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RESEARCH ARTICLE



A blueprint for measuring and improving graduate student mental health

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ABSTRACT

Objective: We provide a step-by-step guide for developing, administering, evaluating, and acting on a survey-based study of graduate student mental health. **Methods:** Blueprint focuses on forging student-faculty collaboration and is based on Harvard University's Graduate Student Mental Health Initiative (GSMHI). The survey tool we use includes validated screening instruments for depression, anxiety, imposter phenomenon, self-esteem, alcohol consumption, exercise and sleep habits, and loneliness. It also includes environmental questions that collect epidemiologic data, as well as ratings of advising relationships and student dynamics. **Results:** After 6 years, GSMHI has analyzed data from 30 different PhD programs and 4,866 students, overseen the implementation of more than 60 departmental action plans, and performed 9 follow-up surveys to assess progress. It has achieved high response rates (60–90%), discovered wide variation in mental health and environmental factors across departments, and supported experiments with interventions. **Conclusion:** We hope this blueprint helps other universities run similar initiatives.

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Introduction

The prevalence and severity of mental health issues among graduate students in the U.S. have been the subject of much public and academic discussion.^{1–6} In the last year, the COVID-19 pandemic has worsened mental health across the population^{7–9} and made more acute the need for universities to better understand and address graduate student mental health.

Begun in 2016, the Graduate Student Mental Health Initiative (GSMHI) at Harvard University can serve as a blueprint for measuring and improving graduate student mental health. The objective of this paper is to lay out this blueprint step-by-step for use by other universities and to provide advice on running a successful graduate student mental health initiative.

GSMHI seeks to address the following limitations of existing survey-based efforts to measure and improve graduate student mental health:

- Lack of graduate student engagement in survey design;
- Low survey response rates;
- Limited data collection on the learning environment and how it is connected to student mental health and wellbeing;
- Data collection at a university or school-wide level makes department-specific interventions harder

The initiative addresses these limitations by:

- Using standardized screening tools for depression, anxiety and other mental health-related issues to

assess the prevalence and severity of these issues in each department;

- Identifying critical department-specific environmental factors interconnected with mental health and wellbeing;
- Facilitating conversations about interventions and regular evaluation of progress with students, faculty, and departmental administrators;
- Institutionalizing department-level collaborations between students, faculty, and administrators on improving the learning environment and graduate student mental health

Overview

Borne out of a student-led initiative at Harvard's Department of Economics, GSMHI is built on collaboration between each graduate program, its students, faculty, and administrators, and the counseling mental health services within Harvard University Health Services (HUHS). Survey instruments used to collect data on student mental health and experiences in the programs are built with student input, and an official from HUHS oversees the process. Communication with departmental leadership makes certain that the results will be considered, discussed, and acted upon with assistance from HUHS. Data are collected and analyzed by the Harvard College Institutional Research office, the Faculty of Arts and Sciences (FAS) team tasked with conducting a wide range of internal research on FAS functions. The office keeps data secure and confidential, effectively serving as a trusted but independent third-party

survey administrator. A GSMHI point-person follows-up with each participating department, engaging them with survey results and recommendations in an ongoing collaborative process to improve the learning environment and graduate student mental health. We only share aggregate, department-level results in this process, taking care to report statistics that will not allow for individual students to be identified or singled out.

As of this writing, the initiative has collected data from 30 different PhD programs and 4,866 students, overseen the implementation of more than 60 departmental action plans, and performed 9 follow-up surveys to assess progress. While we initially worked with Master's and PhD programs, we have over time decided to focus our energies only on PhD programs, where students stay in their department for longer periods of time. The statistics we describe in this paper are based only on the PhD sample.

Prior work on graduate student mental health

GSMHI follows in the footsteps of a number of surveys and analyses of graduate student mental health. In 2016, the University of California administered a survey of 13,400 graduate students across all ten campuses that was completed by 5,356 students for a 40% response rate.¹⁰ Utilizing the CESD-R to measure depression, the study found 35% of respondents self-reporting symptoms that met the clinical cutoff for a major depressive disorder. Students in the humanities reported higher rates of depression and lower life satisfaction than those in STEM or professional fields.

Evans et al. (2018) applied convenience sampling via email and social media to PhD graduate students in the U.S. and around the world.¹¹ There were 2,279 respondents, of whom most were PhD students. Based on the results of the PHQ-9 and GAD-7 scales, the authors reported 39% of respondents scoring in the moderate to severe range for depression and 40% scoring in the moderate to severe range for anxiety. Consistent with other studies, they report that LGBTQ+ students and women are more likely to be experiencing severe symptoms. Additionally, they report a negative correlation between self-reported quality of advising relationships and rates of depression and anxiety.

Eisenberg et al. (2013), in a small sample of doctoral students—5,980 compared to 48,667 college students and 9,872 Master's students—found that 26.7% of doctoral students met criteria for at least one mental health problem. In addition, they report that doctoral students in the humanities and social work were significantly more likely to screen positive for depression.¹² In another study, Eisenberg and colleagues report that graduate students had a lower rate of depression and anxiety. Factors that predicted mental health problems included female, bisexual, “other race,” financial struggles, living with parents or guardians, and socioeconomic background.¹³

Few studies, however, examine department-specific mental health and environmental data with the intent to develop targeted interventions for improving community wellbeing. The Department of Chemistry at the University of Minnesota

is one example of such an effort. The department is engaged in a multi-year initiative to support the behavioral health of their graduate students through a partnership with the graduate students, the director of graduate studies, and the campus health service. New policies and programs have been developed that are aimed to offer more support, reduce stigma, and encourage students to seek professional help. They developed a mental health survey that is administered every 2–3 years, measures student mental health, and evaluates progress. They have also seen survey response rates increase over time, from 49.2% to 59.3%. In addition, the use of PHQ-9, Perceived Stress Scale, and Social Isolation Scale allows for comparability of outcomes measured by these standardized screening instruments across other studies.¹⁴ Similarly, at the University of California, Berkeley, graduate students in the Department of Chemistry have led an initiative to develop a climate survey that investigates issues related to the graduate school department.¹⁵

Our contribution

The efforts we describe here are surely not exhaustive of everything that universities, scholars, mental health services, and individual departments are doing around the world to try to understand and improve graduate student mental health. Through a survey of the literature, conversations with colleagues across universities, and our own experience, we have found, however, that a feeling of needing to “invent the wheel” is a major logistical barrier preventing more institutions from running mental health initiatives of their own. Our hope is that the blueprint we provide here can lower this barrier.

In the section that follows, we discuss each step of our Graduate Student Mental Health Initiative—collaborate, measure, discuss, implement, and follow-up—with the intention of providing a concrete example for how such an initiative could be structured at other universities. We then summarize key lessons from 6 years of running the initiative.

Materials and methods: Step-by-step

Collaborate

Our first step is to build relationships and achieve buy-in for collaborative problem-solving across stakeholders. The first step is to obtain support for a data collection effort, motivated by the view that acting on facts rather than impressions is itself consensus-building. This effort is led by a GSMHI point-person who talks to faculty leadership, administrators, and interested students in each department from the outset.¹ Stakeholders are much more likely to take the initiative, its results, and its recommendations seriously if they feel that the study is being done *with them* instead of *to them*. We believe this approach is the reason for our high student response rates and high faculty engagement in the discussion and follow-up parts of the initiative.

The initial expression of interest most often comes from PhD students, who contact the GSMHI point-person with

a request that their department participate in the initiative. Over time, more expressions of interest have come from departmental leaders, but in all cases the desire to understand and improve graduate student mental health comes, in a grassroots way, from the department itself. This approach allows for the initiative to build out slowly, mostly through word-of-mouth, and to address any common issues with its implementation along the way. It also leads to students and faculty taking ownership of the initiative and to sustained engagement over the course of the effort.

After meeting with the interested students, the GSMHI point-person reaches out to their departmental leadership, noting student interest and encouraging participation in the initiative. Faculty are asked to explicitly encourage students to take the surveys and to communicate their interest in working with students to discuss and address survey results. The GSMHI point-person thus acts as a facilitator, a credible expert who is external to the department, impartial when it comes to existing tensions between students and faculty, and someone who helps both parties overcome hurdles in communication. In this role, he or she is also constrained, unable to force students or faculty to take any actions that they cannot mutually endorse.²

After student interest and departmental support is established, we arrange for a meeting with all of the stakeholders: student leaders, faculty leaders, department administrators, and the GSMHI point-person. When we come in to such meetings, we bring a draft of our survey instrument with us. Purposefully, one section—the section that contains validated screens for mental health issues, questions about the utilization of mental health services, and a number of environmental questions—is fixed, while another section is open for some faculty and student input. In this way, the survey administered with each department allows for both comparability with other departments and for tailored inquiry into department-specific concerns. Over the course of several years of work with different departments, we have converged on a set of screening tools and learning environment questions that are now largely fixed. We do still allow each department to add an additional five environmental questions that are unique to the survey their students receive.

Among the topics discussed in this meeting are the objectives of the survey, the process for developing and administering the survey, the process for analyzing the data, and the process of sharing results with students and faculty. Some departments decide to create working groups of student and faculty volunteers tasked to come up with questions that they would like to see integrated into the study. With others, we just have an open call for suggestions. The most commonly raised questions address student-faculty relationships, sources of stress, comfort levels in voicing thoughts in class or with peers, and job market-related dynamics. All of these questions are ones that students themselves identify as issues potentially affecting their emotional wellbeing and academic performance.

We are up front about the fact that not all questions will be integrated, but we promise that the survey will address the themes that each proposed question desires to tackle.

Most importantly, this collaborative process makes students, faculty, and department administrators feel like they are working together, to directly improve and strengthen their community. Only once we have established a trusting, supportive foundation for the study in the department do we move on to the measurement phase.

Measure

Each survey includes common and validated screening instruments for depression, anxiety, imposter phenomenon, self-esteem, alcohol consumption, exercise and sleep habits, and loneliness, among others (see [Supplementary material](#), Appendix for the survey). Environmental questions include epidemiologic data, ratings of advising relationships, competitiveness, and year in the program. The survey is also an opportunity to evaluate student utilization of mental health services and assess mental health treatment levels, especially for those suffering with serious mental health issues.

When working with students to customize the survey, we have found that graduate students across the university consistently return to a set of key themes that they believed relate to their emotional well-being in the department. As GSMHI has grown, we realized that we could improve the quality and usefulness of the data by identifying the underlying constructs in these questions and selecting questions shown in the literature to have “validity,” that is, questions that have been shown to measure the underlying construct. As a result, we have converged on eight major constructs that measure the effect of the learning environment on student emotional well-being: quality and trustworthiness of relationships with faculty; advising; relationships between graduate students; degree of inclusivity in the learning environment; belonging and connectedness; progress toward degree, career prospects, and work engagement; stress; and work-life balance.

Once a survey instrument is set, an email is sent to students that references the students who helped in the development of the survey, describes the goals of the survey, explains confidentiality, and emphasizes that this is a collaborative effort to improve the community’s well-being. The email includes a link to the survey. The survey remains open for two weeks and during that time the response rate is shared with student leaders who in turn encourage fellow students to complete the survey.

Discuss

Once the data are collected, the GSMHI official works with the College Office for Institutional Research to produce department-specific reports. The GSMHI official then arranges to meet with the relevant department’s stakeholders—faculty, students, and administrators—once again. The goal of this meeting is to share meaningful data with departments that will allow them to understand both the nature and scope of mental health issues in their community and

to identify interventions that have the potential to improve student well-being. We have found that this meeting itself, by bringing together stakeholders to see the fruits of their collaboration, can strengthen the sense of community and collegiality in a department.

We have found best results when departments promptly follow up on this meeting by creating a small (5–6 person) mental health working group at the department, consisting of faculty and graduate students.³ Such a group is tasked by the department's leadership to examine the data, speak to members of the department, recommend interventions, and ensure that the interventions are actually implemented. The group also identifies the intended outcome of each intervention, which then allows follow-up surveys to measure the effectiveness of the interventions. Given turnover among students and departmental leadership, it is good practice to include younger students in this group, as well as a department administrator. Anyone transitioning out of the group should work to ensure that a replacement transitions smoothly into it. Finally, it is also helpful for the group to have a point-person, someone who can ensure that the group carries out its responsibilities in a timely fashion.

At this time, as in all steps of this process, it is important for the faculty and student leaders to be actively communicating with the rest of the department, so that everyone is on the same page. As with the survey creation process, engagement with the results is highest when all members of the department feel that they are agents of change and are themselves crucial to the success of the venture to improve well-being in the community.

In parallel, the GSMHI point-person works on a ready-and-able connection between health services and each department by the time results are being discussed. This connection means that the department can expect to have concrete support as it develops interventions to improve areas identified in the survey results. In addition to the 'menu of support services and workshops' arranged through university health services, the GSMHI point-person also works with the graduate school to arrange for mentoring workshops, sexual harassment discussions, and other services related to student life. As departments implement these interventions, they also provide valuable feedback to the service providers on service effectiveness and areas for improvement.

Implement

When it comes time to implement the identified interventions, we have found three common approaches to be particularly useful. The first is expectation-setting. We encourage every department to complete the following sentence: "If we do [blank] then we expect to see [blank] changes that are directly tied to the questions in the survey." This makes the aims of each intervention transparent and increases accountability by tying the work to measurable metrics.

The second is having departments agree to do a follow-up survey in two years in order to track trends and to see if the interventions have the desired outcomes. Of course, the

make-up of the department will change as students graduate and new students enter, making it hard to causally assess progress. Nonetheless, a commitment to a follow-up increases accountability and such surveys are still likely to capture overall trends.

Specific ideas for intervention that arise are unique to the circumstances in each department. However, we have identified the following domains for intervention that appear to be common across departments⁴:

- Social and community building activities
- Smoothing the transition from courses and exams to independent research
- Destigmatizing nonacademic career paths
- Collegiality in workshops and seminars
- Advising experience
- Imposter phenomenon
- Peer mentorship and support groups
- Mental health resource awareness
- Reducing stigma and helping students access mental health resources

More specifically, the following are some examples of interventions in the above domains that we have seen departments initiate:

- Peer mentorship program
 - The goal of a peer mentorship program is to connect students across graduate years, help younger students in particular break the ice with older students about the challenges of graduate school, and increase quality social connections among students. Peer mentors are student volunteers who offer a friendly ear, help students to think through their problems, and point students toward the proper campus or outside resources. These volunteers go through several workshops on good listening and counseling techniques and on the resources available to students on campus.
- Workshops
 - Two-hour Cognitive Behavioral Therapy (CBT) workshop titled "A Single-Session Workshop to Enhance Emotional Awareness and Emotion Regulation." It was organized by graduate students from the Psychology Department in collaboration with HUHS and has been offered to interested departments across the university;
 - An advising and mentoring workshop for faculty, established by the Graduate School of Arts and Sciences;
 - A session on mental health for incoming students, included among the required orientation sessions. Session includes conversations with students further into the program as well as with university representatives who offer various mental health-related resources on campus;
 - Workshop led by faculty that aims to help students transition from coursework to independent research;

- Workshop series that features faculty and alumni talking about nonacademic opportunities post-PhD. Serves as a way to normalize such paths and conversations about them in the department.
- Faculty-student relations
 - Commitment that faculty who are teaching classes have fixed office hours, in addition to setting expectation that students can reach out to faculty anytime for research meetings or simple conversations;
 - Establishing tradition of student-faculty lunches. Department asked all faculty and lecturers to make themselves available at least once per month to meet with a group of 3–4 students for a 45+ minute gathering;
 - A graduate student Mental Health Working Group. Among their activities, students wrote up a proposal, in collaboration with faculty, that links mental health with advising. A final version of the proposal will be included in the department's Graduate Handbook;
 - Writing or re-writing a department handbook that clarifies expectations and responsibilities of faculty and students, including in advising relationships.

Follow-up

Improvements in the learning environment and in graduate student mental health require constant work and persistence. Rather than a one-and-done activity, it is an ongoing effort to form a more perfect department. Continuous engagement and accountability are thus central to GSMHI and its success. We have achieved this by checking in with each department's mental health working groups (often through their point-person) every few months, often at the end of each semester. These check-ins help remind departments that there is an external entity that is expecting action, commitment, and progress. We also have departments agree to participate in a follow-up survey every two years. The primary reasons for these follow-up surveys are:

1. To follow trends in mental health and environmental conditions over time;
2. To learn if the responses to the findings of the earlier survey produced intended improvements. At the time of a follow-up survey, the GSMHI point person contacts students and faculty to debrief on the actions taken in response to earlier survey findings. If concrete actions were taken, the follow-up survey includes questions about those actions—how they were received and whether or not they were helpful;
3. To initiate discussions about actions that are still in process;
4. To allow students and faculty to reflect on the progress since the first survey, confirm the positive steps taken, and identify areas that need more work;

5. To hold both the students and faculty accountable for making progress. The central importance of a follow-up process is that it maintains engagement between students and faculty.

Even if the metrics show limited progress, having faculty and students working together in good faith will increase departmental collegiality and decrease the probability of stressful, often unproductive, antagonism.

Discussion

The GSMHI at Harvard has provided important new data about the mental health and emotional well-being of graduate students. Unlike with most mental health surveys, the departmental response rates that we have seen have been extraordinarily high: 60–90%. Such high response rates indicate strong engagement of students and reduce concerns about selection bias. Conducting surveys at a departmental level, we have found wide variability in the rates of depression and anxiety across departments. For example, of the 39 PhD program surveys conducted so far, the median positive PHQ-9 score is 23.3%, the mean is 25.3%, and the range is 11–43%.⁵ The median positive GAD-7 score is 23.7%, mean is 26.5%, and the range is 11.4–57%. We see similar wide ranges in scores for imposter phenomenon, loneliness, measures of feeling overwhelmed, and other metrics of mental health.

We see similar variability in response to the learning environment questions. For example, in response to the question “Faculty care about my mental health and well-being,” the average affirmative response is 63%, with a range of 44–89%. In response to the question “If I had difficulties in my program I would be inclined to keep them from faculty in my department,” the average affirmative response is 50%, with a range of 32–69%. Comparing their responses with the min, median, mean, and max statistics across all departments allows each department to see more clearly where they have work to do and generates a competitive spark to make improvements. Department leaders find this kind of data particularly valuable as they evaluate what items to prioritize for an intervention. Further, these data provide departments with reference points for subsequent surveys.

The data we have collected from the screening tools and the learning environment questions have revealed significant correlations between mental health and the learning environment. At the same time, we have generally found that the percentage of students in a department who report worse than desirable relationships with faculty or high levels of loneliness and imposter phenomenon, for example, is higher than the percentage of students experiencing serious symptoms of anxiety and depression. Thus, while our work does lead us to conclude that mental health and the learning environment are closely linked, this is not going to be the case for every student. Given the mission of academic departments, however, we believe that collaborative efforts to improve the learning environment, even if they do not

improve every student's mental health along the way, are still worth pursuing.

Our experience has also confirmed that a targeted, department-by-department approach to improving graduate student mental health is warranted. Even when the data identify a similar issue across multiple departments, each department will often come up with a different, tailor-made solution. Throughout our work, we have found the following to be key determinants of how well each department addresses their issues:

1. Student involvement and leadership;
2. A collaborative approach between students and department leadership that allows for the development of a mutual interest in addressing issues identified by the survey, while mitigating blaming and divisive conversations;
3. A willingness of department leadership to acknowledge the issues and commitment to work with students. We find that departments who view the work as important to the entire academic enterprise that will benefit both faculty and students are most likely to engage the data and find solutions to the issues raised in the survey; and
4. Viewing the initiative and the survey as a critical ongoing process for building a better learning environment, rather than a one-and-done activity.

Limitations and future work

One important potential limitation to the initiative is that participation in it is elective. Thus, we may be surveying departments that are already inclined to address their issues, while issues in less-inclined departments go unaddressed. Our hope is that peer pressure, from an increasing number of participating departments, will ultimately lead the less-inclined departments to engage on these issues as well.

A second limitation is that student participation is critical to the success of the initiative. We have already seen examples of student interest diminishing for the follow-up surveys, which leads to a general lack of interest among all stakeholders in maintaining the initiative. We are examining the reasons for this lack of student interest. Possibilities include a change in the student population, a lack of successful interventions in response to the first survey, and a change in student focus from mental health to issues like diversity and inclusion.

A third limitation is that the GSMHI, as it is designed now, applies to PhD programs. We found that Master's programs were harder to evaluate, as programs were generally shorter (1–2 years), high student turnover made engagement harder to sustain, and student-faculty relationships were substantially different from those experienced by students in PhD programs. The existing initiative would need to be modified before it is applied to Master's programs.

In addition to addressing these three limitations going forward, we aim to use the data that we have collected through GSMHI to ask broader questions about the

environments, relationships, and demographics that are related to mental health. Understanding such connections could help Harvard, and other universities engaging in similar initiatives, to chart broader university policies and complement the work happening at the departmental level. Finally, we aim to explore the results from our surveys in-depth and to evaluate the effectiveness of different interventions in future work.

Notes

1. One of the authors, Paul Barreira, is the current GSMHI point-person. Having previously served as Director of HUHS, he has been able to build on the relationships he formed with administrators, faculty, and students over the years to form GSMHI partnerships. We recommend choosing a point-person for GSMHI-like initiatives who can build on a similar foundation of trust across the university.
2. This is the case throughout the different stages of the initiative. The will and the interest have to come from the bottom-up rather than from the top-down.
3. We have heard from working group participants that this work not only gives them purpose and satisfaction from doing good things for their community, but also helps them build the skills necessary to deliver concrete solutions on difficult issues with many stakeholders.
4. Findings from the initiative run at University of Minnesota's Department of Chemistry also emphasize some of these areas for intervention, especially in social and community building and in improving the advising experience.¹⁴
5. These 39 surveys are made up of initial and follow-up surveys.

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Conflict of interest disclosure

The authors have no conflicts of interest to report. None of the authors have a financial interest or benefit from the direct applications of this research. The research presented in this article was reviewed by Harvard University's Institutional Review Board (IRB), but was determined to pose minimal risks and fell into the exempt category.

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References

1. Duffy ME, Twenge JM, Joiner TE. Trends in mood and anxiety symptoms and suicide-related outcomes among U.S. undergraduates, 2007-2018: evidence from two national surveys. *J Adolesc Health*. 2019;65(5):590–598. doi:10.1016/j.jadohealth.2019.04.033.
2. Hunt J, Eisenberg D. Mental health problems and help-seeking behavior among college students. *J Adolesc Health*. 2010;46(1):3–10. doi:10.1016/j.jadohealth.2009.08.008.

3. Hyun JK, Quinn BC, Madon T, Lustig S. Graduate student mental health: needs assessment and utilization of counseling services. *J Coll Stud Dev*. 2006;47(3):247–266. doi:10.1353/csd.2006.0030.
4. Lipson SK, Zhou S, Wagner B, III, Beck K, Eisenberg D. Major differences: variation in undergraduate and graduate student mental health and treatment utilization across academic disciplines. *J Coll Stud Psychother*. 2017;30(1):23–41. doi:10.1080/87568225.2016.1105657.
5. Bolotnyy V, Basilico M, Barreira P. Graduate student mental health: lessons from American economics departments. *J Econ Lit*. 2021. <https://www.aeaweb.org/articles?id=10.1257/jel.20201555>
6. Satinsky EN, Kimura T, Kiang MV, et al. Systematic review and meta-analysis of depression, anxiety, and suicidal ideation among Ph.D. students. *Sci Rep*. 2021;11(1):1–12. doi:10.1038/s41598-021-93687-7.
7. Vahratian A, Blumberg SJ, Terlizzi EP, Schiller JS. Symptoms of anxiety or depressive disorder and use of mental health care among adults during the COVID-19 pandemic—United States, August 2020–February 2021. *MMWR Morb Mortal Wkly Rep*. 2021;70(13):490–494. doi:10.15585/mmwr.mm7013e2.
8. Taquet M, Geddes JR, Husain M, Luciano S, Harrison PJ. 6-month neurological and psychiatric outcomes in 236,379 survivors of COVID-19: a retrospective cohort study using electronic health records. *Lancet Psychiatry*. 2021;8(5):416–427. doi:10.1016/S2215-0366(21)00084-5.
9. Racine N, McArthur BA, Cooke JE, Eirich R, Zhu J, Madigan S. Global prevalence of depressive and anxiety symptoms in children and adolescents during COVID-19: a meta-analysis. *JAMA Pediatrics*. 2021;175(11):1142–1150. doi:10.1001/jamapediatrics.2021.2482.
10. University of California, Office of the President. Graduate student well-being survey report. https://ucop.edu/institutional-research-h-academic-planning/_files/graduate_well_being_survey_report.pdf. Published 2017. Accessed March 28, 2022.
11. Evans TM, Bira L, Gastelum JB, Weiss LT, Vaderford NL. Evidence for a mental health crisis in graduate education. *Nat Biotechnol*. 2018;36(3):282–284. doi:10.1038/ntb.4089.
12. Eisenberg D, Hunt J, Speer N. Mental health in American colleges and universities: variation across student subgroups and across campuses. *J Nerv Ment Dis*. 2013;201(1):60–67. doi:10.1097/NMD.0b013e31827ab077.
13. Eisenberg D, Gollust SE, Golberstein E, Hefner JL. Prevalence and correlates of depression, anxiety, and suicidality among university students. *Am J Orthopsychiatry*. 2007;77(4):534–542. doi:10.1037/0002-9432.77.4.534.
14. Mousavi MP, Sohrabpour Z, Anderson EL, et al. Stress and mental health in graduate school: how student empowerment creates lasting change. *J Chem Educ*. 2018;95(11):1939–1946. doi:10.1021/acs.jchemed.8b00188.
15. Stachl CD, Brauer DD, Mizuno H, et al. Shaping the future of higher education: practical, community-driven initiatives to improve academic climate. *ACS Cent Sci*. 2021;7(6):910–916. doi:10.1021/acscentsci.1c00491. [InsertedFromOnline[pubmed Mismatch]]