# Mental Health of PhD Students in US Agricultural Economics Departments*

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**Abstract**

In this study, we investigate the mental well-being of agricultural economics PhD students at 33 universities in the United States. Analysis of our survey data reveals that about 40% of respondents reported experiencing symptoms indicative of depression, anxiety, or suicidal ideation. Although most participants recognized the meaningfulness of their work, achieving a satisfactory work-life balance emerged as a prominent concern. Notably, stress levels were consistent across departments irrespective of their rankings. Furthermore, our examination uncovers some racial disparities: Hispanic and White students exhibited a higher prevalence of mental health issues but were more inclined to seek treatment, while Asian and Black students reported lower prevalence rates but faced challenges accessing support services.

**Keywords:** Mental Health, Higher Education, Inequality
**JEL Codes:** A23, I14, I18, I23

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# 1 Introduction

The journey towards earning a PhD is both fulfilling and demanding. Extensive research has highlighted the significant prevalence of mental health issues among doctoral students. A global survey conducted by *Nature* in 2019 indicated that 36% of the respondents sought help with anxiety or depression related to their PhD studies (Woolston, 2019). Similarly, a meta-analysis using 32 articles published before the COVID-19 era found a pooled estimate of 24% for depression and 17% for anxiety among PhD students worldwide (Satinsky et al., 2021). Recent studies conducted after the onset of the COVID-19 pandemic in the EU and India (e.g., Giner et al., 2022; Shevlin et al., 2022; Rahiman et al., 2023; Macchi et al., 2023) have further confirmed the alarming mental health challenges faced by doctoral students, including severe mental distress and even suicidal tendencies.

Beyond the examination of the broader PhD student population, it is necessary to focus specific attention on evaluating and improving mental health outcomes within distinct academic disciplines, given the potential variability in stressors across fields (Lipson et al., 2016). Bolotnyy et al. (2022) investigated the mental well-being of PhD students in the top eight US economics departments before the COVID-19 pandemic, revealing that 17.7% experienced depression and 17.6% experienced anxiety. To add to the evidence, our study focuses on PhD students in agricultural economics. The solitary nature of research and the geographic isolation often associated with agricultural economics may exacerbate feelings of loneliness, thereby contributing to mental health challenges (Rohde et al., 2016; Hish et al., 2019; Satinsky et al., 2021; Logel et al., 2021).

We conducted a nationwide survey from late September to early November 2023, reaching all the departments targeted. Beginning with clinically validated mental health assessments, our survey then explored students' self-perceptions, PhD experiences, and demographic details. We achieved an overall response rate of 44.1%. Our findings illuminate a concerning mental health status, with 39.4% of participants reporting symptoms indicative of depression, anxiety, or suicidal ideation. Alarmingly, 72% of those experiencing depression or

anxiety did not seek treatment, while 14% lacked clarity on how to access help. These severe conditions are not exclusive to students in top-ranking departments; our analysis reveals comparable or even higher rates of depression among students from lower-ranking departments. Additionally, our results unveiled a racial disparity in mental health, with Hispanic and White students experiencing a higher prevalence of mental health conditions but actively seeking treatment. While Asians and Blacks appeared to have a lower prevalence, yet they demonstrated a reluctance to seek treatment and lacked information on how to access help.

We conducted further research on the factors that influence student mental well-being. Academic performance, particularly perceived success in research, emerged as a crucial factor in mitigating mental illness. Furthermore, the perceived meaningfulness of work was shown to be a significant contributor to mental wellness, a distinctive aspect observed within AgEcon PhD programs. In particular, our survey revealed that 46% of agricultural economics students reported feeling that their work provided a sense of usefulness always or most of the time, almost double the rate (26%) reported by PhD students in top economics programs (Bolotnyy et al., 2022). However, our findings also revealed concerning trends. Loneliness emerged as the leading factor contributing to the poor mental health of our respondents, with scores averaging 30% higher than those reported by top economics students (Bolotnyy et al., 2022), irrespective of their university location. A considerable proportion of respondents reported a poor work-life balance: 61% reported working 6-7 days a week, 76% expressed concerns about work during nonworking hours, and 43% indicated that work had interfered with their time spent with family or significant others.

# 2 Methodology

## 2.1 Sample selection

We launched our survey in late September 2023 and the data collection ended in early November to safeguard our results from the influence of the holiday season (Peretti, 1980; Velamoor

et al., 1999; Bergen and Hawton, 2007). We implemented a multifaceted outreach strategy to ensure a representative survey response. We contacted the chairs of the 33 departments that offer PhD programs and partnered with the Graduate Student Organization (GSO) of the Agricultural & Applied Economics Association to distribute our sign-up form[1]. The students who expressed interest were then provided a link to the main mental health survey in a follow-up survey. To boost the response rate, we also extended individual invitations using publicly available information from university websites. A $10 Starbucks card is provided as an incentive for completing the survey.

In total, we gathered 487 responses from 1,026 PhD students across all 33 programs. After excluding 4 incomplete responses[2], as well as 31 responses that failed the attention check criterion (6.4%)[3], we were left with 452 complete responses. This yields an estimated response rate of 44.1%. Figure 1 plots the number of responses by geographic regions[4].

Table A1 summarizes the received responses. The majority of participants (89%) fall within the 23-34 age range, while 11% are 35 years old and above. Gender distribution is fairly balanced, with slightly more female respondents (52%). Regarding race, 63% identified as Asian, 25% as White, 7% as African American, and 5% as Hispanic. Additionally, 6% reported having a disability, 10% identified as LGBTQ+, and 27% were first-generation college students. In comparison to the population of agricultural economics PhD students, our respondents are more likely to be White and less likely to be in the 5th year or beyond in their PhD program. Section 3.2 further discussed adjustments made to the reported prevalence of mental health conditions, based on various assumptions about the student population.

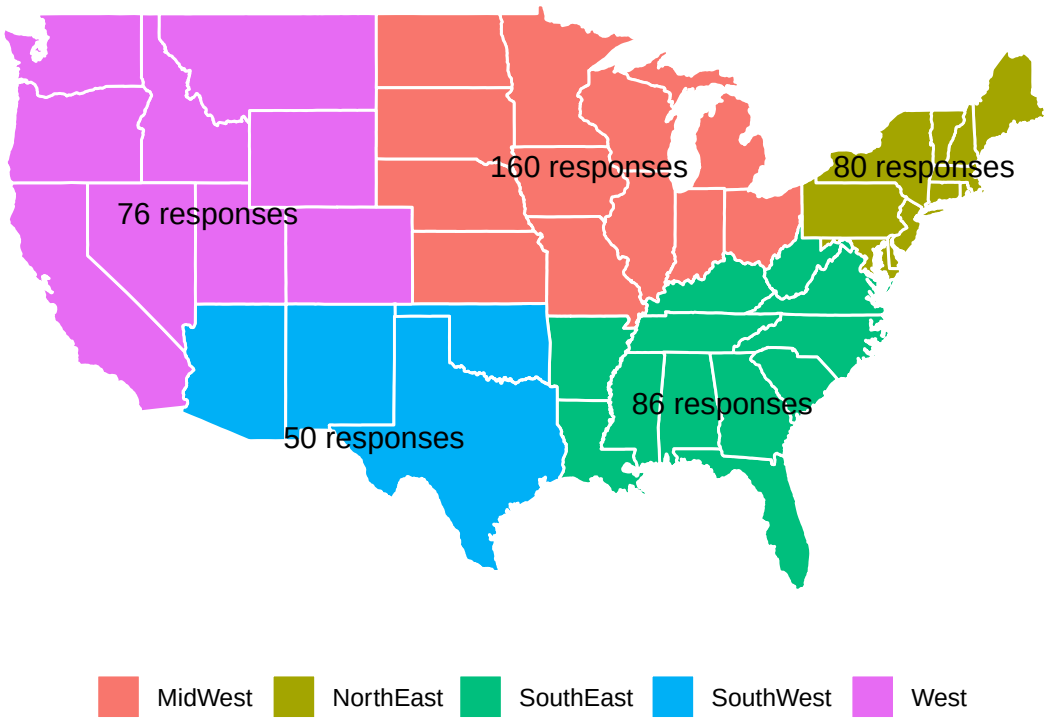
[1]Implementing an initial sign-up step allowed us to establish a screening process. This is important for data security. Detailed signup questions are shown in Appendix D.

[2]These responses lacked sufficient demographic information and were deemed ineligible for further analysis, though they exhibited even higher reported levels of mental illness compared to completed responses.

[3]We included an attention check question between self-perception and PhD program experience. 31 responses failed to adhere to our instructions and were thus excluded from further analysis.

[4]Responses by each university are available upon request.

Figure 1: Number of Responses by Geographic Region




*Notes:* This figure plots the number of responses by geographic regions. **Midwestern** universities include Iowa State University, University of Illinois Urbana-Champaign, Kansas State University, University of Missouri, Michigan State University, Ohio State University, Purdue University, University of Minnesota St. Paul, University of Nebraska-Lincoln and University of Wisconsin-Madison. **Northeastern** universities include Cornell University, Pennsylvania State University, University of Connecticut, University of Massachusetts, and University of Maryland. **Southeastern** universities include Auburn University, Louisiana State University, North Carolina State University, University of Florida, University of Georgia, University of Kentucky, Virginia Tech University, and West Virginia University. **Southwestern** universities include Arizona State University, Oklahoma State University, Texas A&M University, and Texas Tech University. **Western** universities include the University of California-Berkeley, Colorado State University, Oregon State University, University of California-Davis, Utah State University, and Washington State University. First-generation college means the PhD student whose parents have never attended college or above.

## 2.2 Measurement of Mental Health Status

We implemented the widely-recognized nine-item patient health questionnaire (PHQ-9), a clinically validated tool to assess depression (Kroenke et al., 2001). The PHQ-9 consists of nine questions about various aspects of mood, sleep, interest, guilt, energy, concentration, attention, psychomotor slowing, and suicidal ideation. Respondents are asked to indicate the frequency with which they have experienced each symptom, with four options: "not at all"

(0 points), "several days" (1 point), "more than half the days" (2 points), and "nearly every day" (3 points). The final score is obtained by summing the responses to all nine questions with a maximum of 27 points. In clinical practice, a PHQ-9 score exceeding 10 is indicative of depression[5]. Notably, item 9 of the PHQ-9 asks "Over the past two weeks, how frequently have you experienced distressing thoughts about being better off dead or harming yourself in any way?" Respondents can choose from the following response options: "not at all", "several days", "more than half the days", or "nearly every day". In clinical practice, any response other than "not at all" indicates the presence of suicidal ideation (Rossom et al., 2017).

We used the seven-item generalized anxiety disorder questionnaire (GAD-7) to detect anxiety (Spitzer et al., 2006). The seven questions of the GAD-7 measure the severity of various signs of anxiety, including nervousness, inability to stop worrying, excessive worry, restlessness, difficulty relaxing, easy irritation, and fear of something awful happening. The GAD-7 asks about the frequency of each symptom with options ranging from "not at all" (0 points) to "nearly every day" (3 points), similar with PhQ-9. In clinical practice, a GAD-7 score exceeding 10, out of a maximum of 21, is indicative of anxiety[6].

## 2.3 Empirical model

We employ a multivariate logistic regression model, represented by the equation:

$$ln(\frac{p(X)}{1-p(X)}) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_p X_p, \tag{1}$$

where $X$ is the whole set of covariates $X_1$, $X_2$,..., $X_p$, representing university fixed effects, individual student characteristics, and factors associated with mental health status, and $p(X)$ represent the prevalence of a mental health outcome that depends on $X$. The coefficients of

[5]Individuals are considered to have minimal depression if their score falls 0-4, mild depression if 5-9, moderate depression if 10-14, moderately severe if 15-19, and severe if it exceeds 20.

[6]Individuals are considered to have minimal anxiety if their score falls 0-4, mild anxiety if 5-9, moderate anxiety if 10-14, and severe anxiety if 15 and beyond.

interest, $\beta_1$ to $\beta_p$, are easier to interpret when transforming the left-hand-side of Equation (1) into an odds ratio:

$$OddsRatio = \frac{\frac{p(X_1,X_2,..X_i+1,..X_p)}{1-p(X_1,X_2,..X_i+1,..X_p)}}{\frac{p(X)}{1-p(X)}} = e^{\beta_i}. \tag{2}$$

where $i$ is any number between 1 and $p$, and $e^{\beta_i}$ represents the change in the odds ratio of the prevalence of a mental condition associated with a 1-unit change in $X_i$.

# 3 Results

## 3.1 Prevalence of mental health issues

In our sample, the average PHQ-9 score is 7.48, with 29.9% of respondents clinically indicative of depression. Comparatively, according to CDC, 7.7% of Americans aged 20–39 experienced moderate to severe depression between 2013 and 2016. The COVID-19 pandemic exacerbated this situation, with 21.5% of American adults aged 18–24 and 19.9% aged 25–44 reporting diagnoses of depression (Lee, 2023). A pertinent benchmark by Bolotnyy et al. (2022) focused on the mental health of PhD students from the top eight US economics departments, reporting that 17.7% experienced symptoms of depression before COVID. Their subsequent study in the European Union during COVID revealed that 27.3% of surveyed PhD students experienced depression (Macchi et al., 2023). Although our survey was conducted after the official end of the COVID-19 pandemic, the prevalence of mental illness among our target population surpasses the results of all previous benchmarks.

The average GAD-7 score in our sample is 6.99 and 27.9% of respondents reported experiencing moderate to severe anxiety[7], which is clinically indicative of anxiety. The 2019 CDC report revealed that 7.4% and 6.4% of Americans aged 18–29 and 30–44 exhibited symptoms of anxiety. Previous studies on economics PhD students found that before the

[7]Specifically, 72.1% of respondents reported minimal or mild anxiety, 16.6% reported moderate anxiety, and the remaining 11.3% reported severe anxiety.

COVID-19 pandemic, 17.6% of PhD students in the top eight US economics departments reported experiencing anxiety (Bolotnyy et al., 2022); during COVID, 25.9% of students in 14 economics departments in the European Union reported anxiety symptoms (Macchi et al., 2023). Once again, the prevalence of anxiety among the participants in our study surpasses these established benchmarks.

Table 1: Prevalence of Mental Health Issues (in %)

| | |
|---|---|
| **Panel A: Depression** | |
| AgEcon PhD students in our study | **29.9** |
| Benchmark 1: PhD students in 14 Econ departments in EU (post-COVID) | 27.3 |
| Benchmark 2: PhD students in 8 top Econ departments in USA (pre-COVID) | 17.7 |
| Benchmark 3: meta-analysis from 16 global studies on PhD (pre-COVID) | 24.0 |
| **Panel B: Anxiety** | |
| AgEcon PhD students in our study | **27.9** |
| Benchmark 1: PhD students in 14 Econ departments in EU (post-COVID) | 25.9 |
| Benchmark 2: PhD students in 8 top Econ departments in USA(pre-COVID) | 17.6 |
| Benchmark 3: meta-analysis from 16 global studies on PhD (pre-COVID) | 17.0 |
| **Panel C: Suicidal ideation** | |
| AgEcon PhD students in our study | **14.4** |
| Benchmark 1: PhD students in 14 Econ departments in EU (post-COVID) | 17.3 |
| Benchmark 2: PhD students in 8 top Econ departments in USA (pre-COVID) | 11.3 |
| **Panel D: Three mental conditions in combination** | |
| Either of the three illnesses, AgEcon PhD students in our study | **39.4** |
| All of the three illnesses, AgEcon PhD students in our study | **8.8** |
| **Panel E: Diagnosis of mental conditions** | |
| Before PhD, AgEcon PhD students in our study | **14.8** |
| During PhD, AgEcon PhD students in our study | **13.3** |
| **Panel F: Treatment** | |
| AgEcon PhD students in our study | **19.7** |
| **Panel G: Untreated among those experiencing depression or anxiety** | |
| AgEcon PhD students in our study | **72.0** |
| Benchmark 1: PhD students in 14 Econ departments in EU (post-COVID) | 80.8 |
| Benchmark 2: PhD students in 8 top Econ departments in USA(pre-COVID) | 74.8 |
| **Panel H: Unsure how to seek help among those experiencing depression or anxiety** | |
| AgEcon PhD students in our study | **14.0** |

*Notes:* The table summarizes the percentage of agricultural economics PhD students who score about critical thresholds, compared to several benchmarks using the same set of measurements. Benchmark 1 is from a working paper by (Macchi et al., 2023) studying the mental health of PhD students across 14 economics departments in Europe. Benchmark 2 is from Bolotnyy et al. (2022) studying the mental health of PhD students in the top eight US economics departments. Benchmark 3 (Satinsky et al., 2021) is from a meta-analysis based on 16 published papers on a global scale. Depression and Anxiety show those scoring 10 or higher on the PHQ-9 and GAD-7. Suicidal ideation refers to those reporting contemplating suicide or self-harm on at least several days in the last two weeks, as captured by item 9 from PHQ-9.

Among our survey participants, 14.4% indicated a response other than "not at all" when asked about the frequency of distressing thoughts about being better off dead or harming themselves, suggesting signs of suicidal ideation. This percentage exceeds the 11.3% observed among top economics PhD students in the United States during the COVID pandemic (Bolotnyy et al., 2022), but is lower than the 17.3% reported among European economics PhD students during the pandemic (Macchi et al., 2023). Our findings indicate that 39.4% of respondents in our study experienced at least one of the three mental health conditions, and 8.8% experienced all three conditions.

Apart from the three mental health conditions examined, our survey revealed that 14.8% of the respondents had received a mental health diagnosis before enrolling in the program, with 13.3% reporting a diagnosis post-enrollment. Although 19.7% of respondents mentioned they were currently undergoing treatment, among those who reported experiencing symptoms of depression or anxiety in our study, 72% were not receiving professional treatment, and 14% expressed uncertainty about how to access mental health support.

## 3.2 Non-response adjustment

Although our survey achieved responses from all 33 departments with an overall response rate of 44.1%, more than half of potential respondents opted not. To address potential response selection bias, we examined how survey participation might have influenced the prevalence of mental illness through various scenarios. Initially, we applied inverse response weighting, adjusting the prevalence of mental illness based on the response rate in each department. The resulting changes were minimal: depression decreased from 29.9% to 29.6%, anxiety dropped from 27.9% to 27.85%, and suicidal ideation increased from 14.4% to 15.4%. In the most optimistic scenario, assuming all non-respondents are mentally healthy, depression, anxiety, and suicidal ideation persist at rates of 13.2%, 12.3%, and 6%, respectively. Conversely, in the most pessimistic scenario, assuming all non-respondents are mentally distressed, rates soar to 56.1% for depression, 56.1% for anxiety, and 56.0% for suicidal ideation. Detailed

results from different scenarios are summarized in Table 2.

Table 2: Prevalence of Mental Health Issues - Alternative Estimates

| | Observed | Response-Rate Adjusted | Lower Bound | Upper Bound |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Depression | 29.6% | 29.9% | 13.2% | 56.1% |
| Anxiety | 27.9% | 27.85% | 12.3% | 56.1% |
| Suicidal ideation | 14.4% | 15.4% | 6% | 56% |
| Any of the three | 39.4% | 39.2% | 17.3% | 56.1% |

*Notes:* The table summarizes how the prevalence of mental health issues changes with alternative weights. Column (1) presents our observations from respondents, as reported in the main analysis. Column (2) reports estimates adjusted based on response rate, assuming that unresponsive students exhibit a similar prevalence as responsive students. Column (3) details the lower-bound estimates, assuming that all unresponsive students are below the critical threshold, while Column (4) outlines the upper-bound estimates, assuming that all unresponsive students are above the critical threshold. Depression and Anxiety show those scoring 10 or higher on the PHQ-9 and GAD-7. Suicidal ideation refers to those reporting contemplating suicide or self-harm on at least several days in the last two weeks, as captured by item 9 from PHQ-9.

## 3.3 Heterogeneity in mental health

### 3.3.1 Department ranking

Utilizing logistic regression analysis outlined in Equation (1), we analyze the association between department academic ranking and the mental health outcome of PhD students while controlling for individual student demographics and various departmental characteristics that could potentially influence the mental health of PhD students, including faculty size, female faculty size, the geographical region, and the level of ruralness of the department's location. To assess the academic ranking of each department, we rely on the 2023 IDEAS/RePEc ranking (IDEAS/RePEc, 2023). The rankings are categorized into four groups: 1–10 (156 responses), 11–20 (140 responses), 21–30 (69 responses), and 30+ (87 responses).

Contrary to the conventional belief that PhD students from top-ranked academic departments may face elevated stress levels and subsequently poorer mental health, our findings indicate that respondents from lower-ranking departments exhibited similar or even higher prevalence as plotted in the left panel of Figure 2. In particular, responses from programs

ranked 30 and below show a significantly higher prevalence of depression. The odds for lower-ranking students are 156% higher than the odds for students from the top 10 programs. Further details from the regression analysis can be found in Table A2.

### 3.3.2 By student demographics

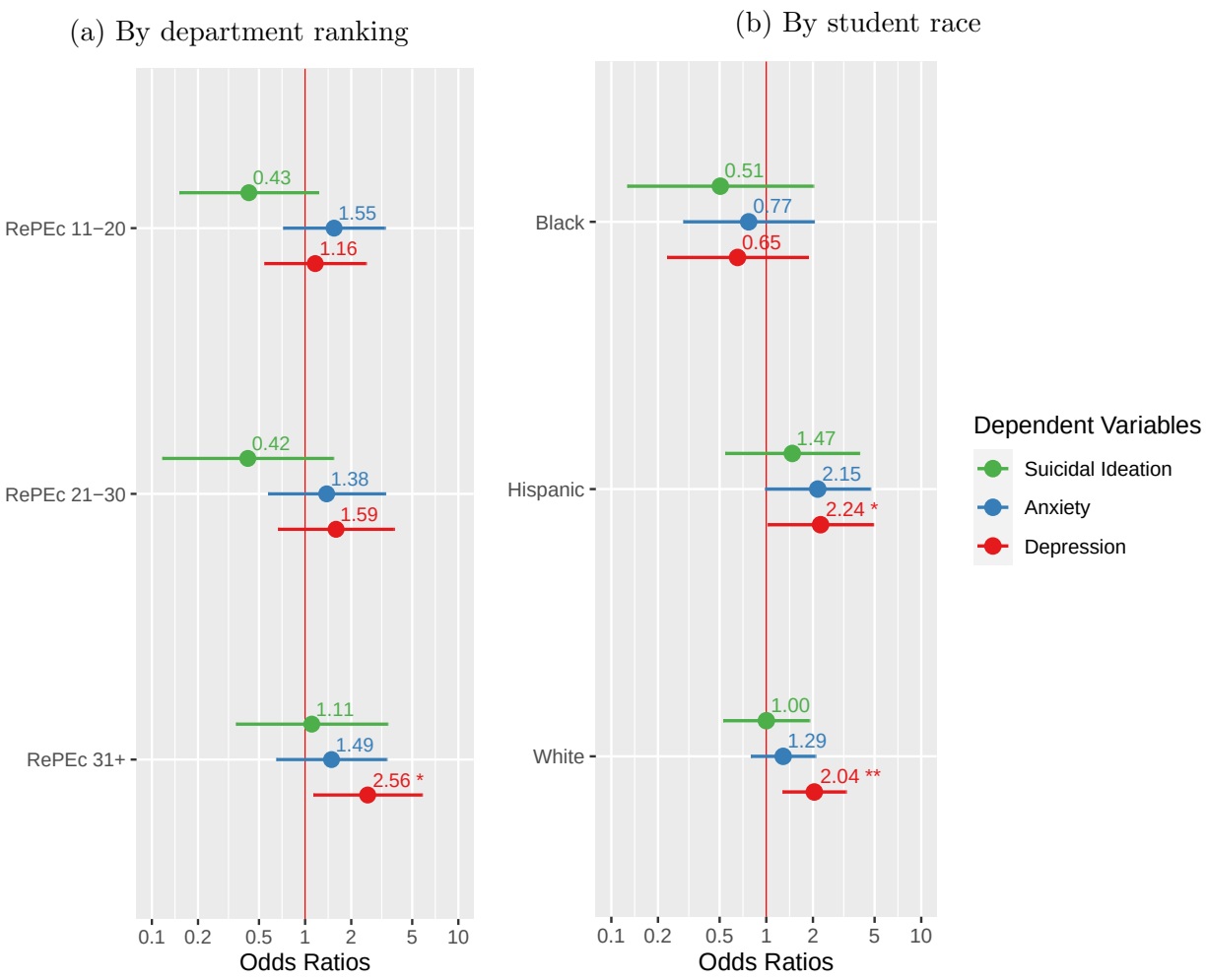
We conducted a thorough examination of the correlation between various student demographics and mental health, considering factors such as gender, sexuality, race, disability status, parental status, living arrangements, relationship status, first-generation college status, and year in the PhD program. To mitigate potential confounding factors at the university level, we included university fixed effects as covariates in the logistic regression models described in Equation (1). The detailed regression results are presented in Table A3. Specifically, our findings reveal higher levels of suicidal ideation for respondents in their fifth year and beyond, and increased anxiety for those with disabilities compared to those without. No notable differences in mental health were observed across gender or sexuality.

However, a noteworthy racial disparity in mental health did emerge. As depicted in the right panel of Figure 2, Hispanic and White students experience elevated levels of anxiety, suicidal ideation, and significantly higher rates of depression than Asians, while Black students exhibit comparable levels with Asians. Specifically, concerning depression, Hispanic students have odds 124% higher, and White students have odds 104% higher than Asian students. Despite the elevated mental health conditions observed among Hispanic and White students, we also observe their proactive engagement in diagnosis and treatment. Conversely, Asians and Blacks appear to experience better mental health but are less likely to seek treatment or lack information on how to do so. Notably, both before and after entering PhD programs, a significantly higher proportion of Hispanic and White students received professional diagnoses[8]. 30% of Hispanic and 39% of White respondents were re-

[8]Before enrolling in the PhD program, 17% of Hispanic and 29% of White students had received mental health diagnoses, compared to 10% of Asian and 4% of Black students. After enrollment, 39% of White and 30% of Hispanic students received diagnoses, in contrast to 8% of Asian and 4% of Black students.

ceiving professional treatment for mental health issues, compared to 12% of Asian and 8% of Black students. Further highlighting this discrepancy, among those experiencing depression or anxiety in our survey, a significantly higher percentage of White (47%) and Hispanic (46%) students received treatment compared to Asian (18%) and Black (0%) students.

Figure 2: Heterogeneity in Odds of Mental Health Issues




*Notes:* This figure illustrates the odds of depression (in red), anxiety (in blue), and suicidal ideation (in green) based on department academic ranking (left panel) and student race (right panel). Dots represent estimated coefficients, horizontal lines indicate the 90% confidence interval. The red vertical line positioned at 1 is the odds of the base reference group, which refers to responses from departments with RePEc rankings 1-10 for the left panel, and responses self-identified as Asians for the right panel. In the left panel, we apply the Logit model from Equation (1) and control for individual student demographics and department characteristics (faculty size, female faculty size, geographic location, and ruralness of the university). In the right panel, we control for university fixed effects and student demographics (excluding race), such as PhD program year, disability status, gender, sexuality, marital and child status, living arrangements, and first-generation college student status. See detailed regression results for the left panel in Table A2 and right panel in Table A3. Significance levels are denoted as follows: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

## 3.4 Key associated factors

We examine key factors associated with student's mental well-being, including academic performance, loneliness, perceived meaningfulness of work, work-life balance, adviser satisfaction, and department atmosphere. Specifically, we employ the model outlined in Equation (1), introducing one key factor at a time, while accounting for university fixed effects and individual student characteristics. To enable a straightforward comparison of the impacts of these factors, we standardize each factor and present our results in units of 1 standard deviation. The resulting changes in odds ratios for experiencing each of the three mental health outcomes are summarized in Table 3, with the factors ranked according to the magnitude of their associations.

Table 3: Change in Odds of Experiencing Mental Conditions by Associated Factors (Logit)

| | Depression (1) | Anxiety (2) | Suicidal Ideation (3) |
|---|---|---|---|
| **Panel A: Aggravators** | | | |
| **Loneliness** | | | |
| Loneliness(+1SD) | 2.44*** | 2.01*** | 2.56*** |
| **Work-life Balance** | | | |
| Worried about work when not working (+1SD) | 1.14*** | 0.95*** | 0.78** |
| Too tired for activities in private life (+1SD) | 0.71** | 1.05*** | 1.07*** |
| **Panel B: Mitigators** | | | |
| **Academic Performance** | | | |
| Perceived success in research (+1SD) | -0.61*** | -0.42*** | -0.51** |
| Perceived success in coursework (+1SD) | -0.31** | -0.13 | -0.15 |
| **Meaningfulness of Work** | | | |
| Satisfaction of work well done (+1SD) | -0.52*** | -0.45*** | -0.39 |
| Opportunities to fully use your talents (+1SD) | -0.35** | -0.32* | -0.06 |
| **Adviser Satisfaction** | | | |
| Adviser satisfaction (+1SD) | -0.26** | -0.10 | -0.24* |
| **Social Events** | | | |
| Frequency of happy hour with faculty (+1SD) | -0.20 | -0.41*** | -0.08 |

*Notes:* The table summarizes how the odds ratio of mental illness changes with a 1-standard deviation increase in each factor using a logit specification. The dependent variables are dummy variables indicating whether a student experiences depression or not in column (1), anxiety in column (2), and suicidal ideation in column (3). In all estimations, we control for student demographics, as outlined in Table A1, and university fixed effects. Significance levels are denoted as follows: *p<0.1; **p<0.05; ***p<0.01.

**Loneliness:** Our respondents consistently reported heightened levels of loneliness, which emerged as a primary factor contributing to the observed poor mental health among surveyed students. Perceived loneliness was measured using the eight-item short form of the UCLA Loneliness Scale (ULS-8), yielding scores ranging from 8 to 32, with an average score of 17.69 in our study. Compared to loneliness levels reported in top economics departments by Bolotnyy et al. (2022)[9], our respondents consistently scored at least 30% higher in loneliness[10], regardless of the ruralness of the university location. The significantly positive correlation between loneliness and mental illness was confirmed using Equation (1), controlling for student demographics and university fixed effects. For every 1-standard-deviation increase in loneliness, the odds ratio increased by 244% for depression, 201% for anxiety, and 256% for suicidal ideation.

**Poor work-life balance:** Through the survey, we explored students' work-life balance across three dimensions: weekly working days, daily leisure hours, and responses to work-life balance questions adapted from the RAND American Working Condition Survey. Our findings reveal that 61% reported working 6-7 days a week, with 54% having less than 3 hours per day for leisure activities. The challenges of poor work-life balance are further underscored by responses to the RAND American Working Condition Survey questions: 76% reported worrying about work when not working, 49% felt too fatigued for personal activities, 45% felt too tired for household chores, and 34% faced financial difficulties. Notably, 43% reported that work hindered their time with family or significant others, compared to only 1.2% for PhD students in the top eight U.S. economics programs (Bolotnyy et al., 2022). Furthermore, our regression analysis, incorporating these work-life balance factors, student demographics, and university fixed effects (Table 3), reveals that higher levels of depression, anxiety, and

[9]For comparison purposes, we recalculated our responses using the ULS-3 version, generating scores between 3 and 12 based on questions 1, 4, and 5 from ULS-8.

[10]We assessed ruralness using the 2013 Rural-Urban Continuum Codes (USDA, 2013), categorizing areas based on population size. The average loneliness scores increased with the rural code, ranging from 6.89 in code 1 (metropolitan areas with a population of 1 million or more) to 7.17 in code 4 (non-metropolitan areas with populations fewer than 20,000). These scores are at least 30% higher than the 5.2 reported by students in top economics departments.

suicidal ideation are associated with students who worry about work when not working and those who feel too fatigued for personal activities.

**Academic performance:** The mental well-being of college students is notably influenced by academic success (Grøtan et al., 2019). We asked about PhD students' perceived success in coursework, research, and teaching, utilizing a 5-point Likert scale. Our findings reveal that higher perceived success in both research and coursework correlates with lower levels of mental health issues, and the association is more pronounced for perceived success in research[11] than in coursework[12].

**Meaningfulness of work:** We found that 70.6% of our respondents reported their work offers some sources of meaning always or most of the time. This percentage surpasses the 60% reported for working Americans aged 25 to 35 with a college degree (Maestas et al., 2015) and exceeds the number reported for PhD students in top economics programs (Bolotnyy et al., 2022). Specifically, 43% of our students reported their work provides opportunities to make a positive impact on society always or most of the time, compared to only 20% for PhD students in top economics programs. Similarly, 46% of our students reported feeling that their work was useful always or most of the time, whereas only 26% of PhD students in top economics programs reported the same. Interestingly, the perceived meaningfulness of work among our respondents does not vary much by academic ranking. Further regression analysis using Equation (1) has uncovered that opportunities to fully utilize students' talents or deriving satisfaction from a job well done are two key aspects negatively correlated with students' mental illness.

**Adviser Satisfaction:** Our results indicate a positive student-advisor relationship in general[13], with a high level of satisfaction (averaging 4.2 out of 5) and minimal conflicts (95% reported no or minimal conflicts) with their advisors. Importantly, students highly value

[11]With each standard deviation increase in perceived success in research, the odds ratio decreases by 61% for depression, 42% for anxiety, and 51% for suicidal ideation.

[12]A one standard deviation increase in perceived success in coursework leads to a 31% decrease in the odds ratio for depression.

[13]Out of the 452 responses analyzed, 401 (88.7%) students reported having a main advisor.

their advisor's opinion, as evidenced by a significant increase in their perceived meaningfulness of work when it aligns with their advisor's views, comparable to the satisfaction derived from having their work published. However, despite this positive relationship, students express lower confidence in meeting their advisor's requirements compared to their own assessments. When asked to evaluate their success in coursework, research, and teaching, students reported the highest levels of self-perception, lower when compared to their peers, and the lowest when compared to their advisors' expectations.

**Department Atmosphere:** Concerns persist regarding the department's dedication to addressing students' mental health challenges. Our survey revealed that 21.2% of respondents "disagreed" or "strongly disagreed" with the department's supportiveness toward mental health, and 27.2% "disagreed" or "strongly disagreed" that students feel encouraged to discuss potential mental health challenges openly, suggesting the existence of mental health stigma. We found no significant correlation between professional events and students' mental well-being. However, students who reported a higher frequency of happy hours with faculty members in their departments experienced a notable and significant decrease in anxiety levels.

# 4 Conclusion and Recommendations

We conducted a comprehensive study of mental health among PhD students across all PhD programs in agricultural economics in the United States. Our findings reveal concerning information: 39.4% of respondents reported symptoms of at least one of these three mental health conditions (i.e., depression, anxiety, and suicidal ideation). The prevalence of depression and anxiety observed among our surveyed PhD students exceeds that documented in both the general population and PhD students in top economics departments in the US before the COVID-19 pandemic and PhD students of economics in the European Union during the COVID-19 pandemic. On the positive side, our students reported perceived meaningful-

ness of their work surpassing what is reported in the general population and nearly double that reported by students from top economics departments. However, students also reported markedly poor work-life balance. Moreover, these severe mental health conditions are not exclusive to top programs, and there are nuanced racial disparities associated with mental well-being and treatment status.

We propose the following recommendations: Firstly, regardless of academic rankings, departments should heighten awareness of mental health issues among graduate students, recognizing that these challenges are not exclusive to top-ranking programs. Additionally, special attention may be needed for the mental health of Hispanic and White students compared to other racial groups. Secondly, departments should advocate for increased mental health resources, considering that 72% of respondents with symptoms of depression or anxiety remain untreated, and 14% are unsure how to seek help. This is particularly crucial for Asian and Black students, who appear less likely to seek treatment. Thirdly, there is an urgent need to address the work-life balance issues identified in our study. One potential approach is for departments to foster more frequent informal social interactions among PhD students and faculty members, such as organizing happy hours. Unlike seminars and professional development programs, these events have shown a positive correlation with student mental health.

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# Appendix A. Additional Tables

Table A1: Number of Responses by Demographics

| | # of responses | % of responses |
|---|---|---|
| **Panel A: Year in PhD program** | | |
| 1st | 73 | 16% |
| 2nd | 82 | 18% |
| 3rd | 103 | 23% |
| 4th | 75 | 17% |
| 5th+ | 119 | 26% |
| **Panel B: Age** | | |
| Younger than 22 | 1 | 0% |
| 23-27 | 155 | 34% |
| 28-34 | 247 | 55% |
| 35 or older | 49 | 11% |
| **Panel C: Race** | | |
| Asian or Asian American | 284 | 63% |
| White | 113 | 25% |
| Hispanic or Latino | 30 | 7% |
| Black or African American | 24 | 5% |
| Native Hawaiian or Other Pacific Islander | 1 | 0% |
| **Panel D: Gender** | | |
| Woman | 236 | 52% |
| Man | 212 | 47% |
| Prefer not to say | 4 | 1% |
| **Panel E: Sexuality** | | |
| Heterosexual | 385 | 85% |
| LGBTQ+ | 47 | 10% |
| Prefer not to say | 20 | 4% |
| **Panel F: Disability** | | |
| No | 415 | 92% |
| Yes | 26 | 6% |
| Prefer not to say | 11 | 2% |
| **Panel G: Marital Status** | | |
| Single | 149 | 33% |
| Married | 147 | 33% |
| Long-term/Committed | 109 | 24% |
| Dating | 33 | 7% |
| Casual | 10 | 2% |
| Divorced | 4 | 1% |
| **Panel H: Having children** | | |
| No | 396 | 88% |
| Yes | 56 | 12% |
| **Panel I: Live Alone** | | |
| No | 296 | 65% |
| Yes | 156 | 35% |
| **Panel J: First-generation College** | | |
| No | 330 | 73% |
| Yes | 122 | 27% |
| Total | 452 | 100% |

*Notes:* The table summarizes the demographic characteristics of the students who participated in our survey.

Table A2: Mental Health Issues and Department Academic Ranking

| | Depression Mean(SE) | Anxiety Mean(SE) | Suicidal Ideation Mean(SE) |
|---|---|---|---|
| RePEc ranking 11-20 | 0.15(0.46) | 0.44(0.46) | -0.85(0.63) |
| RePEc ranking 21-30 | 0.46(0.53) | 0.32(0.53) | -0.86(0.78) |
| RePEc ranking 30+ | 0.94*(0.50) | 0.40(0.50) | 0.10(0.69) |
| University region | Y | Y | Y |
| Ruralness of the university location | Y | Y | Y |
| Number of faculty | Y | Y | Y |
| Number of female faculty | Y | Y | Y |
| All student demographics | Y | Y | Y |
| Observations | 452 | 452 | 452 |

*Note:* The table summarizes the variations in the prevalence of depression, anxiety, and suicidal ideation across different department academic rankings. The reference group excluded from the regression analysis comprises responses from top 10 programs based on the RePEc ranking for the year 2023. The analysis is controlled for individual student demographics and various departmental characteristics that may impact the mental health of PhD students, including faculty size, female faculty size, the geographical region, and the degree of ruralness (measured using the 2013 Rural-Urban Continuum Codes) of the department's location. *p<0.1; **p<0.05; ***p<0.01.

Table A3: Mental Health Issues and Student Demographics

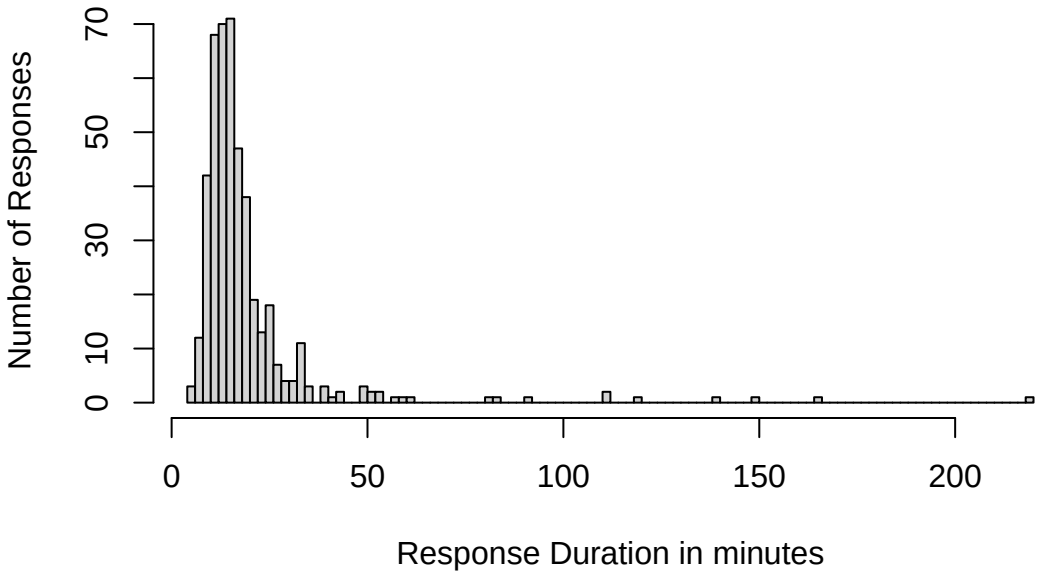
| | Depression Mean(SE) | Anxiety Mean(SE) | Suicidal Ideation Mean(SE) |
|---|---|---|---|
| Year in PhD program | | | |
| 2nd | -0.12(0.42) | -0.17(0.43) | 1.13*(0.59) |
| 3rd | 0.16(0.38) | 0.17(0.39) | 0.22(0.62) |
| 4th | 0.12(0.42) | -0.02(0.43) | 0.85(0.60) |
| 5th+ | 0.35(0.39) | 0.35(0.39) | 1.27**(0.56) |
| Race | | | |
| Black or African American | -0.43(0.64) | -0.26(0.59) | -0.68(0.84) |
| Hispanic or Latino | 0.81*(0.48) | 0.76(0.48) | 0.39(0.61) |
| White | 0.71**(0.29) | 0.25(0.29) | 0.001(0.39) |
| Disability | | | |
| Yes | 0.68(0.48) | 1.34***(0.49) | 0.40(0.59) |
| Prefer not to say | 1.26*(0.76) | 0.78(0.75) | 0.13(1.02) |
| Other Student Characteristics | Y | Y | Y |
| University Fixed Effects | Y | Y | Y |
| Observations | 451 | 451 | 451 |

*Note:* The table summarizes how the prevalence of mental illness changes with student demographics. For brevity, we report only statistically significant estimated coefficients associated with the student's year in the PhD program, race, and disability status. Across all estimations, we controlled for "Other Student Characteristics", including gender, sexuality, marital and child status, living arrangements, and first-generation college student status, together with university fixed effects. The number of observations decreased from 452 to 451 after excluding the sole student who identified as Native Hawaiian or another Pacific Islander due to statistical considerations. *p<0.1; **p<0.05; ***p<0.01.

# Appendix B. Response Duration

In this appendix section, we first plot the number of responses by response duration in minutes for completed responses passing the attention check, which are the sample we use for all our analysis. As shown in Figure A1, the response duration ranges from 5.4 to 219.63 minutes, with an average of 19.4 minutes. 84% of our responses fall within the 9–30 minute range, which is considered reasonable. To address concerns about response duration impacting mental illness prevalence, we divided responses into 10 equal bins based on duration, presenting depression and anxiety scores in box plots (see Figure A2). While attention is given to responses in the first bin (extra short duration, <9.87 mins) and the tenth bin (extra long duration, ≥29.6 mins), minimal variation was observed in both cases.

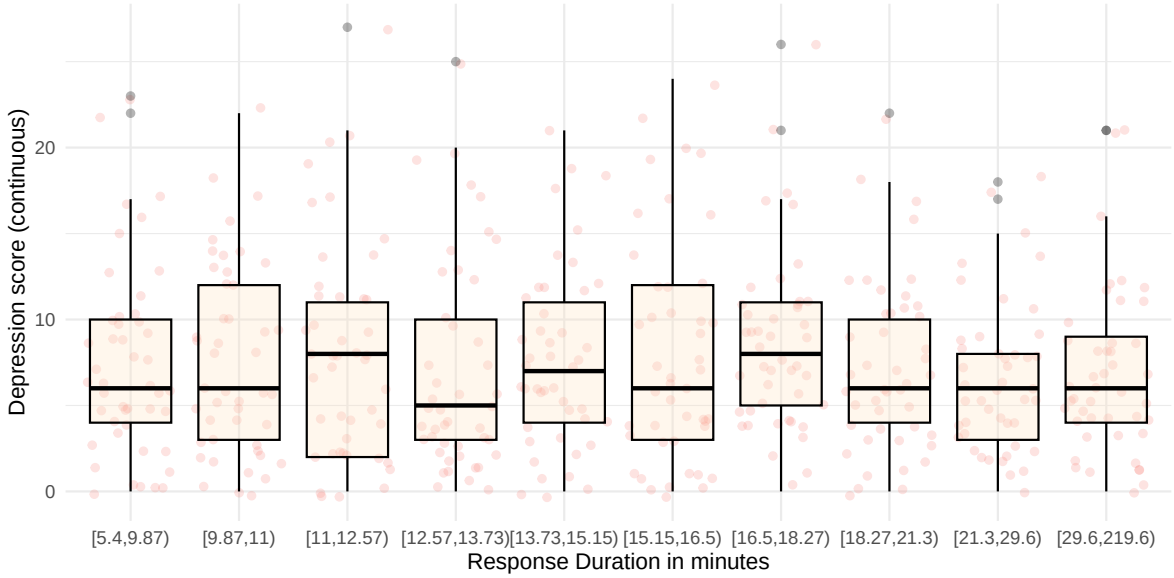
Figure A1: Number of responses by response duration



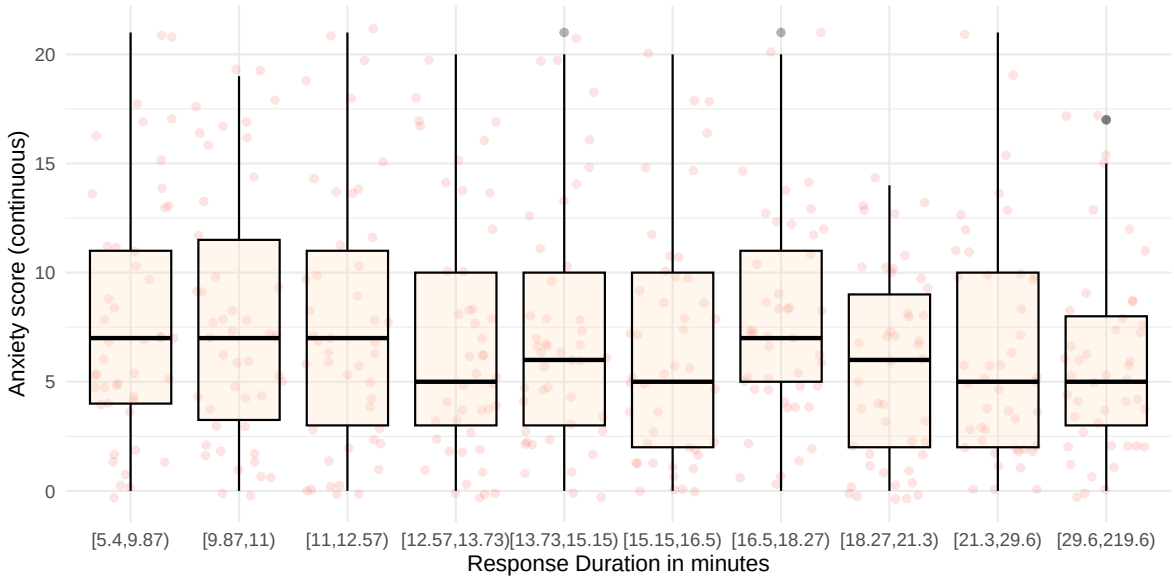

*Notes:* The figure plots the number of responses by response duration in minutes.

Figure A2: Depression and anxiety scores across response duration in each decile

(a) Depression




(b) Anxiety




*Notes:* The figure plots the variation in depression (PHQ-9) and anxiety (GAD-7) scores across response duration in minutes, presented in Panel (a) and (b), respectively. All responses are equally divided into ten bins. The pink dots represent the depression and anxiety scores of all responses in each bin, and the grey dots are outliers. Additionally, the box displays a 95% confidence interval, with the mean indicated by the horizontal black line.

# Appendix C. Contributing Factors to Racial Disparity

In the main paper, we documented a racial disparity in mental health. Here, we further investigated factors that can help elucidate the mental health disparity among racial groups. As shown in Table A4, we found that the primary factor contributing to a higher prevalence of mental illness among both White and Hispanic students, compared to Asian students, is the poor work-life balance, while loneliness is an additional key factor specifically for White students. Below are the detailed findings.

**Loneliness:** To investigate, we incorporated loneliness, students' race, and their interaction terms into a logistic regression model (Equation (1)). In Table A4, Column 1 recapitulates our findings from Table A3 for comparison, highlighting a higher prevalence of mental illness among White and Hispanic students compared to Asian students, our base group. The inclusion of the interaction term (column 3) changed the sign of the estimate for White students, indicating that those without feelings of loneliness exhibit even lower depression than Asian students. Additionally, the interaction term between loneliness and White race is significantly positive, suggesting that the prevalence of depression increases more for White students when feelings of loneliness increase relative to other racial groups.

**Poor work-life balance:** To efficiently report our regression results with interaction terms with student race, we computed an average work-life balance score based on the five work-issue questions from the RAND American Working Conditions Survey. This aggregated work-life balance score ranges from 1 to 5, with an average of 3.34 in our data. As shown in column (5) of Table A4, when the interaction between work-life imbalance and race is taken into account, the signs of both "Hispanic" and "White" students change from positive to negative, suggesting that Hispanic and White students without work-life imbalance might exhibit a lower prevalence of depression compared to Asians, our base group. Moreover, the significantly positive interaction terms between work-life imbalance and Hispanic and White indicates that work-life imbalance would intensify the prevalence of depression more among Hispanic and White students.

Table A4: Factors Associated with Racial Disparity in Depression (Logit)

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Black or African American | -0.43 | -0.32 | 2.99 | -0.76 | -3.65 |
| | (0.64) | (0.70) | (2.72) | (0.67) | (3.52) |
| Hispanic or Latino | 0.81* | 0.87* | 2.08 | 0.35 | -7.68* |
| | (0.48) | (0.53) | (1.97) | (0.52) | (4.26) |
| White | 0.71** | 1.14*** | -2.84* | 0.66** | -4.81*** |
| | (0.29) | (0.33) | (1.71) | (0.32) | (1.86) |
| Loneliness | | 0.24*** | 0.21*** | | |
| | | (0.03) | (0.04) | | |
| Loneliness×Black or African American | | | -0.17 | | |
| | | | (0.14) | | |
| Loneliness×Hispanic or Latino | | | -0.07 | | |
| | | | (0.10) | | |
| Loneliness×White | | | 0.22** | | |
| | | | (0.09) | | |
| Work-life imbalance | | | | 1.23*** | 0.85*** |
| | | | | (0.17) | (0.19) |
| Work-life imbalance×Black or African American | | | | | 0.77 |
| | | | | | (0.86) |
| Work-life imbalance×Hispanic or Latino | | | | | 2.12* |
| | | | | | (1.11) |
| Work-life imbalance×White | | | | | 1.52*** |
| | | | | | (0.50) |
| Student demographics | Y | Y | Y | Y | Y |
| University fixed effects | Y | Y | Y | Y | Y |
| Observations | 451 | 451 | 451 | 451 | 451 |

*Notes:* The table summarizes factors associated with racial disparity in depression, especially among White and Hispanic students. The dependent variable is a dummy variable indicating whether a student's depression (PHQ-9) score is above the threshold. The independent variables include the race of students, their feelings of loneliness measured using the 8-item UCLA loneliness scale, average scores of five questions from the RAND work issues, and their interactions with students' race. In addition to these independent variables, we also control for student demographics other than their race, and incorporate university fixed effects. The number of observations decreased from 452 to 451 after excluding the sole student who identified as Native Hawaiian or another Pacific Islander due to statistical considerations. Significance levels are denoted as follows: *p<0.1; **p<0.05; ***p<0.01.

# Appendix D. SIGN UP

## Sign-up Questions

Are you currently a Ph.D. student majoring in Agricultural Economics?

- ○ Yes, I am.
- ○ No, I am not.

---

What is your gender?

- ○ Male
- ○ Female
- ○ Other

---

Which of the following races best describes you?

- ○ White
- ○ Black or African American
- ○ American Indian or Alaska Native
- ○ Asian
- ○ Native Hawaiian or Pacific Islander
- ○ Other

---

Are you a U.S. citizen or permanent resident?

- ○ Yes
- ○ No

What year are you in your PhD program?

- ○ 1st
- ○ 2nd
- ○ 3rd
- ○ 4th
- ○ 5th
- ○ 6th+

---

Would you be interested in participating in a mental health survey aimed at gaining a deeper insight into the mental well-being of Ph.D. students from Agricultural Economics departments across the United States? (This study has received approval from the University of Florida under Protocol IRB202300858. Please click to access the Informed Consent.)

- ○ Yes, I am interested.
- ○ No, I am not interested.

---

To participate in the mental health survey, please provide your university email address below. **(Confidential)**

- ○ Your University Email _____
- ○ Confirm Your University Email _____

---

Would you like to receive a $10 Starbucks digital gift card once you complete the mental health survey?
If you would like to receive a $10 Starbucks digital gift card after completing the survey, please enter your name on the next page. This information will be kept confidential and collected for UF tax purposes. The gift card will be sent to you via email within 2 weeks of completion.

- ○ Yes, I would like to receive a gift card and provide the information.
- ○ No, I would not like to receive a gift card.

---

Please provide your name to receive a $10 Starbucks gift card after completing the survey. (**Confidential)**

- ○ First Name _____
- ○ Last Name _____

---

# Appendix E. MENTAL HEALTH SURVEY

**Research Participant Informed Consent**

Please read this carefully before you decide to participate in this research study. **Your participation is voluntary, and you can decline to participate, or withdraw consent at any time, with no consequences.**

**Study Title:** Mental well-being for PhD students: Evidence from Agricultural Economics Departments in the US

**Persons conducting the research:** Dr. Di Fang, who is an associate professor in Food and Resource Economics Department of University of Florida (difang@ufl.edu). Xi Zhang is a PhD candidate in Economics department of University of Florida (cathyzx@ufl.edu). This study was approved by University of Florida under Protocol IRB202300858.

**Purpose of the research study:** To gain a better understanding of the mental health status experienced by PhD students in Agricultural Economics departments across the United States.

**What you will be asked to do in the study**: In this study, you will be asked to provide responses to questions about your mental well-being, self-perception, PhD program experience, and personal background information.

**Time required**: This survey will take approximately 15 minutes to complete. Once you begin the survey, you will not be able to leave it and return to it at another time. So please complete it in one sitting. There is no "Back" button, so you cannot change responses once you proceed to the next page.

**Risks and benefits**: We cannot promise any benefits to you or others from your taking part in this research. However, possible benefits of participating in this research include an improved understanding of your own mental health and its connection to your life experiences; structural department-level and profession-level reforms that improve student quality of life; improved departmental culture around mental health; initiatives across graduate programs worldwide to improve mental health among students. If you choose to participate, answering questions related to your mental well-being and potentially distressing past experiences may have some psychological risk. If you become upset or feel any distress when you are responding to these questions, please call your university's mental health services. The National Suicide Prevention Lifeline is another resource that is available 24 hours a day at **988**.

**Confidentiality**: Study data will be collected and stored in a way that ensures participant confidentiality. No raw, individual response-level data will be disclosed to the public at any time. Access to the data will be strictly limited to the research team members. There will be no attempts made to identify or attribute specific individuals' responses within this study. Completed surveys will be identified only with random survey IDs. The list linking random survey IDs and your email addresses will be used for compensation and then destroyed.

**Compensation**: A $10 Starbucks card will be sent via the email provided on the sign-up survey for each participating and completed student after the survey is fully conducted.

Your payment for participation in this research study is handled through the University of Florida's Research Participant Payments (RPP) Program. Your information, which includes your email address, is protected: Access to the (RPP) Program site is limited to certain staff with the assigned security role. You will be randomly assigned a specific identification (ID) number in their system to protect your identity. If you have any problems regarding your payment, please contact the lead researcher, Dr. Di Fang, who can be reached at difang@ufl.edu.

**Withdrawal from the study**: You are free to withdraw your consent and stop participating in this study at any time without consequence. Additionally, you can decline to answer any question by closing your web browser.
If you wish to discuss the information above or any discomforts you may experience, please contact one of the research team members listed above. If you have any questions regarding your rights as a research subject, please contact the Institutional Review Board (IRB02) office (University of Florida; PO Box 100173; Gainesville, FL 32610; (352) 392-0433 or irb2@ufl.edu.)

Click here to download the PDF Informed Consent.

**Agreement:** If you wish to participate in the study, click the "I agree to participate" button to continue; if you do not consent to participate, click "I do not wish to participate" or just close this window.

- ○ I agree to participate
- ○ I do not wish to participate

Please enter the survey ID number provided in the e-mail:

_____

**Part 1: Mental Health**

At the present time, how would you rate your mental health?

- ○ Poor
- ○ Fair
- ○ Good
- ○ Very Good
- ○ Excellent

---

Over the last 2 weeks, how often have you been bothered by any of the following problems?

| | Not at all | Several days | More than half the days | Nearly every day |
|---|---|---|---|---|
| Little interest or pleasure in doing things | ○ | ○ | ○ | ○ |
| Feeling down, depressed, or hopeless | ○ | ○ | ○ | ○ |
| Trouble falling or staying asleep, or sleeping too much | ○ | ○ | ○ | ○ |
| Feeling tired or having little energy | ○ | ○ | ○ | ○ |
| Poor appetite or overeating | ○ | ○ | ○ | ○ |
| Feeling bad about yourself - or that you are a failure or have let yourself or your family down | ○ | ○ | ○ | ○ |
| Trouble concentrating on things, such as reading the newspaper or watching television | ○ | ○ | ○ | ○ |
| Moving or speaking so slowly that other people could have noticed. Or the opposite - being so fidgety or restless that you have been moving around a lot more than usual | ○ | ○ | ○ | ○ |
| Thoughts that you would be better off dead or hurting yourself | ○ | ○ | ○ | ○ |

Over the last 2 weeks, how often have you been bothered by any of the following problems?

| | Not at all | Several days | More than half the days | Nearly everyday |
|---|---|---|---|---|
| Feeling nervous, anxious or on edge | ○ | ○ | ○ | ○ |
| Not being able to stop or control worrying | ○ | ○ | ○ | ○ |
| Worrying too much about different things | ○ | ○ | ○ | ○ |
| Trouble relaxing | ○ | ○ | ○ | ○ |
| Being so restless that it is hard to sit still | ○ | ○ | ○ | ○ |
| Becoming easily annoyed or irritable | ○ | ○ | ○ | ○ |
| Feeling afraid as if something awful might happen | ○ | ○ | ○ | ○ |

Were you diagnosed with any mental health issue(s) by a mental health professional before starting the PhD program?

- ○ Yes
- ○ No

Have you been diagnosed with any mental health issue(s) by a mental health professional after you started the PhD program?

- ○ Yes
- ○ No

Are you currently receiving treatment for ...?

| | No | Yes |
|---|---|---|
| Depression | ○ | ○ |
| Anxiety | ○ | ○ |
| Any other mental health issue | ○ | ○ |

Would you know where to turn for help if issues with mental health?

- ○ Yes
- ○ No

Please rate the degree to which you agree or disagree with each statement.

| | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|
| I believe that my department is conducive to and supportive of mental health | ○ | ○ | ○ | ○ | ○ |
| Students are encouraged to speak up about potential mental health issues | ○ | ○ | ○ | ○ | ○ |

**Part 2: General feelings about yourself**

Please indicate how strongly you agree or disagree with each statement.

| | Strongly Disagree | Disagree | Agree | Strongly Agree |
|---|---|---|---|---|
| On the whole, I am satisfied with myself. | ○ | ○ | ○ | ○ |
| At times I think I am no good at all. | ○ | ○ | ○ | ○ |
| I feel that I have a number of good qualities. | ○ | ○ | ○ | ○ |
| I am able to do things as well as most other people. | ○ | ○ | ○ | ○ |
| I feel I do not have much to be proud of. | ○ | ○ | ○ | ○ |
| I certainly feel useless at times. | ○ | ○ | ○ | ○ |
| I feel that I am a person of worth, at least on an equal plane with others. | ○ | ○ | ○ | ○ |
| I wish I could have more respect for myself. | ○ | ○ | ○ | ○ |
| All in all, I am inclined to feel that I am a failure. | ○ | ○ | ○ | ○ |
| I take a positive attitude toward myself. | ○ | ○ | ○ | ○ |

Please think of how you compare to most people in the world - not just the people you know well, and indicate the degree to which the following statements apply to you.

| | Not like me at all | Not much like me | Somewhat like me | Mostly like me | Very much like me |
|---|---|---|---|---|---|
| New ideas and projects sometimes distract me from previous ones. | ○ | ○ | ○ | ○ | ○ |
| Setbacks don't discourage me. | ○ | ○ | ○ | ○ | ○ |
| I have been obsessed with a certain idea or project for a short time but later lost interest. | ○ | ○ | ○ | ○ | ○ |
| I am a hard worker. | ○ | ○ | ○ | ○ | ○ |
| I often set a goal but later choose to pursue a different one. | ○ | ○ | ○ | ○ | ○ |
| I have difficulty maintaining my focus on projects that take more than a few months to complete. | ○ | ○ | ○ | ○ | ○ |
| I finish whatever I begin. | ○ | ○ | ○ | ○ | ○ |
| I am diligent. | ○ | ○ | ○ | ○ | ○ |

Please indicate the degree to which the following statement applies to you.

| | Almost never | Rarely | Sometimes | Often | Always |
|---|---|---|---|---|---|
| I can tell when someone doesn't understand what I am saying. | ○ | ○ | ○ | ○ | ○ |
| I can detect the mood of others by looking at them as we converse. | ○ | ○ | ○ | ○ | ○ |
| I manage to express my ideas clearly. | ○ | ○ | ○ | ○ | ○ |
| I have difficulty putting my thoughts into words. | ○ | ○ | ○ | ○ | ○ |
| I feel free to politely voice my disagreement with someone in a position of authority. | ○ | ○ | ○ | ○ | ○ |
| I tend to clam up when dealing with someone I find intimidating. | ○ | ○ | ○ | ○ | ○ |

For each question, please tell us how often you feel that way.

| | Never | Rarely | Sometimes | Always |
|---|---|---|---|---|
| I lack companionship | ○ | ○ | ○ | ○ |
| There is no one I can turn to | ○ | ○ | ○ | ○ |
| I am an outgoing person | ○ | ○ | ○ | ○ |
| I feel left out | ○ | ○ | ○ | ○ |
| I feel isolated from others | ○ | ○ | ○ | ○ |
| I can find companionship when I want it | ○ | ○ | ○ | ○ |
| I am unhappy being so withdrawn | ○ | ○ | ○ | ○ |
| People are around me but not with me | ○ | ○ | ○ | ○ |

When you have a problem or worry, how often do you let someone in your personal life know about it?

- Never
- Sometimes
- Most of the time
- Always

---

If you let someone know about it, who will you talk to?

- Choose all that apply.
- Please drag the options and drop them into the box.
- You can rank them in order, where 1st = the person you are most likely to talk to.

| Who you will talk to |
| --- |
| _____ Parents |
| _____ Spouse |
| _____ Random person online |
| _____ Online friends (e.g. Facebook or Instagram) |
| _____ Offline friends in the same PhD program |
| _____ Offline friends outside the PhD program |
| _____ Adviser |
| _____ Faculty or staff in the department other than your adviser |
| _____ Professional help |

---

Please select 'strongly agree' to show you are paying attention to this question.

- Strongly agree
- Agree
- Disagree
- Strongly disagree

---

**Part 3: PhD life**

What year are you in your program?

- ○ 1st
- ○ 2nd
- ○ 3rd
- ○ 4th
- ○ 5th
- ○ 6th+

---

Is your program considered STEM?

- ○ No
- ○ Yes
- ○ I don't know

---

Since the start of your PhD, how successful do you think you are ... ?

| | 1 Not at all | 2 | 3 | 4 | 5 Very | Not applied |
|---|---|---|---|---|---|---|
| In your courses | ○ | ○ | ○ | ○ | ○ | ○ |
| In your research process | ○ | ○ | ○ | ○ | ○ | ○ |
| In your teaching | ○ | ○ | ○ | ○ | ○ | ○ |

ince the start of your PhD, how successful do you think you are ... compared to your peers?

| | 1 Not at all | 2 | 3 | 4 | 5 Very | Not applied |
|---|---|---|---|---|---|---|
| In your courses | ○ | ○ | ○ | ○ | ○ | ○ |
| In your research process | ○ | ○ | ○ | ○ | ○ | ○ |
| In your teaching | ○ | ○ | ○ | ○ | ○ | ○ |

Since the start of your PhD, how successful do you think you are ... compared to your main adviser's expectation?

| | 1 Not at all | 2 | 3 | 4 | 5 Very | Not applied |
|---|---|---|---|---|---|---|
| In your courses | ○ | ○ | ○ | ○ | ○ | ○ |
| In your research process | ○ | ○ | ○ | ○ | ○ | ○ |
| In your teaching | ○ | ○ | ○ | ○ | ○ | ○ |

What was your grade in the first-year Microeconomic Theory course?

- A
- A-
- B+
- B
- B- or lower
- Haven't taken it yet

What was your grade in the first-year Econometrics course?

- A
- A-
- B+
- B
- B- or lower
- Haven't taken it yet

Please tell us how many ....

| | 0 | 1-2 | 3-4 | 5+ |
|---|---|---|---|---|
| research projects you are currently working on | ○ | ○ | ○ | ○ |
| conferences you have presented at during PhD | ○ | ○ | ○ | ○ |
| department seminars you have presented at during PhD | ○ | ○ | ○ | ○ |
| papers you have published during PhD | ○ | ○ | ○ | ○ |

In general, how often does your work provide you with the following:

| | 1 Never | 2 | 3 | 4 | 5 Always |
|---|---|---|---|---|---|
| Opportunities to fully use your talents | ○ | ○ | ○ | ○ | ○ |
| Opportunities to make a positive impact on society | ○ | ○ | ○ | ○ | ○ |
| Sense of personal accomplishment | ○ | ○ | ○ | ○ | ○ |
| Goals to aspire to | ○ | ○ | ○ | ○ | ○ |
| Satisfaction of work well done | ○ | ○ | ○ | ○ | ○ |
| Feeling of doing useful work | ○ | ○ | ○ | ○ | ○ |

Please indicate the degree to which the following may help improve the perceived meaningfulness of your work.

| | 1 Not at all | 2 | 3 | 4 | 5 Very much |
|---|---|---|---|---|---|
| Someone from your cohort tells you he/she believes the meaningfulness of your work | ○ | ○ | ○ | ○ | ○ |
| Your adviser tells you he/she believes the meaningfulness of your work | ○ | ○ | ○ | ○ | ○ |
| You get positive feedback from a department seminar | ○ | ○ | ○ | ○ | ○ |
| You get positive feedback attending a conference | ○ | ○ | ○ | ○ | ○ |
| Your work gets published | ○ | ○ | ○ | ○ | ○ |

Over the last 7 days, how many days did you work? (*Working remotely and in the department both counts.)*

- ○ 0 days
- ○ 1 day
- ○ 2 days
- ○ 3 days
- ○ 4 days
- ○ 5 days
- ○ 6 days
- ○ 7 days

---

Over the last 7 days, how many hours per day did you typically spend on a leisure activity unrelated to the PhD program?

- ○ 0
- ○ 1
- ○ 2
- ○ 3 or more

---

How often, in the last 3 months, has it happened that you:

| | 1 Never | 2 | 3 | 4 | 5 Always |
|---|---|---|---|---|---|
| Worried about work when not working | ○ | ○ | ○ | ○ | ○ |
| Were too tired for activities in private life | ○ | ○ | ○ | ○ | ○ |
| Were too tired to do household chores | ○ | ○ | ○ | ○ | ○ |
| Had difficulty making ends meet financially | ○ | ○ | ○ | ○ | ○ |
| Had work prevent time with family or significant others | ○ | ○ | ○ | ○ | ○ |

Do you currently have an adviser?

- ○ Yes
- ○ No

What is the gender of your main adviser?

- ○ Female
- ○ Male
- ○ Other

---

Which of the following races best describes your main adviser?

- ○ American Indian or Alaska Native
- ○ Asian or Asian American
- ○ Hispanic or Latino
- ○ Black or African American
- ○ Native Hawaiian or Other Pacific Islander
- ○ White

---

Overall, how satisfied are you with your main adviser?

- ○ 1 Extremely dissatisfied
- ○ 2
- ○ 3
- ○ 4
- ○ 5  Extremely satisfied

---

Please think of all the time you have worked with this adviser, and answer the following questions:

| | 1 Never | 2 | 3 | 4 | 5 Always |
|---|---|---|---|---|---|
| How often is your adviser available to you via emails? | ○ | ○ | ○ | ○ | ○ |
| How often is your adviser available to meet you in-person? | ○ | ○ | ○ | ○ | ○ |
| How often does your adviser provide positive feedback during your meetings? | ○ | ○ | ○ | ○ | ○ |
| How often does your adviser provide constructive feedback during your meetings? | ○ | ○ | ○ | ○ | ○ |

How helpful has your main adviser been in the following aspects, throughout the time that you have worked together?

| | 1 Not helpful at all | 2 | 3 | 4 | 5 Very helpful |
|---|---|---|---|---|---|
| providing course selection suggestions | ○ | ○ | ○ | ○ | ○ |
| guiding you through the Ph.D. experience | ○ | ○ | ○ | ○ | ○ |
| assisting you to locate your research topics | ○ | ○ | ○ | ○ | ○ |

How helpful has your main adviser been in the following aspects, throughout the time that you have worked together?

| | 1 Not helpful at all | 2 | 3 | 4 | 5 Very helpful |
|---|---|---|---|---|---|
| assisting you in your research projects | ○ | ○ | ○ | ○ | ○ |
| supporting you to present at a conference | ○ | ○ | ○ | ○ | ○ |
| supporting you to present at a department seminar | ○ | ○ | ○ | ○ | ○ |
| suggesting the kind of jobs better fit you | ○ | ○ | ○ | ○ | ○ |
| sharing job searching experiences | ○ | ○ | ○ | ○ | ○ |

Have you ever experienced any kind of issues or conflicts with your adviser?

- ○ Not at all
- ○ Barely
- ○ Sometimes
- ○ Often
- ○ Prefer not to say

---

If you ever feel that you are experiencing an issue with advising, to whom would you most likely turn for help?

- ○ University staff
- ○ Department faculty
- ○ Department staff
- ○ Student association
- ○ Family
- ○ Other

---

Is there a faculty member in your department that you consider to be your professional role model?

- ○ No
- ○ Yes

---

Is your main adviser your professional role model?

- ○ No
- ○ Yes

---

What is the gender of your professional role model?

- ○ Female
- ○ Male
- ○ Other

---

Which of the following races best describes your professional role model?

- ○ American Indian or Alaska Native
- ○ Asian or Asian American
- ○ Hispanic or Latino
- ○ Black or African American
- ○ Native Hawaiian or Other Pacific Islander
- ○ White

---

How often does your department hold a meeting as follows?

| | 1 Never | 2 | 3 | 4 | 5 Always |
|---|---|---|---|---|---|
| Unstructured meetings with faculty members (e.g. happy hour) | ○ | ○ | ○ | ○ | ○ |
| Workshops allowing PhD students to present preliminary research projects | ○ | ○ | ○ | ○ | ○ |
| Workshops sharing job information or job search experiences | ○ | ○ | ○ | ○ | ○ |
| Professional development workshops (e.g. presentation or writing skills) | ○ | ○ | ○ | ○ | ○ |

**Part 4: Background**

How old are you?

- ○ Younger than 22
- ○ 23-27
- ○ 28-34
- ○ 35 or older

---

Which of the following races best describes you?

- ○ American Indian or Alaska Native
- ○ Asian or Asian American
- ○ Hispanic or Latino
- ○ Black or African American
- ○ Native Hawaiian or Other Pacific Islander
- ○ White

---

Are you a U.S. citizen or permanent resident?

- ○ No
- ○ Yes

---

Is English your first language?

- ○ No
- ○ Yes

---

Which best describes your gender identity?

- ○ Man
- ○ Woman
- ○ Other
- ○ Prefer not to say

---

Do you consider yourself to be:

- ○ Heterosexual
- ○ Bisexual
- ○ Gay or lesbian
- ○ Other
- ○ Prefer not to say

---

Do you have a disability?

- ○ No
- ○ Yes
- ○ Prefer not to say

---

How would you best describe your current relationship status?

- ○ Single
- ○ Casual
- ○ Dating
- ○ Long-term/Committed
- ○ Married
- ○ Divorced

---

Do you have 1 or more children?

- ○ No
- ○ Yes

---

Do you live alone?

- ○ No
- ○ Yes

---

Please indicate the highest degree earned by your father (biological or step).

- ○ High school or below
- ○ Associate
- ○ Bachelor's
- ○ Graduate degree
- ○ I don't know

---

Please indicate the highest degree earned by your mother (biological or step).

- ○ High school or below
- ○ Associate
- ○ Bachelor's
- ○ Graduate degree
- ○ I don't know

---