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Continued STEM Commitment in Light of 2020 Events: A Perspective From the Illinois Louis Stokes Alliance for Minority Participation

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We evaluated the impact of the current COVID-19 pandemic and systemic racism on Underrepresented Minority (URM) students pursuing higher education in the STEM fields. Given the ongoing pandemic and the wave of protests in response to a series of police brutalities and systemic racism, URM students were thrown into uncharted territory. We reached out to a group of Black and Latino students who were already engaged in STEM. We began surveys and interviews by asking participants how they were and how their family and communities were doing. Next, participants answered questions about academic progress, challenges, and what support would be helpful. Our framework was based on a mixed-methods approach that draws on the work of Michael Patton (Qualitative Research & Evaluation Methods: Integrating Theory and Practice, 2014) and Veronica Thomas (American Journal of Evaluation, 2016, 38 (1), 7–28). Qualitative data from interviews were collected to capture perceptions, experiences, and recommendations of the study participants. Survey data were collected to reach as many students as possible and to provide numerical self-assessments of student experience, progression, and obstacles. All qualitative data were coded thematically using Atlas. ti, with the goal of illuminating emerging themes, and quantitative data were reviewed using descriptive statistics. Themes emerging from both data sets were compared, contrasted, and integrated in order to develop consistent findings that would enhance URM student perseverance and persistence in the face of confounding adversities. This study shows that ILSAMP COVID-19 Study participants maintained a commitment to pursuing a career in STEM. The findings of this study also indicate that the participants are stressed by their immediate circumstances and by the ongoing racism of U.S. society. These students ask for additional financial, academic, and networking support during the disruptions caused by the pandemic. More specifically, students request continued advising and connection with STEM professionals who can help them envision and enact a pathway to their own careers in STEM during this tumultuous period. The study validates the importance of key elements of the national LSAMP model as reported by Clewell et al. (Revitalizing the Nation's Talent Pool in STEM, 2006). These are: academic integration, social integration, and professional integration. In

addition, it identifies several other factors that are key to student success, including interventions that directly address racial trauma and economic hardship.

Keywords: systemic racism, Lsamp, stem education, minority, underrepresented minority, COVID-19 pandemic, deconstruct URM

INTRODUCTION

In this introduction, we provide an overview of the study and a literature review. This is followed by three major sections: Methods, Results, and Discussion.

Overview of the Study

This study set out to understand how underrepresented minority students pursuing higher education in the STEM fields have been affected by two significant events that unfolded in 2020: the COVID-19 pandemic and the wave of Black Lives Matter protests responding to the killing of George Floyd by Minneapolis police and, more broadly, to police brutality and systemic racism (Evans, et al., 2020; Krieger, 2020). The research, initiated in the spring of 2020, examined the experience of students in the face of these developments, how the experience affected their academic progress, what support they received, and what support they needed.

The first COVID-19 patient in the United States was diagnosed January 21. On March 13, the president declared the pandemic to be a national emergency. On March 26, the number of U.S. cases surpassed those in China and Italy. The United States became the most infected nation (USA Today, 2020), a ranking that it still holds as this article is drafted in 2021, with Black, Latino, and Indigenous communities getting sick and dying at rates that exposed and exacerbated the underlying racial inequalities in U.S. society. The nation's education system was profoundly disrupted.

This study was conceptualized by the Center for STEM Education and Research (CSER) and the Illinois Alliance for Minority Participation (ILSAMP) at Chicago State University (CSU), and it was implemented between July and September 2020 by a team of researchers affiliated with Creative Research & Evaluation LLC (CR and E). CSU is the lead institution for the ILSAMP and CSER is a hub for STEM activities on the CSU campus. ILSAMP is a 27-year-old alliance of 12 institutions of higher education from across the state of Illinois (https://www.csu.edu/ILSAMP), and it is part of a larger national group of similar alliances funded by the National Science Foundation (NSF). The alliance's central mission is to improve the retention, success, and progression of underrepresented minority (URM) college students in Science, Technology, Engineering, and Mathematics (STEM).

This study took place during a period when the COVID-19 pandemic had already killed at least 158,000 people in the United States. Black Americans and Latinos got sick with the virus at a higher rate, were hospitalized with it more often, and died from it more often than white Americans. Black Americans were hospitalized 4.7 times more often than white Americans, and Latino Americans were hospitalized 4.6 times more often than white Americans (The Center for Disease Control, 2020). Black and Latino families were also disproportionately losing income, going hungry, and facing evictions (Maxwell, 2020).

The study also took place in the wake of the events on and following May 25, when Minneapolis police killed George Floyd. A viral video showed him die while an officer knelt on his neck in the street. Black communities across the country responded with public marches and memorials. Led by Black Lives Matter activists, public attention turned to anti-Black police brutality and systemic racism, and the country was swept by a wave of Black Lives Matter protests (Buchanan et al., 2020). In order to understand the perceptions and the impacts of the pandemic and the wave of anti-Black violence and subsequent protests on the experiences of URM STEM students and their progression to graduation, we set out to answer the following research questions within the ILSAMP Alliance:

1. What is the experience of ILSAMP students and their families during the COVID-19 pandemic and the increased visibility of systemic racism?
2. What is the impact of these two current confounding events on the academic progression of ILSAMP students?
3. What support are students receiving from their institutions and the ILSAMP program?
4. What other supports do ILSAMP students need?

The participants in this study were drawn from all the undergraduate students who registered for the 2020 Spring Symposium in STEM, which was organized by CSER and Illinois LSAMP and held in late February. This annual symposium is a two-day event where STEM undergraduates from the 12 institutions in ILSAMP present their research, attend panel discussions with STEM professionals and graduate students, and interact informally with other students and professionals. Undergraduate participants include LSAMP scholars and other prospective scholars. LSAMP scholars receive stipends for conducting research and participating in other professional, social, and academic activities. By definition, all LSAMP scholars meet the NSF criteria for being an "underrepresented minority". Most of the other students who attend are also African American, Latinx, Indigenous, or multiracial. Every student who participated in the symposium received an email invitation to participate in the survey component of the study. A small number of students from every partner school were also invited to participate in one-on-one interviews.

Literature Review

Prior evaluations of Illinois LSAMP showed that ILSAMP students are excited by opportunities to engage in research

TABLE 1 | Major LSAMP components.

Focus/Activity for students	STEM academic integration	STEM social integration	STEM proffesionalization
Summer Bridge	✓	✓	
Scholarship/Stipend	✓		
Peer study Group	✓	✓	
Skills Building Seminar	✓	✓	
Learning Centers	✓	✓	
Academic Advising	✓		
Summer Acedamic Enrichment	✓		
Tutoring	✓		
Research Experience	✓	✓	✓
Mentorships	✓	✓	✓
Conferences	✓		✓
Internships	✓	✓	✓
Career Awareness			✓
GRE Test Preparation	✓	✓	✓
Graduate School Admissions Support			✓
Graduate summer Bridge	✓		✓

and are inspired by attending annual conferences with STEM students and scientists who look like them (Blanc and Day, 2020). In addition, the evaluation of ILSAMP during its prior 5-year funding period showed that both enrollment and graduation of under-represented minority (URM) students increased at participating universities. In 2013, 1,351 baccalaureates were awarded to URM STEM students at nine four-year institutions in ILSAMP. By 2017, the number had increased by 380 to 1,731. The approximate average increase of 7% per year surpassed the Alliance goal of an annual increase of 5%. In addition, the number of URM STEM baccalaureates increased at a slightly higher rate than White and Asian baccalaureates during the same period (op cit.). The evaluation findings that ILSAMP participants were enthusiastic about research activities and that the initiative was affecting graduation rates are consistent with a rigorous 2006 evaluation of the national LSAMP initiative, which indicated that LSAMP participants had more positive outcomes on a variety of measures than comparable students, including enrollment in post-baccalaureate STEM courses (Clewell et al., 2006).

Clewell et al. (2006) identified three key aspects of the LSAMP model across the entire portfolio: academic integration, social integration, and professional integration. Of particular importance is the fact that successful LSAMP partners address all of these aspects of student experience based on the needs and strengths of their particular campuses and communities. In their evaluation, the authors of the national LSAMP evaluation found that LSAMP as a whole reflects a theory of student retention developed by Vincent Tinto in the 1970s. Tinto hypothesized that a college is able to retain students through graduation only if these students become attached and committed to the college. This requires academic integration into the formal, institutional aspects of college (success in courses, knowledge of course progression, etc.) and social integration into the informal aspects of college life (faculty/staff interactions, extra-curricular activities, peer-group interactions, etc.) (**Table 1**) In addition, LSAMP incorporates a component of professionalism or socialization and induction into the sciences through activities and services that prepare students for the future and teach them the skills, culture, and attitudes of their prospective professional discipline and what it takes to be successful in STEM. De Cohen (2006) described professionalism as anchoring students to their disciplines while preparing them for the future.

As explained by Clewell et al. (2006) and Othman (2016), Tinto developed a theory of departure from college at a time when the field of higher education in the United States was expanding rapidly, but was also experiencing a large number of first-generation students who were leaving before attaining their degrees. Drawing on the theories of social anthropology (Van Gennep, 1960) and sociology (Durkheim and Simpson, 1951), Tinto developed a stage model to explain how first-generation students move through the process of leaving their families, transition to a new situation, and become incorporated into a new environment. Using this model, Tinto argued that withdrawal from college is the result of insufficient integration into the new community. A major implication of the Tinto model is that colleges and universities can take active steps to help students from all backgrounds become better integrated into the institutions. As discussed below, the Tinto model has been the object of frequent critiques and revisions. Nevertheless, it was an important guiding principle for many student support programs that began developing in the 1970s and 1980s. Clewell et al. (2006) identified a large set of activities that typified LSAMP programs and provided a review of empirical data for the success of these interventions. **Table 1** provides an overview of these activities.

Many researchers have critiqued the Tinto model and continue to develop and refine new theoretical paradigms. Although Tinto has refined his language and uses the term "belonging" rather than "integration" (Tinto 2015), his critics continue to fault a model that introduced the idea that successful students must experience a rupture with their families and be integrated into the dominant culture of universities. Among many examples of themes and research studies that contrast with Tinto's initial assumptions about student integration into higher education are:

- Studies of Latino student experience by Sylvia Hurtado and her colleagues. These utilize large, longitudinal data sets and argue that researchers must pay attention to subjective student experience, including experiences of racism, in order to identify interventions that can change exclusionary institutional culture and structures (Hurtado et al., 1996).
- Ethnographic, longitudinal studies of varieties of science identities and how they change over time and interact with racial identity, often drawing on work of Carlone and Johnson (2007).
- Exploration of how universities can support belonging and take into account different identities, such as race, gender, and sexual orientation (Straythorne, 2018).
- Psycho-social quantitative studies that use frameworks such as Bandura's social cognitive theory to analyze how student agency and racial identity intersect with science self-efficacy (White, 2017).
- Financial analyses that demonstrate the importance of finances in supporting or inhibiting STEM graduation (Castleman et al., 2017).

To date, the authors have found few published research studies or peer-reviewed articles about LSAMP programs. Although formative and summative evaluation is required for all LSAMP programs, the authors have not yet identified theoretical or empirical research about LSAMP that utilize conceptual frameworks that provide alternatives to Tinto's theory of integration. This is somewhat surprising given that there are decades of work by researchers such as Hurtado (op cit.) and Carlone (op cit.) about how racial identity, science identity, and STEM success are intertwined for students of color. The gap in theoretical framing of LSAMP's success and challenges could usefully be filled in many ways, including examination of LSAMP as a programmatic framework for creating a community in which both racial identities and science identities are visible and valued.

The research reported in this article was developed and implemented very quickly in response to ia request about immediate needs of LSAMP students during the period of the COVID pandemic. In this context of crisis, the research team formulated an approach and design that drew on members' varied skills and experiences. Although the study was primarily practical and empirical—and was not designed to respond to issues raised in the literature—the team brought a depth of knowledge and experience, including personal and professional knowledge of Black and Latino families and communities, years of work with community-led racial justice groups, and extensive knowledge of LSAMP strategies and program components that derived from many years of implementing and evaluating the Alliance. Thus, though this study was not designed to speak to the research world, the results are likely to have relevance beyond the project's immediate sphere.

METHODS

This section addresses the research framework and instruments, the process of participant recruitment, the study sample, and the processes for data analysis.

Research Framework and Instruments

This research study drew on survey and interview data collected between July 20 and August 20, 2020. Analysis and initial reporting were completed prior to September 30, 2020. The research was designed to explore the experiences and center the voices of underrepresented minority students who had been enrolled in undergraduate STEM programs in ILSAMP institutions at the start of the COVID pandemic and to identify supports that would help ensure students' well-being and support their academic progress.

Given the extent of the crisis at the time the research took place, the team had no assumptions that participants would still be enrolled in school or thinking of themselves as STEM students. In addition to taking the usual steps in planning a research project, the team identified a process for helping participants access immediate support if it was needed. As we report below, most study participants were still in school and were not in the midst of serious crisis. However, the team's sense of responsibility to step out of their researcher roles in order to support participants is a reminder of the intensity of COVID-19 impacts during the summer of 2020. This sense of responsibility to participants was also evidence of the team's adoption of a commitment to a culturally responsive approach to research and evaluation.

Drawing on culturally responsive evaluation approaches articulated by scholars such as Veronica Thomas, the team aimed to be attentive to culture, context, and inclusiveness in all phases of the research, including design, data collection, analysis, and writing. The culturally responsive approach was integrated into the team's use of qualitative methods, as well as its use of survey data.

The principles of culturally sensitive evaluation produced by the American Evaluation Association (AEA) and described by Thomas and Parsons are applicable to this research project. The AEA called for fitting theory to the cultural context of evaluation practice, as well as engaging in a set of essential practices (e.g., recognizing the dynamics of power, recognizing and eliminating bias in language, employing culturally appropriate language, and acknowledging the complexity of cultural identity) (Thomas and Parsons, op cit. p. 9).

In this study, a culturally responsive approach led the team to foreground questions related to family, community, and racial experiences even though participants in the study were selected because they had been LSAMP students. As argued by researchers such as Hurtado and Carlone, family/community identities and student/scientist identities are frequent sources of tension in the lives of URM STEM students. As mentioned above, given the context in which the research took place, the team had no advance knowledge about participants' actual realities and whether they would even consider themselves STEM students at the time of the research.

Quantitative survey data were collected with a goal of reaching as many students as possible, and as a method to collect provide numerical self-assessments of student experience, progression, and obstacles. As with interview protocols, surveys were constructed with the goal of conveying a sense of respect, interest, and support for participants. Survey responses were

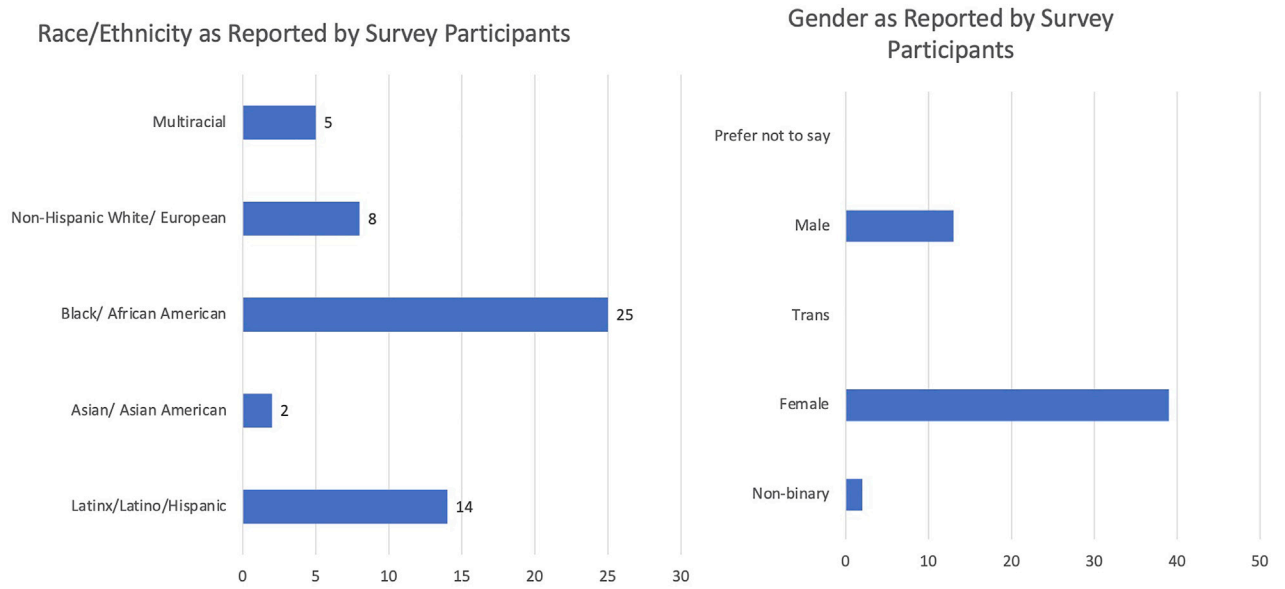

FIGURE 1 | Gender and race/ethnicity.

analyzed using descriptive statistics such as frequency distributions of responses, as well as measures of central tendency (mean, median, mode).

In his guide to qualitative evaluation and research, Michael Quinn Patton writes that qualitative methods are especially useful for documenting the diverse perceptions of participants in their own words and for producing findings that emerge from the fieldwork, not from the laboratory or the academy (Michael Quinn Patton, 2014). In this study, the use of interviews was especially appropriate to provide in-depth and detailed study of participant experiences without requiring detailed development of categories that would be used for analysis and reporting.

An important decision in developing instruments was beginning both the surveys and the interviews by asking participants how they were doing as people, as family members, and as members of communities. After answering questions about themselves and their families, they moved on to answer detailed questions about academic progress, academic challenges, and what other supports would be helpful. Understanding how URM students negotiate two of their identities that are typically challenging—their family/community identity and their academic identity—will be essential to creating an environment in the STEM fields where racial equality goes beyond lip service and where the contributions of people from communities that have previously been shut out are truly embraced.

The survey instrument was designed by the research team for online administration through the Survey Monkey platform. It consisted of 26 questions and was designed to be completed in 15–20 min. The first survey section had both closed-ended and open-ended questions about student and family experiences, supports, and hopes. The first question on the survey asked participants to rate their overall well-being and that of their families using a slider. The scale on the slider went from 0 on the left to 100 on the right. The scale was labeled in the following way: Zero on the scale was identified as "having problems", the midpoint (50) was identified as "OK," and 100 was identified as "fine." A follow-up survey question asked students to explain their numerical ratings. Based on answers to this question, the research team defined categories to provide a rough sense of where most students fell on the spectrum and to demonstrate the extent of variation in how students and their families were doing during the pandemic and the wave of protests.

The second survey section consisted of multi-part questions about students' academic progress, challenges, and expectations. These were primarily a checklist designed to capture information about students' academic pathways. Most of these questions also included a section where students could add open-ended responses. This section included a request for student recommendations on how ILSAMP could support its target population. The final section of the survey asked students to identify their colleges, majors, and year in college. They were also asked to self-identify their gender and race/ethnicity (**Figure 1**), with options to choose as many labels as they liked and to add their own descriptors. At the end of the survey, students had another opportunity to identify suggestions and add open-ended comments.

Semi-structured, open-ended interviews were designed to address many of the same themes as the surveys, with the opportunity for students to explore issues in more depth. In addition, the interview protocol specifically asked students whether they would like to share their perceptions and experiences on heightened national awareness of racist violence and recent Black-led protests. These interviews were structured as interactions that would be constructive alternatives to a long-embedded research practice in which white researchers

are in positions of power while the people of color are not necessarily the agents in a research process. The three-person team implementing the research study consisted of one white member, one Black member, and one Latinx member. With one exception, all interviews were conducted by the two people of color on the team, who are researchers with extensive experience listening to and supporting young people in their communities. The interview was designed to take 30–45 min and to be conducted remotely, either by phone or by Zoom.

Participant Recruitment

Another important initial decision was to draw our sample from the mailing list of students who had participated in the 2020 Spring Symposium in STEM, organized by CSER and the Illinois Louis Stokes Alliance for Minority Participation (ILSAMP). Thus, we reached a group of Black and Latino students who had already been relatively engaged with STEM. The Symposium was held in late February 2020, shortly before all universities and college ended in-person classes. Thus participants were recruited from a group of young people who are already likely to be interested in careers in STEM and who had been motivated to take advantage of opportunities to conduct research and to interact with other STEM scientists and professionals who look like them.

The annual symposium is a two-day event where STEM undergraduates from the 13 schools in ILSAMP present their research, attend panel discussions with STEM professionals and graduate students, and interact informally with other students and professionals. Undergraduate participants include LSAMP scholars and other undergraduate STEM students. LSAMP scholars receive stipends for conducting research and participating in other professional, social, and academic activities. By definition, all LSAMP scholars meet the NSF criteria for being an "underrepresented minority". The great majority of other students who attend the Symposium are also African American, Latinx, Indigenous, or multiracial and are also involved in activities sponsored by LSAMP or other similar programs on their campuses (Blanc and Day, 2020). Although they are not LSAMP scholars, these students are also considered LSAMP students because they also attended at one or more LSAMP events (i.e., the Symposium and possibly other LSAMP activities). The option to participate in the survey was shared with all undergraduate students who registered for the 2020 Spring Symposium in STEM.

All participating undergraduates in the spring symposium received an email in early August 2020, explaining the study and inviting them to participate in an anonymous online survey. A subset of students was also invited to participate in the interview study. The list of survey invitees was developed to ensure that representation from every college that participated in the symposium was included in the interviews. Invitations for students from each college were roughly proportional to each college's participation in the symposium. When information was available, the initial group of those invited from each college was randomly drawn from a list of students who had received LSAMP scholarships in 2019–20. If this information was not available, the interview invitees were randomly drawn from the list of students registered for the symposium from each college. The study followed informed consent protocols as approved by the Chicago State University IRB. As an incentive, survey participants had the opportunity to participate in a drawing for a $50 gift card. As an incentive and as a recognition of the value of their time, all interview participants received a $25 gift card.

Study Sample

The study sample was a self-selected group of STEM students from a larger Universe of students who participated in the 2020 Spring Symposium in STEM. Out of 166 symposium registrants, 78 started the survey, 54 completed it, and 24 interviews were conducted.

Of the survey respondents, 44 were from underrepresented minority groups in STEM, as defined by the National Science Foundation. Ten survey respondents were from groups that are not considered underrepresented in STEM. The survey was completed by students who identified in the following ways: 25 African American students, 14 Latino students, 5 multiracial students, 8 white students, and two Asian students. All multiracial students identified themselves as African American and another race; Latino and another race; or Pacific Islander/Hawaiian and another race. Twenty-one of the interviewees were from underrepresented minority groups in STEM as defined by the NSF. Undergraduate students from 11 ILSAMP partner colleges and universities participated in the research. These will be referred to here as ILSAMP Partner Institution A, ILSAMP Partner Institution B, and so on.[1] **Figures 1**–**3** provide an overview of information about the 54 students who responded to CR&E's request for survey research participation and completed the online survey. **Figures 1**, **2** show the study participants by year of schooling and by their academic major, respectively.

Data Analysis

All qualitative data were coded thematically using Atlas. ti, with the goal of illuminating and discovering emerging themes. With one exception, quantitative data were reviewed using descriptive statistics. This exception is discussed below. In addition, the three-member research team represented multiple races, disciplines, and generations, which enabled them to bring unique lenses to this study. All findings were reviewed and discussed by the entire research team, and they were revised as needed.

As Patton points out, the flexibility provided through qualitative methods does not imply that findings from qualitative data are not accurate. This study used a number of analytic methods identified by Patton to ensure that the study met

[1]Representation by underrepresented minority groups in STEM by each partner in the research study is as follows: Partner A, 10 surveys, 8 interviews. Partner B, 7 surveys, 4 interviews. Partner C, 5 surveys, 4 interviews. Partner D, 4 surveys, 0 interviews. Partner E, 3 surveys, 2 interviews. Partner F, 5 surveys, 1 interview. Partner G, 4 surveys, 0 interviews. Partner H, 1 survey, 1 interview. Partner I, 3 surveys, 1 interview. Partner J, 1 survey, 0interviews. Partner K, 1 survey, 0 interviews. Quantitative data broken down by partners is reported only for colleges that had 5 or more survey responses.

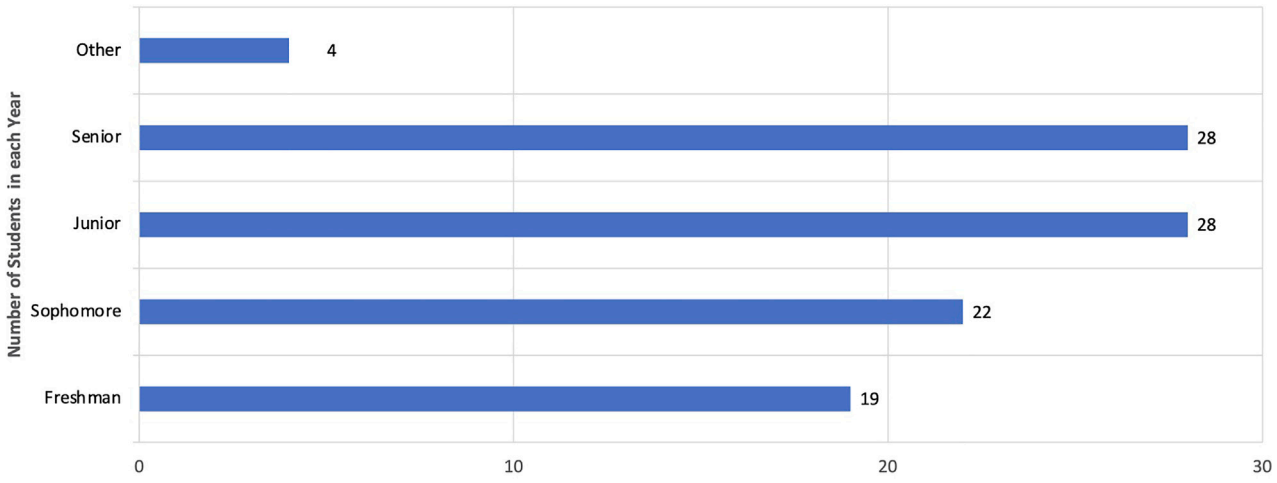

FIGURE 2 | Academic year.

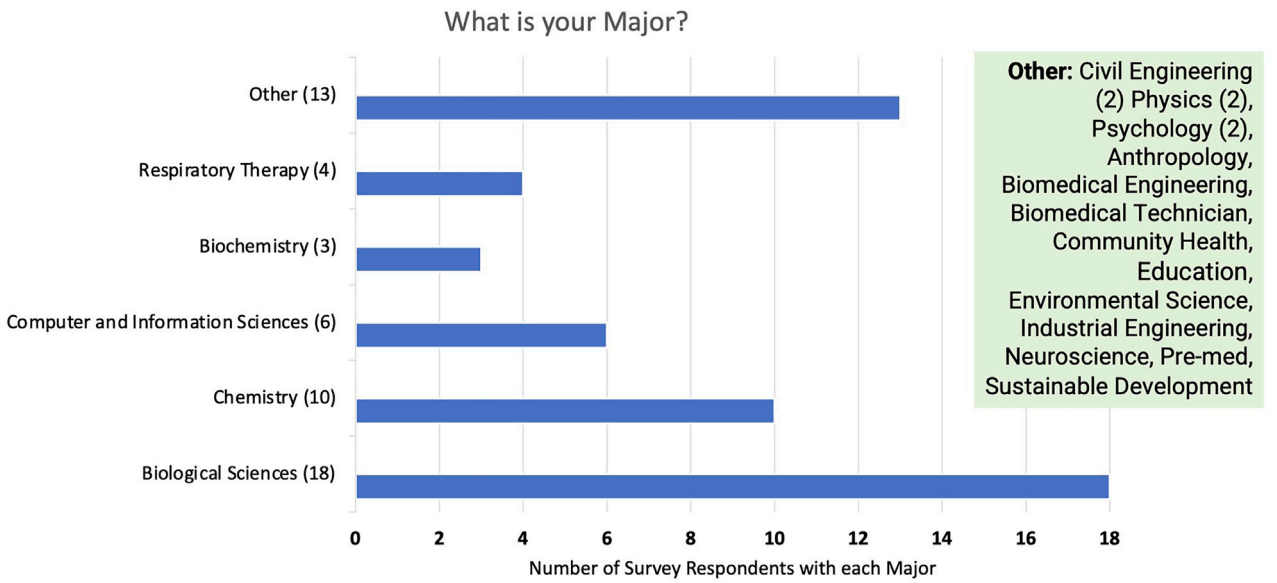

FIGURE 3 | Academic major of students in the study.

expectations for utility and credibility. These methods consist of inductive and deductive analysis to identify themes and patterns that applied to the entire sample of participants or to subsets of participants.

In this study, there were five major steps of qualitative data analysis:

Step 1 (Inductive)—Team members reviewed transcripts for individual interviews and identified salient issues for each individual.

Step 2 (Inductive)—Team members identified cross-cutting themes for two groups of schools. The three schools with the largest number of participants were in one group. The remaining schools were in another group.

Step 3 (Inductive): Team members compared cross-cutting themes across the two groups of schools and agreed on major themes to use for the next phase of analysis.

Step 4 (Deductive): All interviews are coded to capture data related to the major themes that were identified.

Step 5 (Deductive): Coded data is reviewed to refine themes and identify findings based on qualitative data.

After the identification of patterns in the qualitative data, findings were extracted by using strategies that Patton refers to as

TABLE 2 | Overview of student self-ratings.

Category name	Numerical rating	Quartile	Research Team's interpretation based on open-ended comments
In Crisis	0–25	Bottom Quartile	These students described themselves and their families as facing serious new problems due to recent events.
OK- 2nd quartile	26–50	2nd Quartile	In general, students in both these quartiles described less severe or moderate additional challenges due to recent events.
OK- 3nd quartile	51–75	3rd Quartile	In general, students in both these quartiles described less severe or moderate additional challenges due to recent events.
Fine or OK	76–100	Top Quartile	Students in this quartile described themselves as having moderate or minimal additional challenges due to recent events.

"determining substantive significance." In inferential statistics, quantitative researchers run tests to determine whether relationships between variables were strong enough to have "statistical significance." One of the important probes identified by Patton that was used in this study is "How solid, coherent, and consistent is the evidence in support of the findings." Triangulation, or the comparison of patterns across different data sources and between different subgroups, is one key method identified by Patton and used in this study.

The survey question that enabled students to use a slider to show their well-being required a different method of analysis than the other items, which were Likert-scale survey questions. For heuristic purposes, student ratings on the sliding scale were divided into quartiles defined by the rating scale (not by number of responses within each quartile). Qualitative review of URM students' open-ended responses was conducted within each quartile (numerical band) and across bands. Based on students' open-ended comments, bands were labeled "In crisis," "OK—2nd quartile," "OK-3rd quartile," and "Fine or OK." A subsequent review of non-URM students' open-ended responses showed that comments by the two subsets (URM and non-URM students) were thematically similar when divided by band. Although these labels are rough, the use of quartiles provides a structure to indicate the range of distress and adaptation in students' self-reports. **Table 2** provides an overview of these ratings.

It is also worthwhile to note that the members of the research team had different frameworks for using the terms "In crisis" and "OK," two of the labels provided on the "wellness" question on the survey instrument. Using the perspective of culturally responsive research and evaluation, the multiracial team discussed these terms and remained focused on what they mean for people who experience the never-ending impacts of American racism. This was an important part of the analytic process and informed the final findings of the project.

RESULTS

Black, Latino, and Multiracial ILSAMP Students

In this section, we begin with findings about the experience of interviewees and survey respondents who are members of groups that are underrepresented in STEM fields.

After these findings, there is a short discussion about experiences of STEM students who participated in the study, but who don't fit the category of URM as defined by the National Science Foundation.

Findings about URM students address the following research questions:

1. What is the experience of ILSAMP students and their families during the COVID-19 pandemic and the increased visibility of systemic racism?
2. What is the impact of these two current confounding events on the academic progression of ILSAMP students?
3. What support are students receiving from their institutions and the ILSAMP program?
4. What other supports do ILSAMP students need?

Figures 4–9 draw on survey responses from the 44 participants were Black, Latino, and multiracial URM students completed the survey. Results in this section also draw on interview data with the 21 interview participants in these groups. Quotations have been selected to represent African American, Latino, and multiracial students from all of the colleges represented in the research study. To ensure confidentiality as promised in attaining student consent, quotes are not identified by letters or pseudonyms. The reason for this is that aggregating the details of "anonymous" students makes identification possible in certain situations.

Research Question 1: What is the experience of ILSAMP students and their families during the COVID-19 pandemic and the increased visibility of systemic racism?

Finding: Most ILSAMP COVID-19 Study participants rate themselves as "OK" on a sliding scale that ranges from "having problems" through "OK" to "fine."

Finding: Even though ILSAMP COVID-19 Study participants are not in crisis due to the COVID-19 pandemic, they are grappling with the persistent crisis of systemic racism.

Sense of Well-Being

The first question on the survey asked participants to rate their overall well-being and that of their families using a slider. The scale on the slider went from 0 on the left to 100 on the right. The scale was labeled in the following way: Zero on the scale was identified as "having problems", the midpoint (50) was identified as "OK", and 100 was

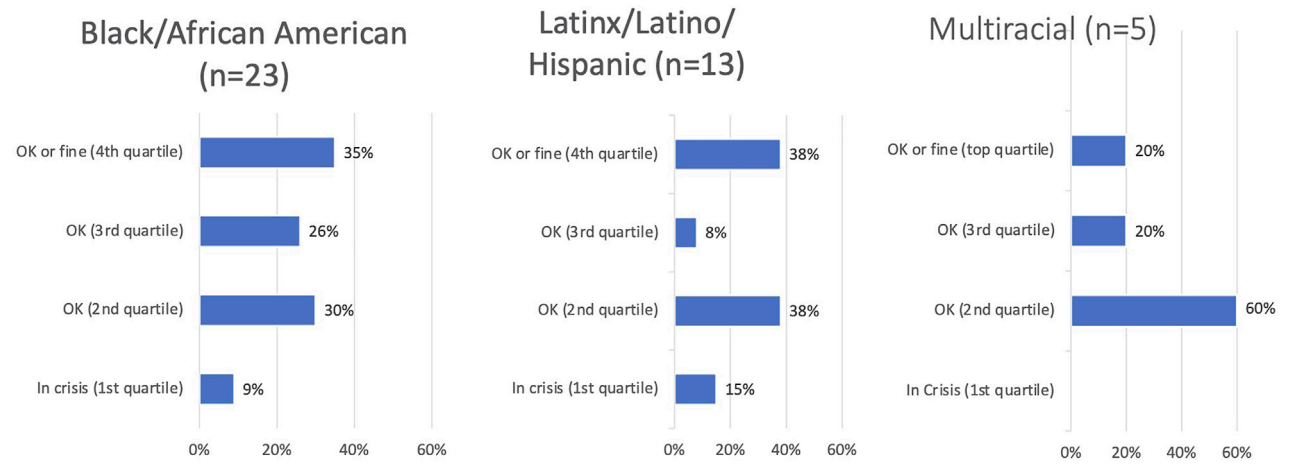

FIGURE 4 | How are students feeling? (By race/ethnicity).

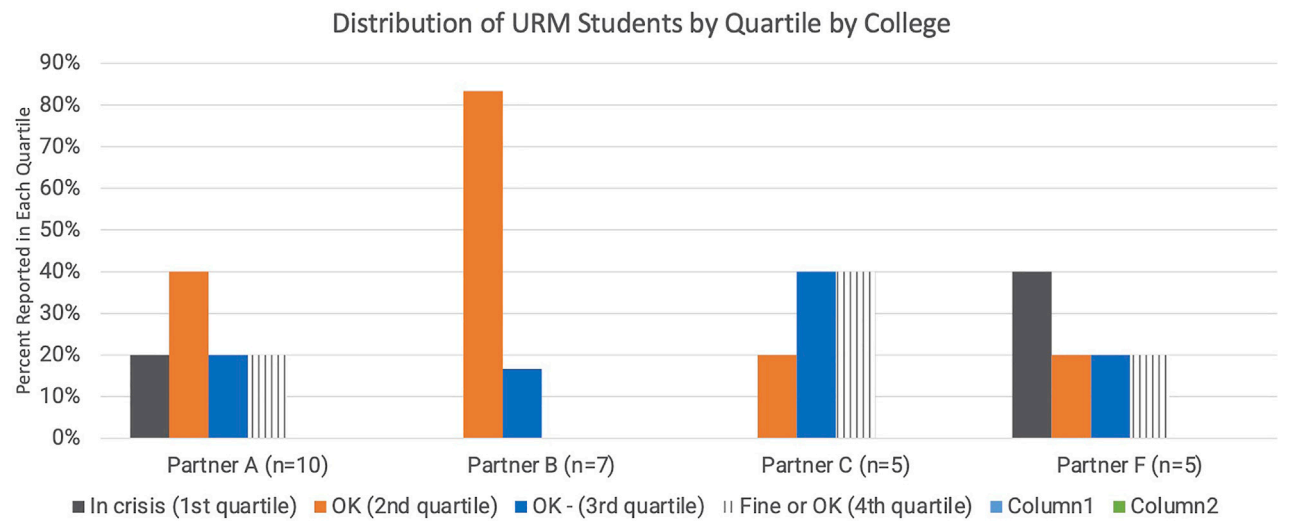

FIGURE 5 | How are Students Feeling? (By Schools–with 5 or More Survey Responses).

identified as "fine". The research team's interpretation of the frequency distribution of ratings and central tendency measures leads us to state that ILSAMP COVID-19 Study participants rated themselves as "OK." The average self-rating for all URM students was 58. The median rating was 52. The mode was 50. The text below provides additional information about rating categories and participant responses. Examples of open-ended survey comments from each wellness category of students provide a small window into the many different experiences of ILSAMP students and their families during the pandemic.[2]

In crisis–Quartile 1 (n = 4): "Father was laid off from his job. Mother owns a pharmacy on the south side of Chicago. It was looted during riots."

> "We are having problems because we stopped working due to COVID-19. It is hard to keep up with food, house payments, and bills."

OK–Quartile 2 (n = 15): "My mom got divorced. We had to find a new apartment, and she had to find a job. She used to be a housewife, so it became somewhat difficult to find a job for her, especially since she is near her mid 50s. Also, right when the pandemic hit, I was placed in mandatory furlough, so I am currently not bringing income to the house."

OK–Quartile 3 (n = 8): "I think we're doing good considering the issues all over place, people, and police

[2]The total number of URM students who provided self-ratings was 41. Three additional students shared open-ended comments, but did not rate themselves.

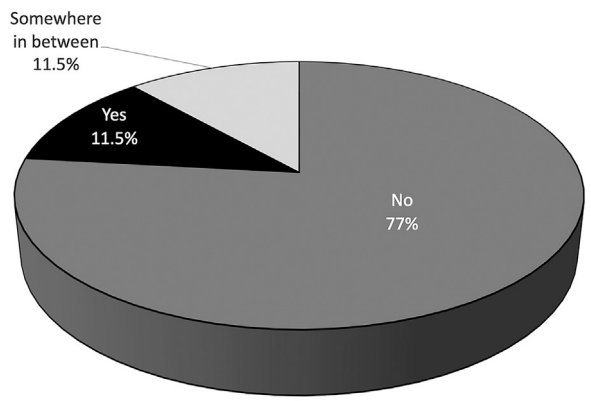

FIGURE 6 | Changes in STEM academic plans: Have your plans for pursuing your undergraduate STEM degree changed from what they were in March 2020?

brutality and the COVID-19 pandemic. I do think it could be better."

Fine or OK—Quartile4 ($n = 14$): "My parents still have a job to go to every morning, so things are fine as far as finances are concerned, we just go about our daily routines differently."

Figures 4, **5** show the breakdown for COVID-19 Study participant surveys by "wellness" category, racial/ethnic identity, and colleges that had more than five survey responses. These figures show differences across racial/ethnic groups and across schools in student perceptions of the wellness of their family and themselves. However, the sample size was small and the analysis was not designed to explore inter-group differences in sense of wellness.

Figure 4 shows that of the students who responded to this survey, Latinos had the largest percentage of students who rated themselves/their families at 50 and below on the rating scale, as well as the largest percentage of students who rated themselves toward the top of the scale. For Latino students, the mean rating was 52, the median was 50, and the mode was bimodal with two modes: 80 and 90. For African American students, the mean rating was 63, the median was 52 and the mode was 50.

In open-ended comments provided to explain the ratings, students from all racial and ethnic groups reported that their family members were sick or out of work due to COVID-19, but this was a more frequent situation for Latino students responding to the survey. In addition, as shown in **Figure 5**, students from some colleges were more likely to rate themselves in the bottom two bands than students from other colleges. **Figure 5** displays student self-ratings aggregated by ILSAMP partner institutions where five or more URM students completed the survey. Although the data set was very small, Institution F is especially noticeable for having a high proportion of students who described themselves as having problems. All of these students also identify as Latino/Latinx/Hispanic.

Crisis of Systemic Racism

Students interviewed were asked about how the current wave of protests against police brutality affected their experiences as STEM students at their respective universities. In their responses, students reflected on how the protests resonated with their individual experiences, how their academic plans were impacted, and what supports were helpful in navigating their own emotions during this time. When speaking about how the protests resonated with their individual experiences, many Black students were reflective and well-invested in the issue behind the demonstrations:

> "I dealt with a lot of depression during that time. I related my life experience with what was being protested. I wanted to look away but, as a Black person, I knew I could not."
>
> "As a Black man in America, [police brutality] has had very real reverberations in my life. I live in the West Loop, and commute to O'Hare. There's an increase in police patrolling. Increase in police mobility."

Some of the Black students interviewed mentioned their concern about having to educate colleagues on racial injustice, particularly because their work environments were largely occupied by white colleagues:

> "I usually work with White peers and colleagues. Being able to stay home when the protests were happening allowed me to be protected from co-workers asking about my opinions and for advice. Working-from-home protected me from any danger."
>
> "Not a lot of minorities work in my field. It was not easy to focus so much on the work. I don't feel responsible to teach them [white colleagues]. I come to work for work, not to teach social justice."

Other students (Black, Latinx, and multiracial) felt personally impacted by the looting occurring in their local communities:

> "It was very scary. I was lucky enough to not have to go out to work. Many stores close to me were affected. It could be said that it was unrelated to the real reasons for the protests. There was a lot of confusion."
>
> "I was frustrated because many of the grocery stores near my home were closed due to looting, so I had to go far to get groceries. My internship was also in the city and I had to get there four days a week. It was a mental strain thinking of how to travel there safely."
>
> "There was so much tension between gangs and protestors in my community. At one point, police weren't really doing anything [to intervene]. The gangs decided to run it, and would not let any Black people come into Pilsen or Little Village. It was a stressful time for my family living in those areas."

> "Within the mile radius [of] where I lived, stores and transportation were shut down and I had to leave the community to get the things I needed. I was always wondering if we would be looted or if I would be stopped by police. I was very anxious, so I didn't even want to go outside to take a walk and clear my head."

When speaking about how their academic plans were affected, some students from all URM subgroups commented on how the protests sparked motivation in their academic pursuits and overall involvement in the movement to end police brutality:

> "But the protests made me feel very angry. I did not like the social injustice at all but I feel it motivated me to push harder at what I'm pursuing."
>
> "It has not motivated my plans, but I am getting more involved in organizations and issues pertaining to police brutality."
>
> "It (the protests) was all over my Twitter feed and I felt like I really wanted to go out there and sacrifice myself, but I had to ask myself if that is something I should do as the best and most productive thing for me, given what I want to achieve for my people. I don't want to sacrifice myself to COVID. . . . I have always been aware of my Blackness and our trials, and felt that personal and business need to be separated. I am about the goals I set for helping my people. (The protests) make me want to learn more to do more."

Research Question 2: What is the impact of the two confounding events (the COVID pandemic and the increased visibility of systemic racism) on the academic progression of ILSAMP students?

Finding: Most ILSAMP COVID-19 Study participants are motivated to continue with STEM and plan to continue their studies, even if their specific plans have changed somewhat.

Finding: Survey data shows that ILSAMP COVID-19 Study participants were most impacted by the pandemic in their abilities to manage internships, in their increased financial needs, and in the increased amount of time it will take them to graduate.

Motivation to Continue With STEM

Survey data, as shown in **Figure 6**, indicates that most study participants are committed to continuing their STEM studies. In their interviews, students conveyed their hope and their enthusiasm. In many cases, fear about the pandemic coexists with commitment to continue in STEM. Students expressed many concerns and problems:

> "[The spring] was really hard. All lectures moved to zoom, [and I was on] without a camera. It's easy to get sidetracked and distracted. . . . I did not get to finish. I was looking forward to research and did not get to do it."

Since the pandemic hit, many students also had a harder time thinking about the future and their plans. Other students remain upbeat, even while they are worried. As one student commented, the pandemic both inspires and scares her:

> "I'm concerned mainly about the social distancing. How will we get back into the lab? What will we do? How do we maintain six feet distance? I want to continue in research and better my understanding of my major. The pandemic will make me stronger. It inspires me to work in research. As long as we can implement the safety standards that the CDC [Centers for Disease Control and Prevention] wants me to abide by."

Several told us that even though their work was slowed down, they are even more inspired.

> "My plans to graduate haven't changed. I will go to graduate school in chemistry. The pandemic has slowed down my research. I couldn't get into the lab. I wasn't impacted by the protests. But I was very angry, and I did not like the social injustice at all. But I feel it motivated me to push harder at what I am pursuing."

One recent transfer student from a two-year school to a four-year school said that her biggest regret was missing an opportunity for a fully paid scholarship to study abroad during the summer of 2020. She also slowed down her research so she wouldn't increase the risk of COVID-19 for her large family. This student has been very engaged with her college community and plans to graduate with a four-year degree in environmental science in 2022–23, after an earlier period of indecision during the summer. Looking forward past the bachelor's degree, she remains motivated to get the broader experience outside of the United States that she missed out on:

> "I definitely want to continue my education, but I haven't looked into it specifically. I would want to study in a different country and be less biased in my own learning, especially given my environmental sciences major. U.S. policies are a little bit behind. I want to learn from other places."

Impacts on Internships, Finances, and Time to Graduation

Figures 7, **8** provide numerical assessments of what changed and what didn't change as a result of the COVID-19 pandemic. Finances were one area commonly mentioned by students who were interviewed:

> "They are still forcing us to participate in a meal plan [that I don't like] because of safety reasons. We are forced into something for the sake of generating revenue."
>
> "I will be going [out of town] for my master's. It turns out that classes will be online this fall. I wish I had

known that before I signed a lease. I am working to find additional funding because not all things are covered by my scholarship."

"The problem with all my scholarships is that I need to be full time and it was very frustrating to find virtual classes to do that."

"I got terminated from my job because of the pandemic. I'm trying hopefully to get it back."

Interviewees also identified many disruptions in internships and other plans:

"I lost out on money from not doing the internship and I'm figuring out if it'll take more time to gain experiences. I wanted to boost my application for med school."

"It's very difficult to coordinate classes. I'm not sure it'll work out for the fall. I might need to take another semester before applying to the MD/PHD program for fall 2020."

"I will not return to school full time. I live in West Virginia and there is no community college here whose credits [my school] accepts."

"The biggest change was that I was set to study abroad this semester in China, then in Korea."

"This will be my last year as a senior. I am in the process of applying to grad school and I feel that COVID has slowed my application because it has interrupted my research."

Research Questions 3 and 4: What support are students receiving from their institutions and the ILSAMP program? What other supports do ILSAMP students need?

Finding: Most ILSAMP COVID-19 Study participants have received valuable support from their colleges or from their ILSAMP coordinators. However, the students have many more needs.

Finding: ILSAMP COVID-19 Study participants reported a high degree of frustration and disappointment with online learning. Students need support for negotiating these challenges, and faculty must be fluent with best practices for this pedagogy and need to have adequate technical support.

Finding: Several ILSAMP institutions provide examples of communication and community-building approaches that need to be expanded in the current environment.

Supports and Needs

In surveys and interviews, ILSAMP participants from all colleges reported both positives and negatives about the support they had received from their schools and their campus LSAMP initiatives.

Financial support was the most frequently mentioned factor, both as a positive and as a negative. **Figure 9** provides an overview of survey responses about support. On the positive side, students frequently mentioned that they appreciated generous CARES grants that they received through their institutions. Many students also commented that their colleges and professors were doing the best they could in a difficult situation. In rarer cases, some students said that their colleges care about them and shared information effectively. When students expressed this level of trust in an educational institution, they either identified a specific individual with whom they felt connected or they mentioned the financial assistance. For example, one student who rated themselves at the lowest possible level of wellness (0) commented in an open-ended survey question that:

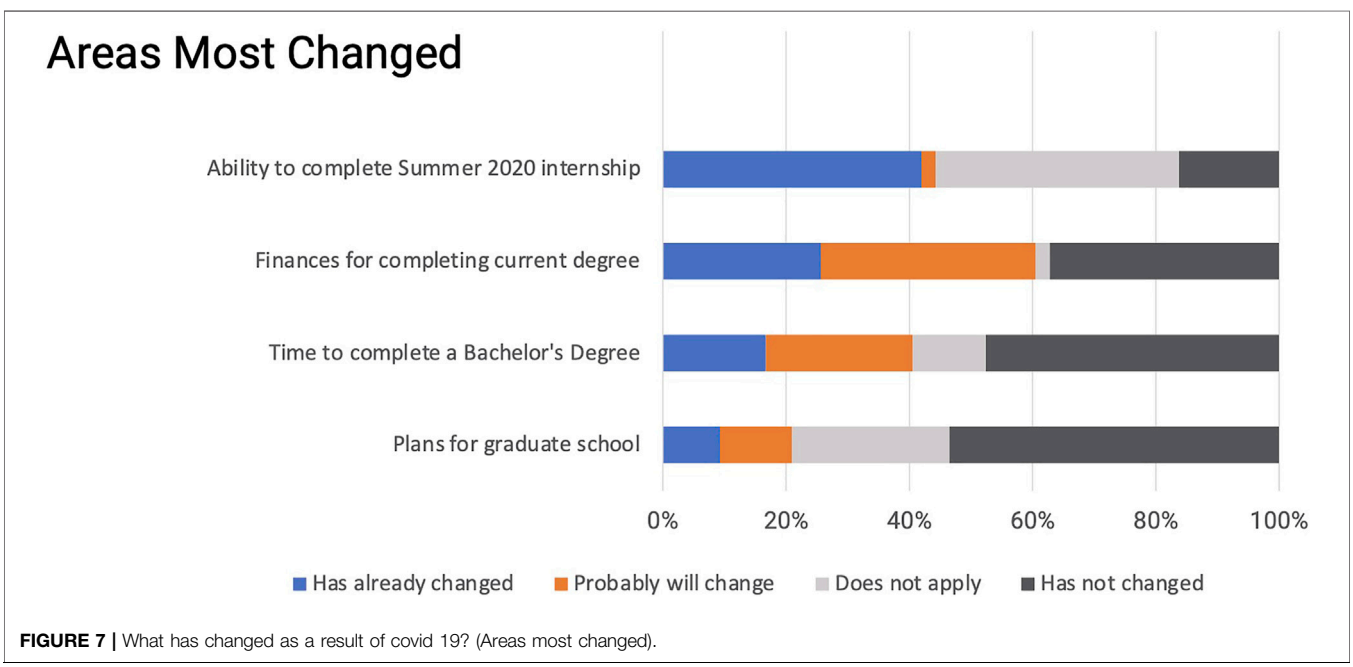

FIGURE 7 | What has changed as a result of covid 19? (Areas most changed).

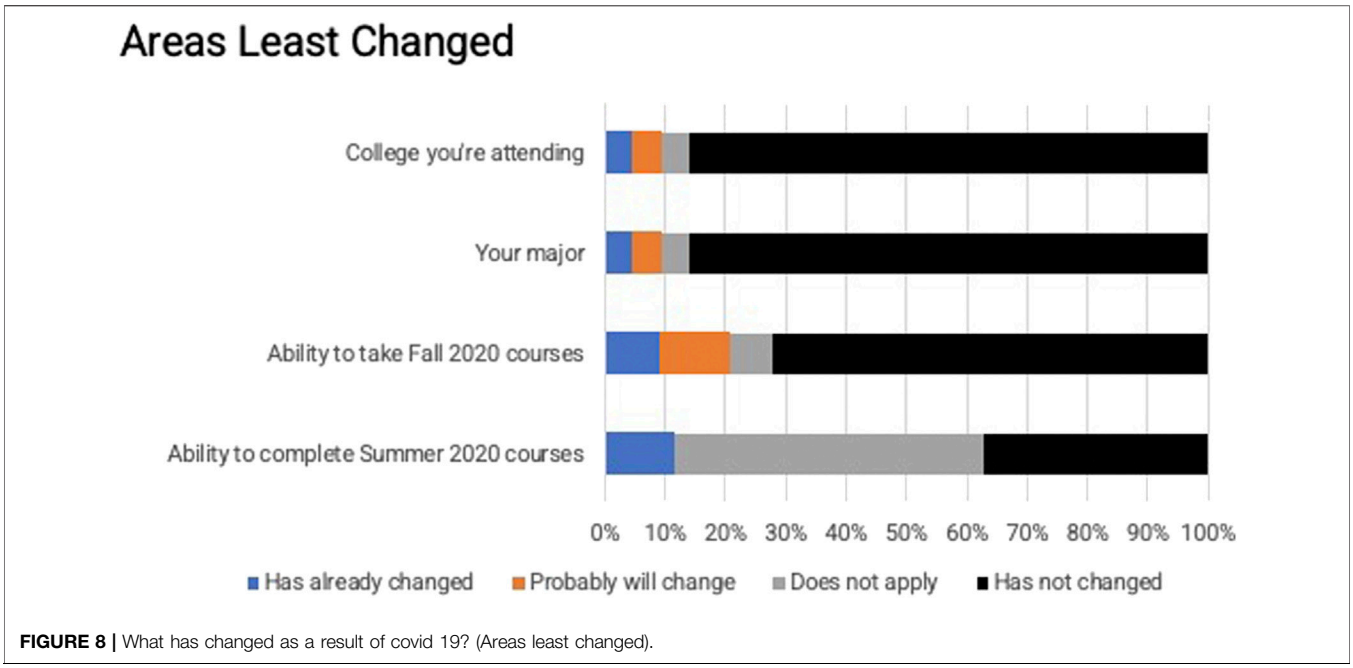

FIGURE 8 | What has changed as a result of covid 19? (Areas least changed).

> "We had the opportunity to apply for help because we had extra expenses at home and a lot of us got a check. This kind of helps us feel like they care about the situation."

On the negative side, many students also expressed anger at being charged full price for online education when they were not getting the equivalent value in course content and interaction with faculty and peers. Other material requests include additional grants, increased pay rates for student workers, and information about how to access basic needs such as food, housing, and personal protective equipment to avoid infection by the virus. Students also frequently requested clear, honest information about their institutions' plans for classes and for maintaining safe, healthy campuses.

Based on surveys and interviews, students at all colleges reported both positives and negatives about support from their colleges. However, several trends emerged:

- Several ILSAMP Partner Institution A interviewees mentioned the value of connections with specific mentors, with research teams, or with faculty connected with the learning assistance program.

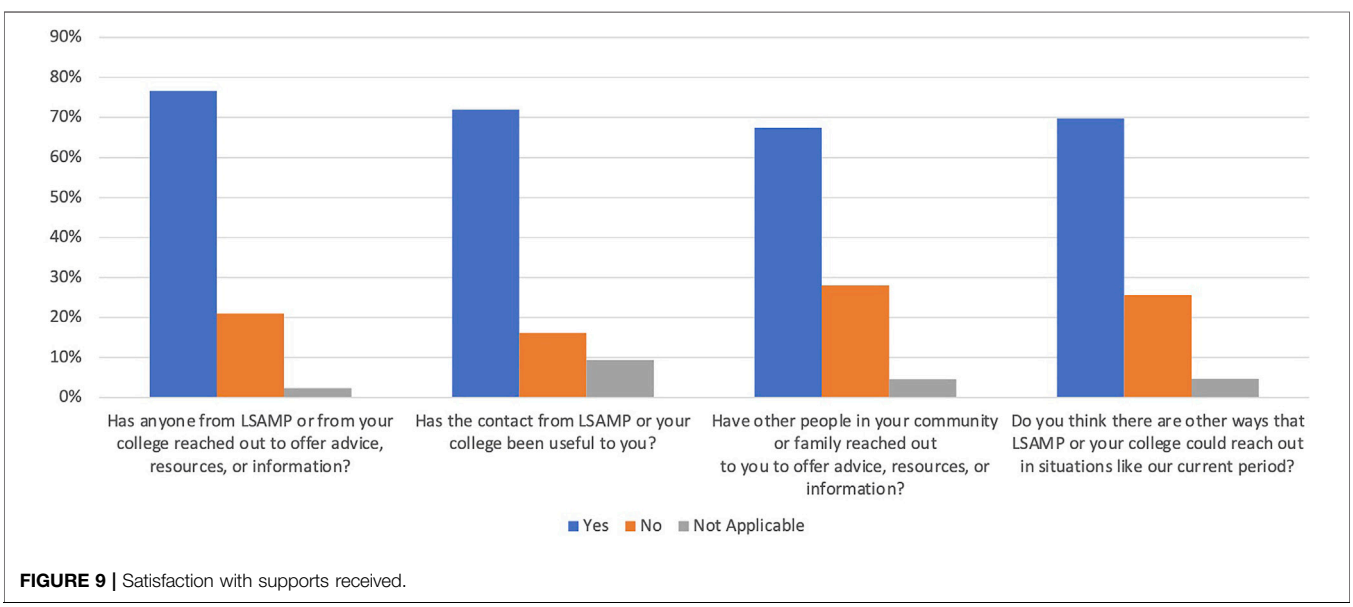

FIGURE 9 | Satisfaction with supports received.

- Several ILSAMP Partner Institution C students commented in interviews on the value of a Zoom meeting about anti-Black violence and racial profiling organized by a faculty member who is also the ILSAMP coordinator.
- All survey respondents from ILSAMP Institution E reported that the assistance from their college or ILSAMP was valuable. In interviews, these students clarified that a representative had reached out to Black and Latino students to make sure that they knew the grant application process.

Responses from students from other colleges showed no clear themes or did not have enough responses to identify either positive or negative themes. In some other colleges, individual students did identify specific people they were connected to. Sometimes these mentors were identified as being connected with ILSAMP, and sometimes they were identified as not being connected with ILSAMP. Students from several colleges mentioned that they were disappointed not to have heard from an ILSAMP representative or that they had not heard at all from individual STEM faculty members.

Frustration and Disappointment With Online Learning

Students interviewed were also asked about their individual experiences with virtual learning during their Spring 2020 semester. Overall, students faced challenges with the following:

- Stress management
- Access to resources
- Academic and technical support
- Other logistical problems.

Some students welcomed virtual learning as an opportunity for increased flexibility in their schedules:

> "I took advantage that classes were online and continued to work [at the hospital] as I needed to. I appreciated the flexibility of the online, nonsynchronous method."

Some students had mixed feelings about online instruction:

> "Online classes are manageable but very hard to resist distraction. The workload and instruction have been fine."

Many students expressed frustration with the transition to online learning in the Spring. Students said it was difficult to remain focused on instruction while facing the stresses of the pandemic. For example:

> "The online experience was horrible. It's depressing and not at all motivating. It is very hard on the eyes and the connections with technology was really bad."

> "The cultural environment was already very poor before the pandemic, as the students didn't really talk to each other. When the professor broke us out into working groups, no one talked in the working groups. There was no one to facilitate the groups, or deal with persons who were just really depressed."

Student after student reported that they did not have adequate access to technology, instruction, or other supports needed to successfully complete course expectations. For example:

> "I had to scrape money together for a new laptop. Some classes like Calculus 3, thermodynamics and chemistry lab were designed to be in person."
>
> "It was hard for me to study at home and find space for listening to and focusing on lectures. They could have refunded more money to us given that we had to rely on our own WiFi quality. I missed many things due to WiFi going down, I couldn't ask the professors to repeat it."
>
> "A lot of the material learned in class is usually clarified more in class. The professor can't gauge confused looks because all lectures are previously recorded and posted online."
>
> "I missed having study groups. Not having that made it more difficult to stay on top of deadlines. It was hard to keep track of everything going on."
>
> "The online courses are different, especially for STEM majors. . . . Anything could be on the test, even if they had never even gone over it in class, just to make it more difficult."

Examples of Communication and Community-Building in the Online Environment

Several ILSAMP institutions also provide valuable examples of communication and community-building approaches that need to be expanded in the current environment. Areas of challenge and problem-solving in the arena of student-staff-faculty interaction were:

- Faculty flexibility
- Mentor preparation for the virtual world
- Real connections between mentor and intern
- Community-building.

Table 3 provides examples of challenges in communincation and relationship building and how they are being met. Based on our research, none of the ILSAMP campuses provides a complete model, and this table draws on quotes from students from a variety of different schools. We share these examples to give glimpses of the types of activities that are likely to be especially important for translating LSAMP's framework into a virtual, post-pandemic, race-positive world, with a framework that

TABLE 3 | Challenges and solutions in communication and relationships.

Challenges	Solutions
Faculty becoming inflexible	**Faculty becoming flexible**
My teachers did not lift any of the grading requirements. It was insanely unfair. They were offloading all of the responsibility onto the students.	I was taking C+. It required a lot of self-teaching. The teacher did his best. He knew that all of us were not very familiar with taking online courses. He was very understanding if someone couldn't get online right away. He recorded it so they could watch it later. He was very good if we sent him emails or something.
Mentor without preparation for virtual world	**Mentor with preparation for virtual world**
My internship was with Oakridge National Laboratory in Tennessee for 10 weeks. I was disappointed not to be able to attend live. We did it virtually. I feel that my mentor did not respond to me as he should have—not as accessible, he clearly was not comfortable in using the technology. I had to constantly reach out to him. I sent him my paper 3 weeks before it was due. He never got back to me so I submitted it so that it would be on time.	I did an internship at Argonne, which was from May 26-July 2020. I think it went as well as possible. My project involved coding so I would have been online anyway. Everyone tried to mentor us as well as possible online. The research project that I was doing at went well, as well. It was mostly written research, I did a poster and then engaged in presentations online. It was a different experience, but it went well.
Sharing information with no interpersonal connection	**Sharing information as part of an ongoing mentoring relationship**
Without the guidance of an advisor, it is significantly more difficult to sign up for the classes I need. Advisors have reached out remotely. It is not the same. It takes a lot longer. There have been a lot of technical difficulties. A lot of busy-ness. I am worried about miscommunication. The advisors don't fully understand the question because I haven't been able to explain it in person.	I have been getting help from the state in cash assistance and food stamps. I was working at the hospital. Now I have a [different job] and am also doing research with my advisor. She has been very helpful. She checks up on me to see if I am alright and sends me emails through the day with information.
Desire for community	**Building a community**
My school did a pretty good job in giving updates. There were a couple of updates. There were a couple of events that showed there was still support to students. Anything else that could break the social distance would be helpful. I would love more of a sense of community. I would benefit from having conversations about what is going on now. Just starting the conversation, sharing experiences and resources.	I also belong to the group that does tutoring. A lot of people know me there, and they all reach out. My counselors also know me because I am a tutor. We try to know what is going on with everyone. I think [this communication] helps you to cope with being isolated. It's especially good that one of the counselors started organizing lunches to talk about what's going on with the students and basically to improve everything.

could be adopted by other alliances as well as organizations and institutions seeking to address STEM equity issues.

Experiences of Non-URM Students

We also looked into the experiences of students who responded to our request for research participants, but who were not considered "underrepresented minorities" in STEM by the National Science Foundation and are thus outside of ILSAMP COVID-19 Study participants highlighted above. Discussing the experiences of participants in LSAMP activities who are not URM students can shine a light on the processes and support systems needed across all campuses. The interviewees from this group included one Chinese American woman, one white woman, and one Filipino woman. Eight white students and two Asian students responded to the survey. Students in these categories were not eligible to receive LSAMP stipends, but were invited to participate in ILSAMP events and were connected to other external funding sources.

Survey data from white and Asian students shows that as a group they report higher wellness scores than URM students. For seven white and two Asian students who supplied ratings, the mean was 64 and the median was 72. Among these nine students, each rating was different, so there was no mode. Looked at by quartiles, we report the following information. The comments for non-URM students within each quartile are similar to the comments for URM students in the same quartile, although the distribution between quartiles is different.

In crisis–Quartile 1 (n = 1): "We are struggling to pay our bills and put food on the table due to covid-related job loss and fear of getting sick."

OK–Quartile 2 (n = 2): "My father owns his own business and due to COVID-19, business has slowed significantly. Currently, my family is living on profits from last year and hoping that business booms again soon."

OK–Quartile 3 (n = 3): "I'm doing ok, the family is also. Our jobs have been affected and it is stressful but I am coping."

Fine or OK–Quartile 4 (n = 3): "My family is always supporting and caring for each other. . . .when we face problems we will put (conflicts) aside and be united."

The perspective of the Chinese American interviewee highlights the importance of personalized outreach and communication with any students who may be at risk. This student experienced anti-Chinese harassment that resulted from racist rhetoric used by U.S. politicians in addressing the root origin of COVID-19. Because this particular student is excelling academically, her mental, psychological, and spiritual health may be flying under the radar of advisors or mentors. Through sharing her experience with researchers, this student highlighted her heightened exposure to risk and her need for support from a community like ILSAMP. Her experience should be a wake-up call to ILSAMP, adding to the reasons that processes and support systems need to be put in place across campuses that can benefit all participants, especially at a time when various groups and individuals are targeted by xenophobic, white nationalist sentiments.

She gave more details:

> "My family is doing well overall. We are safe and have had the ability to shelter in place. I was able to finish in the spring and maintain my 4.0 and I have been doing my student research at my school. This (pandemic) has hit me more mentally and psychologically than anything else. I am very empathic and when we shut down in the spring, people were very fearful of the disease."

As a Chinese American, she is part of a community that has been targeted since the president of the United States repeatedly blamed the COVID-19 pandemic on China.

> "I used to work in Chinatown. I stay in touch and I know that restaurants there are being harassed (In my own neighborhood,) people walk past my porch and cross the street. I have a history of anxiety, and this heightened it."

The college and the ILSAMP program have done little or nothing to address these issues or even acknowledge them.

(My school) has a coronavirus task force that gives us weekly updates and advice on coping, like meditation, but it's not very proactive. I am not aware that ILSAMP has reached out. Just the recent survey and then this interview. It's hard to say whether anything is happening because everything is so remote. They could have provided social Zoom sessions so that we still felt like part of a university family. There could have been more cohesiveness, letting us know that the world was "still here."

A white student from a different college provided an additional lens in this study, sharing her experiences during this time as someone living and learning with physical disabilities. She highlighted the importance of personalized outreach and communication for all students during the current crisis and describes both the challenges and support she received from faculty and staff at her two-year college.

> "My family is doing pretty OK. We generally keep to ourselves. My mom had a stroke last year. My mom, my son, my brother, and I live with my grandmother."
>
> "It's stressful to start the semester. My son has ADD and he's in special education. I'm also dealing with the complications of giving my sister a kidney. For me as a student, it's kind of difficult doing the online classes. I'm grateful to still be able to complete classes, but I appreciate the in-person way more. With my learning disabilities, it's hard to concentrate. . . . I was taking intro to organic in the spring, finishing the class online. It can click when I'm there in person, but not online. I ended up passing with a C. There was no way to get an A."

This student counts on her campus office that supports people with disabilities and relies on the support of her advisor, who is also the ILSAMP coordinator for this school.

> "What's been helpful is my advisor and the people in the office. A lot of students don't take advantage of the many resources going on at school. I've been working with an advisor to maintain my funding after 6 years at this school. I used up all financial aid, and I'm trying to work that out."
>
> "The college and LSAMP did a really good job, asking me 'How is your day going?' They generally really care. I'd like to go to graduate school, but my learning disabilities make me apprehensive."

The ability to develop this relationship prior to the pandemic was essential in facilitating the student's ability to access accommodations and support during the current crisis. The situation highlights the need to focus even more attention at the current time on providing space for relationship-building.

Other examples include several ILSAMP students who identify as non-binary and ask that ILSAMP see and recognize them for who they are. One of these survey respondents is a white student from a family that is experiencing a financial crisis, like several of the African American and Latino students' families detailed above. After completing the first year of college, this student's timeline for completing college had already changed as a result of the pandemic:

> "We are struggling to pay our bills and put food on the table due to COVID-related job loss and fear of getting sick. I wish my school would give more financial aid to its students."

The feelings of isolation and marginalization described by these non-URM students who are part of the LSAMP sphere intersect in many ways with the feelings of isolation and disconnection described by the URM STEM students in this study. The lenses that the non-URM students offer on issues such as anti-Asian racism, disability, poverty, and gender difference point to a deep need for LSAMP staff and faculty be tuned into the multi-faceted realities of all their students. Openness to the complexity of student identities, as well as skills in reaching out to different groups of students in times of crisis, is one way to strengthen the entire LSAMP community, including its core population of URM students.

DISCUSSION

Implications of This Study

We report here on findings based on work that was primarily empirical and practical, with the goals of identifying what was happening and what could be done to assist URM STEM students during the crisis that began in March 2020 in the United States and continues as this manuscript is being prepared. The project was not designed as an examination of theoretical issues of URM student retention in STEM. However, during this period of crisis, pre-existing patterns of inequality, as well as challenges to them, became more

visible across the country. Similarly, this short-term, crisis-focused study provided a valuable lens for looking at the needs and strengths of URM STEM undergraduates. Thus the voices of young Black and Latino students during this crisis period do have relevance to several theoretical constructs that underpin interventions for student success and retention.

ILSAMP students generously shared many suggestions for the needed supports in the current environment. To a large extent, student recommendations overlap with key elements of the LSAMP model—academic support, community, and professional opportunity (**Table 1**). These needs are exacerbated by the current crisis, and student voices underline the relevance of the key elements of the LSAMP model. In spite of the practical relevance of LSAMP as program framework, student interviews also highlight gaps in Tinto's conceptual framework, which gave rise to many of the elements that have been incorporated into LSAMP.

In particular, this study shows the gaps in a conceptual framework that focuses on integration and belonging, but fails to theorize concepts related to student agency, racial identity, and racism. The motivation and determination of URM students to pursue their STEM careers in the face of adversity of the Covid 10 pandemic a remarkable theme in this study. Experiences with race and racism were also highly salient to study participants. This sample was small, and it is quite likely that students who were more motivated were the ones who responded to the researchers' request for study participants. Nevertheless, these participants demonstrate that an adverse context including attacks on science and a health crisis can motivate, rather than deter, URM STEM students.

On a theoretical level, a conceptual model that employs concepts of "integration" or "belonging" without recognizing the complexity of student identities will miss the role that URM students' racial identities, family identities, and community identities play in contributing to a commitment to pursue a STEM degree career. Similarly, a conceptual model that ignores what Hurtado refers to as "exclusionary cultures"of higher education will miss the ways that faculty and staff are often oblivious to the lived realities of URM students.

On a practical level, student experiences during this period of crisis show that is essential for college faculty and staff to a) be attuned to racial trauma; b) be comfortable talking with students about race and racism; and c) ensure that they have developed trust and connection with all students.[3]

Student Recommendations and Requests

These can be divided into two broad categories**:** financial needs and safety and connection to community. The increased visibility and exacerbation of U.S. racism in the United States also highlights the need to explicitly address racial trauma with LSAMP students (Comas-Díaz et al., 2019).

Financial Needs

First, faculty, staff, and administrators should be advocating for increased funding to support the education of URM college students at this time. Across the board, the need for financial assistance is a great priority. It is important to note that the students who participated in this study are most likely to be those who are least in need—their participation indicates that they had the time, the place, and the technology to take part in a study like this (Ball et al., 2019).

Students who participated in this research identified needs for: additional grant money; tuition reduction; jobs to replace their lost jobs; and information about access to basic resources (food, shelter, medical assistance). Staff and faculty are in a position to share information with students about available resources and to advocate for additional funds. Many resources provide information about strategies for increasing material support to students during the pandemic and other crises. At the national level, the National Science Foundation can ramp up funding to engage URM students and professionals across the country in the current period. One option is to research and implement best practices for creating a virtual professional development and research network. This could be a targeted source of stipends for participating students who are badly in need of immediate resources. This type of virtual network is a natural extension of the networking that has consistently grown through LSAMP. It has the potential to motivate both students and faculty to reach out in new and needed ways.

Safety and Connection to Community

Faculty, staff, and administrators should be working to ensure a sense of safety—emotional, social, and physical—for their students. Communities of color and immigrant communities are under attack (Morey, 2018), not only due to a health crisis, but *also* because they are targets of police, racists, and other fear-mongers—egged on by national leaders and their allies. Students of color are at risk. Therefore, those responsible for LSAMP and similar programs need to engage proactively with the threats facing their students on campuses and in their respective communities. The Partner Campus C Zoom meeting about racial targeting is a good example of this. Others include training in active listening and sensitive questioning by white faculty members about whether students feel that they are in danger. Additional resources are available through many racial justice organizations.

We make some recommendations to support STEM students of color that may also be applicable to Alliances across the country or other organizations seeking to provide and promote equity in STEM. These would build on the existing strengths of LSAMP and would position the model as a resilient building block to help students face unknown future crises:

- At every campus, program staff and faculty need to help URM STEM students stay connected to their college and stay committed to achieving their goals. Setting up online study sessions and group talking sessions are low-hanging

[3]This last point would include recognition that the ways that students self-identify are often different from the racial categories used by the National Science Foundation. For example, a student who is classified as African-American/Black or Latino/Hispanic, might identify more strongly with a national identity of their country of origin than with a U.S. racial category.

fruit in terms of support strategies. Strong and ongoing mentorship by faculty members is essential in helping students to stay motivated, negotiate the constantly shifting information available from universities, and mitigate the consequent anxieties that are likely to continue for the foreseeable future.

- At all LSAMP alliances, there should be communication among coordinators about what has proven successful at each of the campuses in supporting students, helping them address a racist environment, and accessing funding opportunities. Students on some campuses report feeling more connected than students on other campuses. LSAMP coordinators should share what they are doing to help students during this period.
- Students on every campus should feel that LSAMP is a program that cares about students. LSAMP should utilize online spaces for students to interact with each other and with professionals who look like them. LSAMP conferences have been valuable spaces where student participants learn about new opportunities, where achievements of Black and Brown students are celebrated, and where information about STEM pathways is shared.

Limitations

By its nature, this study was limited in timeframe and scope. It raises many additional questions:

- First, it would be valuable to conduct a longitudinal, qualitative study of students who expect to continue their education in STEM. Do African American, Latino, and multiracial students who are motivated and committed during the summer of 2020 continue their pathways as they expect? What stays the same? What changes? What supports and challenges do they encounter along the way? What adaptations are ILSAMP, departments, and other programs able to make to continue to provide high-quality educational experiences to their students?
- Secondly, it would be useful for a future qualitative study to contact students who were "missing" from the current research project. Targeted outreach to these students might be possible through LSAMP coordinators and peers at their colleges. These students are absent from this study, but they would be an important part of the story of how students of color negotiate their identities as college students and as community members.
- Finally, it would be valuable to collaborate with LSAMP partners and access university databases in order to compare changes in STEM enrollment patterns among African American, Latino, Indigenous, white, and Asian students. This would provide information about a much larger group of students than was feasible in the current design, which was limited to students who were already engaged with ILSAMP or other STEM research opportunities. In addition, collecting data from colleges would be a way to access information about students who are less engaged or who may be facing other critical problems and may not be likely to respond to research requests like this study.

CONCLUDING COMMENTS

In conclusion, URM STEM undergraduates who participated in this study maintained a commitment to their educational goals while facing the challenges of the COVID-19 pandemic. For many students, racial and community identities contributed to their commitment to achieving success in science and related fields. While LSAMP programs provide important avenues of success for URM students, many students in this study described a sense of disconnection from their professors and institutions during this period of crisis, suggesting the importance of additional attention to deeper relationship-building in LSAMP and similar programs. Furthermore, theoretical work about student agency, racial identity, and science identity would also be important to have fuller understanding of the role of LSAMP and other programs in supporting student success.

In addition, it is important to note that the online format adopted in this study may exclude a group of URM students who may be in dire need and therefore unable to participate in this study because technology is lacking or limited for them (Ball et al., 2019). The students who participated in this study are, by and large, motivated and committed to attaining their STEM degrees in spite of a challenging environment.

This study uncovered hope, optimism, and tenaciousness among ILSAMP students as they face challenging circumstances while pursuing their STEM degrees. Additional research could further examine the depth, breadth, and limitations of LSAMP student progress amid such conditions.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material,** further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Chicago State University IRB, amendment on Protocol #: 015–06–17. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CB, SB, LJ, and MD were involved in the design of the study. SB, MD, and MC were involved in quantitative data acquisition, and data analysis. CB, SB, and MC were involved in manuscript preparation.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2021.681027/full#supplementary-material

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