

Graduate Student Mental Health: Lessons from American Economics Departments[†]

VALENTIN BOLOTNY, MATTHEW BASILICO, AND PAUL BARREIRA*

We study the mental health of graduate students at eight top-ranked economics PhD programs in the United States using clinically validated surveys. We find that 24.8 percent experience moderate or severe symptoms of depression or anxiety—more than two times the population average. Though our response rate was 45.1 percent and sample selection concerns exist, conservative lower bounds nonetheless suggest higher prevalence rates of such symptoms than in the general population. Mental health issues are especially prevalent at the end of the PhD program: 36.7 percent of students in years 6+ of their program experience moderate or severe symptoms of depression or anxiety, versus 21.2 percent of first-year students. Of economics students with these symptoms, 25.2 percent are in treatment, compared to 41.4 percent of graduate students in other programs. A similar percentage of economics students (40–50 percent) say they cannot honestly discuss mental health with advisers as say they cannot easily discuss nonacademic career options with them. Only 26 percent find their work to be useful always or most of the time, compared to 70 percent of economics faculty and 63 percent of the working age population. We provide recommendations for students, faculty, and administrators on ways to improve graduate student mental health. (JEL A23, I12, I18, I23)

* Bolotny: Hoover Institution, Stanford University. Basilio: Harvard Medical School and Department of Economics, Harvard University. Barreira: University Health Services, Harvard University. We are grateful to Joshua Abel, Angie Acquatella, Alex Bell, Laura Blattner, Cristina Bratu, John Coglianesi, Brendan Eappen, Julia Feinberg, Joshua Freedman, Siddharth George, Edward Glaeser, Claudia Goldin, Siobhan Greatorex-Voith, Nathaniel Hendren, Andrew Hillis, Matthew Jackson, David Laibson, Sydney Levine, Chen Lossos, Jarrod Marks, David Martin, Ishan Nath, Christina Patterson, Otis Reid, Jonathan Roth, Hannah Shaffer, Nihar Shah, Justin Shugarman, Jann Spiess, Rebecca Staiger, Michael Stepner, Mark Tendall, Chenzi Xu, and members of the American Economic Association's Executive Committee for their comments and suggestions on the survey instruments. Peter Hong provided exceptional technical support. Christine Huang and Karen Pearce at Harvard College Institutional Research did an excellent job running the pilot at the Harvard Economics Department during the 2016–17 academic year.

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1. Introduction

Recent deaths by suicide among graduate students and faculty in economics have raised questions and concerns about mental health in the profession. In response, we developed a study of graduate student mental health with the aim of addressing these questions and concerns with data. The results we present here contribute to a literature in education and psychiatry by being the first to document the prevalence and severity of graduate student mental health problems in economics departments. This work is also, consequently, the first systematic study of the mental health of economists.

How common and how severe are symptoms of depression, anxiety, and suicidal ideation among aspiring economists? Is there something about the economics PhD environment that contributes to these symptoms? If so, what can we do about it?

To answer these questions, we put together three survey instruments: (i) an initial student survey, about 25 minutes in length, that covered mental health, experiences in the PhD program, and personal background information; (ii) a 10-minute follow-up student survey that covered mental health and experiences in the program; and (iii) a 10-minute survey of faculty in each participating department that covered experiences with students, reflections on the work environment, and recommendations on how to help students struggling with mental health issues.¹ Due to initial feedback we received from departmental leaders, we chose not to include mental health assessments in the faculty survey for fear of a low response rate. We administered the initial student survey and

the faculty survey in the fall of 2017, with the student follow-up survey administered in the spring of 2018. The follow-up survey allowed us to see whether our results were robust to seasonal differences and to understand the nature of attrition between surveys.

With support from members of the American Economic Association's (AEA) Executive Committee, we contacted department chairs and deans of graduate studies at 15 US departments in an effort to recruit programs to participate. Our objective was to obtain buy-in from departmental leaders on the importance of the study, including a commitment to encourage student and faculty participation and to take our findings seriously. The downside of this approach was a sample that in the end included only eight top-ranking departments and gave us a lens into only a particular segment of the entire economics graduate student population. The upside, we believe, was a high response rate from both students and faculty. Fruitful future work could expand our study to other departments, fields of study, and countries, exploring differences and similarities with the findings we report here.

1,138 economics PhD students received our first survey via e-mail and 513 of them (45.1 percent) participated (table 2).² Concurrently with the first student survey, department chairs sent the faculty survey to approximately 448 faculty members, of whom 187 (42 percent) participated. We did not provide participation incentives for any of the surveys. The final list of participating institutions included: Columbia University;

¹We promised confidentiality and anonymity, making it impossible for us to reach out to students who were experiencing serious mental health issues while participating in the study. To address this limitation, our consent form and the final page of the surveys provided students with mental health resources.

²In an earlier draft, we wrote that 1,185 students were contacted, for a response rate of 43 percent. We did in fact email 1,185 students, but only 1,138 of them were actually enrolled in their PhD program at the time. Some of the email addresses we received from departments were of students who remained on the department mailing list even though they were no longer enrolled. We were explicit in our e-mails and consent form that only currently enrolled students should take the surveys.

TABLE 1
ENROLLED STUDENTS AND STUDY PARTICIPANTS BY PROGRAM

Programs	Total enrolled	Total responded	% responded	% of all responses
UC Berkeley	131	71	54.2%	13.8%
Columbia	149	71	47.7%	13.8%
Harvard	190	73	38.4%	14.2%
MIT	130	76	58.5%	14.8%
Princeton	131	55	42.0%	10.7%
UC San Diego	127	50	39.4%	9.7%
U of Michigan	163	66	40.5%	12.9%
Yale	117	51	43.6%	9.9%
Total	1,138	513	45.1%	100.0%

Notes: The table shows, for each participating economics PhD program, the total number of students receiving the fall 2017 survey; the total number of students who took the survey; the percent of invited students who took the survey; and the percent of the entire sample represented by students from each program.

TABLE 2
ENROLLED STUDENTS AND STUDY PARTICIPANTS BY YEAR IN PROGRAM

	Year in Graduate Program						Total
	G1	G2	G3	G4	G5	G6+	
<i>Panel A. All enrolled students</i>							
Number	223	190	175	206	172	172	1,138
Percent female	28.7	31.1	26.3	30.1	27.9	26.2	28.4
Percent US undergrad	52.0	49.5	52.0	47.6	46.0	57.6	50.8
Percent responded to survey	44.4	54.7	44.0	43.2	47.7	36.0	45.1
<i>Panel B. Study participants</i>							
Number	99	104	77	89	82	60	511
Percent female	38.4	32.7	33.8	36.4	37.0	30.5	34.7
<i>Diff w/nonrespondents p-val</i>	0.007	0.704	0.069	0.148	0.024	0.470	0.000
Percent US undergrad	57.6	50.5	54.5	51.1	48.8	58.6	53.5
<i>Diff w/nonrespondents p-val</i>	0.177	0.822	0.656	0.543	0.574	0.998	0.116

Notes: Panel A shows, for each year in the graduate program, the total number of students enrolled in the 8 participating departments and thus receiving the fall 2017 survey; the percentage of enrolled students who are female; the percentage of enrolled students who were undergraduates in the United States; and the percent of enrolled students who took the fall 2017 survey. Panel B shows, for each year in the graduate program, the total number of students who took the fall 2017 survey; the percentage of respondents who are female; *p*-values of chi-squared tests of differences in female percentage between respondents and nonrespondents; the percentage of respondents who were undergraduates in the United States; and *p*-values of chi-squared tests of differences in US undergraduate percentages between respondents and nonrespondents.

Harvard University, the University of Michigan, Massachusetts Institute of Technology (MIT); Princeton University; the University of California (UC), Berkeley; UC San Diego; and Yale University.³

We find that the prevalence of poor mental health in these economics PhD programs is substantial. Our main tools of measurement are the clinically validated Patient Health Questionnaire-9 (PHQ-9), which measures symptoms of depression, and the General Anxiety Disorder-7 (GAD-7), which measures symptoms of anxiety. We find that 17.7 percent of students are experiencing moderate or severe symptoms of depression, 17.6 percent are experiencing such symptoms of anxiety, and 24.8 percent are afflicted with one or the other. These rates are two to three times the national prevalence, but are similar, if not lower than, estimates produced by other studies of graduate student mental health (e.g., University of California Office of the President (UCOP) 2017, Evans et al. 2018, Centres for Disease Control and Prevention (CDC) 2018a).

Although students with moderate or severe symptoms are highly likely to have a diagnosable clinical disease, only 25.2 percent of them are receiving treatment (Kroenke and Spitzer 2002, Spitzer et al. 2006, Plummer et al. 2016). In contrast, a study across graduate programs at Harvard found that 41.4 percent of students with such symptoms are currently receiving treatment (Task Force on Managing Student Mental Health 2020). Suicidal ideation is 1.5 times more prevalent among our survey respondents than among young adults between the ages of 18 and 25, the highest-risk group in the general population (CDC 2015; Garcia-Williams, Moffitt, and Kaslow 2014). Other strong correlates of depression and anxiety symptoms, like loneliness, are also common

among our respondents (Mushtaq et al. 2014).

The prevalence of serious mental health issues is fairly stable across cohorts in the PhD programs, but climbs substantially in the final years. 21.2 percent of first-year students experience moderate or severe depression or anxiety symptoms, compared with 36.7 percent of those who are in years six+ of their program. Similarly, 8.1 percent of first-year students report suicidal ideation in a two-week period, compared to 23.3 percent of those in years six+. While 9.8 percent of fifth-year students and 13.3 percent of six+-year students were diagnosed with a mental illness prior to starting their program, an additional 19.5 percent and 28.8 percent of these students, respectively, received a diagnosis during the program.

Since our response rate is 45.1 percent, one may have concerns about the representativeness of our results. We perform several robustness checks to address potential selection issues. First, weighting our prevalence estimates by the actual gender shares of students enrolled in the participating programs, we obtain similar results: 24.0 percent of students, for example, are afflicted with moderate or severe symptoms of depression or anxiety. Weighting by location of undergraduate degree produces an estimate of 24.6 percent. Second, we go a step further and assume that all 54.9 percent of students who do not participate in our study are well and not experiencing any serious symptoms. Even in this extreme lower-bounding exercise, our prevalence estimates are about as high or higher than in the general population: 11.2 percent, for example, are experiencing serious symptoms of depression or anxiety in this scenario.

We also study the nature of student experiences in their PhD programs. Many students struggle with finding meaning in their work. Only 26 percent report feeling that their work is useful always or most of the

³For more information on sample characteristics, please see table B.1 in the online appendix.

time, compared with 70 percent of our faculty respondents and 63 percent of the entire working-age population. Nineteen percent of students feel that they have opportunities to make a positive impact on their community or society, compared with 58 percent of faculty and 53 percent of the working-age population. We find that the intensity of such experiences is negatively correlated with mental health, providing us with more suggestive evidence of a connection between the graduate experience and student well-being.

While the number of times a student meets with his or her advisers is not correlated with mental health outcomes, a student's ability to be honest with those advisers, feeling that the advisers care about the student's research, and feeling that they care about the student as a person are associated with better mental health. Though few students say they can talk to their advisers about mental health issues, few students also say they want to talk about these issues with advisers. The topics that students want to discuss openly with advisers, but cannot, are for the most part professional: nonacademic career options, preparing for the job market, and research progress top the list.

Many students report that they are unaware of how to address concerns about advising. When a problem with advising arises, only 42 percent of students say they know where to turn for help and only 36 percent say they are moderately or very likely to do so. This is in contrast to issues with mental health: 87 percent of students say they would know where to turn for help if facing a mental health issue and 55 percent say they would be moderately or very likely to do so. Such findings lead us to believe that a key challenge for departments is to improve the quality of communication between faculty and students and to create clear, safe channels through which advising issues can be resolved.

Overall, our work points to the importance of having effective advising relationships, improving collegiality, encouraging collaboration, helping students find meaning in their work, and lowering barriers to high-quality mental health care. We see these as the keys to improving graduate student mental health. Prior work on the importance of easy access to strong sources of support suggests that doing these things early in the program should help students build resiliency for the later, particularly taxing years of the program (e.g., Mousavi et al. 2018).

Our results echo findings in the education and psychiatry literatures that indicate a high prevalence of emotional distress among university students (e.g., Hysenbegasi, Hass, and Rowland 2005; Hyun et al. 2006; Eisenberg et al. 2007; Garlow et al. 2008; Hunt and Eisenberg 2010; Eisenberg, Hunt, and Speer 2013; Lipson et al. 2016; Lipson, Lattie, and Eisenberg 2019; Duffy, Twenge, and Joiner 2019). Like us, other researchers have administered surveys to measure the prevalence and severity of student mental health problems. Many of these studies focus either only on undergraduates or on a sample that combines undergraduate and graduate student populations.

More recent studies that have focused solely on graduate students suggest that these students may experience mental health problems at a higher rate than undergraduates (e.g., Graduate Assembly 2014; Garcia-Williams, Moffitt, and Kaslow 2014; Rummell 2015; UCOP 2017; Levecque et al. 2017; Evans et al. 2018; Twenge et al. 2019; and Task Force on Managing Student Mental Health 2020). Fear of failure, perseveration on setbacks and struggles, self-consciousness, fears of judgment, conflicted advising relationships, financial concerns, and general anxiety are the most common sources of stress highlighted by existing research on graduate student mental health.

In the following section, we discuss the clinical screening tools we use in our study and address sample selection concerns. Section 3 presents our main findings and section 4 discusses potential connections between graduate student mental health and work experiences. Section 5 concludes with specific recommendations for how to make progress on the issues we identify. The online appendix provides advice offered by faculty and includes copies of the survey instruments themselves.

2. Methodology

2.1 Screening Tools

Depression: PHQ-9

We utilize several standardized screening tools from the mental health literature to assess symptoms of common mental health disorders in our population. To examine depressive symptoms, we use the PHQ-9 survey instrument. The PHQ-9 has nine questions related to core symptoms of major depressive disorder, assessing mood, sleep, interest, guilt, energy, concentration, attention, psychomotor slowing, and suicidality. The nine symptoms assessed are classic clinical features of major depressive disorder, a diagnosis that can only be made by a licensed clinician (American Psychiatric Association (APA) 2013).

In the PHQ-9, respondents are asked to report how often they have experienced the nine symptoms over the previous two weeks, with four available answer choices to assess both presence and severity of the symptom: not at all (0 points), several days (1 point), more than half the days (2 points), or nearly every day (3 points). Hence, the allowable range of scores is 0 (no presence of any symptom) to 27 (full severity of each of the 9 symptoms). With a cutoff threshold of greater than or equal to 10, the PHQ-9 has an 88 percent sensitivity and an 88 percent

specificity for the diagnosis of major depressive disorder (Kroenke and Spitzer 2002). Sensitivity tells us the probability of testing positive for depression (PHQ-9 \geq 10) when the disease is present, while specificity shows the probability of testing negative (PHQ-9 $<$ 10) for depression when the disease is absent.

The PHQ-9 is widely used not only as a tool for epidemiological measurement, but also for clinical screening in physicians' offices and hospitals (Kocalevent, Hinz, and Brähler 2013). Since diagnosis of major depressive disorder must involve an interview with a licensed clinician, we are able to gather information on the prevalence of symptoms, not to report the measured prevalence of the disorder itself. As noted above, the PHQ-9 relies on the self-reporting of symptoms. These, in turn, are predictive of diagnosis and of biological changes due to an interaction of genes with environmental stressors (Sapolsky 2003). While many active efforts are underway to identify biomarkers of mental health issues, self-description of symptoms remains a core feature of the American Psychiatric Association's diagnostic criteria (APA 2013).

Other instruments commonly used to measure depressive symptoms include the Beck Depression Inventory II (BDI-II), the Hamilton Depression Rating Scale (HAM-D), and the Center for Epidemiologic Studies Depression Scale (CES-D). Numerous studies comparing these instruments have found high internal consistency among the measures (e.g., Schwenk, Davis, and Wimsatt 2010; Kung et al. 2013; Choi et al. 2014). We chose to use the PHQ-9 in our study because it is short, free, widely used, and has a high sensitivity and specificity. A number of other studies of graduate and professional student mental health have also utilized the PHQ-9, allowing us to directly compare our results to other settings in higher education (e.g., Garcia-Williams, Moffitt, and Kaslow 2014;

Evans et al. 2018; Task Force on Managing Student Mental Health 2020). Instrument internal consistency, however, also allows us to make comparisons across studies that use these other instruments (e.g., UCOP 2017).

Anxiety: GAD-7

Our assessment of symptoms of anxiety proceeded similarly, using the GAD-7 survey instrument. The GAD-7 assesses the severity of common symptoms of anxiety, including feeling nervous, not being able to control worrying, and feeling afraid as if something awful might happen. The scoring system resembles the PHQ-9: points are assessed from 0 to 3 for each symptom, depending on its reported presence and severity over the past two weeks. Using a cutoff threshold of greater than or equal to 10, the GAD-7 has a sensitivity of 89 percent and specificity of 82 percent for the diagnosis of generalized anxiety disorder (Spitzer et al. 2006). As with depression, a clinician is required for the diagnosis of this disorder; our results here indicate the prevalence of symptoms of anxiety, not of the disorder itself. The GAD-7 is widely used for epidemiological estimation and as a clinical screening tool for generalized anxiety disorder (Stein and Sareen 2015; Plummer et al. 2016).

Suicidality: PHQ-9 Item 9 and SBQR

We assess the presence of suicidal risk through responses to the final question (item 9) of the PHQ-9, which asks “over the last two weeks, how often have you been bothered by thoughts that you would be better off dead, or hurting yourself in some way?” Thoughts of death and self-harm measured through this question have been demonstrated to be a predictor of suicidal behavior and completed suicide, which is why we refer to it as a measure of suicidal ideation and suicidality (e.g., Uebelacker et al. 2011, Simon et al. 2013, and Rossom et al. 2017). The question is also widely used as an

indicator of suicidality in the epidemiologic literature and as a clinical assessment tool in behavioral health offices (Arenson et al. 2018). For robustness, we use an additional screening tool for suicidality, the Suicide Behaviors Questionnaire-Revised (SBQR), which assesses the presence of self-reported suicidal ideation in the previous year (Osman et al., 2001). While we focus on PHQ-9 item 9 results throughout the paper, both measures produce similar results.

Other Survey Instruments

We also assess loneliness, a psychological state that is closely related to several common mental health disorders (Mushtaq et al. 2014). We measure loneliness through a validated, three-question version of the UCLA Loneliness Scale, a tool utilized by the vast majority of studies on loneliness (e.g., Russell, Peplau, and Cutrona 1980; Oshagan and Allen 1992; and Hughes et al. 2004). Additional questions borrowed from other instruments, including the RAND American Working Conditions Survey and *Nature's* 2017 survey of graduate student work experiences, are discussed in-depth throughout section 3.

2.2 Sample Selection

One should be cautious with extrapolating our results to all economics PhD programs for two reasons. First, we surveyed only eight programs that are highly ranked among R1 research universities. Second, the students who participated in our study did so voluntarily and thus are likely not fully representative of even the eight programs themselves. While we hope that future research sheds light on the representativeness of our results beyond top-ranked R1 programs, we take several steps here to address the second issue.

Working with administrators at each of the participating programs, we obtained information on gender and undergraduate

institution breakdowns by year in the program. Overall, 28.4 percent of the students enrolled in these programs in the 2017–18 academic year, the year of our study, were women. By comparison, 34.7 percent of the participants in our study were women, making them overrepresented in our sample (table 2). A chi-squared joint test shows the differences in female share in the enrolled and respondent groups to be statistically different from each other. Given that the prevalence of mental health issues is higher among women than men (in our study as in the general population), this could be biasing our headline prevalence rates upwards.

The percentage of enrolled students who have an undergraduate degree from the United States is evenly split with the percentage of enrolled students with a non-US undergraduate degree, 50.8 percent to 49.2 percent.⁴ Of those who took our survey, 53.5 percent were US students, suggesting that our sample is also overrepresenting these students. Since US students report a slightly higher prevalence of depression and anxiety symptoms than international students in our sample, this is likely also biasing our headline prevalence rates upwards.

Table 3 addresses these concerns by providing enrollment-weighted prevalence estimates for our key measures, as well as lower and upper bounds. Since our enrollment statistics are unidimensional (for example, we do not know how many of the US students are female), we calculate gender-weighted (Gender Wgt) and undergraduate country-weighted (Country Wgt) prevalence estimates separately. While these estimates are slightly lower, as anticipated, than our headline estimates, they are qualitatively comparable.

⁴Throughout the rest of the paper, we refer to these students as US students and international students, respectively.

The last two columns of table 3 report lower and upper bounds for our prevalence rates using a special case of Horowitz and Manski (1998). These bounds are “worst-case” bounds in that they assume that nonresponse to our survey is either perfectly negatively (lower bound) or perfectly positively (upper bound) correlated with the prevalence of mental health issues. Thus, the lower bound for depression, for example, assumes that everyone who does not participate in the study scores less than 10 on the PHQ-9 and only has mild or better symptoms of depression.⁵ We also use the 10-point cutoff on the GAD-7 to bound our anxiety estimates, and for suicidality assume that the nonparticipants would all respond “Not at all” to item 9 on the PHQ-9. While extreme, these assumptions are straightforward and nonetheless offer insightful estimates. Specifically, the lower-bound estimates for our economics PhD students are approximately the same as the representative estimates for the general US population (see section 3.1 for detailed comparisons).

One could also take this approach to calculating lower and upper bounds to each year in the PhD program using response rates in table 2 and prevalence rates in table 4. Here too, the “worst-case” lower bounds for years five and six+ in the program continue to be higher than the lower bounds for earlier years, preserving our conclusion that students in the final years of their programs are most likely to be experiencing serious mental health issues.⁶

In addition to these estimates, participation in the spring 2018 follow-up survey also

⁵Horowitz and Manski (1998) propose bounds of this form conditional on covariates. Our approach assumes that covariates are constant across respondents and nonrespondents.

⁶For example, the lower-bound estimates for depression prevalence across years one through six+ are 6.5 percent, 8.4 percent, 7.0 percent, 5.5 percent, 11.8 percent, and 9.1 percent, respectively.

TABLE 3
PREVALENCE OF MENTAL HEALTH ISSUES, ALTERNATIVE ESTIMATES

	Total	Gender Wgt	Country Wgt	Lower Est	Upper Est
<i>Panel A. Mental health issues</i>					
Depression	17.7	16.9	17.3	8.0	62.9
Anxiety	17.6	16.8	17.4	8.0	62.9
Depression or anxiety	24.8	24.0	24.6	11.2	66.1
Suicidality 2-weeks	11.3	11.2	11.2	5.1	60.0
Suicidality 1-year	12.0	11.6	11.7	5.4	60.3
<i>Panel B. Diagnoses and treatment</i>					
Diagnosed, pre-program	13.1	13.1	12.9	5.9	60.8
Diagnosed, during program	11.9	11.4	12.1	5.4	60.3
In treatment for any mental illness	14.9	14.9	14.8	6.7	61.6
Of those w/moderate-severe depression or anxiety, in treatment	25.2	25.3	25.1	11.4	66.3

Notes: Panel A shows the percentage of students who score about critical thresholds on mental health survey instruments. Depression and Anxiety show those scoring 10 or higher on the PHQ-9 and GAD-7, respectively. Suicidality 2-weeks are those reporting contemplating suicide or self-harm on at least several days in the last two weeks, as captured by item 9 on the PHQ-9. Suicidality 1-year are those scoring 7 or higher on the SBQR suicidality screening tool, which contains 1-year look-back questions. The Total column reports the percentage recorded in our surveys. The Gender Wgt column weights each prevalence rate based on the gender breakdown of students enrolled in the programs we survey. The Country Wgt column weights each prevalence rate based on the US and international student breakdown of students enrolled in the programs we survey. The Lower Est column provides lower bound estimates (assuming that all who do not participate in the study score below critical thresholds) and the Upper Est column provides upper bound estimates (assuming that all who do not participate in the study score above critical thresholds). Panel B shows the percentage of students who report being diagnosed, by a mental health professional, with some form of mental illness, either before or during the PhD program. Also shown are percentages of students who are in treatment for any mental illness and the percentage of those with moderate or severe symptoms of depression or anxiety (PHQ-9 ≥ 10 and/or GAD-7 ≥ 10) who are in treatment.

holds information on the robustness of our results.⁷ For example, if the students who took both the fall 2017 and the spring 2018 surveys generally had better mental health results in the fall 2017 survey than those students who attrited and did not take the spring 2018 follow-up, we would have suggestive evidence that those with worse mental health are less likely to engage with our surveys. In this example, our sample selection could be biasing our headline prevalence rates downward.

⁷Only those who participated in the fall 2017 survey were invited to participate in the spring 2018 follow-up.

Performing this kind of check, we do not find evidence that the attriting sample of students is different in its mental health from the sample of students who continuously engage with our study. The share of students scoring above critical thresholds for depression, anxiety, and suicidality in the fall 2017 survey is almost identical in the two samples, and the shares of women and US students scoring above these thresholds in the two samples are comparable as well. Table B.2 reports these shares, along with chi-squared tests of differences between the two samples. None of these tests show statistically significant differences, with the

TABLE 4
 MENTAL HEALTH ISSUES, DIAGNOSES, AND TREATMENT BY YEAR IN PROGRAM

	Year in Graduate Program						Total
	G1	G2	G3	G4	G5	G6+	
<i>Panel A. Mental health issue prevalence</i>							
Depression	14.6	15.4	15.8	12.8	24.7	25.4	17.7
Anxiety	12.2	12.5	19.5	18.2	21.0	28.3	17.6
Depression or anxiety	21.2	19.2	24.7	22.5	29.6	36.7	24.8
Suicidality 2 weeks	8.1	5.8	13.0	15.9	6.1	23.3	11.3
Suicidality 1 year	5.1	11.7	10.4	22.6	8.5	16.7	12.0
<i>Panel B. Diagnoses and treatment</i>							
Diagnosed, pre-program	13.3	11.5	10.4	20.2	9.8	13.3	13.1
Diagnosed, during program	0.0	6.8	9.1	15.7	19.5	28.8	11.9
In treatment for any mental illness	8.1	9.6	11.7	16.9	18.5	32.2	14.9
Of those w/moderate-severe depression or anxiety, in treatment	14.3	15.0	26.3	35.0	33.3	27.3	25.2

Notes: Panel A shows the percentage of students in each year of the graduate program who score about critical thresholds on mental health survey instruments. Depression and Anxiety show those scoring 10 or higher on the PHQ-9 and GAD-7, respectively. Suicidality 2 weeks are those reporting contemplating suicide or self-harm on at least several days in the last two weeks, as captured by item 9 on the PHQ-9. Suicidality 1 year are those scoring 7 or higher on the SBQR suicidality screening tool, which contains one-year look-back questions. Panel B shows the percentage of students in each year who report being diagnosed, by a mental health professional, with some form of mental illness, either before or during the PhD program. Also shown are percentages of students who are in treatment for any mental illness and the percentage of those with moderate or severe symptoms of depression or anxiety (PHQ-9 \geq 10 and/or GAD-7 \geq 10) who are in treatment.

exception that US undergraduates make up a larger share of respondents in the follow-up survey (59.6 percent) than in the fall 2017 survey (46 percent). Put differently, our key prevalence rates would remain virtually unchanged if we study our full sample (513 students) or if we study only those students who disengage after taking the first survey (263 students).

Of course, attrition between the two survey waves could be driven by forces that are very different from those that drive sample selection in the initial survey. Exam-related busyness, for example, could arguably be a bigger factor in May than in November, when it comes to survey engagement. In general, we cannot rule out the possibility

that the mental health of students who do not take our surveys is considerably worse (or better) than the mental health of our participants. However, taken together with our enrollment-weighted estimates and bounds on key mental health measures, these results suggest that our conclusions should be qualitatively robust to sample selection.

For more extensive demographic characteristics of our study participants, please see table B.1 in the online appendix.⁸

⁸Some notable facts in table B.1 from our background questions: International students are considerably more likely to be the first in their family to graduate from college; 14.4 percent of international students have a father

TABLE 5
PERCENT OF STUDENTS SCORING ABOVE CRITICAL THRESHOLDS

Category	Depression	Anxiety	Suicidality 2-weeks	Suicidality 1-year
All	17.7	17.6	11.3	12.0
Male	16.4	15.9	11.6	12.0
Female	18.3	19.2	10.2	10.9
<i>Diff male & female p-value</i>	<i>0.684</i>	<i>0.413</i>	<i>0.746</i>	<i>0.824</i>
US undergrad	19.2	17.9	9.3	9.8
Non-US undergrad	15.5	16.9	13.1	13.6
<i>Diff US & non-US p-value</i>	<i>0.340</i>	<i>0.868</i>	<i>0.213</i>	<i>0.230</i>

Notes: Table shows percent of students scoring above thresholds for mental health concern. Depression and Anxiety show those scoring 10 or higher on the PHQ-9 and GAD-7, respectively. Suicidality 2-weeks are those reporting contemplating suicide or self-harm on at least several days in the last two weeks, as captured by Item 9 on the PHQ-9. Suicidality 1-year are those scoring 7 or higher on the SBQR suicidality screening tool, which contains 1-year look-back questions. *P*-values for chi-squared tests of differences are also reported, showing no statistical significance in the relationship between mental health and gender and mental health and undergraduate location.

3. Results

3.1 Mental Health

Depression

The prevalence of depressive symptoms we find in our sample is higher than for the US population of the same age range, but lower than for other samples of graduate students. 17.7 percent of our economics students score in the moderate or severe symptom zone and would likely be diagnosed with depression upon seeing a mental health professional (table 5 and figure 1). Women (18.3 percent) are slightly more likely than men (16.4 percent) to be experiencing such symptoms, and depression is more prevalent among US students (19.2 percent) than

international students (15.5 percent). While minority (15.0 percent) and first-generation (16.2 percent) students have prevalence rates that are comparable to the sample average, students who report being gay, lesbian, or bisexual are especially afflicted (28 percent) (tables 5 and 6).

For comparison, 8.1 percent of the general US population and 7.7 percent of Americans between the ages of 20 and 39 experience moderate or severe symptoms of depression (CDC 2018b). As table 3 shows, these numbers are in the vicinity of our lower-bound estimate of 8 percent for depression prevalence and are about half the rate we measure in our sample. Women in the general population are about twice as likely as men to be experiencing these symptoms (10.4 percent versus 5.5 percent), whereas women are only about 11.6 percent (18.3 percent versus 16.4 percent) more likely to be experiencing these symptoms than men in our sample. Prior work has also shown prevalence rates of depression for African American (8.9 percent) and Hispanic (10.8 percent) adults that are elevated relative to the general population, but these are considerably lower than

with a high school degree or less, compared to 4.1 percent of US students. Overall, almost 60 percent of students in the participating programs have a father with some kind of graduate degree. International students are also considerably more likely than US students to be working while in the PhD program (80.8 percent versus 71.6 percent), to be living alone (32.2 percent versus 24.1 percent), and to have done something else between their undergraduate degree and the PhD program (81.9 percent versus 70.3 percent).

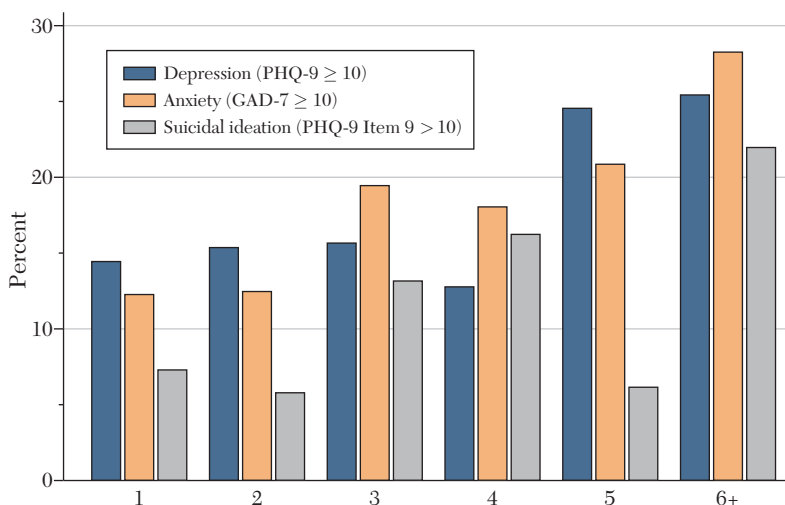


Figure 1. Prevalence of Mental Illness by Year in Graduate Program

Notes: PHQ-9 measures symptoms of depression. GAD-7 measures symptoms of anxiety. Symptom intensity increases as PHQ-9 and GAD-7 scores increase. Mental health professionals use a score of 10 on the PHQ-9 and the GAD-7 as a cutoff when diagnosing individuals with depression or anxiety disorder, respectively. The PHQ-9 item 9 measures suicidality by asking on how many days over the past two weeks a student was bothered by thoughts of wanting to be dead or wanting to hurt themselves. We show here the percent of students scoring 10 or higher on the PHQ-9 and GAD-7, and the percent of students bothered by suicidal thoughts in a two week period.

the rates we observe for minority students (Dunlop et al. 2003). Though limited, mental health studies of LGBTQ adults echo our findings that prevalence rates of mental health disorders in this population are about double those among heterosexual adults (Bostwick et al. 2010).

In contrast to the general population, however, our depression prevalence estimates are lower than those found in other graduate education settings. In a small sample survey of doctoral students at Emory University (301 students, or 8 percent responded to the survey), Garcia-Williams, Moffitt and Kaslow (2014) find 34.5 percent with PHQ-9 scores greater than or equal to 10. Evans et al. (2018) employ convenience sampling via email and social media of PhD

students around the world. Also using the PHQ-9, the authors find 39 percent of the 2,279 respondents with moderate or severe symptoms of depression. In a 2016 well-being survey of graduate students across all ten campuses, the University of California used the CESD-R measure of depression and recorded 35 percent of survey respondents self-reporting symptoms that met the clinical cutoff for major depressive disorder. The survey was administered to a stratified random sample of 13,400 students and had a 40 percent response rate (UCOP 2017).

Motivated by our study, Harvard University has an ongoing Graduate Student Mental Health Survey Initiative which, as of this writing, has surveyed over 6,800 graduate and professional students across more

than 40 departments at Harvard. Preliminary findings show 23.6 percent of students with PHQ-9 scores greater than or equal to 10 (Task Force on Managing Student Mental Health 2020). The initial report also highlights elevated prevalence rates for LGBTQ, underrepresented minority, first-generation, and low-income students. Overall, the prevalence rate of depressive symptoms that we see among economics PhD students in our study is lower than the rate captured by previous studies of graduate students writ large.

Anxiety

Highly positively correlated with symptoms of depression, anxiety symptoms in our sample are also substantially higher than in the general population and lower than earlier studies have measured among graduate students. Studies of the US population over the last 25 years suggest an adult prevalence rate of 6 percent or less (e.g., Wittchen et al. 1994, Kessler et al. 2005, Spitzer et al. 2006) and a worldwide 2017 World Health Organization (WHO) study put the highest regional rate of anxiety disorder at 5.8 percent in the Americas (WHO 2017).

By contrast, our overall prevalence rate is 17.6 percent. Our lower-bound prevalence estimate of 8 percent is higher than the prevalence rate in the general population, as are our gender-weighted and country-weighted estimates (table 3). Female students (19.2 percent) are again more likely than male students (15.9 percent), and US students (17.9 percent) more likely than international students (16.9 percent), to be experiencing serious symptoms of anxiety. LGBTQ students (22 percent) show elevated prevalence rates, while first-generation (12.3 percent) and minority (12.4 percent) students fare better than the average student.

Using the GAD-7 in their convenience sample survey of graduate students around the world, Evans et al. (2018) recorded 39 percent with moderate or severe

symptoms of anxiety. The Task Force on Managing Student Mental Health (2020) report a prevalence of 23.1 percent among graduate students across Harvard departments. Underrepresented minority, first-generation, low income, and LGBTQ students were again especially likely to be experiencing serious symptoms. Overall, as with depression, anxiety symptoms appear to be less prevalent among economics PhD students than among graduate students as a whole.

Suicidality

Suicidal ideation is about 3 times more likely among our survey respondents (11.3 percent) than among adults in the general population (3.9 percent) and 1.5 times more likely than among the highest-risk group, adults aged 18–25 (7.4 percent) (CDC 2015). Our lower-bound estimate for suicidal ideation (5.1 percent) falls below that of the highest-risk group, though our gender and country-weighted estimates (11.2 percent) still exceed it (table 3).

For additional comparison, a 2010–12 study of almost 300,000 adult outpatients treated for mental health conditions found that, among these patients, 20 percent reported suicidal ideation through item 9 on the PHQ-9 (Rossom et al. 2017). The prevalence of suicidal ideation based on the same measure in our sample, at 11.3 percent, is thus in between the rates found for this group and for the general population (table 5).

There is, however, substantial heterogeneity by student characteristics. Though the differences are not statistically significant, men (11.6 percent) are more likely than women (10.2 percent) to have scores of concern on the PHQ-9 item 9, while international students (13.1 percent) are more likely than US students (9.3 percent) to have such scores. Minority (13.9 percent) and LGBTQ students (22 percent) exhibit especially high

TABLE 6
PERCENT OF MINORITY RACE, MINORITY SEXUALITY, AND FIRST-GENERATION STUDENTS SCORING ABOVE
CRITICAL THRESHOLDS

Category	Depression	Anxiety	Suicidality 2 weeks	Suicidality 1 year
All	17.7	17.6	11.3	12.0
Minority race	15.0	12.4	13.9	14.1
<i>Diff w/White p-value</i>	<i>0.286</i>	<i>0.022</i>	<i>0.178</i>	<i>0.301</i>
Minority sexuality	28.0	22.0	22.0	28.0
<i>Diff w/Heterosexual p-value</i>	<i>0.050</i>	<i>0.440</i>	<i>0.013</i>	<i>0.000</i>
First generation	16.2	12.3	8.1	11.0
<i>Diff w/non-first gen p-value</i>	<i>0.838</i>	<i>0.274</i>	<i>0.448</i>	<i>0.902</i>

Notes: Table shows percent of various groups of students scoring above thresholds for mental health concern. Students classified as minority race are those who select at least one non-White race (Black or African American, Hispanic or Latino, Asian or Asian American, Native Hawaiian or other Pacific Islander, American Indian or Alaska Native). Students classified as minority sexuality are those who select bisexual or gay or lesbian as their sexual orientation. Students with a father or mother with high school or less as the highest level of educational attainment are included in the First generation category. Depression and Anxiety show those scoring 10 or higher on the PHQ-9 and GAD-7, respectively. Suicidality 2 weeks are those reporting contemplating suicide or self-harm on at least several days in the last two weeks, as captured by item 9 on the PHQ-9. Suicidality 1 year are those scoring 7 or higher on the SBQR suicidality screening tool, which contains one-year look-back questions. P-values for chi-squared tests of differences are also reported, showing levels of statistical significance for relationships between mental health and race, sexual orientation, and parent education level.

prevalence rates of suicidal ideation (table 6). The difference in suicidality between heterosexual and LGBTQ students is statistically significant at the 5 percent level.

Loneliness

We also find higher prevalence rates of other negative feelings in our sample than in the general population. Feelings like loneliness, are positively correlated with scores captured by the clinically validated screening tools for depression, anxiety, and suicidality (table B.3).

Loneliness is common among our survey respondents, with the average student finding himself or herself considerably lonelier than the average retired American. The mean score on the UCLA 3-item loneliness scale was 5.2, with a standard deviation of 1.8. For a sample of over 2,000 retired Americans

in 2002, that score was 3.9, with a standard deviation of 1.3 (Hughes et al. 2004).⁹

A 2018 study by the Kaiser Foundation and *The Economist* found that loneliness and isolation are widely experienced in the United States (DiJulio et al. 2018). Although we use different scales, our results suggest that economics PhD students are also more likely to experience loneliness and isolation than a representative sample of Americans. Of our respondents, 16.2 percent say they often experience feeling isolated from others, compared to the 11 percent of Americans who report they experience this feeling often or always. Of our respondents, 17.5 percent say they often feel that they lack companionship, compared to

⁹The 2002 Health and Retirement Study (HRS) surveyed individuals with a mean age of 66.5 (SD = 10.2).

13 percent who report such feelings often or always nationwide.

Diagnoses

Even considering that diagnoses of mental illness are likeliest for those in their 20s, our respondents are obtaining such diagnoses at high rates over the course of their programs. 25 percent of economics students in our study report being diagnosed by a professional with a mental illness, 13.1 percent prior to starting their PhD program and another 11.9 percent after starting their program (table 4). Focusing on students who are near the end of their graduate programs, we see significantly elevated levels of diagnosis. 29.3 percent of fifth-year students have been diagnosed with a mental health issue before (9.8 percent) or during (19.5 percent) the program, and 42.1 percent of students in years six+ report being diagnosed with a mental health issue before (13.3 percent) or during (28.8 percent) the program. While the percentage of students diagnosed prior to graduate school is roughly comparable to the percentage in the general population, the percentage of students with a diagnosis after five+ years of graduate school is much higher than for comparably-aged adults.

In comparison, the 2017 National Survey on Drug Use and Health administered by the US Department of Health and Human Services found that 18.9 percent of US adults were living with some form of mental illness (Bose et al. 2018). The highest prevalence, of 25.8 percent, was found among adults aged 18–25, with adults aged 26–49 following closely behind at 22.2 percent.¹⁰

One reason for the increase in diagnoses among college-age adults could be an

increase in the availability of mental health services that comes with entering a college environment. If this were the driving force in our setting, we would expect a lot of the diagnoses to show up while students were undergraduates. Additionally, since availability of mental health services should be constant across years in graduate school, availability should not explain differences in diagnosis prevalence between the first few cohorts and the most senior cohorts in our sample.

We believe, in fact, that our numbers are an underestimate of the actual number of students in our sample who have diagnosable mental health issues. As we discuss below, this is likely the case because our students are less likely than working adults or other graduate students to seek professional help when experiencing serious symptoms of mental illness.

Treatment

Although our findings suggest a high prevalence of various serious mental health issues, few students are receiving clinical treatment. 14.9 percent of students are currently in treatment for some mental health issue, with the percentage rising with each year in the program: from 8.1 percent in year 1 to 18.5 percent in year five and 32.2 percent in years six+ (table 4). Zooming in on those with moderate or severe mental health issues, the share receiving treatment is higher (25.2 percent), though still low: rising from 14.3 percent in year one to 27.3 percent in years six+.

In contrast, a national survey of individuals in the labor market has previously raised concerns that only half of those who experienced serious symptoms of depression were receiving treatment (Kessler, Merikangas, and Wang 2008). In the study of Harvard departments, 41.4 percent of students with moderate or severe symptoms of depression or anxiety reported being in treatment (Task Force on Managing Student Mental Health

¹⁰Note that having a diagnosed mental illness is different from experiencing moderate or severe symptoms of that illness. Diagnosis and proper treatment can reduce symptom severity.

TABLE 7
HELP WITH MENTAL HEALTH: EXPERIENCES AND CORRELATIONS WITH MENTAL HEALTH

Question and answer	Percent	PHQ-9 ρ	GAD-7 ρ	PHQ-9 Item 9 ρ
If issue with mental health, would you know where to turn for help?		-0.103	-0.070	-0.141
Yes	87.1			
No	12.9			
If issue with mental health, how likely would you be to turn to someone for help?		-0.191	-0.092	-0.132
Not likely	12.9			
Somewhat likely	32.0			
Moderately likely	25.0			
Very likely	30.2			

Notes: A higher response value indicates knowing where to turn for help and a greater likelihood of turning to someone for help. Higher PHQ-9, GAD-7, and PHQ-9 Item 9 scores reflect worse mental health. PHQ-9 captures depressive symptoms, GAD-7 captures anxious symptoms, and PHQ-9 item 9 captures thoughts of suicide and self-harm. Last three columns report Pearson correlation (ρ) between response to the question and each mental health measure. For exact question wording, please see survey instrument in online appendix C1.

2020). Economics students in our sample are thus substantially undertreated, even relative to levels in other academic departments.

Certain survey responses point to economics students facing barriers to using mental health services. 87 percent, for example, say that they would know where to turn for help if experiencing a mental health issue, but only 55 percent say that they would be moderately likely or very likely to do so (table 7). The numbers are lower (74 percent and 52 percent, respectively) for those reporting suicidal thoughts.¹¹ Since availability of mental health services should be the same for students across cohorts, other factors, like stigma or the amount of encouragement students receive to seek out services, could be generating this wedge between resource awareness and probability of access. Understanding the relative effects

¹¹As table B.4 shows, only 27 percent of those who report contemplating suicide within a two-week period are currently receiving some form of treatment.

of these factors on whether a student seeks out treatment is an important area for further research. The fact that service usage increases with time in the program could be a valuable clue to investigate further.

3.2 Overall Work Experiences

Before turning to an exploration of how various PhD program experiences could be affecting graduate student mental health, we first want to concretely establish what those experiences are.

We use the 2015 RAND American Working Conditions Survey (Maestas et al. 2017) to get an overview of the work environment and a sense of how it compares to what Americans generally experience in their jobs. The survey is based on a nationally representative sample of Americans and is administered online. We also use the RAND survey questions in our survey of faculty at the 8 participating departments, allowing us to compare graduate student experiences with faculty experiences. Our

other reference point for graduate student work experiences is a 2017 study by *Nature* of more than 5,700 natural science and engineering PhD students worldwide (Woolston 2017).

Graduate students in our study, on average, report substantially lower job satisfaction than economics faculty or other workers of a similar age. Across occupations in the United States, about 60 percent of men and women with a college degree between the ages of 25 and 35 report experiencing satisfaction of work well done always or most of the time. In contrast, 37 percent of our economics PhD students report experiencing such satisfaction always or most of the time (table 8). When economics faculty were posed the same question, 77 percent said they experienced such satisfaction always or most of the time (table B.5).

Of our students, 26 percent report experiencing the feeling of doing useful work always or most of the time, compared to 70 percent of faculty respondents and 63 percent of the entire working-age population. Only 20 percent of students feel that they have opportunities to make a positive impact on their community or society, compared to 58 percent of faculty and 53 percent of the population. Additionally, only 40 percent of students feel they have opportunities to fully use their talents always or most of the time, compared to 85 percent of faculty and 53 percent of the population. The economics PhD program thus appears to be distinct from the average occupation and from the economics professorship in the rarity with which one experiences satisfaction, usefulness, and meaningfulness.

Differences between student and faculty feelings towards work are all the more striking given the experiences that students and faculty share. Seventy-three percent of students and 72 percent of faculty report having very good friends in the department, compared to 56 percent of American workers.

Sixty-two percent of students worry always or most of the time about work when not working, compared to 60 percent of faculty members. 20.5 percent of students find themselves too tired for activities in private life always or most of the time, compared to 23 percent of faculty (tables 9 and B.6). The intensity of the work and the stresses that come with it thus do not seem to abate with professorship.

When it comes to overall student satisfaction with the PhD experience, our eight economics programs look very similar to programs in the natural sciences and engineering. As figure 2 shows, students in our sample are slightly more dissatisfied with their PhD experience, but the differences are negligible.¹² The differences are also negligible when it comes to the number of hours that PhD students report working in a typical week (figure 3).

However, when we asked students what they would do differently if they were starting their program right now, we got starkly different responses from those found in the *Nature* study (figure 4). While many in the natural sciences and in engineering would have changed advisers or area of study, those were not sources of major regret for our students. The unstructured nature of the research stage of most economics programs, which allows students to have more control over what they study and who advises them, is consistent with this finding.

36 percent of students in our sample would have wanted to organize their time more effectively, compared to just 1 percent of students in the natural sciences and engineering. This also is likely a reflection of the unstructured nature of the research years, but could be a statement on the usefulness of the coursework years as well. The fact that 21 percent of our students would

¹²A Kolmogorov–Smirnov test does not reject that the two distributions of student satisfaction are the same.

TABLE 8
 RAND MEANINGFULNESS OF WORK: EXPERIENCES AND CORRELATIONS WITH MENTAL HEALTH

Question and answer	Percent	PHQ-9 ρ	GAD-7 ρ	PHQ-9 Item 9 ρ
Opportunities to fully use your talents		-0.364	-0.240	-0.187
Always	8.7			
Most of the time	32.5			
Sometimes	45.2			
Rarely	12.1			
Never	1.6			
Opportunities to make positive impact on community/society		-0.231	-0.113	-0.120
Always	3.7			
Most of the time	16.4			
Sometimes	31.9			
Rarely	35.6			
Never	12.5			
Sense of personal accomplishment		-0.366	-0.304	-0.123
Always	7.7			
Most of the time	25.8			
Sometimes	47.5			
Rarely	16.6			
Never	2.4			
Goals to aspire to		-0.272	-0.238	-0.166
Always	15.6			
Most of the time	37.3			
Sometimes	34.3			
Rarely	10.5			
Never	2.4			
Satisfaction of work well done		-0.364	-0.325	-0.128
Always	7.5			
Most of the time	26.5			
Sometimes	43.2			
Rarely	19.8			
Never	2.9			
Feeling of doing useful work		-0.313	-0.226	-0.137
Always	6.1			
Most of the time	20.3			
Sometimes	45.9			
Rarely	22.2			
Never	5.5			

Notes: These questions were borrowed from the RAND American Working Conditions Survey (Maestas et al. 2017). A higher response value indicates a respondent's work provides more of each question item. Higher PHQ-9, GAD-7, and PHQ-9 item 9 scores reflect worse mental health. PHQ-9 captures depressive symptoms, GAD-7 captures anxious symptoms, and PHQ-9 item 9 captures thoughts of suicide and self-harm. Last three columns report Pearson correlation (ρ) between response to the question and each mental health measure. For exact question wording, please see survey instrument in online appendix C1.

TABLE 9
 RAND WORK ISSUES: EXPERIENCES AND CORRELATIONS WITH MENTAL HEALTH

Question and answer	Percent	PHQ-9 ρ	GAD-7 ρ	PHQ-9 Item 9 ρ
Worried about work when not working		0.354	0.437	0.140
Always	20.1			
Most of the time	41.8			
Sometimes	31.2			
Rarely	6.2			
Never	0.6			
Were too tired for activities in private life		0.354	0.407	0.221
Always	4.9			
Most of the time	15.6			
Sometimes	49.0			
Rarely	25.0			
Never	5.5			
Were too tired to do household jobs		0.331	0.364	0.132
Always	6.2			
Most of the time	18.3			
Sometimes	42.3			
Rarely	26.7			
Never	6.4			
Had difficulty making ends meet financially		0.215	0.227	0.082
Always	2.5			
Most of the time	5.7			
Sometimes	11.3			
Rarely	26.7			
Never	53.8			
Had work prevent time with family or significant others		0.234	0.350	0.109
Always	6.7			
Most of the time	17.6			
Sometimes	39.1			
Rarely	22.9			
Never	13.7			

Notes: These questions were borrowed from the RAND American Working Conditions Survey (Maestas et al. 2017). A higher response value indicates a respondent experienced more of each type of situation. Higher PHQ-9, GAD-7, and PHQ-9 item 9 scores reflect worse mental health. PHQ-9 captures depressive symptoms, GAD-7 captures anxious symptoms, and PHQ-9 item 9 captures thoughts of suicide and self-harm. Last three columns report Pearson correlation (ρ) between response to the question and each mental health measure. For exact question wording, please see survey instrument in online appendix C1.

have engaged more with their studies, compared to just 1 percent for those in the natural sciences, provides additional evidence that the coursework stage of the

economics programs could be improved (through incentives for engaging more with study, through the usefulness of the content covered, etc.).

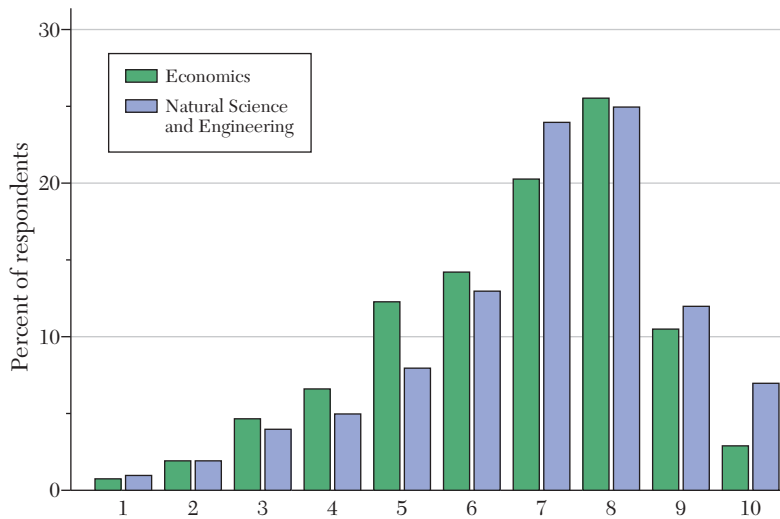


Figure 2. On a Scale of 1 to 10, Where 1 = Extremely Dissatisfied and 10 = Extremely Satisfied, How Satisfied Are You with Your PhD Experience?

Note: Results for natural science and engineering PhD students come from Woolston (2017).

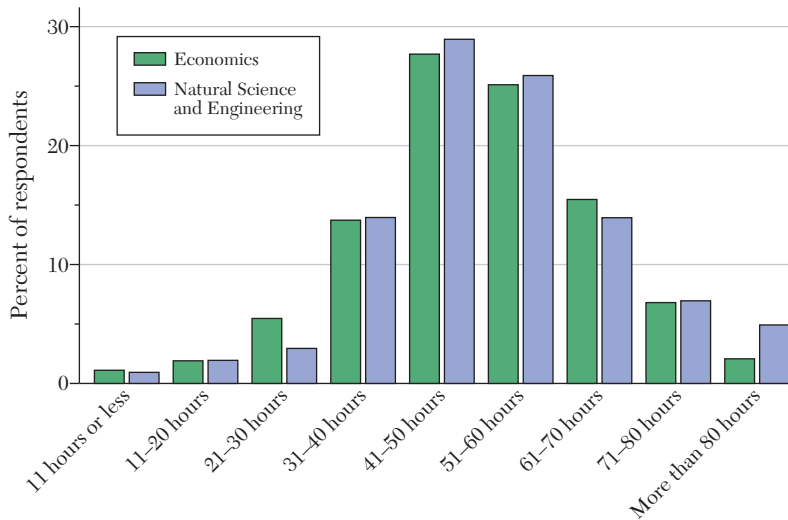


Figure 3. On Average, How Many Hours a Week Do You Typically Work?

Note: Results for natural science and engineering PhD students come from Woolston (2017).

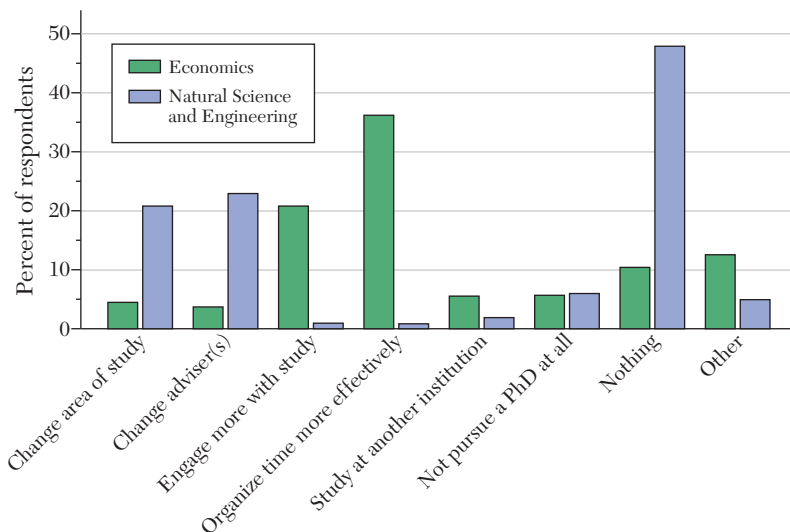


Figure 4. What Would You Do Differently Right Now If You Were Starting Your Program?

Note: Results for natural science and engineering PhD students come from Woolston (2017).

3.3 Relationships with Peers and Advisers

To learn more about the economics PhD environment, we asked students detailed questions about their interactions with their peers and advisers. While students report positive impressions overall, the majority of students are uncomfortable engaging in seminars and many are not communicating honestly and effectively with their advisers.

Table 10 shows that 66 percent of students view their peers as not competitive at all or only somewhat competitive and, as mentioned earlier, 73 percent of students say they have very good friends in the department. Still, a sizable number of students feel isolated and out of place. Three percent say that they never turn to someone when faced with a problem or worry and 6 percent say they have zero people in their personal life with whom they can talk about their most

private feelings. Another 15 percent say that there is only one person in their personal life with whom they can be so open. 17.5 percent of students say they often lack companionship and 16 percent say they often feel isolated from others.

Though seminars have the potential to allow students and faculty to interact on the same level, many students do not feel comfortable engaging. Only 29 percent say they are moderately or very comfortable voicing a thought in a seminar setting, and 77 percent would only raise their hand if they were moderately or very certain about the high quality of their thought (table B.8). These results are in line with those the AEA found in its recent Professional Climate Survey (Allgood et al. 2019).

Women feel an especially high barrier to participation in seminars: only 19 percent of women would be comfortable voicing a

TABLE 10
SOCIAL SOURCES OF SUPPORT: EXPERIENCES AND CORRELATIONS WITH MENTAL HEALTH

Question and answer	Percent	PHQ-9 ρ	GAD-7 ρ	PHQ-9 Item 9 ρ
Number of people you can really open up to		-0.203	-0.123	-0.232
0	5.8			
1	14.6			
2-5	61.2			
6-10	15.2			
11-15	1.6			
16-20	0.8			
More than 20	0.8			
How often share problem or worry?		-0.182	-0.067	-0.162
Never	3.3			
Sometimes	48.4			
Most of the time	36.5			
Always	11.7			
I have very good friends at my Economics department.		-0.233	-0.144	-0.182
Strongly agree	38.4			
Agree	34.3			
Neither agree nor disagree	14.8			
Disagree	8.4			
Strongly disagree	4.1			
How competitive are your peers?		0.222	0.272	0.143
Not competitive at all	24.2			
Somewhat competitive	41.6			
Moderately competitive	23.0			
Very competitive	11.1			

Notes: A higher response value indicates more people to open up to, more often letting someone know about a problem, more friends in the economics department, and more perceived competition among peers. Higher PHQ-9, GAD-7, and PHQ-9 item 9 scores reflect worse mental health. PHQ-9 captures depressive symptoms, GAD-7 captures anxious symptoms, and PHQ-9 item 9 captures thoughts of suicide and self-harm. Last three columns report Pearson correlation (ρ) between response to the question and each mental health measure. For exact question wording, please see survey instrument in online appendix C1.

thought in a seminar compared to 35 percent of men. Virtually no gap exists, however, between US students (30.5 percent) and international students (28.3 percent). The same percentage, 77 percent, of men and women would have to feel certain about the high quality of their thoughts before they voice them (tables B.9–B.10). This

suggests that either women have a higher internal bar for thought quality than men or there are other factors disproportionately affecting their comfort levels in seminars. Or both.

Student relationships with their faculty advisers are also nuanced. 95.6 percent of students say they met with their main

TABLE 11
 NUMBER OF MEETINGS WITH ADVISERS: EXPERIENCES AND CORRELATIONS WITH MENTAL HEALTH

Question and Answer	Percent	PHQ-9 ρ	GAD-7 ρ	PHQ-9 Item 9 ρ
In the last 2 months, number of times met with main adviser		-0.005	0.077	0.002
0	4.4			
1	12.6			
2	19.8			
3	16.2			
4	15.9			
5	8.2			
6–10	19.0			
11–15	1.8			
15+	2.1			
In the last 2 months, total number of times met with one of three advisers		-0.049	0.073	-0.072
0	2.8			
1	5.1			
2	9.8			
3	9.3			
4	11.8			
5	11.1			
6+	50.1			

Notes: For the first question, a higher response value indicates greater number of times met with main adviser. For the second question, a higher response value indicates greater number of times met with one of three advisers. Higher PHQ-9, GAD-7, and PHQ-9 item 9 scores reflect worse mental health. PHQ-9 captures depressive symptoms, GAD-7 captures anxious symptoms, and PHQ-9 item 9 captures thoughts of suicide and self-harm. Last three columns report Pearson correlation (ρ) between response to the question and each mental health measure. For exact question wording, please see survey instrument in online appendix C1.

adviser at least once in the last two months, with the modal number of meetings being 2 (table 11). 97.2 percent met at least once with their main adviser, their second adviser, or their third adviser in the last two months; 50.1 percent met with these advisers six times or more in the last two months.¹³ Asked about the most significant impediments to the frequency with which

they meet with faculty, students pointed to fear of the consequences of a bad impression, doubt about the quality of their ideas, questions, and thoughts, and lack of progress on to-dos from the previous meeting. Scheduling difficulties were a significant impediment for 17 percent of students and meeting unpleasantness was a significant impediment for 8 percent of students (table B.11). As with seminars, these numbers suggest that focusing on what happens during the advising meetings, instead of on their sheer frequency, could improve student experiences.

¹³We defined the main adviser as the faculty member with whom the student meets most frequently, the second adviser as the faculty member with whom the student meets second most frequently, and so on.

TABLE 12
PERCEPTIONS OF FACULTY CARE: EXPERIENCES AND CORRELATIONS WITH MENTAL HEALTH

Question and answer	Percent	PHQ-9 ρ	GAD-7 ρ	PHQ-9 Item 9 ρ
How much do advisers care about the success of your research project(s)?		-0.184	-0.164	-0.161
Do not care at all	2.3			
Care somewhat	16.6			
Care moderately	34.3			
Care very much	46.9			
How much do advisers care about you as a person?		-0.236	-0.245	-0.160
Do not care at all	7.8			
Care somewhat	28.0			
Care moderately	38.6			
Care very much	25.6			

Note: A higher response value indicates greater perceived care. Higher PHQ-9, GAD-7, and PHQ-9 item 9 scores reflect worse mental health. PHQ-9 captures depressive symptoms, GAD-7 captures anxious symptoms, and PHQ-9 item 9 captures thoughts of suicide and self-harm. Last three columns report Pearson correlation (ρ) between response to the question and each mental health measure. For exact question wording, please see survey instrument in online appendix C1.

While most students have good, helpful relationships with their advisers, many do not receive adequate support and engagement. Twenty-seven percent of women and 34.5 percent of men say that their advisers do not care about them as a person. A gap also exists between US students (29 percent) and international students (34 percent). Nineteen percent think that their advisers do not care at all or care only somewhat about the success of their research (table 12).

Eighteen percent do not have a professional role model among the faculty in the department. Forty percent of men say they have 3 or more such role models, compared to 33.5 percent of women (table B.12). Thirty-six percent of students report that no faculty member had initiated an informal conversation with them about how they were doing academically or personally in a two month period.¹⁴ Of international students,

40 percent report not having such faculty interactions, compared to 32 percent of US students.

We measure substantial gaps in how honest students *would like to be* with their advisers about a range of difficulties and how honest they currently *can be* with their advisers about those difficulties (table B.13). The difficulties were, by gap between desired levels of openness and actual levels of openness¹⁵: (i) nonacademic career options, (ii) preparing for the job market, (iii) research progress, (iv) issues with other advisers, (v) issues arising from coauthorship with the faculty member, (vi)

October. We also asked this question in the follow-up survey in May, where 39 percent of students reported not having any informal conversations initiated by faculty about how they were doing in a two-month period.

¹⁵We calculate this gap by taking the percent of students saying they *would like* to be very honest with their advisers about the topic and subtracting the percent of students saying they *can* be very honest with their advisers about it.

¹⁴The initial survey was administered in November, so the two-month period would have been September and

TABLE 13
HELP WITH ADVISING: EXPERIENCES AND CORRELATIONS WITH MENTAL HEALTH

Question and answer	Percent	PHQ-9 ρ	GAD-7 ρ	PHQ-9 Item 9 ρ
If issue with advising, would you know where to turn for help?		-0.188	-0.170	-0.118
Yes	41.9			
No	58.1			
If issue with advising, how likely would you be to turn to someone for help?		-0.250	-0.235	-0.215
Not likely	23.4			
Somewhat likely	40.7			
Moderately likely	23.2			
Very likely	12.6			

Notes: A higher response value indicates knowing where to turn for help and a greater likelihood of turning to someone for help. Higher PHQ-9, GAD-7, and PHQ-9 item 9 scores reflect worse mental health. PHQ-9 captures depressive symptoms, GAD-7 captures anxious symptoms, and PHQ-9 item 9 captures thoughts of suicide and self-harm. Last three columns report Pearson correlation (ρ) between response to the question and each mental health measure. For exact question wording, please see survey instrument in online appendix C1.

presentations, (vii) refereeing, (viii) coauthoring with other students, (ix) teaching, (x) decision to get a PhD, (xi) mental health, (xii) decisions related to starting a family, and (xiii) other personal life issues.¹⁶

Although fewer than 10 percent of students say they can be very honest with their advisers about mental health, starting a family, or other personal life issues, few students actually want to discuss these issues openly with their advisers. This is true for both men and women, international and US students.¹⁷ Additionally, a similar percentage of students cannot be honest with advisers at all about mental health problems (41.5 percent) as say it is not easy at all for them to talk to advisers about nonacademic

career options (49.7 percent) (table B.13). In contrast, only 8.2 percent of faculty think their students find it so hard to talk about nonacademic careers with them (table B.7). Adviser–advisee communication issues thus go beyond a student’s personal life difficulties and impede the core professional objectives of the advising relationship.

Finally, there appears to be a lack of options for students when they experience issues with advising. Forty-two percent of students say that they would know where to turn for help with advising and only 36 percent say they would be moderately likely or very likely to seek out help if an issue arose (table 13). Given the role of evaluator that faculty are playing, it may be difficult for students to see a way to address advising issues constructively and without negative consequences. For a majority of graduate students in our sample, existing channels for addressing advising issues, whether within the department or at the university more broadly, appear to be inadequate.

¹⁶Table B.7 shows faculty perceptions of how honest their students can be with them about these difficulties. The gaps between faculty perceptions and student perceptions are similar to the ones we report here.

¹⁷Women and international students are slightly more likely to want to discuss mental health very honestly with their advisers than men and US students, respectively.

TABLE 14.
HAVE YOU EXPERIENCED SEXUAL HARASSMENT IN YOUR DEPARTMENT?

	All	Male	Female	US undergrad	Non-US undergrad
Yes	16.2%	13.0%	21.5%	22.2%	8.9%

Notes: Table shows percentage of each group of students that report having experienced one or more forms of sexual harassment from someone in their department. A chi-squared joint test revealed no statistically significant difference in the percentage of students who reported sexual harassment and had PHQ-9 \geq 10 and the percentage of students who reported sexual harassment and had PHQ-9 $<$ 10 (p -value = 0.112). This was also the case for critical values of GAD-7 (p -value = 0.521), and PHQ-9 item 9 (p -value = 0.971). For exact question wording, please see survey instrument in online appendix C1.

3.4 Sexual Harassment

In order to obtain a more complete picture about the departmental environment, we asked questions about sexual harassment. Specifically, we wanted to know what share of students have experienced some form of sexual harassment in their department, what form that harassment took, and who perpetrated it. Although the prevalence of sexual harassment appears to be lower in our sample than in graduate and professional programs nationwide, the problem is still substantial. Contrary to common perception, we find that fellow students, rather than faculty members, are the most common perpetrators of such harassment.

For comparability purposes, we used the same phrasing for our questions that was employed by the Association of American Universities (AAU) Climate Survey on Sexual Assault and Sexual Misconduct in 2015 (see Cantor et al. 2017). A preamble to the questions emphasized that students should be thinking about situations that interfered with their work, limited their ability to participate in their program, or created a hostile work environment.

Sixteen percent of students experienced some form of sexual harassment in their department since starting the PhD program (table 14). 21.5 percent of women

experienced harassment compared to 13 percent of men; 22.2 percent of US students, compared to 8.9 percent of international students. Of the instances of harassment, 62.5 percent were perpetrated by another graduate student, while 19 percent came from a professor and about 10 percent from someone the student did not know. Advisers, undergraduates, and others affiliated with the department make up the remaining 9 percent of sexual harassment experiences.¹⁸ For context, the AAU survey revealed that about 44 percent of women in graduate or professional programs had experienced some form of sexual harassment, compared to 30 percent of men.

In order from most common to least common, the following were the forms of harassment experienced by economics PhD students in our sample: (i) sexual remarks, jokes, or stories that were insulting or offensive to you; (ii) inappropriate or offensive comments about your or someone else's body, appearance, or sexual activities; (iii) crude or gross sexual comments or tried to get you to talk about sexual matters when you did not want to; (iv) requests to go out for dinner, have drinks, or have sex even though you said

¹⁸It is possible that students say they have experienced sexual harassment from professors but not from advisers because those professors are no longer their advisers.

“No”; and (v) email(s), text(s), phone call(s), or instant message(s) with offensive sexual remarks, jokes, stories, pictures, or videos that you did not want to receive.

4. *Discussion*

Mental Health and Graduate School: Suggestive Evidence of a Connection

Is there a connection between student mental health and the work experiences we describe above? In line with other studies of the effects of workplace conditions on mental health (Woo and Postolache 2008), our work provides suggestive evidence of a connection.

One such piece of evidence is that of those who are currently experiencing moderate or severe symptoms of depression, 19 percent were diagnosed with a mental health issue before starting their program and 26 percent were diagnosed more recently, during their program. Of those students who were diagnosed in graduate school, 19 percent have contemplated suicide in a two-week period; of those who were diagnosed before the PhD, 10 percent contemplated suicide in the same two-week period (table B.14). In other words, those diagnosed with mental health issues as PhD students are more likely to have worse mental health today than those diagnosed before the PhD program.

Although graduate school could be causing these more severe symptoms for the recently diagnosed, it could also be the case that these students are simply in a different part of the treatment cycle than those diagnosed before the program. Shorter treatment duration, as opposed to graduate school itself, could be the cause of worse symptoms among those who are diagnosed while in the program. The exact mechanisms at play here warrant further study.

Another piece of evidence is that the most senior students have the worst mental

health: 21.2 percent of first-year students experienced moderate or severe symptoms of depression or anxiety (in November of their first year), while 29.6 percent of fifth-year students and 36.7 percent of students in years six+ experienced such symptoms (table 4). When it comes to suicidal ideation, 8.1 percent of the first-years report contemplating suicide in a two-week period, compared to 23.3 percent of those in years six+ (figure 1).

It is possible that repeated shocks and failures in the research process, coupled with a lack of adequate support for working through those failures, can accumulate over time into the symptoms of anxiety or depression that we see at the end of the program. In addition to the accumulation of stress over many years and the peak stress of the job market, the latter years of the PhD can also be characterized by a lack of structure and increased isolation. Existing work on these forces suggests that they are all likely contributing to the pattern of increasing symptom prevalence that we observe (e.g., Cacioppo and Patrick 2009, Layard and Clark 2015, Murthy 2020). Unlike increases in diagnoses and treatment in later years, which section 3.1 notes could be caused by factors like decreased stigma or increased encouragement from administrators to seek out care, large increases in symptom prevalence are harder to explain with alternative hypotheses. Even if our findings can be explained by differential attrition across cohorts, with healthier students disproportionately graduating before year five, our work nonetheless raises serious concerns about the mental health of the majority of economics PhD students—those who spend five or more years in their program.

We find further evidence of a connection between mental health and graduate school when looking at the relationship between students' mental health and their regrets. Of those who say they regret their area of study,

28 percent contemplated suicide in a two-week period. 27 percent of those who said they would not pursue a PhD at all, 24 percent of those who said they would study at another institution, and 20 percent of those who would change their advisers have also contemplated suicide.¹⁹ Among students who regret not engaging more with study and organizing time more effectively, however, a substantially lower percentage (11 percent) have contemplated suicide. Those who say they would change nothing about their graduate school experience have the lowest rate of suicidal ideation, at 7 percent. Though this suggests that the graduate environment is negatively affecting student mental health, it could also be the case that poor mental health is distorting students' perceptions of their program. Regardless of the direction of causality, we see here that one's mental health and one's graduate school experience are closely linked.

Correlations and Mitigating Factors

Correlating students' program experiences with their mental health provides us with additional evidence of a link between the two. The social environment, for example, appears closely linked to student mental health. Mental health is worse for students who say their peers are competitive. Having more very good friends in one's program, on the other hand, is correlated with better mental health, as is having more people in general with whom a student can openly discuss their private feelings without having to hold back (table 10). Supportive and collaborative classmates, people who can empathize with the PhD experience, and others who can be trusted to have the student's best interests in mind appear to be valuable tools for mitigating shocks to mental health. In turn, better mental health might make it

easier for students to connect with others and build supportive relationships in the first place.

In addition to strong social support, having sources of meaning, purpose, and usefulness appears to be important for mental health. Those who have goals to aspire to, feelings of doing useful work, and opportunities to make a positive impact on their surroundings have better mental health than those who do not (table 8). At the same time, when work fatigue and worries negatively affect activities in private life, mental health is worse (table 9). In line with existing literature (e.g., Layard and Clark 2015), students who have difficulties making ends meet financially are also more likely to have mental health problems.

Those with worse mental health also have worse engagement with their programs along a few dimensions. They are less likely to voice a thought in a seminar and substantially more likely to seriously contemplate leaving the program (table B.8). They are also more pessimistic about how well they have done and will do in their courses, teaching, presentations, and (especially) research (table B.16). Of course, the anhedonia, pessimism, and hopelessness that often come with depression can also lead to such disengagement and can prevent someone from deriving joy from their work (e.g., Sapolsky 2004, De Quidt and Haushofer 2016).

Mental health issues do not, however, appear to be affecting students with different values in life differently. In particular, students who believe that tenure at an academic institution is very important for their success in life are not more or less likely to have mental health issues than students who believe that income or recognition or a family are very important for success in life (table B.15). We see this as an important finding, suggesting that it is not possible to use a student's aspirations and values to infer mental health.

¹⁹Students could select more than one option for what they would do differently.

Advising relationships seem to be tightly related to student mental health, likely through both the social support channel and the usefulness of work channel (Hyun et al. 2006). Students who talk to faculty that care about their success and care about them as a person have better mental health than students who do not (table 12). While the number of meetings that students have with their main adviser or with faculty more broadly is not correlated with mental health (table 11), the nature of those meetings is. Students who say they avoid meetings with faculty because those meetings are unpleasant, or because they fear the consequences of a bad impression, have worse mental health than students who do not feel this way. In contrast, students whose biggest issues with meetings are that they are too short or too difficult to schedule do not have worse mental health than students for whom those factors are not problems (table B.11).

How honest a student can be with their adviser about difficulties in the program is also correlated with that student's mental health. We dove deeply into those difficulties, asking students to tell us how honest they can be with their advisers about problems that ranged from research progress and presentations to mental health and starting a family. While students who cannot honestly discuss mental health with their advisers have worse mental health, it is also true that students who cannot honestly discuss problems with research progress also have worse mental health. Openness on teaching, preparing for the job market, and considering nonacademic jobs is also correlated with student mental health (table B.13). In other words, what matters is whether the relationship between student and adviser is trusting and honest, not whether the problems are professional or personal.

These findings are in line with existing evidence that the repeated failure of coping mechanisms in the face of stressors can

lead to depression (Sapolsky 2003). Since the research process is full of shocks and failure, the absence of adequate mechanisms for bouncing back from such failure could, over time, lead to the kind of learned hopelessness that characterizes depression. While peers, family, friends, and university resources are a crucial source of support, the nature of the research process ultimately puts advisers on the front lines of this battle.

Whether mental health problems are causing a lack of honesty and openness in advising relationships or vice versa, it is clear that many students could be having better relationships with their advisers. We think it would be beneficial for departments to experiment with various advising schemes and feedback mechanisms to improve student–adviser relationships. Creating a channel for faculty to receive constructive feedback on their advising, perhaps by allowing anonymous student evaluations of each faculty member's advising strengths and weakness over a several year period, could help each faculty member understand what he or she can do better.

If our results are any indication, a substantial part of that improvement will be in figuring out ways to better balance the role of adviser and evaluator so as to facilitate honest and open conversations with students. Social or even financial incentives for such advising could also be explored. One approach could be to assign incoming students to faculty members who have actively volunteered to advise more on how to navigate the program and less on specific research questions. Such an advising relationship, without any evaluative constraints, could be a valuable source of support for students even into the later research years and could help students navigate future relationships with dissertation committee members.

Certainly, a change in culture to the point where students and advisers can openly and harmlessly agree on an advising relationship

that works best for everyone could go a long way. If the arrow of causality points the other way, then making a concerted effort to improve student mental health should improve advising relationships and student productivity.

5. *Summary and Recommendations*

Our study of eight graduate economics PhD programs establishes several important features of student mental health and their connection to student experiences. Moderate or severe symptoms of depression or anxiety are prevalent among graduate students in our sample, with rates that are more than double those of the general population (Kessler et al. 2005 and WHO 2017). Over a tenth of students report suicidal ideation on at least several days over a two-week period. Though sample selection concerns exist, robustness checks nonetheless suggest higher prevalence rates of such symptoms than in the general population and lower rates than found in previous studies of graduate student mental health.

We find that our survey respondents are considerably less likely to be in treatment than other graduate students. Only 25.2 percent of students in our sample with moderate or severe symptoms of depression or anxiety are currently receiving professional treatment. In contrast, prior work has shown that over 40 percent of graduate students with such symptoms across disciplines are receiving treatment.

Students often feel limited meaning in their work and in their ability to make a positive impact on their community. 20 percent feel that they have opportunities to make a positive impact on their community or society, whereas 58 percent of faculty and 53 percent of the population report feeling that they have these opportunities (Maestas et al. 2017).

We measure notable correlates between mental health and student experiences. Students in years five+ of their program are especially likely to have high levels of depressive or anxious symptoms. Students who express regrets about their PhD experience have higher rates of mental health distress as well. Having friends and advisers with whom students can openly and honestly discuss their difficulties is correlated with better mental health, while the sheer frequency of advising meetings is uncorrelated with mental health. Overall, our work points to the importance of having effective advising relationships, improving collegiality, encouraging collaboration, helping students find meaning and purpose in their work, and lowering barriers to high-quality mental health care. We see these as the keys to improving graduate student mental health.

Below, we include six specific recommendations for students, faculty, department leadership, and university administrators on ways to improve graduate school experiences and student mental health. These recommendations echo those proposed in prior work on the subject (e.g., Mousavi et al. 2018). For free-form recommendations that economics faculty submitted through the supplemental faculty survey, please see online appendix A.

First, we recommend that department leaders raise awareness of mental health issues among graduate students, raise awareness of available mental health resources, and encourage students to take their mental health and the health of their peers seriously. Doing so early in the program, as early as math camp, should make it easier to tackle issues when they arise later on. Encouragement can involve asking students to arrange for a consultation with campus mental health services, use online screening tools often provided by campus mental health services to identify depression and anxiety symptoms, or simply to feel comfortable seeking support. See (Mowbray et al.

2006) for more details on ways to improve mental health-care utilization.

Second, department leaders could use their platform to encourage students to invest in building friendships with their peers and to actively avoid prolonged isolation. In the same vein, we recommend discouraging competitive attitudes, while encouraging collaboration, peer advising, and coauthorship among students across years in the program. Confirming prior work, we find that students who have more people in their lives that they can really open up to and who do so more frequently are less likely to suffer from mental health issues. See (Cacioppo and Patrick 2009, Murthy 2017, and Choi et al. 2020 for more on the value of strong social support for mental health.

Messaging these points to students is important, but departments could also think more from a design perspective about how the requirements throughout the program, the physical spaces, and the financial and advising resources made available to students can encourage collaboration. Students themselves could work on organizing more informal activities and resources for each other, modeling the mutual helpfulness that such activities should strive to foster. Prior research suggests that these steps should reduce feelings of isolation and loneliness, increase empathetic connections, and help students build strong social networks that will serve them well into their professional lives (see Whitlock, Wyman, and Barreira 2012; Small 2017).

Third, improving student–faculty advising relationships can help students identify promising directions for research and bounce back better from setbacks. One element of the strain could be that advisers play a dual role—one of support and one of evaluation. Some departments have started connecting students early on with faculty who volunteer to advise students in the pre-research years. Such advising relationships,

established outside of the dissertation committee structure, may provide students with faculty support that does not come bundled with consequential evaluation. These advisers could also help students navigate their relationships with other faculty members and help address other issues with advising. We believe that helping students build a strong support structure and develop growth and strategic mindsets early on in the program will help them navigate shocks that arise later on, especially at the end of the program. See Posselt (2018) for more on how faculty can best help their students persist and Chen et al. (2020) for more on building growth and strategic mindsets.

Fourth, relatedly, we recommend instituting policies that help advisers ensure that students are not falling through the cracks and are progressing with their projects. In programs where the advising structures are more diffuse, field-specific meetings among faculty to discuss student progress could be a good way to do this. If, for example, none of the faculty have interacted with the student in a while, the most relevant faculty member could be tasked with checking in with that student. If a student is stuck, such faculty meetings could also allow faculty to brainstorm and triage solutions. Another approach could involve students and faculty establishing a regular check-in schedule, with a mutual understanding that such meetings are not just meant for showcasing progress but are also for working through problems. Helping students climb out of research ruts and bounce back from shocks more easily could lower the probability that these students develop debilitating anxious and depressive symptoms over time (Sapolsky 2003).

Fifth, with so few students finding meaning in their work, we think it would be useful to actively encourage students to pursue research questions they find meaningful and socially valuable. Additionally, though many

students ultimately find meaning and purpose outside of academia, many cannot talk to advisers about nonacademic career trajectories. In fact, we find that talking to advisers about nonacademic careers is just as hard for students to do as discussing mental health issues. Efforts to normalize private- and public-sector opportunities, by celebrating alumni who work in those sectors and perhaps even inviting them to talk to current students, might help alleviate the mental distress that students feel when transitioning out of graduate school (Gardner 2010).

Sixth, departments could partner with campus mental health services to experiment with different approaches to mental health treatment. Some departments have experimented with peer support groups and “Let’s Talk” programs that make campus mental health professionals available for drop-in hours close to the department. Other low-cost interventions that reduce barriers to care seeking deserve further research.

Additionally, interventions like cognitive behavioral therapy (CBT), for example, deserve more attention. We know CBT works in other settings and initial results from an intervention with Harvard graduate students are promising (e.g., Cuijpers et al. 2013, Guille et al. 2015, Ross et al. 2019, and Bernstein et al. 2021). More research and experimentation with such tools holds substantial promise for addressing the problems we document in this study.

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