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The Effects of Knowledge and Perceptions of Campus Mental Health Services on College Students' Academic Performance

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The Effects of Knowledge and Perceptions of Campus Mental Health Services on College Students' Academic Performance

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Abstract:
This study investigates how knowledge and perceptions about mental health and campus services affect the academic performance of college students. Using the 2017-2018 Healthy Minds Study, this analysis focuses on the differences in prevalence of anxiety and depression, in addition to opinions and awareness of mental health services across academic degree. By using the Patient Health Questionnaire (PHQ-9), Generalized Anxiety Disorders (GAD-7), and survey data on students' attitudes, knowledge, and utilization of campus mental health services, Grade Point Average (GPA) is evaluated to measure these effects on academic performance using Ordinary Least Squares (OLS). This study ultimately finds that knowledge and personal stigma have significance impacts on academic performance, especially when controlling for depression and anxiety prevalence. These findings can be used to help colleges and universities effectively promote the use of mental health services by destigmatizing mental health and increasing students' awareness of the services available.

I. Introduction

High prevalence of mental health disorders has been an on-going issue on college campuses. Despite college campuses beginning to prioritize mental health and promote easily accessible campus services, there still remains the issues of lack of utilization, knowledge, and treatment of mental health disorders among college students. This study adds to the literature on college students' mental health by investigating how knowledge and perceptions of campus mental health services affect the academic performance of students. Additionally, I assess how these effects either mitigate or intensify the negative effects of anxiety and depression.

Based on the past literature, it is well established that mental health disorders, especially anxiety and depression, are associated with negative effects on academic performance (Eisenberg et. al, 2009). Some studies have shown that stigma, perceptions, and knowledge are correlated with the level of utilization of mental health services and treatments among certain communities (Eisenberg et. al, 2007). Additionally, mental health disorders, especially during the college-aged years, have negative impacts on human capital accumulation, productivity, and social well-being, which can continue to persist after college (Cornaglia et. al, 2015). Therefore, it is important to research and understand the effects of access to campus services and the differing perceptions of mental health across various subgroups to effectively address and reduce mental health disorders among future participants in the labor force.

Using the 2017-2018 Healthy Minds Study, I answer the question of how knowledge and perceptions of mental health issues and campus services affect the academic performance of college students. Specifically, I measure the effects of awareness, stigma, and use of campus mental health services, while controlling for anxiety and depression severity, on GPA. My first hypothesis is that there is no effect of knowledge of mental health services on GPA, conditional on depression and anxiety prevalence. Hypothesis two is that utilization of campus counseling and therapy services has no effect on GPA, conditional on depression and anxiety prevalence. My third hypothesis is that there is no effect of both perceived and personal stigma regarding mental health disorders on academic performance for college students, conditional on depression and anxiety prevalence. Lastly, there are no differences in effects of the knowledge, stigma, and therapy between undergraduates and graduate students. I will be testing these four hypotheses to determine whether knowledge, stigma, and therapy have an impact on academic performance.

By researching how students' knowledge and beliefs on seeking mental health services affect academic performance, as well as further exploring the effects of anxiety and depression, I hope to enhance the limited amount of economic scholarship on mental health disorders. Ultimately, this study illustrates the correlations between GPA and students' knowledge and beliefs regarding mental health rather than causal relationships. Mental health among college students is of economic importance due to the fact that prevalence and persistence of mental disorders could result in negative effects on academic performance. These effects on educational development and skills could lead to possible long-term economic consequences after college. Despite fewer economic barriers to mental health care among college students, relative to individuals who do not have easily accessible mental health care, anxiety and depression still remains an on-going issue on college campuses. Therefore, this study ultimately seeks to illustrate how, in addition to anxiety and depression, knowledge and stigma regarding mental health are associated with educational outcomes.

II.   Literature Review

The past literature on the economic and social costs of mental health disorders among college-aged individuals conveys instrumental findings on the effects of common mental illnesses, such as anxiety and depression. Despite the growing literature on the prevalence and persistence of mental health disorders among college students, there is still a limited amount of scholarship on the variation across subgroups, as well as the academic effects of knowledge and beliefs surrounding mental health services. Before discussing this study's economic methodology and findings, I will discuss the economic costs of anxiety and depression, the effects on academic performance, the scholarship regarding demographic variation, and the drivers behind the persistence of mental health illnesses on college campuses.

As discussed in the past literature, mental health disorders have substantial costs on individuals' economic and social well-being. Mental health problems, especially among college students are shown to have negative effects on academic performance, which also hinders human capital accumulation (Eisenberg et. al, 2009). "Mental health may affect college students' academic outcomes along two margins: 1) the decision to remain in school; 2) productivity, or performance, given that one is in school" (Eisenberg et. al, 2009, pp. 3). Cornaglia et. al's (2015) longitudinal studies has shown that mental illnesses are strongly associated with negative long-term educational outcomes, early-drop out, and future unemployment. Additionally, "…mental health problems persist over time for a substantial proportion of the students. Sixty percent of students who had a mental health problem in 2005 still had a problem in 2007, whereas 24% of students who did not have a problem in 2005 developed one by 2007" (Zirin et.al, 2008, pp. 4). In the context of economic costs and implications, the persistence of lifetime mental health disorders, 75% of which develop between the ages of 18-24, could result in long-term effects on labor market outcomes and earnings (Eisenberg et. al, 2009). Hence, addressing mental health in college is crucial to individuals' short-term and long-term success and development. Therefore, the effectiveness and accessibility of mental health care among individuals, especially college students, is both an important social and economic issue that needs to be analyzed further to understand the mechanisms that can potentially mitigate these effects.

Specifically, in the context of educational outcomes, many of the studies in the past literature assess the effects of mental health disorders on academic performance and human capital accumulation, in regard to educational decisions. In Currie and Stabile's (2005) paper on ADHD and child mental health, they argue that human capital accumulation and the economic effects can be captured through grade repetition, test scores, and special education. The large negative effects of a child's mental health on test scores and educational attainment, which hinders one's human capital accumulation, could result in long-term effects on earnings and employment (Currie & Stabile, 2004). Therefore, using GPA as a measure of academic effects can help evaluate the impacts human capital accumulation and other economic outcomes related to educational development. Furthermore, Eisenberg et. al (2009), whom uses the same depression and anxiety questionnaire measure as this study, found that "…a 15 point increase on the PHQ-9 scale (which would be the difference between what are considered low levels and severe levels of depressive symptoms) correspond to a 0.17 drop in GPA…and a 0.40 drop in the presence of anxiety"(pp. 20). While in Hysenbegais et. al's (2005) investigation, they found that diagnosed depression is associated with a 0.49 decline in GPA, while mental health treatments mitigated this effect by 0.44 GPA points. Therefore, understanding what can mitigate these

academic effects is essential to effectively analyze and implement necessary changes to college mental health facilities.

In addition to understanding the effects of mental illness on human capital accumulation, it is important to focus on the variation across subgroups to identify underserved populations. For instance, Al-Qaisy (2011) found that females have more anxiety than males, while males tend to have higher levels of depression. Additionally, students in educational sciences, art, and finance have higher levels of both depression and anxiety, relative to students in STEM fields. Eisenberg et. al (2013) found that "… the substantially higher prevalence of depression among minority groups as compared with the white students is perhaps the most striking finding…given that depression predicts persistence in college" (64). Additionally, it has be shown that students of color who are studying in a field that is perceived as a highly competitive learning environment have a stronger association with anxiety and depression, compared to their white counterparts in the same field (Posselt et. al, 2016). Lipson et. al (2018) found that students of color receive less diagnoses, medication use, and campus counseling, compared to white students. This supports their overall findings that non-white students illustrate more variation in campus service utilization, rather than symptoms for disorders (Lipson et. al, 2018). Even though Lipson et. al's (2018) study provides massive contributions to the literature on racial and ethnic inequalities in mental health among college students, it is also essential to assess these demographic differences in the context of educational outcomes. By further understanding the costs and drivers behind disparities in mental health services, despite students having equal access to treatment and counseling, college campuses can implement additional services and support that appeal to students of various backgrounds and academic environments.

In addition to understanding the effects of mental health problems and counseling services, analyzing the impact of perceptions and stigmas surrounding mental health can help identify some of the mechanisms that influence why and whether students seek help for mental illnesses. Despite college campuses providing easily accessible and cost-efficient mental health services, "Of students with positive screens for depression or anxiety, the proportion who did not receive any services ranged from 37% to 84%" (Eisenberg et. al, 2007, pp. 594). The main drivers behind students not using campus services are lack of knowledge about services available, skepticism of medication and therapy treatments, socioeconomic factors, and stigma (Eisenberg et. al, 2007). Additionally, Eisenberg et.al (2009), found that perceived public stigma, or how students believe mental health disorders is viewed by their peers, is significantly more prominent than personal stigma and beliefs. Also, personal stigma is associated with demographics, such as gender, race, ethnicity, citizenship, and socioeconomic background, as well as perceived need and seeking treatment (Eisenberg et. al, 2009). Instead of assessing the effects of stigma and beliefs on the prevalence of mental health disorders, Eisenberg et. al (2009) focuses on the effects of stigmas on the decision to seek help for illnesses.

As displayed, there is an extensive amount literature on the prevalence, effects, and determinants of mental health disorders among college students. However, there is no study to my knowledge that assesses the academic effects of the non-financial barriers to mental health treatment for college students. It is essential to address the educational costs to knowledge and stigmas, in addition to disorders, to understand the variation across student subgroups. As seen in the limited literature on the disparities in mental health on college campuses, the variation in prevalence of depression and anxiety is conveyed in utilization of services. Therefore, it is important to research and understand the mechanisms that both mitigate and intensify the

negative effects of mental health disorders to effectively address and reduce mental health problems among future participants in the labor market.

III.   Data

This study uses 2017-2018 Healthy Minds Study, an annual web-based survey for undergraduate and graduate students attending colleges and universities across the U.S. The data contains self-reported information about students' demographics, academic performance, mental health conditions, and knowledge, decisions, and stigmas regarding disorders and campus mental health services (Healthy Minds Network, 2019). "HMS is one of the only annual surveys of college and university populations that focuses exclusively on mental health…understanding service utilization and help-seeking behavior, including factors such as stigma, knowledge, and the role of peers and other potential gatekeepers" (Healthy Minds Network, 2019). To incentive student participation, subjects are entered into a cash sweepstakes drawing for the chance to win $500 or $100.

For the 2017-2018 academic year, the sample size is 67,389 students from 60 colleges and universities. The response rate of the survey during the 2017-2018 academic year was 24% (Healthy Minds Network, 2019). As listed in table 1, the average GPA, scored on a 4.0 scale, is 3.21 points, and the mean age is 22.68 years old. This sample contains 66% female and 34% male. The race and ethnicity categories are 68% White, non-Hispanic, 7% Black/African American, 18% Asian/Asian American, 12% Hispanic/Latino/a, 3% Middle Eastern/Arab/Arab American, and 2% other. White, non-Hispanic is used as the base category for all regressions ran in this study. Additionally, table 1 illustrates the differences in demographics and statistics between undergraduate and graduate students. As shown in the table, graduates have a higher average GPA, compared to undergraduates, which is most likely due to the difference in importance of grades in graduate school. Therefore, graduates and undergraduates are analyzed separately in all the models in this study.
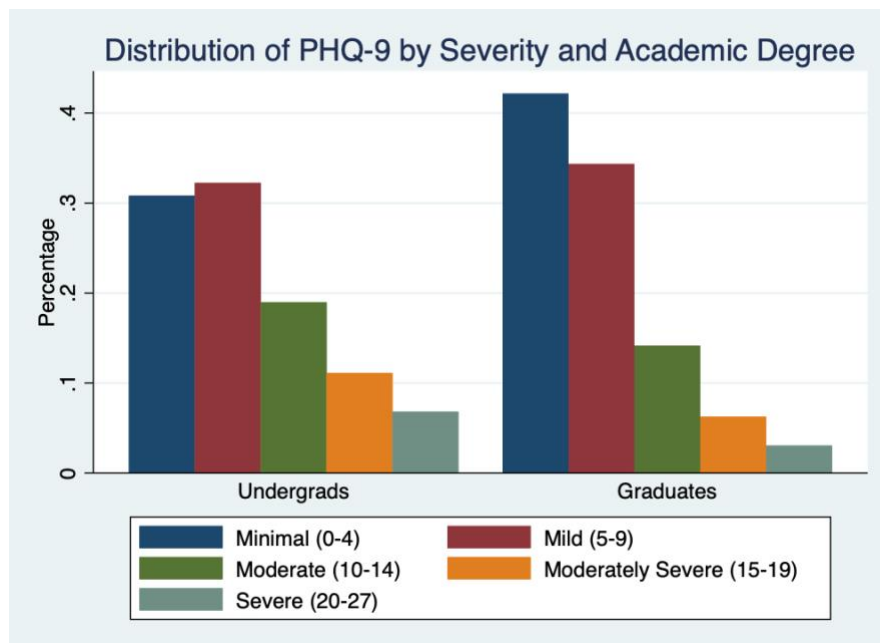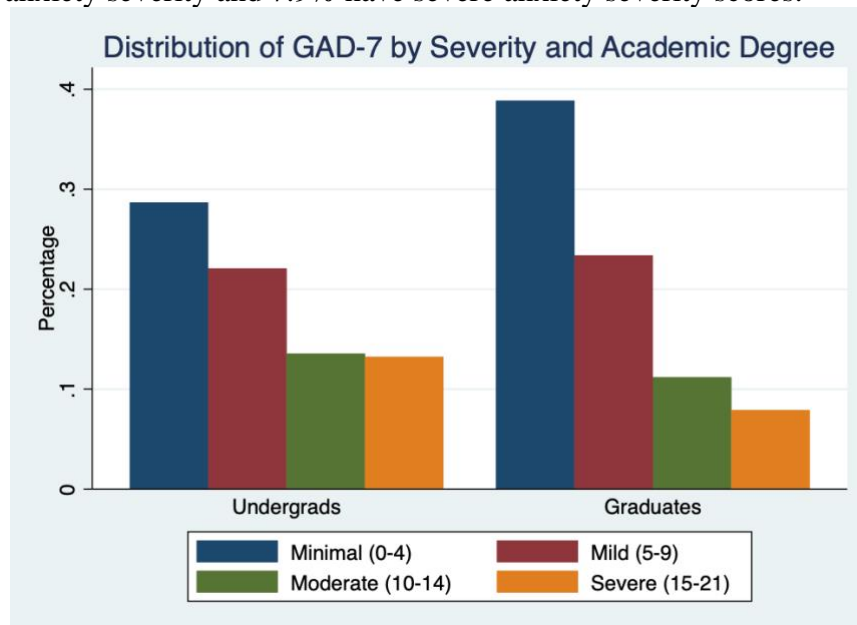

Graph 1: Percentage of PHQ-9 by level of severity and academic degree

In this study, I use the Patient Health Questionnaire (PHQ-9) and the Generalized Anxiety Disorder (GAD-7) severity measures. In the Healthy Minds Study, students are asked the standard PHQ-9 and GAD-7 questionnaires, and their scores are revealed at the end of the survey. Both questionnaires ask a series of questions related to ones' symptoms of depression or anxiety over the past two weeks, with answers ranging from "'0' (not at all) to '3' (nearly every day)" (Kroneke et. al, 2001). The higher one's scores are on the questionnaires, the higher their level of depression and/or anxiety severity. The Patient Health Questionnaire (PHQ-9) is an abridged, self-administered assessment of depression severity that is commonly used in surveys on mental health. As shown in Kroenke et. al's (2001) study that tests the reliability of the PHQ-9 as a measure of depression severity, the PHQ-9 is considered a valid, reliable measure that allows researchers to assess depression severity in nine questions.

With the PHQ-9 being scored from 0-27, depression severity is categorized as minimal (0-4), mild (5-9), moderate (10-14), moderately severe (15-19), and severe (20-27) (Kroneke et. al, 2001). The average PHQ-9 score in this sample is 8.06, with undergraduates having an average of 8.58 and graduates with 6.66. As illustrated in the graph above, depression severity significantly varies between undergraduate and graduate students. For undergraduates, 31% have minimal or no depression severity and 18% have moderately severe or severe depression severity. However, for graduate students, 42% have minimal or no depression severity and 9.3% have moderately severe or severe depression.

Similar to the PHQ-9, the Generalized Anxiety Disorder (GAD-7) is a brief, yet reliable assessment of anxiety severity that is commonly used in clinical practice and research (Spitzer et. al, 2006). For GAD-7, which is scored from 0-21, anxiety severity is categorized as minimal (0-4), mild (5-9), moderate (10-14), and severe (15-21) (Spitzer et. al, 2006). The average GAD-7 score in this sample is 6.92, with undergraduates having an average of 7.29 and graduates with 5.91. As illustrated in the graph below, anxiety severity also significantly varies between undergraduate and graduate students. For undergraduates, 38.7% have minimal or no anxiety severity and 13.2% have severe anxiety severity. However, for graduate students, 49% have minimal or no anxiety severity and 7.9% have severe anxiety severity scores.

Graph 2: Percentage of GAD-7 by level of severity and academic degree

Table 1: Summary Statistics

	(1)	(2)	(3)
	Full sample	Undergraduates	Graduates
GPA	3.21	3.11	3.49
	(0.597)	(0.619)	(0.415)
White	0.68	0.72	0.58
	(0.468)	(0.451)	(0.494)
Black/ African	0.07	0.07	0.07
American	(0.253)	(0.253)	(0.250)
Asian/ Asian	0.18	0.15	0.26
American	(0.383)	(0.356)	(0.441)
Hispanic/	0.12	0.12	0.11
Latino/a	(0.324)	(0.329)	(0.311)
Middle Eastern/	0.03	0.02	0.03
Arab	(0.159)	(0.151)	(0.179)
PHQ-9	8.06	8.58	6.66
(Scored 0-27)	(6.026)	(6.194)	(5.304)
GAD-7	6.92	7.29	5.91
(Scored 0-21)	(5.520)	(5.631)	(5.077)
Diagnosed	0.22	0.23	0.20
Depression	(0.417)	(0.423)	(0.397)
Diagnosed	0.25	0.26	0.22
Anxiety	(0.434)	(0.440)	(0.415)
Age	22.68	21.00	27.53
	(5.317)	(3.929)	(5.822)
Female	0.66	0.67	0.63
	(0.474)	(0.470)	(0.483)
N	67885	49650	17290

Notes: Means are reported in this table, while the values in the parentheses are standard deviations.

For additional controls for depression and anxiety, I include self-reported indicators of whether a student has been diagnosed by a health care professional. For diagnosed depression, students are asked whether they have been diagnosed with depression by a health care professional. As shown in table 1, 22% have been diagnosed with depression, with 23% of undergraduate and 20% of graduate students. For diagnosed anxiety, students are asked whether they have been diagnosed with anxiety by a health care professional. In this sample, 25% have been diagnosed with anxiety, with 26% of undergraduate and 22% of graduate students.

As presented in table 2, knowledge, stigma, and service utilization are also measured by survey questions. To assess knowledge of campus mental health services, students are asked how much they agree with the statement "If I needed to seek professional help for my mental or emotional health, I would know where to go on my campus" (Healthy Minds Network, 2019). The answers range from strongly agree, agree, somewhat agree, somewhat disagree, disagree, and strongly disagree. The knowledge variable is reported in table 2 as a measure ranging from 0, the least amount of knowledge, and 5 being the highest level of awareness of college campus services. However, in all the models in this study, knowledge is standardized into a z-score for easier interpretation. The average level of knowledge is 3.39.

To assess therapy use among students, students are asked whether or not they have been to therapy or counseling for a mental health issue, both before and/or during college. Therapy is reported as a dummy variable, where 1 indicates a student has used and/or currently uses therapy or counseling services. As shown in table 2, 44% have used therapy or counseling services, with 43% for undergraduate and 45% for graduate students.

For perceived stigma, I averaged the scores of three questions that assess students' levels of perceived stigma. For perceived stigma the statements asked are "Most people think less of a person who has received mental health treatment," "Most people would willingly accept someone who has received mental health treatment as a close friend" and "Most people feel that receiving mental health treatment is a sign of personal failure" (Healthy Minds Network, 2019).

Table 2: Summary Statistics

	(1)	(2)	(3)
	Full sample	Undergraduates	Graduates
Knowledge	3.39	3.44	3.24
	(1.434)	(1.402)	(1.511)
Therapy	0.44	0.43	0.45
	(0.496)	(0.496)	(0.498)
Perceived	2.23	2.19	2.31
Stigma	(1.199)	(1.204)	(1.180)
Personal	0.65	0.64	0.70
Stigma	(0.897)	(0.877)	(0.948)
N	62389	46093	16259

Notes: Means are reported in this table, while the values in the parentheses are standard deviations.

Similarly, for personal stigma I also averaged the scores of three questions that assess students' levels of personal stigma. For personal stigma, the statements asked are "I would think less of a

person who has received mental health treatment," "I would willingly accept someone who has received mental health treatment as a close friend," and "I feel that receiving mental health treatment is a sign of personal failure" (Healthy Minds Network, 2019).

Similar to knowledge, the answers range from strongly agree, agree, somewhat agree, somewhat disagree, disagree, and strongly disagree. Both stigma variables are scored from 0 through 5, 0 being no/low levels of stigma regarding mental health, and 5 being extremely high levels of stigma. In all the models in this study, both perceived and personal stigma are reported as z-scores. As shown in table 2, the average level of perceived stigma is 2.23, while personal stigma is 0.65 out of 5.

IV.   Empirical Strategy

To effectively assess the effects of knowledge and perceptions about mental health and campus services on college students' academic performance, I use the Healthy Minds Study, a web-based survey regarding mental health problems and service use on college campuses. I ran Ordinary Least Squares (OLS) regressions to understand the relationship between depression, anxiety, and students' perceptions about their campus services. Additionally, in all the models discussed, separate models are run for undergraduate and graduate students, and interactions between the main independent and race and ethnicity dummy variables are also included in each model.

First, I want to understand and verify how depression and anxiety affect academic performance. Since it is well documented in the literature that mental health issues, especially depression and anxiety, have a negative effect on GPA, I ran regressions to see how my results align with past studies, as well as understand the magnitudes of these effects within my sample. My first model uses self-reported GPA as the main dependent variable. GPA is used as a measure of academic performance, which it associated with educational achievement. For the main independent variables, I am using the Patient Health Questionnaire (PHQ-9) and the Generalized Anxiety Disorder (GAD-7), two commonly used measures of mental health severity. Since the PHQ-9 and GAD-7 have been shown to differ in the past literature, separate regressions are run for depression severity, containing only the PHQ-9 as the main independent variable, and anxiety severity using the GAD-7. Both PHQ-9 and GAD-7 are z-scores in all the models in this study. Additionally, I included a self-reported measure of whether a student has been diagnosed with clinical depression in the regression with the PHQ-9 and a similar measure for anxiety diagnosis in the GAD-7 regression.

$$GPA_{ij} = \alpha + \beta_1 PHQ - 9_{ij} + \beta_2 Depression_{ij} + \beta_3 Race_{ij} \\ + \beta_4 Race * PHQ - 9_{ij} + \epsilon \tag{1}$$

$$GPA_{ij} = \alpha + \beta_1 GAD - 7_{ij} + \beta_2 Depression_{ij} + \beta_3 Race_{ij} \\ + \beta_4 Race * GAD - 7_{ij} + \epsilon \tag{2}$$

To control for the possible variation in the effects of mental health severity on GPA across subgroups, race and ethnicity background dummy variables and their interactions with the main independent variables are also included. Race and ethnicity include White, non-Hispanic, Black/African American, Asian/Asian American, Middle Eastern/Arab/Arab American, and

Other. Additionally, I control for age, gender, parents' education, past financial situation, and current financial situation. All models in this study have school fixed effects to control for variations in campus mental health services across different colleges that participated in the Healthy Minds Study.

In the second model, I try to understand how knowledge of campus mental health services effect academic performance, and whether the effect mitigates or intensifies the negative effects of depression and anxiety on GPA. With GPA still as the dependent variable, the main independent variable is a measure of a student's level of knowledge of their campus mental health services. This variable, as well as the stigma variables in model 4, are standardized into a z-score for an easier interpretation of the effects relative other variables that are on a numerical scale. Additionally, separate regressions are run for depression and anxiety severity and diagnosis. The knowledge regression with depression included PHQ-9 score, depression diagnosis indicator, and interactions between these variables and knowledge. The knowledge regression with anxiety included GAD-7 score, anxiety diagnosis indicator, and interactions between these variables and knowledge. Race and ethnic dummy variables and their interactions with knowledge are also included, along with the same set of controls as model 1 and 2.

$$GPA_{ij} = \alpha + \beta_1 Knowledge_{ij} + \beta_2 PHQ - 9_{ij} + \beta_3 Depression_{ij}$$
$$+ \beta_4 Knowledge * PHQ - 9_{ij} + \beta_5 Race_{ij} + \epsilon \qquad (3)$$

This study hypothesizes that there is no effect for knowledge of mental health services on GPA. Thus, by evaluating the effects of knowledge of campus services and its interactions with mental health illness, this study can convey the magnitude and impact on academic performance. A positive, sizable effect of knowledge on GPA would illustrate that higher levels of awareness can mitigate the negative effects of depression and anxiety. Furthermore, this outcome would be evidence for campuses to promote more awareness of the mental health services available to their students, while also focusing on subgroups that have lower levels of knowledge of campus services.

After analyzing the effects of knowledge, I try to see how therapy use among college students affects academic performance, and whether the effect mitigates or intensifies the negative effects of depression and anxiety on GPA. Similar to model 3, model 4 includes the same controls, measures of race/ethnic variation, and separate regressions for depression and anxiety severity and diagnosis. However, the main independent is a dummy variable that indicates whether a student has or currently receives therapy for mental health problems. Therapy serves as a measure of how campus counselling and psychological services effect college students' GPA. The therapy regression with depression includes the PHQ-9 score, depression diagnosis indicator, and interactions between these variables and therapy. While the therapy regression with anxiety includes the GAD-7 score, anxiety diagnosis indicator, and interactions between these variables and therapy.

$$GPA_{ij} = \alpha + \beta_1 Therapy_{ij} + \beta_2 PHQ - 9_{ij} + \beta_3 Depression_{ij}$$
$$+ \beta_4 Therapy * PHQ - 9_{ij} + \beta_5 Race_{ij} + \epsilon \qquad (4)$$

As discussed previously, this study hypothesizes that utilization of campus counseling and therapy services has no effect on GPA. Therefore, similar to knowledge, a positive, substantial effect of therapy use would provide evidence to support the promotion of easily assessible therapy and counselling services among college-aged students. Additionally, the

variation of this outcome across subgroups could support the need to promote more community-specific mental health services for students that may benefit more or who are less likely to seek these services.

After evaluating knowledge and utilization of campus mental health services, I investigate how stigma and perceptions of mental health affect academic performance. In addition to understanding whether awareness and use of mental health resources mitigate the negative effects of depression and anxiety, it is also essential to investigate how beliefs and stigma interact with mental health disorders, as well as impact GPA. As discussed in Eisenberg et. al (2009), stigma surrounding mental health disorders impact students' perceptions of their own mental health and whether they seek help when needed. Additionally, they discuss the differences in effects between perceived stigma, how one believes their peers feel regarding an issue, and personal stigma, ones' own views towards a situation. Therefore, this study also separates perceived and personal stigma to analyze the differences in effects on academic performance.

$$GPA_{ij} = \alpha + \beta_1 Perceived_{ij} + \beta_2 PHQ - 9_{ij} + \beta_3 Depression_{ij}$$
$$+ \beta_4 Perceived * PHQ - 9_{ij} + \beta_5 Race_{ij} + \epsilon \qquad (5)$$

Similar to model 3 and model 4, the stigma models includes the same controls, measures of race/ethnic variation, and separate regressions for depression and anxiety severity and diagnosis. However, two separate sets of regression are composed, one with a score of a students' perceived stigma as the main independent variable and the other with a score of a students' personal stigma. Therefore, these indicators evaluate how an increase in a student's level of stigma effects GPA, as well as interact with the depression and anxiety measures. The stigma regressions with depression included the PHQ-9 score, depression diagnosis indicator, and interactions between these variables and the particular stigma measure for that model. While the stigma regressions with anxiety included the GAD-7 score, anxiety diagnosis indicator, and interactions between these variables and the particular stigma measure for that model.

$$GPA_{ij} = \alpha + \beta_1 Personal_{ij} + \beta_2 PHQ - 9_{ij} + \beta_3 Depression_{ij}$$
$$+ \beta_4 Personal * PHQ - 9_{ij} + \beta_5 Race_{ij} + \epsilon \qquad (6)$$

As mentioned, this study hypothesizes that there is no effect for both perceived and personal stigma on the academic performance for college students. Therefore, evidence illustrating that stigma has a significant, negative effect on academic performance would reject this study's null hypothesis, as well as indicate that higher levels of stigma regarding mental health intensifies the negative effects of depression and anxiety.

V.   Results

In this section, I evaluate and analyze the effects of knowledge of campus mental health services, service utilization, and stigma on college students' academic performance. All the models in this study are ran separately for undergrad and graduate students since there is significant variation in mental health severity and GPA in this sample. Since all models exhibit similar results for race/ethnicity as model 1, these variables are not shown in the other result tables. Additionally, interactions between the race and ethnic indicator variables and the main independent for each model were not statistically significant. Therefore, they are also excluded from the tables in this paper. As mentioned in the empirical strategy section, all models have

school fixed effects and control for socioeconomic factors, parents' highest level of education, gender, race, and age. All standard errors shown are heteroskedastic-consistent.

To verify the effects of depression and anxiety severity seen in the past literature, model 1 and 2 measures the effects of the PHQ-9 and GAD-7 on GPA. As shown in table 3, for undergraduates, an increase in the PHQ-9 score by one standard deviation, decreases GPA by 0.09 points, while GAD-7 decreases GPA by 0.04 points. Moreover, for graduate students, an increase in the PHQ-9 score decreases GPA by 0.05, while an increase in the GAD-7 score by one standard deviation decreases GPA by 0.02 points. Therefore, as expected, depression and anxiety severity have negative effects on academic performance, as conveyed in the past literature. Additionally, for both undergraduate and graduate students, depression severity has more of an effect on GPA than anxiety severity, yet both are significant indicators of academic performance. Also note that in all models, the various racial and ethnic categories indicate lower levels of GPA, relative to their white counterparts, yet the interactions between the mental health severity measures in all of the regressions were not statistically significant estimators of academic performance.

Table 3: Effects of Depression and Anxiety Severity on GPA

VARIABLES	Undergraduates		Graduates	
	(1)	(2)	(3)	(4)
PHQ-9	-0.085***		-0.048***	
	(0.004)		(0.007)	
GAD-7		-0.040***		-0.016***
		(0.004)		(0.006)
Black	-0.316***	-0.315***	-0.187***	-0.185***
	(0.015)	(0.016)	(0.020)	(0.020)
Asian	-0.039***	-0.048***	-0.117***	-0.123***
	(0.009)	(0.009)	(0.010)	(0.010)
Hispanic	-0.119***	-0.122***	-0.086***	-0.088***
	(0.011)	(0.011)	(0.014)	(0.014)
Middle Eastern/Arab	-0.046**	-0.058**	-0.010	-0.013
	(0.022)	(0.023)	(0.022)	(0.021)
Other	-0.124***	-0.134***	-0.086***	-0.086***
	(0.018)	(0.018)	(0.021)	(0.021)
Female	0.127***	0.134***	0.048***	0.050***
	(0.007)	(0.007)	(0.008)	(0.008)
Constant	2.816***	2.761***	3.127***	3.123***
	(0.032)	(0.032)	(0.189)	(0.196)
Observations	33,495	33,118	11,920	11,819
R-squared	0.115	0.102	0.097	0.091

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Notes: Control for race, ethnicity, age, gender, financial situation, parents' education, and school fixed effects

After verifying the negative effects of anxiety and depression, model 3 evaluates the effects of knowledge of campus services for undergraduates on academic performance. Overall, a higher level of knowledge of campus mental health services is associated with a higher GPA. To assess the effects of knowledge as it interacts with depression and anxiety, in the second regression in table 4 I include just the PHQ-9 score, while in the third regression I control for whether a student has been diagnosed with depression. Similarly, for anxiety, regression 4 includes the GAD-7 score, while the fifth regression controls for whether a student has been diagnosed with anxiety.

Table 4: Effects of Knowledge on GPA (Undergraduates)

VARIABLES	(1)	(2)	(3)	(4)	(5)
Knowledge	0.016***	0.009**	0.015***	0.013***	0.018***
	(0.004)	(0.004)	(0.00510)	(0.004)	(0.005)
Knowledge*PHQ-9		-0.003	-0.001		
		(0.003)	(0.004)		
PHQ-9		-0.084***	-0.078***		
		(0.004)	(0.004)		
Knowledge* Depression			-0.015		
			(0.009)		
Depression			-0.050***		
			(0.009)		
Knowledge*GAD-7				-0.001	-0.001
				(0.003)	(0.004)
GAD-7				-0.041***	-0.031***
				(0.004)	(0.004)
Knowledge*Anxiety					-0.006
					(0.009)
Anxiety					-0.069***
					(0.009)
Constant	2.703***	2.819***	2.850***	2.764***	2.805***
	(0.031)	(0.033)	(0.035)	(0.033)	(0.035)
Observations	40,976	31,693	29,047	31,703	29,065
R-squared	0.105	0.116	0.116	0.103	0.104

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Notes: Control for race, ethnicity, age, gender, financial situation, parents' education, and school fixed effects

As shown in table 4, in all the regressions that evaluate the effects of knowledge of mental health services, knowledge has a significant positive effect on GPA. In column 1, an increase in knowledge by one standard deviation is associated with a 0.016 increase in GPA points. After controlling for depression and anxiety severity in columns 2 through 5 knowledge still remains to have a positive relationship with academic performance. However, while the depression and anxiety measures still maintain a negative relationship with GPA, none of the interactions between knowledge and mental health are significant. Therefore, for undergraduates,

knowledge of campus services has a positive association with GPA, yet there is no interactive effect with depression or anxiety. Additionally, when controlling for depression and anxiety severity, knowledge cannot fully mitigate the negative effects of mental health disorders on academic performance.

Similar to undergraduates, knowledge of campus mental health services is associated with a higher GPA for graduate students. As shown in table 5, I ran the same regressions as table 4, yet the sample only includes graduate students. In column 1, an increase in knowledge by one standard deviation is associated with a 0.014 increase in GPA points. As shown in column 3, diagnosed depression has no significant effect on GPA for graduate student, which may be due to the smaller sample size and smaller variation in GPA, compared to undergraduate students. Additionally, while the PHQ-9 and GAD-7 still maintain a negative relationship with GPA, none of the interactions between knowledge and mental health are significant. Therefore, for graduates, knowledge of campus services has a positive association with GPA, yet there is no interactive effect with depression or anxiety.

Table 5: Effects of Knowledge on GPA (Graduates)

VARIABLES	(1)	(2)	(3)	(4)	(5)
Knowledge	0.014***	0.010**	0.012**	0.013***	0.013**
	(0.004)	(0.005)	(0.006)	(0.005)	(0.006)
Knowledge* PHQ-9		-0.003	-0.005		
		(0.004)	(0.005)		
PHQ-9		-0.050***	-0.051***		
		(0.005)	(0.006)		
Knowledge*Depression			0.0003		
			(0.010)		
Depression			0.0006		
			(0.011)		
Knowledge*GAD-7				-0.005	-0.007
				(0.004)	(0.004)
GAD-7				-0.026***	-0.023***
				(0.005)	(0.005)
Knowledge*Anxiety					0.010
					(0.010)
Anxiety					-0.022**
					(0.011)
Constant	3.099***	3.152***	3.120***	3.142***	3.104***
	(0.218)	(0.194)	(0.066)	(0.205)	(0.066)
Observations	13,898	11,401	10,650	11,402	10,658
R-squared	0.080	0.094	0.095	0.088	0.090

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Notes: Control for race, ethnicity, age, gender, financial situation, parents' education, and school fixed effects

After evaluating the effects of knowledge of campus services, I investigate how these services effect academic performance by assessing therapy/counseling services. As illustrated in

table 6 column 1, going to therapy is associated with a 0.07-point decrease in GPA for undergraduates. This result may be due to the fact that students who utilize therapy services may have more severe mental health problems. As illustrated in column 3 of table 6, the interaction between therapy use and the GAD-7 score is statistically significant. Therefore, for a student who has used or currently uses therapy services, an increase in the GAD-7 by one standard deviation, decreases GPA by 0.07 points. Therapy seems to be associated with lower academic performance, especially when controlling for depression and anxiety, yet this outcome may be due to external factors that I cannot control for in my model. For graduate students, therapy has no significant effect on GPA. As shown in column 4 on table 6, therapy has a small and not statistically significant effect on academic performance. Additionally, while the PHQ-9 and GAD-7 still maintain a negative relationship with GPA, none of the interactions between therapy and mental health are significant for graduate students.

Table 6: Effects of Therapy Use on GPA

VARIABLES	Undergraduates			Graduates		
	(1)	(2)	(3)	(4)	(5)	(6)
Therapy	-0.072***	-0.0003	-0.029***	-0.013	0.001	0.013
	(0.007)	(0.010)	(0.010)	(0.009)	(0.012)	(0.012)
Therapy*PHQ-9		0.0002			-0.008	
		(0.008)			(0.010)	
PHQ-9		-0.077***			-0.048***	
		(0.006)			(0.008)	
Therapy*Depression		0.005			0.069	
		(0.029)			(0.042)	
Depression		-0.054**			-0.064	
		(0.027)			(0.041)	
Therapy*GAD-7			-0.019**			-0.002
			(0.008)			(0.010)
GAD-7			-0.020***			-0.023***
			(0.006)			(0.007)
Therapy*Anxiety			0.018			-0.044
			(0.023)			(0.030)
Anxiety			-0.063***			0.014
			(0.021)			(0.027)
Constant	2.729***	2.845***	2.810***	3.090***	3.092***	3.070***
	(0.032)	(0.036)	(0.035)	(0.205)	(0.067)	(0.067)
Observations	41,662	29,604	29,625	14,092	10,797	10,802
R-squared	0.109	0.116	0.104	0.081	0.098	0.091

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Notes: Control for race, ethnicity, age, gender, financial situation, parents' education, and school fixed effects

Lastly, after evaluating mechanisms that could potential mitigate the effects of depression and anxiety, I investigate how stigma surrounding mental health affect academic performance. Understanding how beliefs and perceptions regarding mental health impact GPA it essential to identifying what attitudes and decisions regarding mental health mitigate or intensify the effects of mental health disorders. As mentioned, I composed separate models for perceived and personal stigma.

As shown in table 7, undergrads experience a 0.01 decline in GPA as ones' level of perceived stigma increases by one standard deviation. However, once I control for the various depression and anxiety measures, perceived stigma has an even smaller and not statistically significant effect. Similarly, for graduates, once I control for the various depression and anxiety measures, perceived stigma has a minor and not statistically significant effect. Therefore, perceived stigma about mental health seems to not have a large significance on academic performance, after controlling for depression and anxiety measures.

Table 7: Effects of Perceived Stigma on GPA

VARIABLES	Undergraduates			Graduates		
	(1)	(2)	(3)	(4)	(5)	(6)
Perceived Stigma	-0.014***	-0.0009	-0.008	-0.018***	-0.008	-0.009
	(0.004)	(0.005)	(0.005)	(0.005)	(0.006)	(0.007)
Perceived*PHQ-9		0.002			0.010**	
		(0.004)			(0.005)	
PHQ-9		-0.078***			-0.053***	
		(0.004)			(0.006)	
Perceived*Depression		0.004			-0.002	
		(0.009)			(0.010)	
Depression		-0.052***			0.003	
		(0.009)			(0.011)	
Perceived*GAD-7			-0.006			0.008
			(0.004)			(0.005)
GAD-7			-0.030***			-0.024***
			(0.004)			(0.005)
Perceived*Anxiety			0.002			-0.007
			(0.009)			(0.010)
Anxiety			-0.066***			-0.018*
			(0.009)			(0.011)
Constant	2.710***	2.854***	2.811***	3.107***	3.102***	3.084***
	(0.031)	(0.035)	(0.035)	(0.220)	(0.067)	(0.067)
Observations	40,632	28,786	28,805	13,801	10,577	10,582
R-squared	0.106	0.116	0.104	0.080	0.096	0.089

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Notes: Control for race, ethnicity, age, gender, financial situation, parents' education, and school fixed effects

As shown in table 8, in all the regressions that evaluate the effects of personal stigma, personal stigma has a significant negative effect on GPA. In column 1, an increase in personal stigma by one standard deviation is associated with a 0.02 decrease in GPA points. After controlling for depression and anxiety severity in columns 2 and 3, personal stigma still remains to have a negative relationship with academic performance. However, while the depression and anxiety measures also still maintain a negative relationship with GPA, none of the interactions between personal stigma and mental health are significant. Therefore, for undergraduates, personal stigma has a negative association with GPA, yet there is no interactive effect with depression or anxiety.

Table 8: Effects of Personal Stigma on GPA

VARIABLES	Undergraduates			Graduates		
	(1)	(2)	(3)	(4)	(5)	(6)
Personal Stigma	-0.017***	-0.024***	-0.026***	-0.034***	-0.028***	-0.032***
	(0.004)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)
Personal*PHQ-9		0.002			0.004	
		(0.004)			(0.005)	
PHQ-9		-0.077***			-0.051***	
		(0.004)			(0.005)	
Personal*Depression		-0.008			-0.011	
		(0.011)			(0.011)	
Depression		-0.057***			-0.004	
		(0.009)			(0.011)	
Personal*GAD-7			-0.002			0.006
			(0.004)			(0.005)
GAD-7			-0.031***			-0.023***
			(0.004)			(0.005)
Personal*Anxiety			-0.003			-0.0002
			(0.010)			(0.013)
Anxiety			-0.072***			-0.023**
			(0.009)			(0.011)
Constant	2.706***	2.854***	2.808***	3.064***	3.102***	3.085***
	(0.031)	(0.035)	(0.035)	(0.212)	(0.067)	(0.066)
Observations	40,624	28,782	28,803	13,803	10,581	10,586
R-squared	0.106	0.116	0.104	0.082	0.098	0.091

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Notes: Control for race, ethnicity, age, gender, financial situation, parents' education, and school fixed effects

Similarly, for graduate students, personal stigma has a large, more substantial effect on academic performance than perceived stigma. An increase in personal stigma results in a 0.03-point decline in GPA. After controlling for depression and anxiety severity in columns 5 and 6, personal stigma still remains to have a negative relationship with academic performance.

However, similar to undergraduates, personal stigma has a negative association with GPA, yet there is no interactive effect with depression or anxiety.

Overall, knowledge, therapy, and stigma regarding mental health and mental health services do impact academic performance, yet there are no significant interactive effects with depression or anxiety. Knowledge of campus mental health services has a mitigating effect on depression and anxiety prevalence. However, this effect only slightly alleviates the negative effects of mental health disorders on academic performance. This holds for both undergraduates and graduate students. Therapy use is associated with a decline in GPA for undergraduates, yet this outcome may be due to external factors. For instance, students using therapy services may have more severe mental health disorders. Perceived stigma seems to have no substantial impact on academic performance, after controlling for depression and anxiety. Moreover, increases in personal stigma intensifies the negative effects of depression and anxiety for both undergraduate and graduate students. Lastly, undergraduates and graduate students illustrate slight variations in outcomes. This is most likely due to the higher levels of GPA and lower levels of depression and anxiety severity among graduate students.

VI.   Conclusion

This study investigates how college students' knowledge and beliefs on mental health and campus services affect their academic performance. After evaluating the effects of knowledge of mental health services, therapy use, and stigma surrounding mental health, this study concludes that these mechanisms are associated with GPA; however, the magnitude and impact vary. Additionally, the interactions between the main independent variables, knowledge, therapy, and stigma, and depression and anxiety were not significant, for both undergraduates and graduate students. A limitation to this analysis is that since the data is self-reported there is always a concern of potential inaccuracies in the data. Additionally, the measure of service utilization does not fully assess students' use of campus mental health services. Ideally, more information on the use of the schools' campus mental health facilities would have provided a better assessment of service utilization. Also, since GPA is a stock measure, or cumulative measure, it may not be sensitive to current circumstances, which could explain the lack of significant outcomes for some of the variables. Lastly, this study illustrates correlations, not casual relationships. It is difficult to justify a causal relationship when there are many omitted variables that I am not able to control for in my models.

Despite colleges prioritizing mental health and promoting easily accessible campus services, it is essential to understand how students' knowledge and beliefs on mental health services interaction with mental health disorders and impact their academic performance. These findings can be utilized to help colleges and universities effectively promote the use of mental health services by destigmatizing mental health and increasing students' awareness of the services available. Additionally, future researchers could assess how knowledge and beliefs vary by other dimensions, such as race, ethnicity, socioeconomic background, and field of study. It is important to research and understand the differing perceptions of mental health and reasons for undertreatment across various subgroups to effectively address and reduce mental health disorders among future participants in the labor force. Moreover, a longitudinal study on college students' mental health could illustrate the long-term economic effects of this study's findings, as well as how knowledge and beliefs of mental health and mental health services change over time.

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