduate Assembly [UCGA], 2014). Not surprisingly, over half of graduate students borrow money to finance their education. Graduate and professional degrees account for about 40% of the current $1.3 trillion in outstanding student loans (Federal Reserve Bank of New York, 2017). Deneke, Feaster, Okahana, Allum and Stone (2016) found that the majority of master and doctoral students reported feeling stressed about their personal finances and dissatisfied with their current financial situation, with over a quarter of them stating they could not manage a $1,000 financial emergency. Difficulties managing relationships with significant others and family often go hand-in-hand with economic troubles, as graduate students struggle to balance academics with multiple demands on their time and competing role expectations (Oswalt & Riddock, 2017).

In spite of the academic pressures and financial and family-relationship stressors that graduate students experience, relatively little is known about their mental health. Many studies that focus on student mental health mix undergraduate and graduate students in samples, making it difficult to obtain a clear picture of graduate student mental health. Those few studies that have focused exclusively on graduate students have reported concerning findings. Surveys at the University of California (UC) Berkeley conducted in 2004 and 2014 found that a substantial proportion of graduate students reported symptoms of depression, with rates as high as 37% among master students and 47% among doctoral students (UCGA, 2014). In 2016, this survey study at UC was expanded to include a stratified random sample of graduate students from across all ten UC campuses and 35% reported symptoms indicative of depression, which is higher than prevalence rates found among young adults and the general U.S. population (Anxiety & Depression Association of America [ADAA], 2017; UCGA, 2017). Other studies that focused on graduate students reported that the prevalence of depression and anxiety was higher or statistically the same as rates found for undergraduates (Eisenberg, Gollust, Golberstein & Hefner, 2007; Hunt & Eisenberg, 2010). In a study of mental health and suicidal behavior among graduate students, Garcia-Williams et al. (2014) reported 34.4% had depression screening scores indicative of moderate to severe depression and 52% reported feeling intensely anxious or having anxiety attacks. Over 7% reported thoughts of suicide, 2.3% had a suicide plan, and 1.7% had hurt themselves in the past two weeks.

Both depression and anxiety are treatable mental disorders with a range of pharmaceutical and psychotherapy treatment modalities available (ADAA, 2017). However, Lipson, Zhou, Wagner III, Beck and Eisenberg (2016) found that only about

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40% of graduate students with at least one mental health problem received treatment in the past year. Several barriers to seeking treatment have been identified in studies using mixed samples of undergraduate and graduate students, including stigma, fear of impact on academic career, time, cost of services, lack of awareness, and access problems (Downs & Eisenberg, 2012; Miranda, Soffer, Polanco-Roman, Wheeler & Moore, 2015). The lower rates of seeking help and the variety of barriers are concerning given the high prevalence of depression, anxiety and suicide risk in this population (Garcia-William et al., 2014; Eisenberg, Golberstein, & Gollust, 2007; Eisenberg, Gollust et al., 2007). In order to implement effective university prevention programming and treatment services, a better understanding is needed of depression and anxiety disorders among graduate students, as well as knowledge of the factors that predispose graduate students to the development of these mental disorders (Miranda et al., 2015; Oswalt & Riddock, 2017). The current study was designed to address this gap in our understanding.

Purpose

The primary purpose of the current study was to determine the prevalence and correlates of screening positive for depression (major depression and other depressive disorder) or anxiety disorders (generalized anxiety disorder and panic disorder) in a national sample of graduate students. This study also investigated if demographic or social factors were predictive of screening positive for these mental disorders.

Methods

Study Design and Sampling Procedure

This cross-sectional study used data collected as part of the Healthy Minds Study (HMS), an annual web-based survey exploring mental health and service utilization among college students that began in 2007 (HMS Network, 2007-2017). The current study used data collected in 2010 from 25 different U.S. colleges and universities and included only those students who self-identified as graduate students. Permission to access the HMS data was granted by the HMS principal investigator, and human subjects approval was obtained from Texas Woman's University. Of the sample of 5,220 graduate students, 286 indicated their age was between 18 and 20 years and were excluded because the accuracy of their age responses could not be determined. Medical students were also excluded in recognition of their unique educational experiences and because they have been studied as a distinct group elsewhere (Dyrbye, Thomas, & Shanafelt, 2006). Any participant with missing data was excluded. The final sample included 4,477 graduate students.

Instrumentation

The HMS survey included the Patient Health Questionnaire (PHQ), which was used to screen for depression (major depressive disorder and other depressive disorder) and anxiety disorders (generalized anxiety disorder and panic disorder). A positive PHQ screening result was used as a proxy measure for determining prevalence. Although a positive PHQ result is not equivalent to a clinical diagnosis, it has been highly correlated in validation studies comparing the PHQ with diagnosis from a mental health professional, as well as with other screening instruments (Kroenke, Spitzer, & Williams, 2001; Martin, Rief, Klaiberg, & Braehler, 2006; Spitzer, Kroenke, Williams, & Patient Health Questionnaire Primary Care Study Group, 1999). Specifically, depression was measured using the PHQ-9, a clinically validated instrument developed using the nine diagnostic criteria for major depression established in the DSM-IV (Martin et al., 2006; Spitzer et al., 1999). In a validation study including over 6,000 subjects, the internal reliability of the PHQ-9 was excellent in both primary care and obstetrical-gynecological settings with a Cronbach's α of 0.89 and 0.86 respectively (Kroenke et al., 2001). Test-retest reliability was also highly correlated (0.84) when self-administration was compared with clinician administration, and the mean scores were very similar (5.08 versus 5.03). A strong association between worsening PHQ-9 scores and worsening function on the six SF-20 scales was found, which served to establish construct validity. The PHQ-9 was used in a primary care depression screening initiative at a large urban university health center and found to be effective and well-accepted among students and clinical staff (Klein, Ciotoli, & Chung, 2011). The PHQ-9 anxiety scale was used to measure anxiety disorders (generalized anxiety disorder and panic disorder). In a validation study of the PHQ that included the PHQ anxiety scale, the sensitivity and specificity for generalized anxiety disorder were 63% and 97% respectively, and the overall accuracy was 91% (Spitzer et al., 1999). For panic disorder, the sensitivity (81%) and specificity (99%) were also excellent, and the overall accuracy was 98%. Demographic and social factors were self-reported (see Table 2).

Data Analysis

Cross tabulations using Pearson Chi Square analysis were conducted to explore the relationships between the factors and screening positive, and multiple logistic regression modeling was used to determine if any of the factors were predictive of screening positive. Because p values depend upon the sample size and the magnitude of the association, a very weak relationship may reach significance if the sample size is large enough (Field, 2009). To account for any potential bias that the large sample size (4,477) could have introduced, a higher level of significance was used in interpreting the cross tabulations and a rigorous cross validation procedure was conducted as part of the multiple logistic regression modeling. In the cross tabulations, only those results with a p value of less than .01 were considered significant and meaningful from a practical perspective. Results with a p value of .01 to .05 or that had a percentage difference between groups of less than 5% were considered technically significant, but not clinically meaningful. In keeping with this conservative and rigorous approach to the analysis, results from the multiple logistic regression modeling were considered significant if the odds ratio was less than 0.85 or greater than 1.30. If the odds ratio was between .85 and 1.30, the finding was considered technically significant, but clinically not meaningful. A total of four models were run. The cross validation procedure was performed on each model and involved creating three random sub-samples and running the model again on each sub-sample. This procedure assisted in determining if a variable that was a significant predictor in the main model was strong enough to remain statistically significant ($p<.05$) with a smaller sample, or if the large sample size was contributing to the predictor's significance. For the significant predictor in the main model to be considered verified, it had to be a significant

Table 1.

Sample Characteristics (n = 4,477)

Characteristic	*f*	%
Degree Program		
Master Degree	2851	63.7
Juris Doctorate	374	8.3
Ph.D. Degree	1252	28.0
Age		
21 to 25 years old	1931	43.1
26 to 30 years old	1646	36.8
Over 30 years old	900	20.1
Gender		
Female	2658	59.4
Male	1819	40.6
Race/Ethnicity		
Caucasian	2956	66.0
African American	175	3.9
Hispanic	180	4.0
Asian/Asian-American	763	17.0
Other	186	4.2
Multi-Racial/Ethnic	217	4.8
Nationality		
Yes, US Citizen	3660	81.8
No, International Student	817	18.2
Sexual Orientation		
Heterosexual	4146	92.6
Bisexual	133	3.0
Gay or Lesbian	143	3.2
Questioning	22	0.5
Other	33	0.7
School Region		
Midwest	745	16.6
Northeast	1399	31.2
South	219	4.9
West	2114	47.2
Living Situation		
Campus Residence Hall	361	8.1
Fraternity or Sorority	7	.2
Other University Housing	451	10.1
Off-Campus, Non-University Housing	3378	75.5
Parents or Guardian's Home	280	6.3
Relationship Status		
Single	1519	33.9
In a relationship	1702	38.0
Married or domestic partnership	1187	26.5
Divorced	65	1.5
Widowed	4	.1
Current Financial Situation		
It's a financial struggle	787	17.6
It's tight but I'm doing fine	2754	61.5
Finances are not really a problem	936	20.9
Financial Situation Growing Up		
Very poor, not enough to get by	148	3.3
Had enough to get by but not many "extras"	1527	34.1
Comfortable	2291	51.2
Well to do	511	11.4

Note. Frequencies not equaling 100% reflect missing data.

predictor in at least two out of the three random sub-samples.

Results

Sample Characteristics

As shown in Table 1, most of the 4,477 participating graduate students were female (59.4%), U.S. citizens (81.8%), Caucasian (66.0%), self-identified as heterosexual (92.6%) and enrolled in Master degree programs (63.7%). Age groups were categorized as 21 to 25 years (43.1%), 26 to 30 years (36.8%), and over 30 years of age (20.1%). Geographically, most students attended schools in the West (47.2%) or Northeast (31.2%).

Prevalence of Screening Positive

Prevalence testing found that 14.0% (625/4,477) screened positive for depression, 9.5% (424/4,477) screened positive for anxiety disorders, and 4.4% (195/4,477) screened positive for both.

Correlates of Screening Positive for Depression

Table 2 shows the results of cross-tabulations with Pearson chi-square for demographic and social variables and screening positive for depression. A significant relationship was found with race/ethnicity [χ^2 (1) = 37.96, $p < .001$], nationality [χ^2 (1) = 22.99, $p < .001$], living situation [χ^2 (1) = 10.22, $p = .001$], relationship status [χ^2 (2) = 29.42, $p < .001$], and financial problems growing up [χ^2 (1) = 18.42, $p < .001$]. Screening

Table 2.

Demographic and Social Correlates of Screening Positive for Depression (n = 4,477)

	Negative Screen		Positive Screen			
	f	%	*f*	%	χ^2	*p*
Demographic Factors						
Age					.33	.567
21 - 25 years old	1668	43.3	263	42.1		
26 years or older	2184	56.7	362	57.9		
Gender					2.80	.094
Female	2306	59.9	352	56.3		
Male	1546	40.1	273	43.7		
Race/Ethnicity					37.96	.000*
Caucasian	2611	67.8	345	55.2		
Other Ethnic Group	1241	32.2	280	44.8		
School Region					4.90	.180
Midwest	643	16.7	102	16.3		
Northeast	1225	31.8	174	27.8		
South	184	4.8	35	5.6		
West	1800	46.7	314	50.2		
Sexual Orientation					10.64	.001**
Heterosexual	3587	93.1	559	89.4		
Other Sexual Orientation	265	6.9	66	10.6		
Nationality					22.99	.000*
Yes, US Citizen	3192	82.9	468	74.9		
No, International Student	660	17.1	157	25.1		
Social Factors						
Living Situation					10.22	.001*
Live on Campus	676	17.5	143	22.9		
Live off Campus	3176	82.5	482	77.1		
Relationship Status					29.42	.000*
Single Divorced Widowed	1309	34.0	279	44.6		
In a Relationship	1483	38.5	219	35.0		
Married or Domestic	1060	27.5	127	0.3		
Current Financial Situation					4.35	.037**
No Problems	825	21.4	111	17.8		
Has Financial Problems	3027	78.6	514	82.2		
Financial Situation Growing Up					18.42	.000*
No Problems	2459	63.8	343	54.9		
Had Financial Problems	1393	36.2	282	45.1		

* Significant at *p* less than .01

** Not clinically meaningful: *p* value of .01 to .05 or percentage difference between groups of less than 5%

positive for depression was significantly more likely in minorities, international students, those living on campus, those who were single, divorced or widowed, or those having financial problems when growing up. Sexual orientation and current financial status were technically significant, but did not meet the threshold for clinical meaningfulness. Age, sex and school region were not significant.

Correlates of Screening Positive for Anxiety Disorders

Cross tabulation results for screening positive for anxiety disorders are displayed in Table 3. Significant relationships were found with sex [χ^2 (1) = 43.24, $p < .001$], nationality [χ^2 (1) = 25.72, $p < .001$], sexual orientation [χ^2 (1) = 19.53, $p < .001$], and current financial situation [χ^2 (1) = 7.38, $p = .007$]. Females, US citizens, those self-identifying as lesbian, gay, bisexual, transgender or queer (LGBTQ), or those having current financial problems were significantly more likely to screen positive for anxiety disorders. Relationship status and financial situation growing up were technically significant, but did not meet the threshold for clinical significance. Race/ethnicity and living situation were not significant.

Table 3.

Demographic & Social Correlates of Screening Positive for Anxiety (n=4,477)

	Negative Screen		Positive Screen			
	f	%	*f*	%	χ^2	*p*
Demographic Factors						
Age					2.68	.102
21 - 25 years old	1764	43.5	167	39.4		
26 years or older	2289	56.5	257	60.6		
Gender					43.24	.000*
Female	2343	57.8	315	74.3		
Male	1710	42.2	109	25.7		
Race/Ethnicity					3.38	.066
Caucasian	2659	65.6	297	70.0		
Other Ethnic Group	1394	34.4	127	30.0		
School Region					1.72	.633
Midwest	680	16.8	65	15.3		
Northeast	1259	31.1	140	33.0		
South	202	5.0	17	4.0		
West	1912	47.2	202	47.6		
Sexual Orientation					19.53	.000*
Heterosexual	3776	93.2	370	87.3		
Other Sexual Orientation	277	6.8	54	12.7		
Nationality					25.72	.000*
Yes, US Citizen	3275	80.8	385	90.8		
No, International Student	778	19.2	39	9.2		
Social Factors						
Living Situation					2.75	.097
Live on Campus	754	18.6	65	15.3		
Live off Campus	3299	81.4	359	84.7		
Relationship Status					6.97	.031**
Single Divorced Widowed	1431	35.3	157	37.0		
In a Relationship	1525	37.6	177	41.7		
Married or Domestic	1097	27.1	90	21.2		
Current Financial Situation					7.38	.007*
No Problems	869	21.4	67	15.8		
Has Financial Problems	3184	78.6	357	84.2		
Financial Situation Growing Up					6.08	.014**
No Problems	2560	63.2	242	57.1		
Had Financial Problems	1493	36.8	182	42.9		

* Significant at *p* less than .01

** Not clinically meaningful: *p* value of .01 to .05 or percentage difference between groups of less than 5%

Predictors of Screening Positive for Depression

Multiple logistic regression and the cross validation procedure previously described were used to determine if social or demographic variables were predictive of screening positive for depression. Two models were analyzed, one using demographic variables and the other using social variables. As shown in Table 4, the overall demographic model was significant [χ^2 (8) = 55.85, $p < .001$]. Minorities (Odds Ratio = 1.54, $p < .001$), international students (Odds Ratio = 1.27, $p = .042$), or self-identifying as LGBTQ (Odds Ratio = 1.64, $p = .001$) were significant predictors of screening positive for depression. The social model (see Table 4) predicting a positive screen for depression was also significant [χ^2 (5) = 58.89, $p < .001$]. Significant predictors were being single, divorced oror widowed (Odds Ratio = 1.77, $p < .001$) or having financial problems growing up (Odds Ratio = 1.46, $p < .001$). Interestingly, living off campus (Odds Ratio = 0.75, $p = .006$) was protective, with those living off campus having significantly decreased odds of having a positive screen for depression compared to those who lived on campus. Results of the cross validation procedure are shown in Table 5. None of the demographic variables was strong enough to remain significant predictors when subjected to the cross validation procedure. However, two social variables remained strong predictors of screening positive for depression: being single, divorced or widowed and having financial problems growing up.

Table 4.

Multiple Logistic Regression Analysis for Predictors of Depression or Anxiety

	B	*SE*	*Wald*	*p*	Odds Ratio	95% CI Lower	Upper
Depression – Demographic Model							
Older Age[a]	.04	.09	.21	.648	1.04	.88	1.24
Males[b]	.09	.09	1.03	.311	1.09	.92	1.30
Other Race/Ethnicities[c]	.43	.10	19.01	.000	1.54	1.27	1.87
International Student[d]	.24	.12	4.13	.042	1.27	1.01	1.59
Not Heterosexual[e]	.50	.15	11.51	.001	1.64	1.23	2.19
Midwest[f]	-.05	.12	.15	.695	.95	.75	1.21
Northeast[g]	-.14	.10	1.93	.165	.87	.71	1.06
South[h]	.12	.20	.39	.530	1.13	.77	1.66
Depression – Social Model							
Living Off Campus[i]	-.29	.11	7.47	.006	.75	.61	.92
Single Divorced Widowed[j]	.57	.12	24.04	.000	1.77	1.41	2.22
In Relationship[k]	.22	.12	3.41	.065	1.25	.99	1.58
Current Financial Problems[l]	.19	.11	2.81	.094	1.21	.97	1.52
Financial Problems Growing-Up[m]	.38	.09	17.87	.000	1.46	1.22	1.74
Anxiety – Demographic Model							
Older Age[a]	.19	.11	3.28	.070	1.21	.98	1.49
Males[b]	-.70	.12	35.70	.000	.50	.39	.62
Other Race/Ethnicities[c]	.05	.12	.14	.704	1.05	.83	1.33
International Student[d]	-.77	.19	17.26	.000	.46	.32	.66
Not Heterosexual[e]	.67	.16	17.37	.000	1.95	1.43	2.68
Midwest[f]	-.19	.15	1.60	.206	.83	.61	1.11
Northeast[g]	-.06	.12	.27	.602	.94	.75	1.19
South[h]	-.40	.27	2.31	.129	.67	.40	1.12
Anxiety – Social Model							
Living Off Campus[i]	.24	.14	2.96	.085	1.28	.97	1.69
Single Divorced Widowed[j]	.34	.14	5.80	.016	1.40	1.06	1.84
In Relationship[k]	.38	.14	7.89	.005	1.47	1.12	1.92
Current Financial Problems[l]	.30	.14	4.46	.035	1.35	1.02	1.77
Financial Problems Growing-Up[m]	.25	.11	5.53	.019	1.28	1.04	1.57

Note: Designated variable compared to: [a] younger age; [b] females; [c] Caucasians; [d] US citizen; [e] heterosexual; [f, g and h] West region; [i] living on campus; [j and k] married or domestic partnership; [l] no current financial problems; *m* no financial problems growing up.

Predictors of Screening Positive for Anxiety Disorders

Multiple logistic regression and the cross validation procedure were also used to determine if demographic or social variables would predict a positive screen for anxiety disorders. As shown in Table 4, the demographic model was significant [χ^2 (8) = 89.92, $p < .001$]. Sexual orientation was a significant predictor of having a positive screen for anxiety disorders (Odds Ratio = 1.953, $p < .001$). Those self-identifying as LGBTQ had significantly increased odds of having a positive screen for anxiety disorders compared to those self-identifying as heterosexual. Two other demographic variables were found to be protective. Males (Odds Ratio = .496, $p < .001$) and international students (Odds Ratio = .46, $p < .001$) were both significantly less likely to screen positive for anxiety disorders. The main social model was significant [χ^2 (5) = 23.15, $p < .001$]. Being single, divorced or widowed (Odds Ratio = 1.399, $p = .016$) or being in a relationship (Odds Ratio = 1.468, $p = .005$) significantly increased the odds of having a positive screen for anxiety disorders compared with being married or in a domestic partnership. Having current financial problems (Odds Ratio = 1.346, $p = .035$) was also a significant predictor. Results of the cross validation procedure are shown in Table 5. Three demographic variables passed this test. Being male or an international student were validated as significantly less likely (protective) to screen positive for anxiety disorders. Identifying as LGBTQ was validated as a strong predictor of screening positive for anxiety disorders. None of the social variables was strong enough to remain significant in the cross validation procedure.

Table 5.

Cross-Validation of Predicting Positive Screen for Depression or Anxiety

	Sample 1 Odds Ratio		Sample 2 Odds Ratio		Sample 3 Odds Ratio	
Depression – Demographic Model						
Older Age[a]	.87		.96		1.19	
Males[b]	.94		1.44	*	1.36	
Other Race/Ethnicities[c]	1.28		2.26	***	1.43	
International Student[d]	1.50		1.18		1.49	
Not Heterosexual[e]	1.33		1.32		2.42	**
Midwest[f]	1.13		.81		1.09	
Northeast[g]	.91		.81		.94	
South[h]	1.40		1.28		1.13	
Depression – Social Model						
Living Off Campus[i]	.71		.68		.90	
Single, Divorced, or Widowed[j]	1.66	*	1.90	**	1.36	
In Relationship[k]	1.33		1.49		.85	
Current Financial Problems[l]	1.32		1.11		1.08	
Financial Problems Growing Up[m]	1.54	**	1.28		1.64	**
Anxiety – Demographic Model						
Older Age[a]	1.71	**	1.08		1.02	
Males[b]	.52	**	.48	**	.47	***
Other Race/Ethnicity[c]	.78		1.39		.89	
International Student[d]	.38	**	.34	**	.67	
Not Heterosexual[e]	2.05	*	2.16	*	1.78	
Midwest[f]	.79		.70		1.05	
Northeast[g]	.94		1.15		.85	
South[h]	.76		.70		.56	
Anxiety – Social Model						
Living Off Campus[i]	1.22		1.38		1.56	
Single, Divorced, or Widowed[j]	.81		1.39		1.63	
In Relationship[k]	1.02		1.85	*	1.42	
Current Financial Problems[l]	1.03		1.67		1.18	
Financial Problems Growing Up[m]	1.44		1.00		1.32	

Note: Designated variable compared to: [a] younger age; [b] females; [c] Caucasians; [d] US citizen; [e] heterosexual; [f, g and h] West region; [i] living on campus; [j and k] married or in domestic relationship; [l] no current financial problems; [m] no financial problems growing up.
* $p < .05$; ** $p < .01$; *** $p < .001$

Discussion

This study investigated prevalence, correlates and predictors of screening positive for depression or anxiety disorders in a national sample of graduate students, and contributes to a small but growing body of literature examining mental health in this group. In the current study, the prevalence of screening positive for depression or anxiety disorders was substantial and similar to levels found in other studies focusing on graduate students (Garcia-Williams et al., 2014; Lipson et al., 2016; Eisenberg, Gollust et al., 2007). The findings from the current study also lend support to the assertion that depression and anxiety disorders among graduate students may be as common as among undergraduates (American College Health Association [ACHA], 2016), indicating that the prevalence of mental disorders among college students is considerable regardless of academic level.

Analysis of demographic and social correlates of screening positive for anxiety disorders revealed a correlation with being female, a finding that is consistent with the existing literature for the general population (Bandelow & Michaelis, 2015), as well as with recent reports on college students, including graduate students (ACHA, 2016; Eisenberg & Lipson, 2017). Sex, however, did not have a relationship with depression, which has been associated with the female sex in the general population (Salk, Hyde, & Abramson, 2017). It is important to note that in the current study over 17% of male graduate students screened positive for depression, indicating that the prevalence of depression among these male students is considerably higher than in the general U.S. male population, where the prevalence of experiencing a major depressive episode during the past year was only 4.7% (Substance Abuse & Mental Health Services Administration [SAMHSA], 2016). The higher prevalence of screening positive among male graduate students likely contributed to the absence of a correlation between sex and screening positive for depression in the current study and merits further exploration.

Belonging to a minority group was significantly related to screening positive for depression. This is a novel finding because in college students, as well as in the general U.S. population, just the opposite has been reported where depression was significantly associated with being Caucasian, and not with being from a minority racial/ethnic group (Shao, Rickie & Bailey, 2016). It can be speculated that graduate students from minority groups, which comprised 34% of the sample in the current study, may be more disposed to depression than the general U.S. minority population because of the unique stressors that graduate school presents for these minority students. It be should be noted, however, that in this study minority racial and ethnic groups were combined into one group to simplify the analysis, which is consistent with much of what has been published in the literature (Blanco et al., 2008). This approach, however, ignores the obvious cultural differences among minority groups and, therefore, limits our understanding.

International student status was significantly associated with screening positive for depression; whereas, U.S. citizenship was significantly related to screening positive for anxiety disorders. How culture affects the manifestation of the symptoms of depression and anxiety disorders and the diagnostic criteria used to measure these mental disorders must be considered when interpreting this finding. Symptoms of panic disorder and generalized anxiety disorder, in particular, vary across cultures and may be under-reported when measured using instruments validated with western, primarily Caucasian populations. For example, in Puerto Rican, Dominican and other Latin American cultures an *ataque de nervios* (attack of nerves) may actually be a panic attack, but instead is characterized as an anger or grief episode because the cultural symptoms manifested do not meet the DSM-IV criteria for panic disorder (Lewis-Fernández et al., 2010). The absence of these cultural symptoms in DSM-IV criteria contributes to under-recognition of mental disorders and lack of treatment. To accurately measure depression and anxiety disorders among international students, screening instruments that consider cross-cultural presentations of these disorders must be developed and used. Although the PHQ used in the current study has been validated in clinical and community settings in the U.S., it has not been widely validated internationally, and therefore, may not be accurately screening international students.

Over 7% of graduate students in this study self-identified as LGBTQ, which was significantly associated with screening positive for anxiety disorders. This finding supports earlier studies that linked homosexuality, bisexuality and trans-sexuality with anxiety disorders as well as depression among college students (Grant et al., 2014) and that linked mental health problems with sexual orientation among the general U.S. population (Medley et al., 2016). Although reasons for increased anxiety and depression have not been specifically explored among LGBTQ graduate students, it is plausible that they are similar to the stresses experienced among undergraduates and in the general population, making these students particularly vulnerable to these mental disorders. Consequently, LGBTQ graduate students are in need of prevention efforts developed in collaboration with the LGBTQ community so that the unique needs and experiences of this group can be appropriately addressed.

Being single, divorced or widowed was significantly associated with screening positive for depression. This significant association is consistent with results from studies involving the U.S. general population and with research using mixed samples of undergraduate and graduate students (Leach, Butterworth, Olesen & Mackinnon, 2013; Eisenberg, Gollust, et al., 2007). It can be speculated that graduate students who are single, divorced or widowed may be more likely to experience feelings of isolation and poor social support compared with students who are married or in domestic partnerships, and as a result, are at greater risk to experience depressive symptoms as they deal with the academic and financial pressures of graduate school.

Having current financial problems was significantly associated with screening positive for anxiety disorders, while experiencing financial problems growing up was significantly related to screening positive for depression. These findings are generally consistent with other studies that reported students with inadequate financial resources were more likely to experience mental health problems and that college students who grew up in poor families were significantly more likely to have depression or anxiety compared to students who grew up in financially comfortable circumstances (Eisenberg, Hunt & Speer, 2013). This is particularly concerning given the trend of growing student loan debt, which has gained considerable

momentum in recent years.

Multiple logistic regression modeling was used to assess the unique effect of each demographic and social variable on the outcome of screening for depression or anxiety disorders. Two factors were validated as significantly increasing the odds of screening positive for depression: relationship status and financial situation growing up. The odds of screening positive for depression was 77% higher for graduate students who reported being single, divorced or widowed compared to those that reported being married or in a domestic partnership. For graduate students who reported experiencing financial problems growing up, the odds of screening positive for depression were 46% higher than it was for those who reported no financial problems growing up. Two factors, sex and nationality, significantly decreased the odds (protective) of screening positive for anxiety disorders, while sexual orientation was found to increase the odds (predictive). Males were only half as likely to screen positive for anxiety disorders compared to females, and international students were slightly less than half as likely to screen positive as graduate students who were U.S. citizens. Those students who reported their sexual orientation as LGBTQ where almost two times more likely to screen positive for anxiety disorders than those students who reported as heterosexual. This analysis and validation expands our understanding of depression and anxiety disorders in graduate students by identifying variables that consistently have a major effect on the screening outcome, and therefore suggest potential risk factors for this population.

The findings of this study must be interpreted within the context of its limitations. While the age of the data set, which was collected in 2010, presents a study limitation, a strong case can be made that the findings are relevant because this study is one of the very few to focus exclusively on graduate students, while most other studies used mixed samples of undergraduates and graduates, making it impossible to understand the unique mental health picture of graduate students alone. This understanding is important given the indication that mental health disorders are highly prevalent in this population. In addition, this study is relevant because of the large, national sample that was used, which provides a broader perspective of mental health in this population. Other study limitations must also be noted. A positive screening outcome using the PHQ is not equivalent to a clinical diagnosis of depression or anxiety disorders, although the PHQ has been validated against clinical diagnoses and found to be more reliable than self-reports of being diagnosed with these disorders (Kroenke et al., 2001; Martin et al., 2006; Klein et al., 2011). The PHQ has also not been validated as an online screening tool. It has been validated as a self-administered, paper and pencil instrument, and the online version used in the current study mirrored the self-administered version exactly. The current study used self-reported data that cannot be corroborated and, as a result, introduces the potential for error. Although random sampling was used at each university, graduate students with existing mental health concerns may have been more inclined to respond than those without mental health problems, which could bias the results. Response rates for the 2010 HMS survey varied widely from institution to institution, with an overall response rate of about 25%. Graduate schools from all geographic areas of the US were not uniformly represented, but rather concentrated in the West and Northeast. Participating institutions joined the study on a voluntary basis, and, therefore, may reflect a group of schools where mental health problems were more prevalent and of greater concern than at schools that chose not to participate. For these reasons, the generalizability of the results of this study may be limited.

This study adds to our understanding of depression and anxiety disorders among graduate students, a population that has not been widely studied as a unique group, and raises important issues that merit future research. First, it is not understood to what extent anxiety and depressive symptoms persist after graduation among graduate students or which factors promote recovery. Such questions cannot be answered with cross-sectional designs, but instead require a longitudinal approach that would follow students during graduate school and for several years afterwards. Although longitudinal studies can be expensive and challenging to conduct, such an effort is required to appropriately address these issues. Secondly, a valid and reliable screening instrument for depression and anxiety disorders must be developed that takes the cultural variation of symptoms into consideration. The prevalence of depression and anxiety symptoms among international and minority students cannot be determined accurately without such an instrument. Thirdly, the scope of future studies should be expanded to include collection and analysis of data about suicidal ideation. This was not included in the current study, and yet, suicide is the most severe consequence of depression and anxiety disorders.

This study has important implications for college health promotion because it clearly shows that graduate students must be considered a legitimate priority population for mental health programming, and routinely studied as a unique group in assessment activities to gain an improved understanding of their mental health status and needs. This understanding should be used to inform university mental health programming designed specifically for graduate students such that an appropriate combination of prevention initiatives and diagnostic and treatment services could be provided. This would also help justify the use of financial and human resources for graduate student mental health initiatives at U.S. universities. In addition, health educators should embrace a multi-disciplinary approach to college mental health interventions that facilitates collaboration among university mental health providers, psychiatrists/psychologists, social workers, drug and alcohol counselors and the university administration. Such an approach is necessary because, as the current study shows, the factors and behaviors related to depression and anxiety disorders among graduate students are diverse and complicated. Interventions will require the knowledge and skills of all these different professions to be successful. Health educators are uniquely qualified to lead this collaboration and make a vital contribution to improving mental health among graduate students.

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