ONLINE OR ON-CAMPUS?

Learning from the COVID-19 Pandemic

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ACKNOWLEDGMENTS

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EXECUTIVE SUMMARY

In the 2020-21 academic year, colleges and universities across the United States had to develop plans for how to hold classes during a global pandemic. Some taught the bulk of the courses online while others offered most of their classes in person. Even within schools, there was often substantial variation—some classes were offered online while others met in person, some students lived in dorms while others "zoomed in" from other states or even countries.

In this way, the pandemic forced colleges and universities—whether they were ready or not—to confront a question that has been in the background of debates about higher education: How important is the physical campus in the undergraduate college experience? If students could attend college "virtually," without ever coming together in the same physical space, what might be lost? What might be gained? Prior to the pandemic, it was challenging to research these topics because only certain types of classes tended to be taught online, and only a small number of distinctive schools offered a fully online experience.

In this study, we treat the disruptions of the pandemic as a "natural experiment" to investigate long-standing questions about the role of the physical campus in the

undergraduate college experience. The findings are based on survey data collected in spring 2021 from random samples of undergraduate students at three elite, private universities in the Northeast: Brandeis University, Boston College, and Northeastern University.

We examined how physical and virtual campus experiences at the three schools related to students' perceptions of the quality of instruction and faculty engagement, their sense of belonging at their school, and their overall assessment of their mental health. Our results were confirmed by statistical models that controlled for differences between students and schools.

Key Findings

- Students who attended in-person classes at least once a week were more satisfied with the quality of instruction at their school and were less likely to be bored in class, compared to those who never had in-person classes or had them only rarely.
- Students who attended in-person classes regularly were also more likely to say that the faculty were responsive, that their contributions in class were valued, and that their classes inspired them to think in new ways.

- Students who attended in-person classes regularly, as well as those who participated in group activities like sports or clubs, and those who lived with other roommates (on or off campus), as opposed to alone or with parents, were more likely to feel that they belonged at their school.
- Socializing frequently with friends from school in person was associated with a greater sense of belonging at school, however, socializing frequently with friends online was not.
- During the 2021 spring semester, mental health was a problem for many students, whether they were learning in person or online, and was most pronounced among students who felt lonely.
- In-person or online socializing by itself did not alleviate mental health difficulties. The more important bulwark against these difficulties was having a robust social support network of friends and family who could provide support and assistance in times of trouble.
- Existing social inequalities related to race, gender and sexual orientation remain salient in higher education: The majority of Black students at these schools did not feel well integrated into the campus community. LGBTQ+ students were also less likely to feel they fully belonged at their school and more likely than straight, cis-gendered students to report mental health difficulties.

Conclusion

Higher education institutions have long faced pressure to manage costs and increase access, especially to students who previously had few opportunities to attend college. While online learning may help achieve these goals, university administrations should be aware that a "virtual campus" comes with its own costs. Broad-based online teaching can be effective, but will likely be less engaging and fulfilling than in-person classes. Students can use social media and programs like Zoom to connect with one another, but it may be harder for students to build a cohesive campus community without in-person connections. Mental health will also continue to be a challenge for all students, whether they are physically on campus or not, but remote students may have less access to social support networks that can help them cope with mental health difficulties. Given its advantages and flexibility, virtual learning will continue to play an important role in higher education in the future. Our findings demonstrate however, that where these technologies predominate, new ideas will be necessary to ameliorate some of the obstacles they present to robust and satisfying campus communities.

INTRODUCTION

The massive social disruption precipitated by the COVID-19 pandemic did not spare colleges and universities across the United States. Prior to the availability of vaccines, efforts to stop the spread of the virus required major changes to the operations of colleges and universities and led to a shake-up in what it meant to have a college experience. In March 2020, over 10 million college students were abruptly sent home, spending the remainder of the semester in online courses (Hess, 2020).

During summer 2020, colleges and universities across the United States had to develop plans for how to hold classes during a global pandemic, and different schools came to various decisions about how best to proceed. Some schools did not permit students to return to campus in fall 2020 and transitioned to an almost entirely online experience. Others attempted to preserve an in-person experience as much as possible by mandating frequent COVID-19 testing, masks, and social distancing (The Chronicle of Higher Education, 2020). Modes of teaching also varied substantially by school. Some maintained an on-campus student presence while teaching the bulk of the

courses online, and others offered most of their classes in person. Even within schools there was often substantial variation—some classes were offered online while others met in person, some students lived in dorms while others "zoomed in" from other states or even countries.

All of these changes disrupted the traditional undergraduate experience. Not only was there an impact on in-class pedagogy, but the entire campus experience was affected, including students' ability to socialize outside of class, participate in student groups and sports, and safeguard their mental health.

The development of safe and effective vaccines provides hope that campuses may return to something closer to normal operations in the near future. But the experience of the pandemic has also forced colleges and universities—whether they were ready or not—to confront a question that has been long debated in higher education: How important is the physical campus in the undergraduate college experience? If students could attend college "virtually," without ever coming together in the same physical space, what might be lost? What might be gained?

HOW IMPORTANT IS THE PHYSICAL CAMPUS?

The feasibility of an online college experience obviously depends in large part on the efficacy of online or virtual pedagogy. Debates over the effectiveness of "online learning" (sometimes described as "distance learning," or "e-learning") have been underway for decades (Moore, Dickson-Deane, & Galyen, 2011). Online education clearly offers many benefits, including increased flexibility for faculty and students and the potential to simultaneously provide greater access and lower costs. But scholars have long been worried about whether online education can match the quality of in-person instruction.

Research on this topic has been decidedly mixed. Earlier work argued that there were no significant differences in the educational outcomes of students who took online or in-person courses (Russell, 1999), but others noted that such claims were often based on studies with problematic methodologies and ignored the fact that online learning was likely to be considerably more effective in some contexts than others (Swan, 2003). Although some continued to claim that there is strong, albeit not conclusive evidence that "online learning is at least as effective as the traditional format" (Nguyen, 2015, p. 316), other studies found performance gaps between online and traditional learning (Hu & Hui, 2012), with potentially worse outcomes for Black students and those with lower GPAs (Xu & Jaggars, 2014). Furthermore, even when researchers found no dramatic difference in the academic performance of

students who took online or in-person classes, they still often discovered that students in online classes reported lower levels of satisfaction (Chingos, Griffiths, Mulhern, & Spies, 2017). The effectiveness of online pedagogy, and especially whether it can engage students emotionally and intellectually, is still very much an open question.

Of course, higher education is about more than pedagogy. Colleges and universities aim to create a robust and cohesive campus community where students can live and grow together (Boyer, 1990; Dewey, 1897). In a robust campus community, students learn from each other outside class in study sessions and dorm room debates. By participating in sports, student groups, and other activities they gain valuable experience in group dynamics, leadership, and organization. These social interactions, as well as the sense of being valued as an individual, are associated with feeling a part of a campus community (Cheng, 2004). In turn, other research has found that a sense of belonging with campus peers is associated with increased motivation and self-efficacy (Freeman, Anderman, & Jensen, 2007). But research has yet to explore whether it is possible to form a similarly cohesive campus community virtually, without students being present in one physical space.

A shift to a hybrid or online college experience may also have implications for one of the most pressing issues in higher education: student mental health. Even before the pandemic there were already warnings of a mental health crisis on American college campuses (Hibbs & Rostain, 2019; Lipson, Lattie, & Eisenberg, 2019). Research has found that COVID-19 seems to have produced a dramatic uptick in mental health challenges among young adults (Lee, Cadigan,

& Rhew, 2020), in large part due to increased loneliness (Liu, Zhang, Wong, Hyun, & Hahm, 2020). This relationship between loneliness and mental health among young adults suggests that shifting to a virtual campus may further exacerbate mental health challenges by making it more difficult for students to form robust social support networks, which are central to reducing loneliness and mental health challenges (Wright, Volodarsky, Hecht, & Saxe, 2021).

THE FORCED "NATURAL EXPERIMENT" OF THE COVID-19 PANDEMIC

Research has long been needed on all of these issues—the costs and benefits of online learning, as well as the role of the physical campus on students' sense of community and on their mental health. But prior to 2020, conducting such research was difficult because only certain types of classes tended to be taught online and only a small number of distinctive schools, such as the for-profit University of Phoenix and Purdue University Global, offered a fully online experience. These schools also tended to target adult learners rather than college-age young adults.

Four-year colleges and universities sometimes offered hybrid or online classes for introductory or survey courses, but prior to 2020, rarely offered that format for higher level seminars, and few considered offering a fully online experience to students.

Some experiments were designed to evaluate whether teaching the same class online or in person impacted student performance or perceptions of the quality of the class (e.g., Hu & Hui, 2012). However, these isolated experiments tell us little about the pedagogical impact of a college moving *all* classes online. Furthermore, because so few schools offer fully online options to students, there has been almost no research at all comparing physical and virtual campus experiences in terms of students' sense of community or assessment of their mental health.

COVID-19, however, forced a large number of schools to embrace the hybrid or online model. Colleges had to move huge swaths of their classes online, regardless of class size or subject. Although schools and professors made different decisions about the balance between online and in-person learning, the pandemic led to much broader adoption of online and virtual learning than had previously existed. In addition, many students did not come to campus at all, and only interacted with their professors and peers online. Others lived on campus in dorms but faced severe limitations on formal and informal social interactions. In some cases, colleges allowed traditional activities to take place in person with substantial restrictions, but in other cases, these activities were moved entirely online or canceled altogether. In this way, the pandemic forced higher education to conduct an unwilling natural experiment that allows for a more robust exploration of the importance of the physical campus on pedagogy, campus community, and student mental health.

WHAT CAN WE LEARN FROM THE PANDEMIC?

In this study, we will use the disruptions of the pandemic to investigate long-standing questions about the role of the physical campus in the undergraduate college experience by studying students at three elite, private universities in the Northeast: Brandeis University, Boston College, and Northeastern University.

Administrators at these schools made various choices about how to respond to the threat of COVID-19, providing a broad spectrum of student experiences during the spring 2021 semester—from almost entirely in person to fully remote. To understand differences between online and in-person experiences we look at the frequency at which students at these schools attended in-person classes, their living situation during the semester, and their frequency of in-person or virtual interactions with other students. We explore how each of these factors related to students' perceptions of the quality of instruction and faculty engagement, their sense that they belong at their school, and their overall assessment of their mental health.

Past work also suggests that students from minority racial and ethnic backgrounds, as well as LGBTQ+ students, may find themselves more disconnected from the broader campus community and more at risk for mental health challenges, compared to their peers (Hurtado, Milem, Clayton-Pedersen, & Allen, 1998; Wright, Shain, Hecht, & Saxe, 2019). In this study, we will investigate these and other disparities, which serve as important context for debates about the role of the physical campus in the undergraduate experience.

ABOUT THIS STUDY

The data presented in this report comes from online surveys of undergraduate students at three elite, private universities in eastern Massachusetts: Brandeis University, Boston College, and Northeastern University. The Brandeis University and Boston College surveys were conducted during the spring semester of 2021. The Northeastern University survey was conducted immediately after the spring semester.

All surveys were sent to random samples of undergraduates drawn from the university registrars' lists of enrolled undergraduates at the time of the survey. The Northeastern University survey also included undergraduates who had graduated during the spring semester. At each school, invitation emails were sent to students' official ".edu" email address. Students at Brandeis University and Boston College were offered a choice of a $10 Amazon.com gift card or a $10 donation to the Greater Boston Food Bank as an

incentive for completing the survey. Because of university policy, students at Northeastern were not offered a guaranteed incentive. The field period, sample size, and response rates for each survey appear in Table 1. All data were weighted to university-provided demographic targets. Complete methodological details about all surveys can be found in Technical Appendix A.

Throughout the report, we present weighted percentages for respondents from all three schools. The substantive results presented in charts and tables were confirmed by statistical models (either OLS or ordered logit models) that control for student-level demographics, school fixed effects, and other potential confounders. The results of these models can be found in Technical Appendix B. In almost all of these models, the variables for school were not statistically significant.

Table 1. Survey administration and response rates

	Brandeis University	Boston College	Northeastern University
Field period	3/26-4/29, 2021	4/7-4/29, 2021	5/10-6/1, 2021
Sample size	2,034	4,000	8,400
Responses	818	836	715
AAPOR RR2	40%	21%	9%

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ABOUT THESE SCHOOLS

We begin with a brief description of the three universities discussed in this report.[1]

Brandeis University (Brandeis) is a small, private liberal arts university with around 3,600 undergraduate students and about 1,600 graduate students located in the Boston suburb of Waltham, MA. Brandeis was founded by the US Jewish community in 1948 as a nonsectarian university, during a period when women and ethnic, religious, and racial minority groups faced severe discrimination in higher education. Brandeis' founders aimed to create an environment that reflected their Jewish roots and emphasized the importance of learning, critical thinking, and improving the world.

Boston College (BC) is a private Catholic university with around 9,700 undergraduate students and about 3,400 graduate students, located in the Boston suburb of Chestnut Hill, MA. Founded in 1863 by the Society of Jesus (the Jesuits), BC began as an undergraduate liberal arts college but eventually added graduate programs and professional schools, and today seeks to be a national leader in the liberal arts while fulfilling its Jesuit Catholic mission of faith and service.

Northeastern University (Northeastern) is a private research university with approximately 14,000 undergraduates and 7,200 graduate students, located in the heart of Boston MA. Founded in 1898, Northeastern features a cooperative education ("co-op") program that integrates professional experience into the undergraduate experience.

SPRING 2021: LIVING SITUATION AND IN-PERSON TEACHING

The three schools adopted different policies and procedures for dealing with the COVID-19 pandemic. At each school, however, there was considerable variability in where students lived and the prevalence of online instruction.

Living Situation

In spring 2021, a little over half of Brandeis students lived on campus—either alone or with roommates (Figure 1). Nineteen percent lived with roommates off campus, and almost a quarter lived with their parents. At BC, most students lived on campus with roommates

(73%), and very few lived off campus with parents (1%). Undergraduates at Northeastern were slightly less likely to live on campus (44%) than undergraduates at Brandeis, but those who did live on campus were more likely to live with roommates (38%). Over one third of Northeastern students lived off campus with roommates, the highest of all three schools.

In-person Teaching

Although all three schools incorporated online learning, there was substantial variation in the degree to which it was used (Figure 2). In general, in-person learning was far more common at BC than at Brandeis or Northeastern. However, at each school there was a substantial population of students who had in-person classes frequently, and a substantial population who never or rarely were taught in person.

As the results that follow illustrate, even though these three schools instituted different policies with regard to in-person learning and their student populations' living situation, students at the same school had dramatically different experiences during the spring semester. The following sections use these variations in student experiences to explore the relationship of in-person and virtual college experiences on students' views of the quality of their education, their integration into the campus community, and their mental health. In the analyses below, we report aggregate results from all three schools. The statistical models confirm the results presented here and generally find that there are no significant differences by school after accounting for student demographics and the specific factors discussed in this report (see Technical Appendix B for complete model results).

Figure 1: Student living situation by school

■ Off campus, other	■ Off campus with parents	■ Off campus with others
■ On campus with others	■ On campus and live alone	
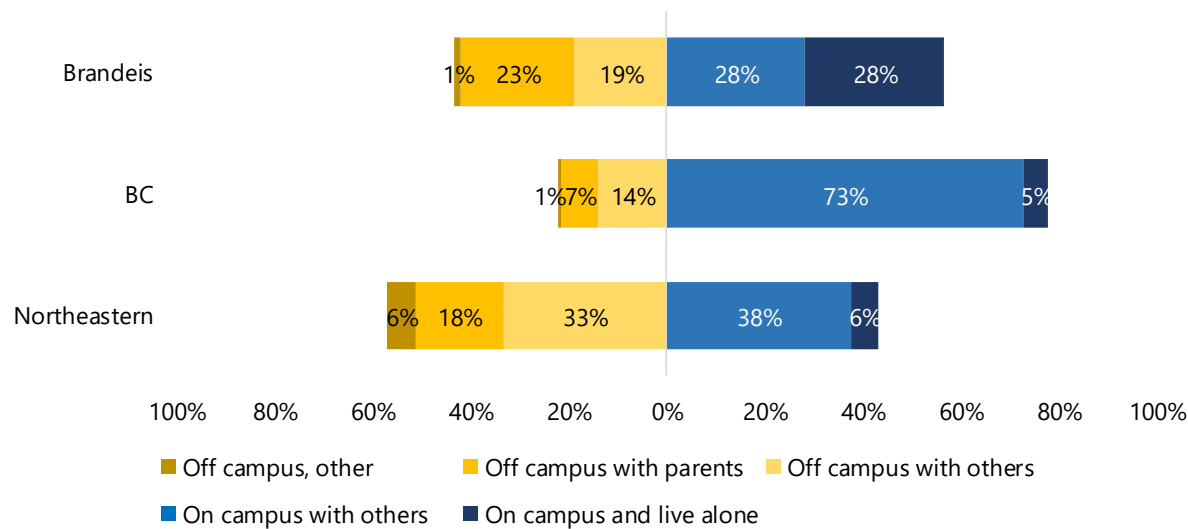
Note: Data are self reported and may differ from the records of each school. See Table B1 in Technical Appendix B for 95% confidence intervals and significance tests.

Figure 2: Frequency of in-person classes by school

■ Never	■ 1-2 times during the semester	■ Once a month	■ 2-3 times a month	■ At least once a week
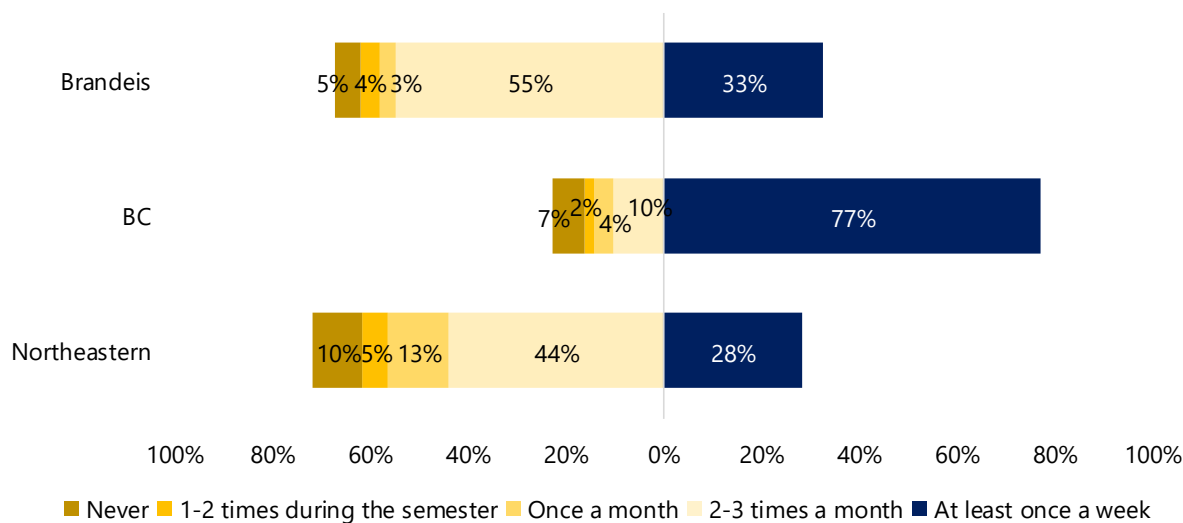
Note: Data are self reported and may differ from the records of each school. See Table B2 in Technical Appendix B for 95% confidence intervals and significance tests.

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FINDINGS

PEDAGOGY

Perhaps the most pressing question brought to the fore by the pandemic is whether online instruction can offer comparable benefits to traditional, in-person instruction. This question is difficult to answer because it seems likely that the efficacy of online instruction varies widely across different contexts. Some subjects may be better suited to online teaching than others, and some teachers may be more effective in online instruction than others. However, the fact that most students at the three schools we studied had substantial experience with both online and in-person teaching during the 2021 spring semester, means that we can examine whether students who participated more frequently in in-person classes differ in their overall assessment of the educational quality of their courses.

To evaluate this issue, we compared students who had an in-person class at least once a week to those who did not on a number of measures. We first asked how satisfied students were with the overall quality of instruction at their school. As shown in Figure 3, 49% of students who had an in-

person class at least once a week reported being "very satisfied" with the quality of instruction at their school, compared to only 35% of those who never or rarely had a class in person.

We also asked students how frequently they felt bored in class. As shown in Figure 4, around 13% of students who had an in-person class at least once a week reported being bored in class "all the time" compared to 20% of students who had in-person classes less frequently.[2]

Students were also asked four other questions about faculty engagement and course quality. In Figure 5 we see that for every item, those who had in-person classes at least once a week gave more positive ratings than those who met in-person rarely or never.[3]

Additional analyses found that, with regard to students' perceptions of the quality of their classes, there were few differences between students who never had in-person classes and those who were taught in-person occasionally but less than once a week.[4]

Figure 3. Satisfaction with instruction by frequency of in-person classes

In-person AT LEAST once a week: Not at all satisfied 3%, Not too satisfied 7%, Somewhat satisfied 41%, Very satisfied 49%

In-person LESS THAN once a week: Not at all satisfied 3%, Not too satisfied 12%, Somewhat satisfied 50%, Very satisfied 35%

Legend: Not at all satisfied · Not too satisfied · Somewhat satisfied · Very satisfied
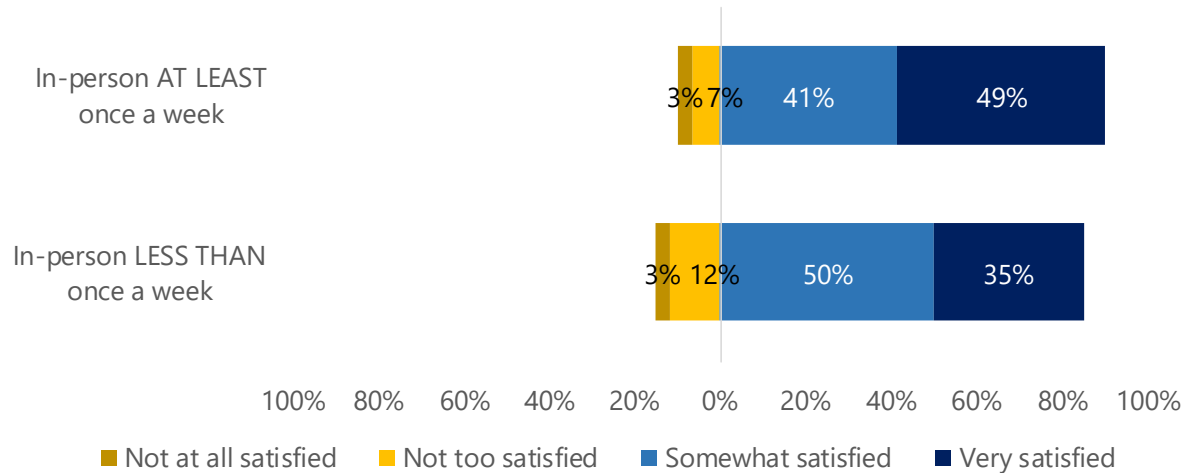
Note: See Table B3 in Technical Appendix B for 95% confidence intervals and significance tests.

Figure 4: Frequency of being bored in class by frequency of in-person classes

In-person AT LEAST once a week: Never 1%, Rarely 11%, Sometimes 40%, Often 36%, All the time 13%

In-person LESS THAN once a week: Never 2%, Rarely 7%, Sometimes 36%, Often 35%, All the time 20%

Legend: Never · Rarely · Sometimes · Often · All the time
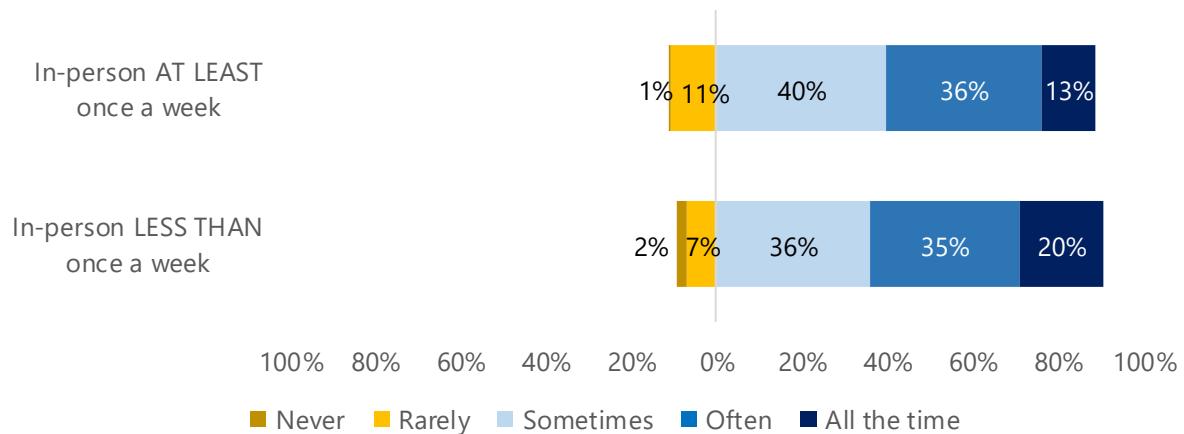
Note: See Table B4 in Technical Appendix B for 95% confidence intervals and significance tests.

Figure 5. Faculty engagement by frequency of in-person classes

Faculty encouraged you to ask questions

In-person AT LEAST once a week: 1% 3% 24% 48% 23%

In-person LESS THAN once a week: 2% 7% 30% 42% 20%

Your contributions were valued in class

In-person AT LEAST once a week: 2% 7% 36% 41% 14%

In-person LESS THAN once a week: 6% 16% 37% 30% 11%

Faculty provided you with good feedback

In-person AT LEAST once a week: 2% 9% 34% 42% 13%

In-person LESS THAN once a week: 3% 12% 36% 37% 11%

Your courses inspired you to think in new ways

In-person AT LEAST once a week: 2% 8% 36% 39% 14%

In-person LESS THAN once a week: 4% 14% 40% 31% 11%

Legend: ■ Never ■ Rarely ■ Sometimes ■ Often ■ All the time

Note: See Tables B5-B8 in Technical Appendix B for 95% confidence intervals and significance tests.

SENSE OF BELONGING

The college campus is more than a venue for formal instruction. College is a place where students meet and live with people from different backgrounds and form a social community. COVID-19 forced college and university administrators to ask whether this sort of community could be fostered virtually, even when some students were not physically on campus.

We asked students to what extent they felt like they belonged at their school and then explored the factors that were related to feelings of belonging to a campus community.

We found that having more frequent in-person classes was not only associated with higher assessments of academic quality, but

also that students who had more frequent in-person classes were more likely to have a stronger sense of belonging to their school. Figure 6 shows that 36% of students who had in-person classes at least once a week felt like they very much belonged at their school, compared to only 26% of students who had in-person classes less frequently.

Feelings of belonging also related to students' living situation, but not in a straightforward way. Students who lived with roommates, either on campus or off, were more likely to report feeling like they belonged, while those who lived off campus with their parents or who lived on campus by themselves were less likely to feel like they belonged (Figure 7).[5]

Figure 6: Feeling of belonging at school by frequency of in-person classes
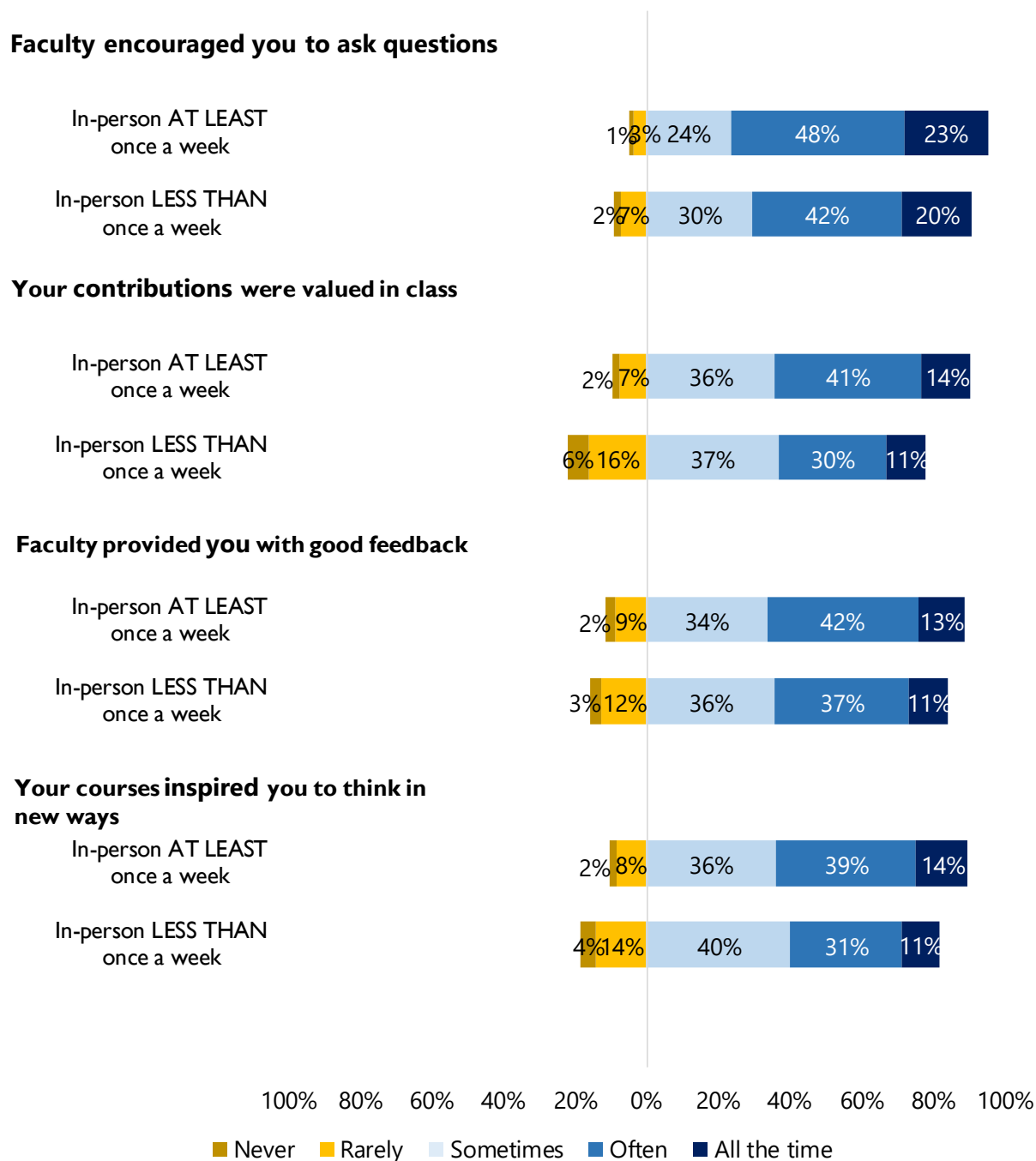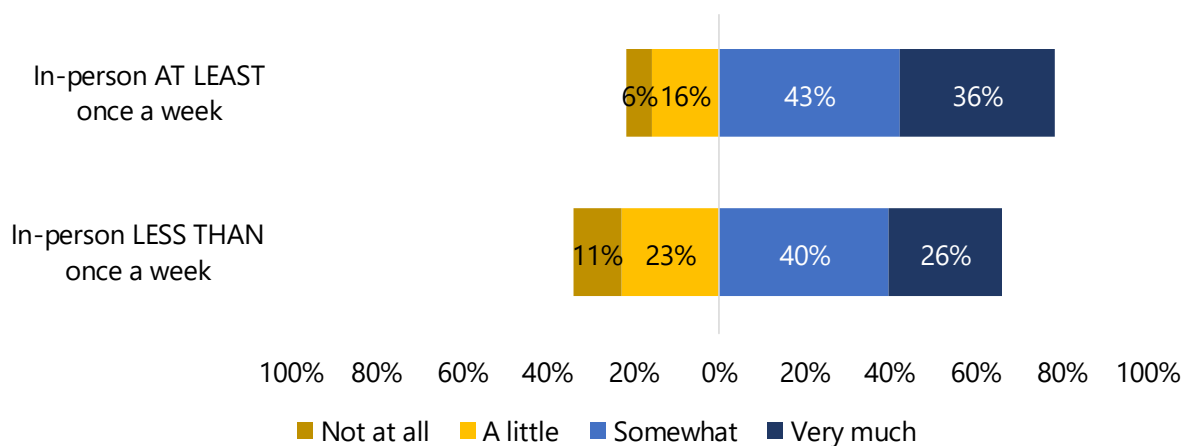

Note: See Table B9 in Technical Appendix B for 95% confidence intervals and significance tests.

Figure 7: Feeling of belonging by living situation

	Not at all	A little	Somewhat	Very much
Off campus with others	10%	19%	39%	32%
Off campus with parents	10%	29%	35%	26%
On campus with others	6%	15%	44%	35%
On campus and live alone	13%	19%	48%	20%
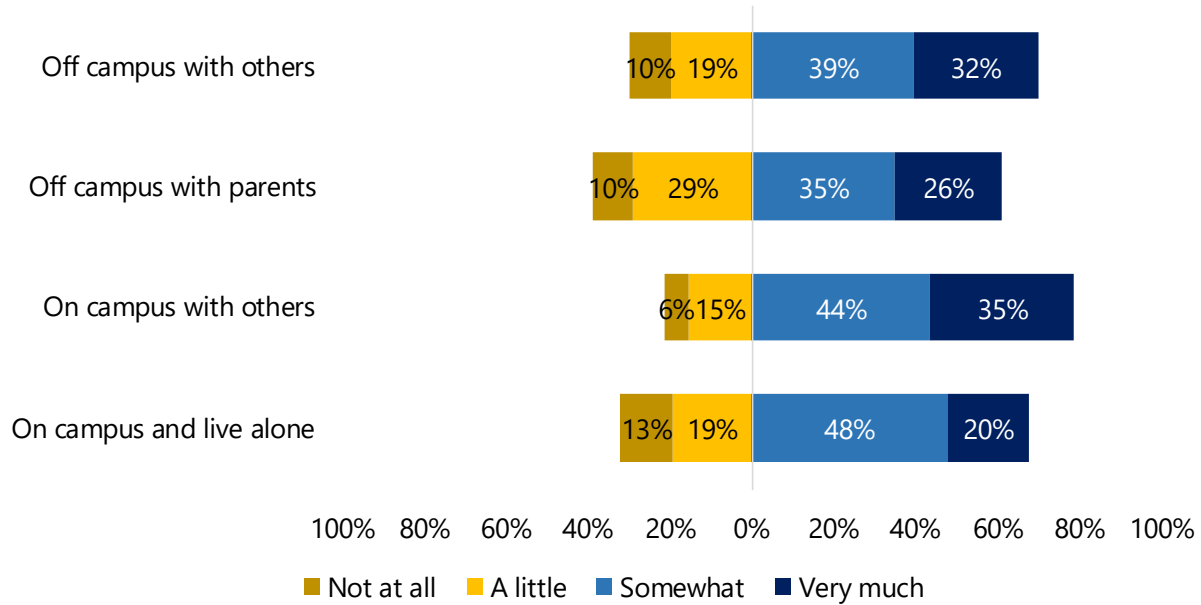
Note: See Table B10 in Technical Appendix B for 95% confidence intervals and significance tests. Estimates for those who

We asked students about in-person and online socialization to determine whether either was associated with feelings of belonging. Figure 8 suggests that online socialization had little bearing on feelings of belonging. Both students who socialized with friends online every day and those who never socialized online were similarly likely to report that they felt that they belonged at their school (73%

and 70% respectively). However, in-person socialization was strongly associated with belonging: 87% of those who said they socialized with friends from school in-person every day said they felt they belonged at their school, compared to only 63% of those who only socialized in person once a week or so, and 50% for those who never socialized in person with school friends.

Figure 8: Feeling of belonging by frequency of in-person and online socialization

Socialized with school friends in-person...

	Not at all	A little	Somewhat	Very much
Never/Twice	18%	32%	36%	14%
Around once a week	9%	28%	42%	21%
Every few days	5%	21%	47%	26%
Every day	3%	10%	39%	48%

Socialized with friends online...

	Not at all	A little	Somewhat	Very much
Never/Twice	9%	21%	38%	32%
Around once a week	5%	20%	43%	32%
Every few days	8%	19%	45%	29%
Every day	7%	20%	40%	33%

100% 80% 60% 40% 20% 0% 20% 40% 60% 80% 100%

■ Not at all ■ A little ■ Somewhat ■ Very much

Note: See Tables B11-B12 in Technical Appendix B for 95% confidence intervals and significance tests.

We also found that participation in group activities (typically on campus) was associated with greater feelings of belonging (Figure 9). Students who were involved in sports, student groups, volunteering or simply pursued a passion or hobby in a group setting were more likely to say that they belonged, compared to students who never participated in such activities.

Figure 9: Feeling of belonging by frequency of participation in group activities

Volunteered...

	Not at all	A little	Somewhat	Very much
Never	9%	20%	42%	29%
At least once	7%	16%	40%	36%
At least once a week	6%	14%	44%	37%

Participated in student groups/clubs...

	Not at all	A little	Somewhat	Very much
Never	12%	24%	41%	23%
At least once	10%	18%	43%	38%
At least once a week	4%	16%	41%	39%

Pursued hobby or interest in group setting...

	Not at all	A little	Somewhat	Very much
Never	13%	22%	40%	25%
At least once	6%	18%	44%	32%
At least once a week	8%	16%	40%	36%

Played sports or excercised in group setting...

	Not at all	A little	Somewhat	Very much
Never	12%	24%	42%	22%
At least once	4%	15%	43%	38%
At least once a week	6%	14%	40%	40%

100% 80% 60% 40% 20% 0% 20% 40% 60% 80% 100%

■ Not at all ■ A little ■ Somewhat ■ Very much

Note: See Tables B13-B16 in Technical Appendix B for 95% confidence intervals and significance tests.

Although this report focuses in particular on the role of the physical campus on belonging, our analyses also revealed that some groups of students were less likely to feel that they belonged at their school. As in past research (Wright et al., 2019), we found that Black students were significantly less likely to feel that they belonged, compared to students with other racial/ethnic identities.[6] Only 11% of Black students felt they "very much"

belonged at their school compared to 37% of white students (Figure 10).

We also found that students who identified as LGBTQ+ or as a non-binary gender were less likely to feel that they belonged at their school, compared to non-LGBTQ+ male or female students (23% versus 35% and 32% respectively) (Figure 11).

Figure 10: Feeling of belonging by racial/ethnic identity
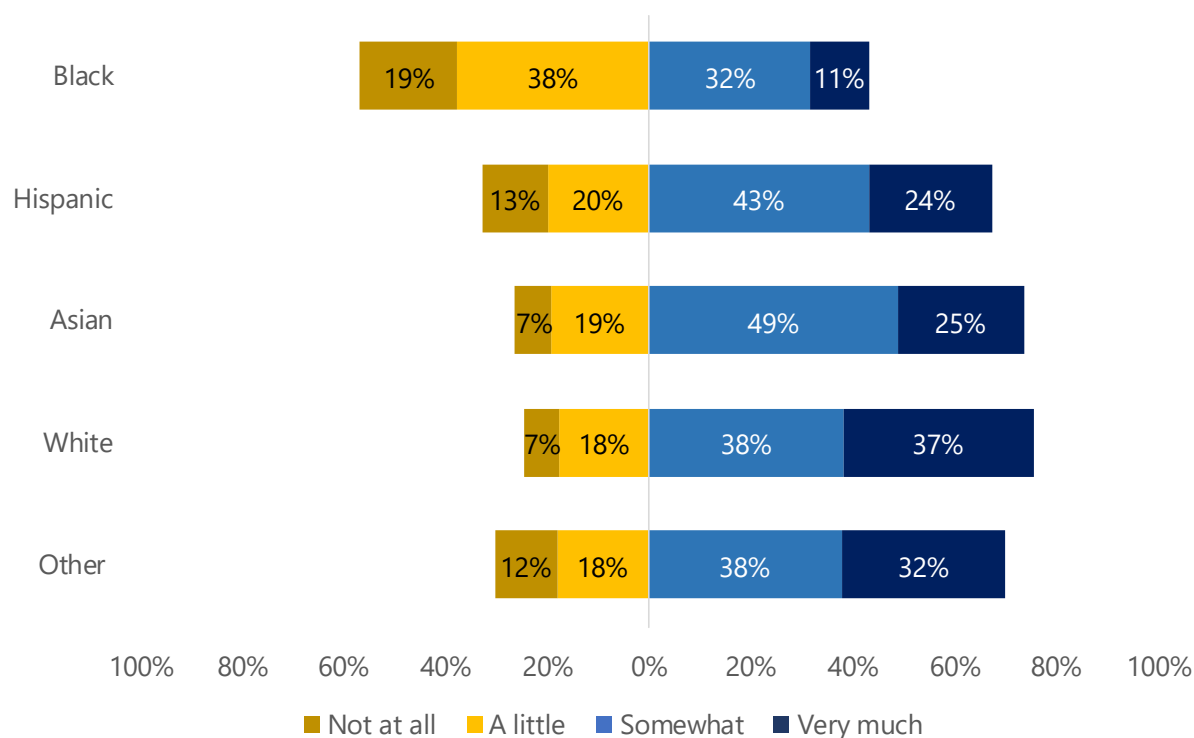
Note: See Table B17 in Technical Appendix B for 95% confidence intervals and significance tests.

Figure 11: Feeling of belonging by gender and LGBTQ+ identification
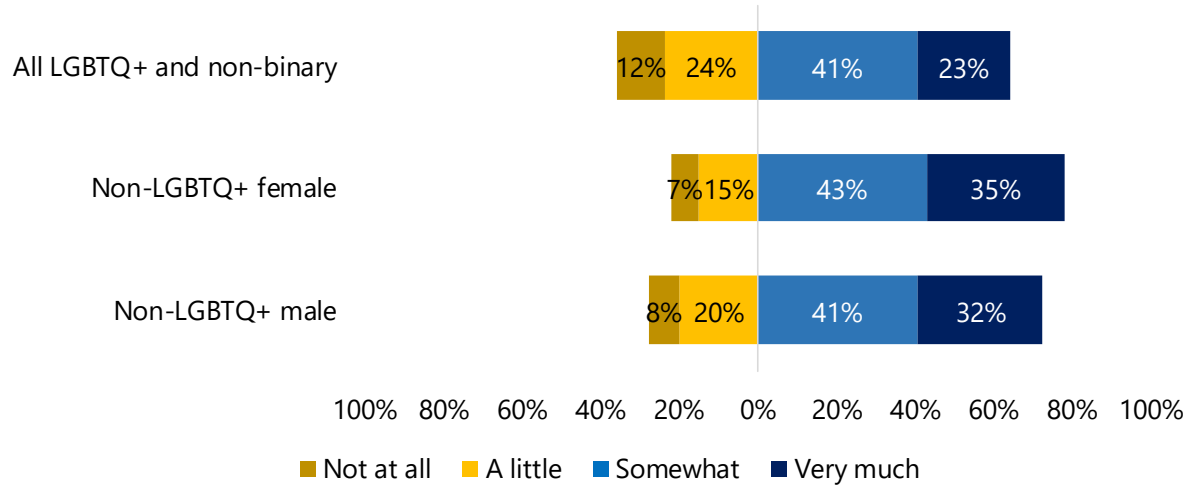
Note: See Table B18 in Technical Appendix B for 95% confidence intervals and significance tests.
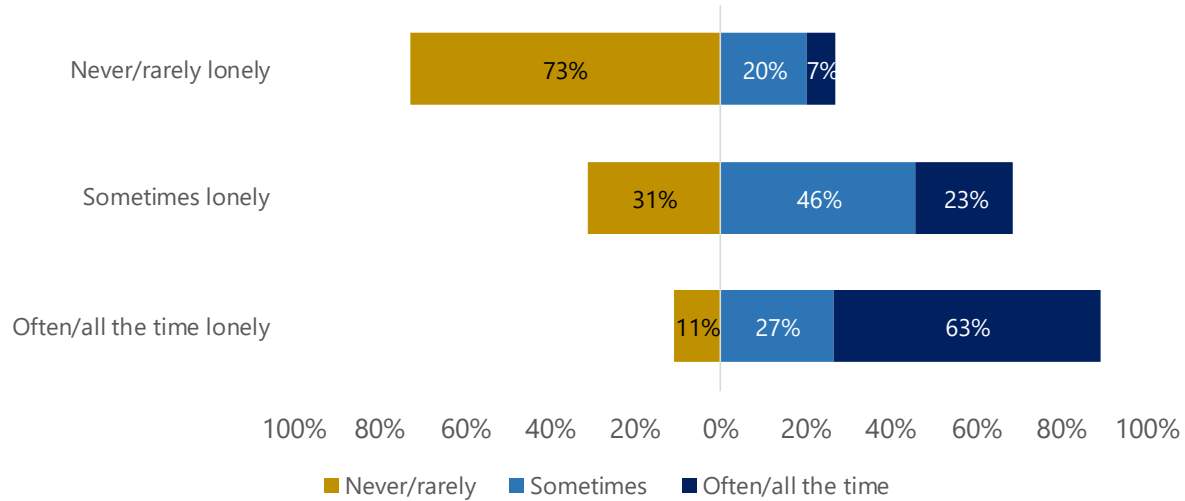
MENTAL HEALTH

Even before the pandemic, mental health was a serious concern on college campuses around the United States, and COVID-19 clearly exacerbated the situation during the spring 2021 semester. To assess mental health challenges, we asked students if, in the past week, they had emotional or mental health difficulties that affected their day-to-day life.[7] In line with earlier work (Liu et al., 2020;

Wright et al., 2021), we found that the factor that was most strongly associated with mental health challenges among students was loneliness.[8]

Only 7% of students who indicated that they never or rarely felt lonely in the past week reported having mental health difficulties often or all the time, compared to 63% of students who reported being lonely often or all the time (Figure 12).

Figure 12: Frequency of mental health difficulties by frequency of feeling lonely

Never/rarely lonely: 73% | 20% | 7%
Sometimes lonely: 31% | 46% | 23%
Often/all the time lonely: 11% | 27% | 63%

Legend: Never/rarely | Sometimes | Often/all the time

Note: See Table B19 in Technical Appendix B for 95% confidence intervals and significance tests.

Students who reported being lonely often were also more likely to report needing help from a mental health professional during the spring semester. Thirty-nine percent of students who reported being lonely often or all the time needed help from a mental health professional in the 2021 spring semester, compared to only 11% of those who reported never or rarely being lonely in the past week (Figure 13).

Figure 13: Needing help from a mental health professional by frequency of feeling lonely

Never/rarely lonely: 11%
Sometimes lonely: 25%
Often/all the time lonely: 39%
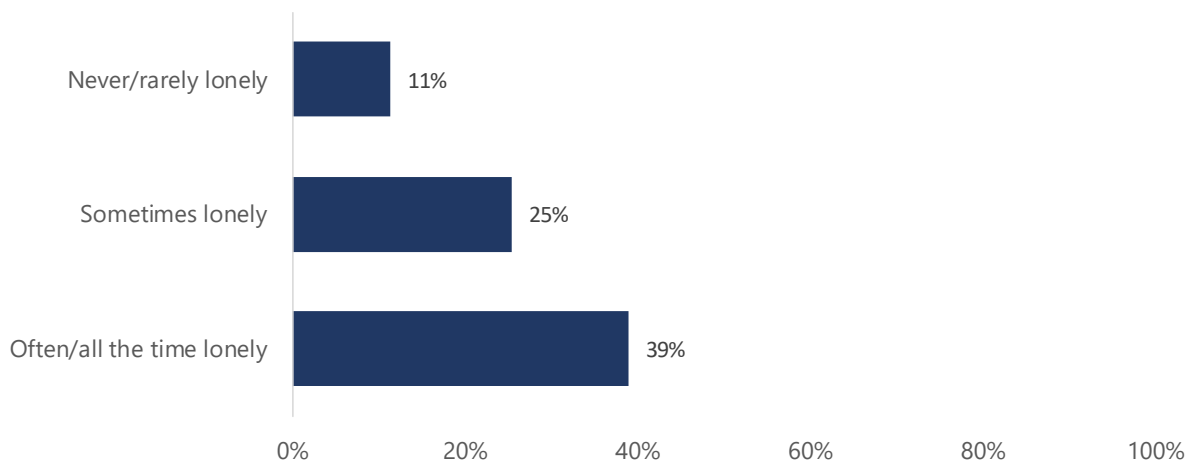
Note: See Table B20 in Technical Appendix B for 95% confidence intervals and significance tests.

The fact that loneliness is so strongly related to mental health challenges suggests that students who lived on campus might have been less vulnerable to mental health challenges during the 2021 spring semester. However, our findings suggest that after controlling for demographic and other factors, there was no relationship between students' living situation or frequency of in-person classes and their likelihood of experiencing mental health difficulties.[9]

Indeed, our results confirm earlier research suggesting that, on their own, virtual or even in-person social encounters have little relationship to mental health difficulties. A more important bulwark against mental health challenges appears to be having a "social support network" of others you can rely on. Only 19% of students who noted that they had a lot of people they could rely on reported experiencing mental health challenges often or all the time, compared to almost 40% of those who said they had no one or only a few people to rely on (Figure 14).

Also consistent with previous research (Wright et al., 2019), LGBTQ+ students were dramatically more likely to report mental health difficulties than non-LGBTQ+ male or female students (Figure 15).

Figure 14: Frequency of mental health challenges by size of social support network
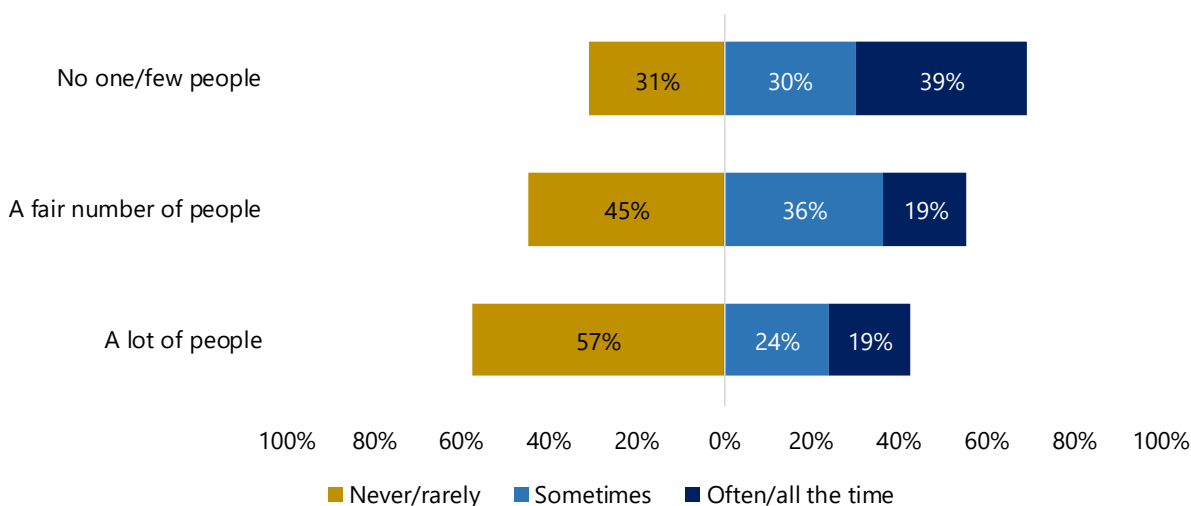
Note: See Table B21 in Technical Appendix B for 95% confidence intervals and significance tests.

Figure 15: Frequency of mental health difficulties by gender and LGBTQ+ identification
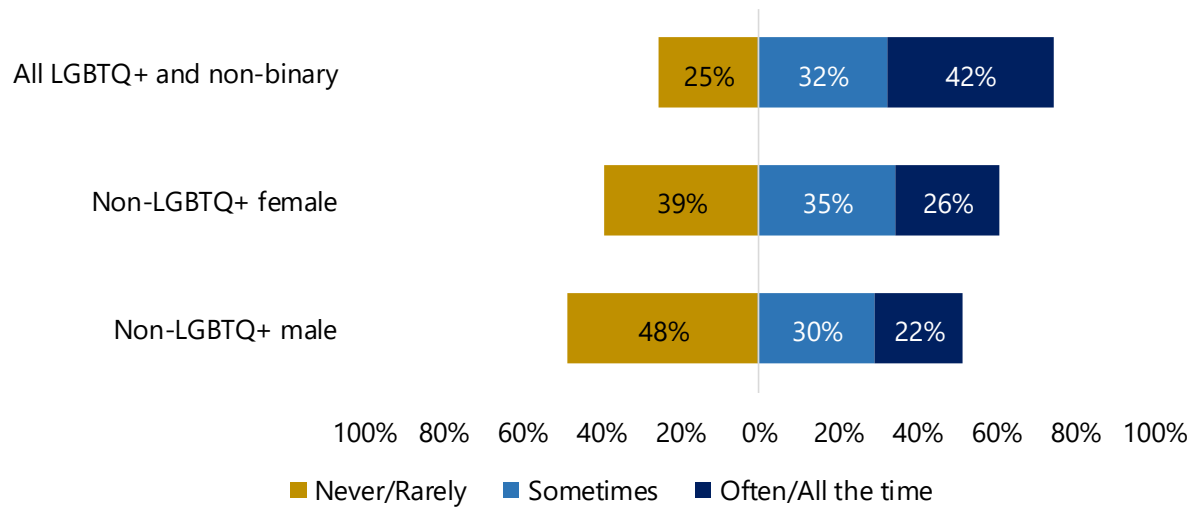
Note: See Table B22 in Technical Appendix B for 95% confidence intervals and significance tests.

DISCUSSION

The COVID-19 pandemic precipitated an unprecedented scenario for US colleges and universities. Although the advent of vaccines provides hope for a better future, the disruptions of the pandemic continue, and past experiences can help guide higher education going forward. COVID-19 forced colleges and universities across the country to experiment with modes of education that placed far less emphasis on the physical campus—a shift that had been considered but rarely enacted at elite schools. Our results suggest that these experiments are likely to have important and long-term impacts—not only on pedagogy and learning, but also on students' sense of their campus community and, potentially, on their mental health.

The universities we studied differed in their approach to teaching classes in person during the pandemic. And within each school, professors made individual decisions about whether to teach their classes partly or fully online. This practice meant that during the 2021 spring semester many students at these schools had both online and in-person classes. It seems self-evident that some professors were better able to manage online teaching than others, and that certain subjects or class types were more compatible with online learning than others. However, even a very crude measure of how often students had classes in-person, suggests that there are dramatic differences between online and in-person teaching.

Our findings indicate that students who were taught in person at least once a week were more satisfied with the quality of instruction at their school and were less likely to be bored in class, compared to those who never had in-person classes or had them only rarely. Those students who attended in-person classes regularly were also more likely to say that the faculty were responsive, that their contributions in class were valued, and that their classes inspired them to think in new ways. Our analyses also suggest that students who attended in-person classes *infrequently* did not differ significantly in their perceptions of the quality of their classes from students who *never* had in-person classes. All of these differences persisted even after controlling for student demographic characteristics and differences between schools. Although these results do not tell us explicitly whether students who took more in-person classes actually learned more, they do suggest that students are more likely to be emotionally invested in and inspired by classes taught in person.

Our data also suggest that online and virtual interactions, compared to in-person experiences, are less likely to foster a cohesive campus community. Students who took more online classes, who participated in group activities like sports or clubs, and who physically lived with other roommates (on or off campus), as opposed to alone or with parents, were more likely to feel that they belonged at their school. We also find that while more frequent in-person socializing with friends from school was associated with a greater sense of belonging, more frequent socializing online appeared to have little relationship to students' sense of belonging. This finding suggests that, even if online pedagogy were found to be of comparable efficacy to in-person teaching, students who have a mostly or fully online college experience are likely to feel more disconnected from their school community, compared to those who are able to physically interact with their school peers.

The situation with respect to student mental health is more complicated. As previous research suggested, loneliness is strongly associated with mental health challenges (Liu et al., 2020; Wright et al., 2021). However, social distancing requirements meant that even students who were physically on campus during the pandemic had limited opportunities to build robust personal connections with their peers. During the 2021 spring semester, therefore, mental health was a problem for many students, whether they were learning in person or online. Although students who lived on campus may have had more opportunities for in-person socializing, our results suggest that social interactions on their own have, at best, only a limited impact on alleviating mental health difficulties. The more important bulwark against mental health difficulties is having a robust social support network of friends and family who can provide support and assistance in times of trouble. It seems unlikely that those students who did not already have a strong social support network before the pandemic could have assembled one in a period where opportunities for meaningful social interactions were so limited.

Student mental health was a problem for all schools even before the pandemic, and this will no doubt continue to be true going forward. However, our results—although profoundly affected by the extraordinary circumstances of the pandemic—provide some reason to worry that students who have an online college experience may have an even more difficult time building the strong social connections with peers that are so important in buffering mental health difficulties.

These data also show that existing social inequalities related to race, gender, and sexual orientation remain salient in higher education. We find that the majority of Black students at these schools did not feel well integrated into the campus community. Creating a robust campus climate for racial minorities at traditionally white institutions is a complex challenge, requiring more than simply increasing the proportion of minority students on campus (Hurtado et al., 1998; Park, 2009). Our data also show that many LGBTQ+ students were also less likely to feel they fully belonged at their school and were more likely to report mental health challenges. As administrators consider the promises and perils of online and in-person education, they should consider the ways that different policies might exacerbate or ameliorate existing inequities in higher education.

CONCLUSION

Higher education is unlikely to emerge from the COVID-19 pandemic unchanged. The spring of 2021 was not a typical semester for students at any of the three schools we studied. But in the years to come the notion of a "fully online" college experience, where platforms like Zoom form the basis of most interactions between students and faculty, may not seem so unusual. Higher education has long faced pressure to manage costs and increase access to their institutions, especially to students who previously had few opportunities to attend college. Technological developments in video conferencing, social media, and online pedagogy offer a tempting solution to a seemingly intractable crisis. A partly or fully "virtual campus" could simultaneously make higher education more accessible while lowering costs. The rapid expansion of online education forced schools to invest in technological solutions, which will no doubt be a boon to future cohorts of students.

Nevertheless, a "virtual campus" comes with its own costs. Broad-based online teaching can work, but likely will be less engaging and fulfilling than in-person classes. Students can use social media and communication platforms such as Zoom to connect with one another, but without shared experiences, it may be harder for students to build a cohesive campus community. Mental health will also continue to be a challenge for all students, whether they are physically on campus or not, but remote students may have less access to social support networks that could help them cope with mental health difficulties. Given its advantages and flexibility, virtual learning will continue to play an important role in higher education in the future. Our findings demonstrate however, that where these technologies predominate, new ideas will be necessary to ameliorate some of the obstacles they present to robust and satisfying campus communities.

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NOTES

[1] Enrollment figures from https://nces.ed.gov/ipeds/datacenter/Data.aspx

[2] We ran exploratory factor analysis on six questions related to pedagogy: This semester how often have you felt…that your courses inspired you to think in new ways; faculty provided you with helpful feedback; that your contributions were valued in class; that faculty encouraged you to ask/participate; that you were bored in class; Please rate your satisfaction with your school's...Overall quality of instruction). Because these six items came from two banks of questions with different scales, responses were Z scored prior to running the factor analysis. The rotated factor loadings can be found in Table C1.2 in Technical Appendix C.

These results indicate that being bored and overall satisfaction with quality of instruction represent one factor ("satisfaction") while the other four items represent a second factor ("efficacy"). We therefore used factor loadings to create two scales—satisfaction and efficacy. These two scales were used as dependent variables in OLS models that include controls for class size, use of online breakout rooms, academic stress, class year, school, race/ethnicity, gender and LGBTQ+ status. In the model of "satisfaction" (which also measures lack of boredom), the coefficient for frequency of in-person classes was positive and significant ($p < 0.001$). Results of these models can be found in Table C3 in Technical Appendix C.

[3] As noted above, these four items formed a single scale measuring perceived pedagogical "efficacy." We use OLS model on the resulted scale while controlling for class size, use of breakout rooms, academic stress, class year, school, race/ethnicity, gender and LGBTQ+ status. In this model, the coefficient for having in-person classes "at least once week" (compared to "never") was positive and significant ($p < 0.001$). The results of this model can be found in Table C2 in Technical Appendix C.

[4] We ran an alternative OLS model of the two pedagogy scales that included a three-category variable for in-person learning ("never," "less than once a week," "at least once a week"). "Less than once a week" was designated as the omitted category (see Tables C4 and C5 in Technical Appendix C). This model indicated that, both in regard to satisfaction and efficacy, there was no significant difference between students who had in-person classes less than once a week and those who never did, and that those who had in-person classes at least once a week had significantly higher scores ($p < 0.001$) on both scales compared to those who had in-person classes less frequently.

[5] We ran a series of ordered logit models on students' feelings of belonging to explore the impact of in-person classes, living situation, different forms of socialization and social embeddedness. Social embeddedness was measured by a scale that includes frequency of volunteering, participation in student

groups or clubs, pursuing a hobby or interest in a group setting, and playing a sport or exercising in a group setting. We first ran a model that excluded variables for socializing and social embeddedness. In this model, the coefficients for in-person classes and living with others on campus were significant (p<0.05). We then ran a second model that added variables for socializing and social embeddedness. In the second model, the coefficients for socializing with friends from school in-person, and social embeddedness were positive and significant (p<0.01), while the coefficients for having in-person classes and living with others on campus both became non-significant. This suggests that the effect of in-person classes and living with others on campus evident in the first model is due to the fact that students who live on campus and attend in-person classes have higher levels of in-person socializing and social embeddedness. All models also control for financial stress, academic stress, having a significant other, class year, school, race/ethnicity, gender and LGBTQ+ status. Results for these models can be found in Tables C6 and C7 in Technical Appendix C.

[6] In the ordered logit model of belonging (which controls for socializing and social embeddedness), Black students were significantly less likely to feel they belonged (p<0.001) compared to white students. Identifying as LGBTQ+ or non-binary was also associated with lower level of belonging (p<0.001), in comparison to identifying as non-LGBTQ+ male (see Table C7 in Technical Appendix C).

[7] Because administration of the Northeastern survey took place after the semester ended, questions pertaining to mental health assessed students' retrospective assessment of their mental health during the previous semester. Given the dramatic changes in students' situation (including the increasing availability of vaccines) in the intervening period, it was decided that retrospective assessments of mental health were not comparable to the contemporaneous assessments provided by Brandeis and BC students. As a result, Northeastern University respondents were excluded from all analyses in this section.

[8] We ran an ordered logit model for frequency of mental health difficulties, including variables for loneliness, living situation, frequency of in-person classes, size of social support network, virtual and in-person socializing, and social embeddedness. The model also controlled for financial stress, academic stress, having a significant other, class year, school, race/ethnicity, gender, and LGBTQ+ status. Loneliness was found to be significantly related to more frequent mental health difficulties (at p<0.001) and was the largest single effect. Model results can be found in Table C8 in Technical Appendix C.

[9] Because the relationship between other variables and mental health are likely to be mediated through loneliness, we ran an additional ordered logit model on frequency of mental health difficulties with the same control variables as in the previous model, omitting loneliness (see Table C9 in Technical Appendix C). In this model, living situation and frequency of in-person classes were not statistically significant. Having a larger social support network was significantly related to lower frequency of mental health difficulties (p<0.001), while identifying as LGBTQ+ or non-binary was associated with higher frequency of mental health difficulties (p<0.001).

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