Costs and Benefits of Undergraduates Revealing Depression to Online Science Instructors

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ABSTRACT

Depression is one of the leading mental health concerns among science undergraduates, and rates of student depression increased during the COVID-19 pandemic. Revealing one's depression in an academic science environment can be helpful, because it can result in increased support from others. However, depression is considered a concealable stigmatized identity, meaning that it can be kept hidden and may carry a stigma. A national pivot to online learning owing to COVID-19 not only increased the need to bolster student mental health, but also presented a novel learning environment. However, it is unclear to what extent students revealed their depression in science courses and why. We surveyed 1179 undergraduates with depression at a research-intensive institution about whether they had revealed their depression to an online college science instructor. Very few undergraduates (5.9%) had revealed their depression to online science instructors; students who identify as LGBTQ+, have lower grade point averages, or experience more severe depression were more likely to reveal their depression to an instructor. Undergraduates reported potential benefits from doing so, including building a connection with the instructor and receiving accommodations. This work provides insight into steps science instructors can take to foster inclusive course environments for students with depression.

INTRODUCTION

Depression is one of the top mental health concerns among undergraduates (American College Health Association, 2021). It is characterized by nine symptoms: depressed mood; markedly diminished interest or pleasure in activities; reduced ability to think or concentrate, or indecisiveness; feelings of worthlessness, or excessive or inappropriate guilt; recurrent thoughts of death or suicidal ideation, or suicide attempts or plans; insomnia or hypersomnia; significant change in appetite or weight; psychomotor agitation or retardation; and fatigue or loss of energy (American Psychiatric Association, 2013; Tolentino and Schmidt, 2018). Major depressive disorder is often diagnosed using the Patient Health Questionnaire-9 (Kroenke *et al.*, 2001); in order for someone to be diagnosed with major depressive disorder, they must report the presence of at least five depressive symptoms most of the day, nearly every day, for at least 2 weeks, in addition to the occurrence of either depressed mood or diminished interest or pleasure (American Psychiatric Association, 2013). Major depressive disorder is estimated to affect approximately 17.0% of adults between the ages of 18 and 25 (National Institute of Mental Health [NIMH], 2022b).

Depression can negatively affect students' experiences in college (DeRoma *et al.*, 2009; Geyer *et al.*, 2018). For example, students with depression underperform in college compared with their counterparts without depression (Hysenbegasi *et al.*, 2005; DeRoma *et al.*, 2009; Yasin and Dzulkifli, 2011). Additionally, depression has been correlated with decreased social integration (Geyer *et al.*, 2018) and difficulty focusing on academic work (Kecojevic *et al.*, 2020). Navigating academic science may

be particularly difficult for undergraduates with depression, given the difficulty of the courses (Udo *et al.*, 2004; Mallow, 2006) and the chilly and competitive environment (Seymour and Hewitt, 1997). In science specifically, undergraduates report that depression can make it difficult to engage in learning, as it affects cognitive domains such as focus and memory, time management, and goal setting (Mohammed *et al.*, 2022). Further, in active-learning science courses, where students are encouraged to participate in their learning through activities and discussions in class (Freeman *et al.*, 2014; Driessen *et al.*, 2020), students report that depression can make it challenging to interact with peers and participate in activities due to a lack of motivation and increased self-doubt (Araghi, T., Busch, C. A., & Cooper, K. M., unpublished data).

Owing to the profound impact that depression can have on students' experiences in college, researchers and national organizations are beginning to champion efforts to improve undergraduate mental health (Mistler *et al.*, 2012; National Council on Disability, 2017; Center for Collegiate Mental Health [CCMH], 2020; Cooper *et al.*, 2020b; Hsu and Goldsmith, 2021). Such calls are most often met with efforts to increase institutional mental health support (e.g., increasing the number of counseling staff; National Council on Disability, 2017). However, our previous research suggests that, in addition to those efforts, students would benefit from instructors making efforts to alter aspects of science learning environments that exacerbate depressive symptoms (Gin *et al.*, 2020; Busch *et al.*, 2022). Notably, for instructors to be responsive to challenges for students with depression, we posit that instructors would benefit from knowing when students in their courses are struggling with depression. In addition, students may experience personal benefits if the instructor knows of their depression, such as being able to be honest about why they struggle to complete an assignment or engage in class (Cooper *et al.*, 2020c).

For students, choosing to reveal their depression can be a complex decision (Chaudoir and Fisher, 2010). Depression can be considered a concealable stigmatized identity (CSI), defined as an identity that is concealable and has a stigma that can result in discrimination (Quinn, 2006). Other CSIs include LGBTQ+ identities, chronic illness, growing up in a low-socio-economic household, and current or previous substance abuse (Quinn and Chaudoir, 2009). Individuals with CSIs often refrain from revealing their identities to others, because they perceive that they may lose status in society if their CSIs are known. For example, individuals with CSIs may report anticipated stigma before disclosing their CSIs (Chaudoir and Quinn, 2010) or may experience actual stigma after disclosure (Ahrens, 2006). However, while sharing one's CSI may result in negative consequences, the disclosure process model suggests that being open about one's CSI can also result in benefits. These benefits could include alleviating the psychological stress associated with concealing an important aspect of oneself, experiencing greater social support, and providing important information to others that can alter behavior toward an individual with a CSI in positive ways (Chaudoir and Fisher, 2010).

Despite the potentially profound impact of revealing one's depression in an academic environment for undergraduates, there are limited studies examining this phenomenon. In an interview study, undergraduates at a competitive midwestern university reported that they disclosed nonapparent disabilities,

including depression, either immediately upon enrolling in a course to increase professor awareness or throughout the course in order to receive accommodations (Kranke *et al.*, 2013). Conversely, some students chose to conceal their invisible disabilities, because they did not perceive they needed accommodations or worried that disclosure would impact access to future opportunities (Kranke *et al.*, 2013). Nontraditional students who had depression and left college prematurely noted that some instructors were dismissive after learning of their depression, which contributed to their decisions to leave their undergraduate programs (Thompson-Ebanks, 2017). To our knowledge, the only studies examining the impact of students revealing their depression specifically in academic science environments have been conducted in the context of undergraduate and graduate research experiences (Cooper *et al.*, 2020c; Wiesenthal, N. J., Gin, L. E., & Cooper, K. M., unpublished data]). Undergraduates who revealed their depression to their graduate student and faculty research mentors reported that they received additional support and flexibility, were able to be honest about why they could not work on certain days, and felt that revealing depression strengthened their relationships with others (Cooper *et al.*, 2020c); graduate students reported similar benefits after telling other members of their lab groups (Wiesenthal, N. J., Gin, L. E., & Cooper, K. M., unpublished data]). Given the existing literature, we expect that undergraduates who reveal their depression to instructors of college science courses may reap unique benefits, such as increased support from instructors, but also risk consequences, such as feeling dismissed or judged.

Some individuals may be more willing to disclose their depression than others. In general, the more open individuals are with their identities, the more likely they are to reveal them to others (Newheiser and Barreto, 2014). Women are more likely to self-disclose personal information compared with men (Dolgin and Minowa, 1997). With depression specifically, one study found that white students are more likely to disclose depressive symptoms than Black, Hispanic, and Asian students in a counseling setting (Morrison and Downey, 2000). Beyond these studies, there is little known about who is most likely to reveal their depression and to what extent individuals experience benefits or consequences from doing so. In the context of science courses, disability resource centers often communicate to instructors that a student may need a specific accommodation, but often do not reveal the specific disability/disabilities of a student. However, many students with depression are not registered with their campus's disability resource center and lack access to formal accommodations (Gin *et al.*, 2022). As such, students may need to reveal their depression to self-advocate for accommodations they need within a course, especially if they are not registered with the disability resource center or existing accommodations are not suitable for evolving learning environments (Gin *et al.*, 2020, 2021a, 2022; Pfeifer *et al.*, 2021).

Given the rising percentage of undergraduates who identify as having depression (Ettman *et al.*, 2020; Son *et al.*, 2020; CCMH, 2022) and the impact that depression can have on students as they navigate academic science, it is important to understand whether students reveal their depression in science classrooms and any associated outcomes. Further, the COVID-19 pandemic not only resulted in a substantial increase in undergraduate depression (Ettman *et al.*, 2020; Son *et al.*, 2020), but temporarily changed the primary mode of instruction from

in-person to online. The online environment presents a unique context to understand the extent to which students reveal their depression and the reasons they have for revealing or concealing their depression. Establishing a relationship with someone is known to be an important predictor of whether students choose to reveal depression (Ragins, 2008), but developing instructor–student relationships is often considered to be more challenging in online courses compared with in-person courses (Song *et al.*, 2004; Mohammed *et al.*, 2021). However, the online environment is thought to provide additional anonymity to students by hiding their appearance (Caris *et al.*, 2002; Mann and Henneberry, 2012), and the anonymous nature of online forums has been associated with an increased willingness of college students to discuss their depression and other concealable identities (Quinn *et al.*, 2009; Miller, 2017; Toscos *et al.*, 2018). Yet it remains unknown how the increased anonymity in online academic environments affects students' willingness to reveal their depression to instructors. Finally, investigating whether students' demographics predict differences in their willingness to reveal their depression has implications for equity within the classroom, because revealing one's depression may be associated with receiving increased support from instructors (Cooper *et al.*, 2020c; Gin *et al.*, 2021b) and could provide insight into differences in college experiences among students with depression.

CURRENT STUDY

In this study, we aimed to examine the extent to which students were revealing their depression to instructors of their online science courses and the reasoning behind their decisions. The research questions that guided our study are:

RQ1: To what extent do students reveal their depression to instructors of online college science courses?

RQ2: What factors affect students' decisions to reveal their depression to their online science instructors or conceal it?

RQ3: What benefits and costs do students perceive are associated with revealing their depression to their online science instructors?

RQ4: What behaviors of an online instructor might increase or decrease students' willingness to reveal their depression?

To assess whether students belonging to particular demographic groups have different experiences regarding their mental health in the context of online college science courses, we tested whether student demographics predicted outcomes of RQ1 and RQ3.

METHODS

This study was conducted with an approved Institutional Review Board protocol (no. 13434) from Arizona State University. The data for this study were collected as part of a biology education course–based research experience, or CRE (also often described as a CURE when offered exclusively to undergraduates; Auchincloss *et al.*, 2014; Brownell and Kloser, 2015), in which 13 undergraduate and graduate students engaged in biology education research projects over the course of a semester (Cooper and Brownell, 2018). The students in the CRE will henceforth be referred to as CRE researchers. The development of the research questions and collection of the data occurred

during the CRE, and eight CRE researchers continued to analyze data for this project after the course was complete.

Survey Development and Distribution

In Spring 2021, we developed a survey for undergraduates at a research-intensive university who were enrolled in an in-person degree program but were taking courses online due to the COVID-19 pandemic. Survey questions were designed to specifically address each of our research questions. Specific survey questions and analyses are described in detail below, organized by research question. A copy of the finalized survey questions analyzed for this study is available in the Supplemental Material. Before survey distribution, each of the 13 CRE researchers used a set of criteria to review all questions (e.g., "Is this grammatically correct?," "Is the meaning of the question clear?") and suggest modifications (Bowden *et al.*, 2002). The survey was distributed through the online platform Qualtrics.

Instructors in the life sciences ($n = 127$) were contacted via email in March 2021 and asked to recruit students in their courses to take the survey in exchange for extra credit or the chance to win one of two $100 gift cards. Of those contacted, 38 instructors (29.9%) agreed to distribute the survey; based on course enrollments, an estimated total of 4450 undergraduate students were invited to participate in the study.

Survey Questions and Analyses

Screening Questions and Demographics. On the survey, students were asked whether they identify as currently or previously struggling with depression/a depressive disorder. We did not require students to have a formal diagnosis, often determined via an initial appointment with a primary care provider and follow-up visits with mental health professionals (NIMH, 2022a), because access to mental healthcare is often disproportionately unavailable to Black and Latinx individuals as well as individuals from lower socioeconomic backgrounds (Kataoka *et al.*, 2002; Howell and McFeeters, 2008; Santiago *et al.*, 2013). Students with depression then rated how severe their depression was in the context of online college science courses. Finally, students were asked a series of demographic questions at the end of the survey including their gender, race/ethnicity, whether they belong to the LGBTQ+ community, their college generation status, whether they consider themselves financially stable, their major, whether they currently or have previously struggled with anxiety/an anxiety disorder, and their college grade point average (GPA). Importantly, participants were provided with nationally available and institution-specific mental health resource at the end of the survey. A similar set of resources is provided at the end of this article.

RQ1: To What Extent Do Students Reveal Their Depression to Instructors in Online College Science Courses?

To assess to what extent students reveal their depression to instructors in online college science courses, we asked students if they had ever told an instructor of an online college science course that they have depression. Then, we calculated the percent of undergraduates with depression who had revealed to at least one instructor of an online science course. To investigate to what extent student demographics predict whether they revealed their depression, we used binomial logistic regression. Predictors in our model include gender

(man/woman),[1] race/ethnicity (white, Asian, Black, Latinx)[2], LGBTQ+ status (yes/no), college generation status (first generation/continuing generation), being financially stable (yes/no), STEM major (yes/no),[3] GPA (self-reported on a four-point scale), division (lower [i.e., first or second year] or upper [i.e., third year or higher]), experience learning online (less [i.e., had taken one to three online courses] or more [i.e., had taken four or more online courses]), and the severity of their depression online (mild/moderate/severe). Model: reveal depression to online instructor (yes/no) ~ gender + race/ethnicity + LGBTQ+ status + college generation status + financially stable + STEM major + GPA + division + experience online + severity of depression.

RQ2: What factors affect students' decisions to reveal their depression to their online science instructors or conceal it?

Students who had told an instructor of an online college science course about their depression were then asked to explain what factors encouraged them to reveal their depression, whereas students who had never told an instructor of an online college science course about their depression were asked to explain what factors discouraged them from revealing their depression. We used open-coding methods (Saldaña, 2013) to identify factors that encouraged or discouraged students to reveal their depression to an online science instructor. Two researchers (E.M.N. and J.G.W.) independently reviewed a randomly selected subset (10%, $n = 118$) of student responses for factors that discouraged students from revealing their depression. Only 70 participants reported having revealed their depression to an instructor; as such, the researchers reviewed all the responses for that question. The researchers then came together and developed a rubric for each question. The two researchers used the rubrics to independently code a newly generated randomly selected subset of 10% ($n = 118$) of student responses explaining why they concealed their depression from their online college science instructors and a randomly selected subset of 25% ($n = 17$) of student responses explaining why they revealed their depression to their online college science instructors. The researchers then compared their codes, and their Cohen's kappa interrater score was at an acceptable level for factors that encouraged students to reveal their depression ($\kappa = 0.96$) and for factors that discouraged students from revealing their depression ($\kappa = 0.96$; Landis and Koch, 1997). One researcher coded the remaining responses for factors that encouraged students to reveal their depression (J.G.W.), and another coded the remaining responses for factors that discouraged students from revealing their depression (E.M.N.). Throughout the article, we report the codes present in at least 10% of student responses; the full set of codes and frequencies can be found in the Supplemental Material.

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[1]We recognize that not all individuals identify as gender binary (man/woman), but there were too few students who identified as a gender other than man or woman in our sample to create a third category for analyses (Cooper *et al.*, 2020a).

[2]Due to low sample sizes we excluded students who identified as American Indian or Alaska Native, Pacific Islander, or as a race not listed on the survey from the regression analyses; however, these students' responses are included in the percentages and example quotes reported throughout.

[3]We grouped students based on their major into science, technology, engineering, and math (STEM) and non-STEM, because we perceive that students pursuing STEM majors may have different experiences in online college science courses than students pursuing non–STEM majors (Cotner *et al.*, 2017; Michaluk *et al.*, 2018).

RQ3: What Benefits and Costs Do Students Perceive Are Associated with Revealing Their Depression to Their Online Science Instructors?

All students, regardless of whether they had actually disclosed their depression to an instructor, were then asked to describe the benefits and costs they perceived to be associated with revealing their depression to an instructor of an online college science course. We used open-coding methods (Saldaña, 2013) to identify benefits and costs that students identified. Two researchers (C.V. and M.L.W.) reviewed a randomly selected subset (10%, $n = 118$) of student responses for each of the questions describing the benefits and costs of students revealing their depression to their online science instructors and then met to develop the rubric. After the rubrics were each finalized, the two researchers (C.V. and M.L.W.) independently coded a newly generated randomly selected subset of 10% ($n = 118$) of each response set (benefits or costs) to establish interrater reliability. The researchers achieved an acceptable Cohen's kappa score for benefits ($\kappa = 0.90$) and costs ($\kappa = 0.86$) of students revealing their depression (Landis and Koch, 1997). One researcher then coded the remaining responses from all survey participants for benefits (M.L.W.), and another coded the remaining responses for costs (C.V.).

To investigate the extent to which student demographics predict the specific benefits and costs undergraduates perceive to be associated with revealing depression, we applied binomial logistic regression using the same predictors as previously described, as well as whether a student had told an instructor of an online college science course about their depression. Model: specific benefit or cost described in response (reported/not reported) ~ gender + race/ethnicity + LGBTQ+ status + college generation status + financially stable + STEM major + GPA + division + severity of depression + revealed to instructor.

RQ4: What Behaviors of an Online Instructor Might Increase or Decrease Students' Willingness to Reveal Their Depression?

All students were asked to describe behaviors of an online instructor that would increase or decrease their willingness to reveal their depression to an instructor. We used the open-coding methods described for RQ3 for each set of responses to create a unique codebook for each response set. Two researchers (D.B. and M.T.) achieved an acceptable Cohen's kappa interrater score for behaviors of an instructor that increase ($\kappa = 0.89$) and decrease ($\kappa = 0.85$) students' willingness to reveal their depression (Landis and Koch, 1997). One researcher coded the remaining responses for behaviors that increase students' willingness to reveal their depression (M.T.) and another coded the remaining responses for behaviors that decrease students' willingness to reveal their depression (D.B.).

Interpretation of Analyses

While we acknowledge that the significance of any given statistical test is continuous based on the *p* value, rather than dichotomous (Wasserstein *et al.*, 2019), throughout the article we report based on the standard threshold of $p \leq 0.05$. Because *p* values greater than 0.05 may be scientifically meaningful while not being statistically significant, we report the full results of all statistical tests in the Supplemental Material.
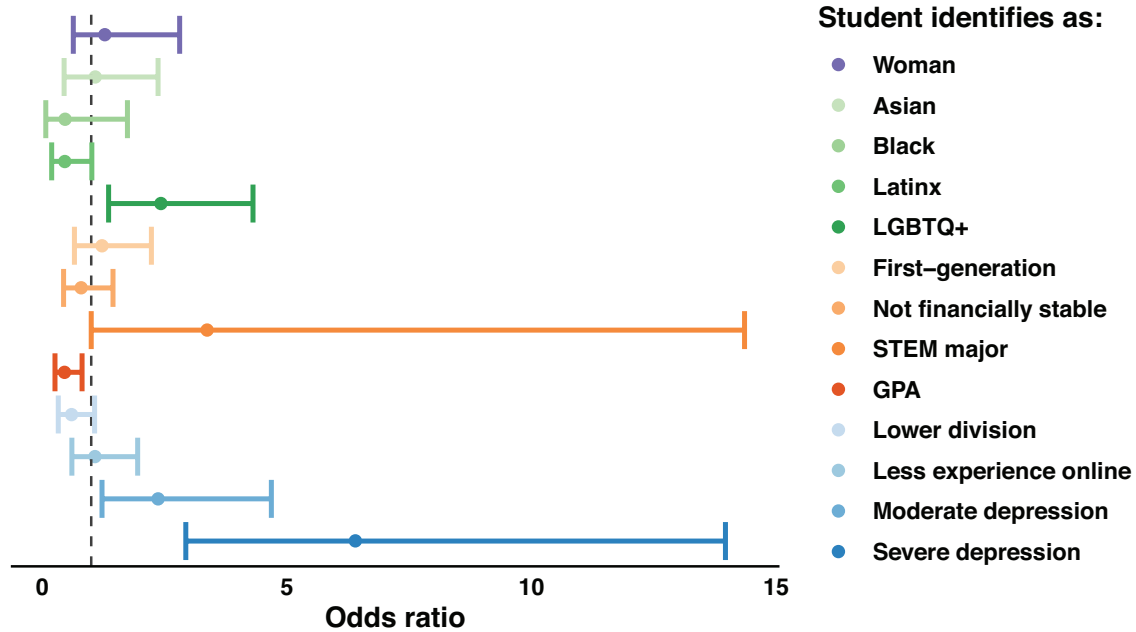
FIGURE 1. Odds ratios of whether students reveal their depression to an online college science instructor. Estimated confidence intervals that do *not* cross the dashed line at *x* = 1 are statistically significant. Points to the right of the line indicate that the group is more likely to reveal their depression to an instructor compared with the reference group; those to the left indicate the group is less likely. Reference groups are men, white, non-LGBTQ+, continuing generation, non–STEM major, upper division, more experience in online courses, little to mild depression.

Positionality Statement

All CRE researchers were enrolled in at least one online college science course at the time the data were collected. Some researchers identify as currently or previously struggling with depression or a depressive disorder and some do not. Additionally, the research team comes from diverse backgrounds and includes individuals who identify as men, women, members of the LGBTQ+ community, first-generation college students, American Indian, Asian, and Latinx. We leveraged our unique experiences and diverse perspectives to try to counteract implicit bias throughout the research process (Intemann, 2009).

RESULTS

In total, 2175 students (~48.8% of all students recruited) completed the survey, and of those students, 1179 students (54.2%) identified as having depression and were included in the analyses for this study. Participants with depression were primarily women (72.7%), white (52.3%), continuing-generation college students (58.5%), and lower-division students (54.9%). The full demographic breakdown of participants can be found in the Supplemental Material.

Finding 1: Most Undergraduates Do Not Reveal Their Depression to Instructors, However, Those Who Identify as LGBTQ+, Have Lower GPAs, or Have Moderate or Severe Depression Are More Likely to Than Their Respective Counterparts

Of the 1179 students with depression who completed the survey, only 70 (5.9%) had revealed their depression to an instructor of an online college science course. Students who were LGBTQ+ ($p < 0.01$), had moderate depression ($p = 0.01$), or had severe depression ($p < 0.001$) were more likely to reveal

their depression than those who were non-LGBTQ+ and reported little to mild depression, respectively. Additionally, the lower a student's GPA, the more likely they were to reveal their depression to an instructor ($p < 0.01$; Figure 1). The full result of the logistic regression can be found in the Supplemental Material.

Finding 2. Students Commonly Reveal Their Depression because They Need Accommodations but Keep Their Depression Concealed If They Perceive It Is Currently Managed

Students listed an array of factors that encouraged them to reveal their depression or discouraged them from revealing their depression to an instructor of an online college science course. Students who had revealed their depression commonly explained that they did so because they needed accommodations from the instructor (31.3%), felt overwhelmed or were struggling with course material (29.9%), or perceived the instructor as kind and concerned about mental health (17.9%; Table 1). Conversely, students who had never revealed their depression to an instructor of an online college science course were discouraged from doing so because they perceived their depression was not impacting course work (30.5%), it would make them feel uncomfortable to do so (23.6%), or they perceived that the instructor would not care or would be dismissive of their depression (20.3%; Table 2).

Finding 3. Students Recognize Potential Benefits of Revealing Their Depression to Instructors but Worry about Many Potential Costs

We asked all students to report the potential benefits and costs they associate with revealing their depression to a

TABLE 1. Factors that encouraged undergraduates to reveal their depression to their online science instructors[a]

Factor	Description	% (*n*)	Example quote 1	Example quote 2
Needs accommodations from the instructor	Student describes that they reveal their depression because they need accommodations to ensure their academic success given their depression.	31.3 (21)	Student 180: "I was falling behind in the course and in the middle of a mental health crisis. I needed an extension on a deadline in order to get the assignment done."	Student 1661: "[I told my instructor about my depression because I needed help with] my testing accommodations."
Feels overwhelmed, is struggling with course material, or is falling behind	Student describes that they reveal their depression because they feel overwhelmed by the amount of work they have to complete for the course.	29.9 (20)	Student 20: "I was struggling with my courses and wanted to let the professors know why I was struggling."	Student 1306: "Feelings of being overwhelmed and very alone."
Perceives instructor is kind or concerned about the mental health of students	Student describes that they reveal their depression because they feel comfortable with the instructor and perceive them as kind, approachable, or understanding.	17.9 (12)	Student 851: "[I reveal my depression] when professors make it clear that it is a safe space and they are here to work with you for whatever life may throw at you; [if the instructor is] genuine and understanding."	Student 1444: "The professor I [revealed my depression] to was very approachable and understanding."
Has a close relationship with the instructor	Student describes that they reveal their depression because they feel close to the instructor.	10.4 (7)	Student 176: "I revealed my struggles [to my instructors] because they already know me well and I want them to know I care about their courses."	Student 822: "My professor was taking time to discuss how I came to my choice of major and the challenges it faces. Telling them about my diagnosis came up organically in the conversation."

[a]Seventy students indicated that they have revealed their depression and received the question asking them what encouraged them to reveal their depression; three students did not give a response (4.3%). Of the 67 students who provided a response, five (7.5%) provided a response that could not be categorized into one of the above factors.

college science instructor in the context of online courses. We tested whether demographics predicted students' perceived costs and benefits and whether students who had previously revealed their depression to an online college science instructor were more likely to identify particular costs and benefits. The most common benefits students associated with revealing their depression to an instructor of an online college science course were that it would increase student–instructor communication (28.6%), it would develop the instructor's understanding of their mental health (26.8%), and the instructor would be more flexible about adjusting the student workload or deadlines (22.9%). Students who had revealed their depression were more likely to recognize increasing student–instructor communication and developing instructor understanding of mental health as benefits and less likely to report that there was no benefit than those who had never told an instructor about their depression. Each benefit and any associated demographic differences are reported in Table 3 along with an example quote, attributed to a student who has or has not revealed their depression to an online college science instructor; the full coding rubric and results from the logistic regressions can be found in the Supplemental Material.

Students also reported potential costs associated with revealing their depression to an instructor of an online college science course. Commonly, students worried they would not be taken

seriously (32.3%) or would be treated differently in a negative way (31.2%) if they revealed their depression (Table 4). LGBTQ+ students and those with moderate or severe depression were more likely to worry that they would not be taken seriously if they revealed their depression compared with non-LGBTQ+ students and those with mild depression. Whereas women were more likely than men to think they would be treated differently in a negative way, men were more likely to report that there would be no costs to revealing their depression. All significant demographic differences and an example quote, attributed to a student who either has or has not revealed their depression, are provided in Table 4. The description of all costs, their frequencies, example quotes, and the full results of the logistic regressions can be found in the Supplemental Material.

Finding 4. Students Report That Perceiving an Instructor as an Understanding Person Would Make Them More Likely to Disclose Their Depression but Perceiving an Instructor as Rude or Disrespectful Would Make Them Less Likely to Disclose

We asked students what behaviors of an online college science instructor would increase or decrease their willingness to reveal their depression. The most common response for increasing students' willingness to reveal their depression is an instructor being a nice and understanding person (33.0%), whereas the

TABLE 2. Factors that discouraged undergraduates from revealing their depression to their online science instructors[a]

Factor	Description	% (n)	Example quote 1	Example quote 2
Perceives depression is not severe, is currently managed, or has never impacted course work	Student describes that they conceal their depression because they do not think it is necessary to reveal it.	30.5 (322)	Student 213: "[My depression] is not severe, and it has not impacted my grades so far."	Student 1774: "My depression is not bad. […] This is why I never bring up that I have any sort of depression."
Feels personally uncomfortable revealing depression	Student describes that they conceal their depression because they often feel uncomfortable sharing their emotions.	23.6 (249)	Student 1358: "It is kind of awkward to talk about [my depression]."	Student 957: "[My depression] is not really something that I would feel inclined to share."
Perceives instructor would not care or would dismiss their depression	Student describes that they conceal their depression because they perceive the instructor would not believe them or would not care about their depression.	20.3 (214)	Student 1478: "I feel that instructors wouldn't really care about mental health but [instead would care about] an assignment to be turned in at 11:59 pm."	Student 1366: "[Instructors] make it clear they do not care for their students."
Perceives instructor would not make accommodations	Student describes that they conceal their depression because it would not help them complete course work.	12.8 (135)	Student 800: "It just seemed like [my instructor] wouldn't really accommodate, so what was the point [of revealing my depression]?"	Student 1604: "Instructors may not compensate by being lenient with deadlines and assignments."
Does not want accommodations or to be seen as making excuses	Student describes that they conceal their depression because they do not want special treatment.	12.6 (133)	Student 2076: "I've never brought [my depression] up to my professor as I didn't want to seem like making excuses for falling behind/struggling."	Student 1502: "I don't want it to seem as if I'm trying to get a free pass."

[a]Of the 1109 students with depression who had not revealed their depression to an instructor and received the question asking them what discouraged them from revealing their depression, 54 students did not give a response (4.9%). Of the 1055 students who provided a response, 60 (5.7%) provided a response that could not be categorized into one of the above factors.

most common factor that decreases students' willingness to reveal their depression is the instructor being rude or disrespectful (41.0%). Additionally, students said that instructors making an effort to develop relationships with students (31.0%) and talking about or addressing mental health (30.0%) would increase their willingness to reveal their depression (Table 5). Conversely, discouraging or avoiding communication with students (27.7%) and making no exceptions for assignments (18.4%) are additional instructor behaviors that students noted would decrease their willingness to reveal their depression (Table 6).

DISCUSSION
Who Reveals Depression in Online College Science Courses?
While women (Kessler, 2003), first-generation college students (Jenkins *et al.*, 2013), LGBTQ+ students (Eisenberg *et al.*, 2007), and students with disabilities (Hsieh *et al.*, 2020) are more likely to report experiencing depression than their counterparts, this study highlights demographic differences in who chooses to share their depression in academic settings. While it was highly unusual for students to reveal their depression to their instructors of online science courses, individuals who are members of the LGBTQ+ community, have lower GPAs, or report more severe depression were disproportionately likely to reveal. Students' reasoning as to why they chose to reveal or conceal their depression provided insight into this finding; students often revealed their depression if it was neg-

atively impacting their course work and they felt as though they needed accommodations, which may be particularly important for students with lower GPAs or more severe depression. Additionally, like depression, the LGBTQ+ identity is considered a CSI (Chaudoir and Quinn, 2010). Therefore, LGBTQ+ students may feel more comfortable revealing depression if they have already gained experience revealing their LGBTQ+ identity, as prior disclosure experiences have been found to affect an individual's willingness to reveal that CSI again (Chaudoir and Quinn, 2010). If LGBTQ+ students have already experienced benefits of revealing a CSI, they may be more willing to reveal another one (i.e., depression). However, more research would need to be done to understand how revealing one CSI impacts an individual's willingness to reveal an additional CSI.

The Benefits of Telling an Online Science Instructor about Depression
Despite the small number of students who revealed their depression to instructors, the undergraduates in this study listed an array of ways that revealing their depression to an instructor might benefit them. The most common benefit students perceived from telling their instructors about their depression was that it would increase the communication between them and the instructor. Undergraduates in research experiences perceived a similar benefit to telling their research mentors about their depression (Cooper *et al.*, 2020c), and a common reason for an individual to disclose a CSI in any

TABLE 3. Potential benefits of students revealing depression to their online college science instructors and demographics that predict the reported benefit[a]

Benefit	Description	% (*n*)	Example quote	Demographic group that is more likely to report the benefit
Increase student–instructor communication	Student describes revealing depression could help build a relationship with the instructor or increase the communication between students and the instructor.	28.6 (320)	Student 822, has revealed depression: "I could feel safer asking for help or letting [the instructor] know what's affecting me."	Asian (compared with white) Has told instructor about depression
Develop instructor understanding of student mental health	Student describes revealing depression will broaden the instructor's view of how depression can present challenges for students.	26.8 (300)	Student 1776, has not revealed depression: "[The instructor] may better understand why I turned in an assignment late, as I occasionally will be depressed to the point of missing homework assignments because of the lack of motivation."	Women Not financially stable Non–STEM major Has told instructor about depression
Increase instructor flexibility	Student describes revealing depression could be a reason the instructor would accommodate a student by adjusting their workload.	22.9 (256)	Student 886, has revealed depression: "Most or all [of my instructors] have been understanding and allowed an extension, which partially relieved the stress of an impending deadline."	None
Student perceives no benefit or is unsure of benefit	Student describes there are no benefits, or they are unsure of what the benefits would be.	23.2 (259)	Student 2056, has not revealed depression: "I don't know that there would be much of a benefit [to revealing depression to an instructor]."	Has never told instructor about depression

[a]Of the 1179 students who were asked this question, 61 did not respond (5.2%). Of the 1118 students who provided a response, 107 (9.6%) provided responses that could not be categorized into one of the benefits described.

context is to strengthen their relationships with others (Chaudoir and Quinn, 2010). Some benefits students perceived were specific to educational settings, such as increasing flexibility by providing accommodations with deadlines. Explaining their inability to complete a task or securing an accommodation is also a common reason for college students to reveal their depression to their instructors in hybrid courses (McManus *et al.*, 2017), as well as in the context of undergraduate and graduate research experiences (Cooper *et al.*, 2020c; Wiesenthal, N. J., Gin, L. E., & Cooper, K. M., unpublished data]). Further, seeking social support and understanding from others is a common reason that individuals reveal CSIs outside the academic context (Chaudoir and Quinn, 2010). This work highlights that although online science courses may be perceived as unique and relatively small aspects of students' college experiences, the benefits students perceived from telling an online science instructor about their depression align with common benefits that individuals with CSIs anticipate across many contexts, including revealing depression to coworkers and family members (Wisdom and Agnor, 2007; Kahn *et al.*, 2017; Follmer and Jones, 2021a,b). Additionally, it is important to note that two of the benefits students perceived, the instructor gaining an understanding of students' mental health and fostering a greater connection with the instructor, were more likely to be reported by students who had revealed their depression to instructors. This suggests that some benefits of revealing depression may be less obvious to students and only realized after a student reveals.

The Costs of Telling an Online Science Instructor about Depression

While students identified many ways in which revealing their depression to an online science instructor may benefit them, the costs may outweigh the benefits, given how few students ultimately chose to reveal their depression to an instructor. Students most frequently expressed concern that their depression would not be taken seriously by their instructors. Further, students expressed concern that they would be treated differently in a negative way. This anticipated bias is a common reason that individuals do not reveal CSIs (Quinn and Chaudoir, 2009; Newheiser and Barreto, 2014), yet it is notable that this fear exists even when students only interact with their instructors via an online platform. A specific concern related to anticipated stigma that students expressed was personal embarrassment. This is likely due to science environments being perceived as spaces where emotion should be avoided, which undergraduate researchers have also attributed to their discomfort disclosing their depression to mentors (Cooper *et al.*, 2020c). The decision to reveal CSIs is often associated with vulnerability and can result in either greater support or greater stigmatization (Chaudoir and Fisher, 2010). Because the reaction of the instructor will be an important factor in predicting whether disclosure will be beneficial (Chaudoir and Fisher, 2010), this uncertainty in how the instructor will react seems to be at the root of students' concerns about revealing their depression to online science instructors. Undergraduates' perceptions of an instructor as kind or rude may act as proxies for how the instructor would

TABLE 4. Potential costs of students revealing depression to their online college science instructors and demographics that predict who reported each cost[a]

Cost	Description	% (n)	Example quote	Demographic group that was more likely to include the cost in their response
Cause student or depression to not be taken seriously	Student describes the instructor will not take their depression seriously, not believe them, make them feel ignored or misunderstood, or the instructor may not understand what depression is.	32.3 (354)	Student 2175, has revealed depression: "[A cost of revealing my depression is] instructors making it worse by telling you to deal with it, they don't think it's an issue, or will not work with you. This increases feelings of hopelessness and loneliness."	LGBTQ+ students Moderate depression Severe depression
Cause student to be treated differently in a negative way	Student describes being worried that the instructor would dislike them or judge them after learning about their depression.	31.2 (342)	Student 511, has revealed depression: "I fear that [my instructors] may judge me, or [revealing my depression] may impact their view of my capabilities as a student. I don't want to be seen as lazy or unfit to do well in the class."	Women Moderate depression
Be viewed as making an excuse	Student describes the instructor will think they are revealing their depression as an excuse to explain unfinished or poor-quality work.	11.8 (129)	Student 1004, has not revealed depression: "Professors may think I am using my depression as an excuse for extensions or poor grades."	Upper division Moderate depression
Student perceives no cost or is unsure of costs	Student describes that there are no costs or they are unsure of any costs associated with revealing their depression to their online college science instructor.	13.7 (150)	Student 549, has revealed depression: "I don't know of any [costs]."	Men Non-LGBTQ+

[a]Of the 1179 students who were asked this question, 83 did not respond (7.0%). Of the 1096 students who provided a response, 135 (12.3%) provided responses that could not be categorized into one of the costs described.

react if the student were to reveal their depression. Perceiving greater social support can encourage disclosure of a CSI (Beals *et al.*, 2009), and kindness from an instructor may be an indication of social support and therefore increase undergraduates' willingness to reveal their depression, making a positive reaction to a student revealing depression more certain.

While many of the students' concerns align with broader concerns of individuals with CSIs, some concerns were specific to an academic context. For example, students expressed concern that their instructors would see their depression as an excuse to avoid course work. Similarly, a study of life sciences graduate students found that a primary concern regarding whether to reveal their depression to their faculty research mentors was mentors viewing the disclosure as an excuse to avoid lab work (Wiesenthal, N. J., Gin, L. E., & Cooper, K. M., unpublished data]). This worry may be valid; disclosing mental illness may be perceived negatively on academic applications (Salzer, 2021; Abraham *et al.*, 2022), so instructors may share this perception and respond negatively to a student disclosing depression.

Given the benefits that students who did reveal depression experienced, we encourage instructors to consider how creating an inclusive environment may help students discuss mental health concerns. Encouragingly, students identified relatively simple ways that instructors can work to remove barriers that prevent students from sharing mental health struggles. Many of these factors, such as expressing an understanding of mental health and being understanding and caring, also encourage undergraduate and graduate students to be more open about their depression with their research mentors (Cooper *et al.*, 2020c; Wiesenthal, N. J., Gin, L. E., & Cooper, K. M., unpublished data]). Individuals often use cues from previous interactions when deciding whether to reveal a CSI to a particular person (Quinn and Earnshaw, 2011; Jones and King, 2014); as such, students likely use proxies such as acts of kindness, expressions of caring, and perceived understanding to gauge how instructors will respond to their depression. Therefore, instructors simply being kind and promoting student–instructor communication may encourage students who would benefit from revealing their depression to do so, which may in turn increase their access to needed accommodations (Gin *et al.*, 2020). Given the documented gap between students' needs and the accommodations they are provided in online science courses (Gin *et al.*, 2022), we argue that helping students feel comfortable enough to reveal depression in class may be a concrete step toward creating a more diverse and inclusive scientific community.

Limitations
In this study, participants self-identified as having depression; we neither required them to be diagnosed nor attempted to make a diagnosis of depression as part of this study. We

TABLE 5. Instructor behaviors that would increase students' likelihood of revealing their depression to their online college science instructors[a]

Behavior	Description	% (*n*)	Example quote from student who has revealed depression	Example quote from student who has not revealed depression
Is a nice or understanding person	Student describes that they would be more likely to reveal their depression if they perceive the instructor as under-standing or caring for students.	33.0 (328)	Student 1306, has revealed depression: "[I am more likely to tell the instructor about my depression if they exhibit] kindness, sympathy, grace, encouragement, words of encouragement, approachable demeanor, considerate responses to questions, and tangibility (more than just a face on a screen)."	Student 43, has not revealed depression: "Perhaps if [the instructor] addressed the inherent difficulty of this online format, I'd be more willing to speak with them. I've had instruc-tors periodically encourage our class to stay positive and maintain focus on the material; a little empathy goes a long way."
Tries to develop relationships with students	Student describes that they would be more likely to reveal their depression if the instructor was actively making an effort to develop relationship with or get to know students.	31.0 (308)	Student 886, has revealed depres-sion: "[I am more likely to reveal my depression when the instructor is] being open and [building] personal relations with students. Getting to know them [would also make me more likely to reveal]."	Student 1776, has not revealed depression: "If the instructor showed more willingness to get to know and understand their students."
Addresses mental health in any way	Student describes that they would be more likely to reveal their depression if the instructor addressed mental health.	30.0 (298)	Student 124, has revealed depres-sion: "If I'm always seeing [the instructor] post announcements about mental health awareness/events."	Student 2053, has not revealed depression: "Openly talk about mental health and the impor-tance of it."
Indicates they would provide accommodations	Student describes that they would be more likely to reveal their depression if they perceive the instructor as willing to be accommodating, e.g., by providing extensions.	14.7 (146)	Student 129, has revealed depres-sion: "Something I appreciate about my [science] instructors is that every course starts with, 'We are completely aware and understanding of the difficulty of current times. Please know that we're here to help and if you need extensions, you can have them at any point in time.'"	Student 1356, has not revealed depression: "If [instructors] explain that they can accommo-date for those things and if they want to make sure that they address you correctly with experiences and words."

[a]Of the 1179 students who were asked this question, 185 did not respond (15.7%). Of the 994 students who provided responses, 44 (4.4%) provided responses that could not be categorized into one of the above behaviors.

intentionally made this decision, because we know that mental healthcare is disproportionately available to more privileged populations (Kataoka *et al.*, 2002; Howell and McFeeters, 2008; Santiago *et al.*, 2013), and studies have shown that, although self-report of depression leads to inflation in the number of indi-viduals who identify as having depression, self-report is rela-tively accurate and appropriate in nonclinical settings (Arias-de la Torre *et al.*, 2020). We did not define depression or provide specific symptoms associated with depression. While we expected that students would be familiar with whether they identified as having depression (Arias-de la Torre *et al.*, 2020), it is possible that not every student knew what was meant by depression. Additionally, in this study we did not explore whether students were registered with the disability resource center; we encourage future studies to examine the relationship between being registered with the campus disability resource center and the decision to reveal depression to an instructor in class. Future studies may also consider how students reveal their depression to instructors of online courses, and the impact the modality of the reveal has on students' decisions. This study was conducted during the COVID-19 pandemic. More students

were likely experiencing depression, and more severe depres-sion, compared with prepandemic times (Ettman *et al.*, 2020; Son *et al.*, 2020). As such, although the number of students who revealed their depression to an online science instructor was low, we may be overestimating the number of students who would typically reveal their depression to instructors. However, instructors may have been more lenient and understanding during this unprecedented time (Pagoto *et al.*, 2021; Supriya *et al.*, 2021); therefore, it is possible that instructors made accommodations for students. Under different circumstances, students may have needed to reveal their depression to access such accommodations. All data were collected from one large research-intensive institution in the United States, and the find-ings should not be generalized beyond this population.

CONCLUSION

We surveyed 1179 undergraduates with depression to assess whether and why individuals revealed their depression to instructors of their online college science courses. Only 5.9% of students revealed their depression to at least one instructor of their online college science courses. Students who identify as

TABLE 6. Instructor behaviors that would decrease students' likelihood of revealing their depression to their online college science instructors[a]

Behavior	Description	% (n)	Example quote from student who has revealed depression	Example quote from student who has not revealed depression
Is rude or uncaring	Student describes they would be less likely to reveal their depression if they perceive the instructor as critical or disrespectful.	41.0 (411)	Student 101, has revealed depression: "Appearing cold or standoffish, not answering questions in a timely way, treating this like any other semester/ not acknowledging current difficulties."	Student 546, has not revealed depression: "If [instructors] are quick to be judgmental and harsh when someone asks a question in class."
Discourages or avoids communication or student–instructor relationships	Student describes they would be less likely to reveal their depression if the instructor discourages or avoids communication.	27.7 (278)	Student 886, has revealed depression: "If [instructors] are not friendly or [do not] manage more personal relations with students."	Student 1006, has not revealed depression: "Showing no concern for students well-being; ineffective communication."
Makes no exceptions for assignments	Student describes they would be less likely to reveal their depression if the instructor makes no exceptions, indicates that revealing mental health will not change anything or help, or does not accept excuses. This category is specific to how revealing mental health would change an aspect of the course (e.g., deadline).	18.4 (184)	Student 886, has revealed depression: "If [instructors] are strict in grading [and] they seem to be more reluctant to follow accommodations."	Student 978, has not revealed depression: "Rigid deadlines that do not excuse late coursework (except exams) for any reason."

[a]Of the 1179 students who were asked this question, 177 did not respond (15.0%). Of the 1002 who responded, 13 (1.3%) provided a response that could not be categorized into one of the above behaviors.

LGBTQ+, have lower GPAs, or report more severe depression were disproportionately likely to reveal their depression compared with their counterparts. The primary reasons for revealing depression to an instructor were needing accommodations in the course and feeling overwhelmed with course expectations. Despite so few students revealing depression, participants identified an array of ways in which revealing depression to an instructor could benefit them including increasing communication with the instructor; however, they also identified costs associated with revealing their depression, such as not being taken seriously. Students reported simple instructor behaviors, such as being kind and increasing lines of communication to students, could encourage them to reveal their depression in this unique context. This work provides insight into why encouraging students to be open about mental health struggles may benefit them in the context of college science courses.

Important Note

If you or someone you know is struggling with depression, there are resources available. Many colleges and universities provide walk-in and online counseling services in addition to crisis hotlines, which can be found by visiting the university health center website. National mental health helplines are also available; the National Suicide Prevention Lifeline (1-800-273-8255 [TALK]) is available for free 24/7, and the National Alliance on Mental Illness offers support to people struggling with mental health Monday through Friday from 10:00 am to 8:00 pm Eastern (1-800-950-6264 [NAMI] or www.nami.org/help). For additional information about depression or resources near you, visit the Anxiety and Depression Association of America website (adaa.org) or the Depression and Bipolar Support Alliance website (dbsalliance.org).

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