EXTERNAL EVALUATION OF CAHSI INCLUDES, YEAR 2
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Executive Summary

In the second year of the CAHSI INCLUDES Alliance funding, CAHSI has made substantial progress in aligning participants and partners with CAHSI’s vision and mission and in mobilizing regional networks to carry out strategic actions. CAHSI also continued to gain national visibility through policy advocacy, external partnerships, and large-scale events, such as the Torohack and CAHSI Summit at the Great Minds in STEM conference. Overall, evaluation data from the second year of the CAHSI INCLUDES alliance grant indicate a well-developed, strong social network among CAHSI participants, growing implementation of strategic activities and regional coordination and collaboration that is aligned with the vision of CAHSI.

National Visibility

CAHSI is gaining national visibility, as is evidenced by two major events in the 2019-2020 academic year, the Los Angeles based, student-led Torohack conference and the policy work accomplished by the national CAHSI Alliance. Torohack, co-branded in 2020 as the The First Annual Los Angeles Cybersecurity Summit-South Bay, is a cybersecurity conference spearheaded by the CSU Dominguez Hills Cybersecurity Student Group, which has grown to accommodate 400 in person attendees and numerous remote participants. CAHSI utilized the regional network infrastructure to promote attendance across California. Congresswoman Maxine Waters served as the keynote speaker, and her address was broadcast on the CSUDH YouTube channel (https://www.youtube.com/watch?v=XYu0mcS-2Ps) in which she detailed bills she has supported to promote cybersecurity efforts in the future. In this way, a CAHSI event garnered regional and national prominence, based on student leadership and action. The CSUDH students shared what they have learned with other CAHSI regional partners via the CAHSI student advocate network, managed by the connector in the West region.

Another way in which CAHSI has earned national visibility in the past academic year has been through its work to support and advocate for equitable funding practices for Hispanic Serving Institutions. In July of 2019 over 40 faculty, administrators, and agency representatives met to develop a set of recommendations to a funding agency regarding how to support equitable distribution of resources to different higher education institution types. The event was hosted by CAHSI, facilitated by the backbone. Participants represented Hispanic populations, either through their affiliation with Hispanic Serving Institutions or through their own reported ethnic identity, and in some cases represented Hispanics in both instances. The findings from this workshop were developed into a report presented to the National Science Foundation. In addition, the CAHSI INCLUDES Alliance was asked to comment on House Bill 4372, The MSI STEM Achievement Act. CAHSI Leadership offered feedback to the developers of the bill, which was passed in the United States House of Representatives in September of 2019.
Systematizing student agency within CAHSI
As CAHSI grows the network, students have been afforded greater agency to do the work of the Alliance in support of their peers. A grant from RebootsCS has provided funding that helped formalize the student advocate roles within CAHSI and provided modest stipends for some of their mentors. At the same time, CAHSI backbone staff have fortified the CAHSI advocates group structure and communication strategies. Regional bi-monthly meetings with advocates and backbone staff reinforce the connector/coordinator monthly meetings as opportunities to share information quickly with the regional networks. At the same time, the CAHSI scholars program, which honors CAHSI students who give back to the community, creates a cohort of leaders who work together to develop CAHSI resources. Some regional staff are beginning to hold advocate meetings within their sub-regions to provide opportunities for students to learn from their peers about ways to promote student excellence. In this way, CAHSI INCLUDES has created opportunity for student leadership, and a potential path towards successive opportunity within the alliance, e.g., from CAHSI advocate to honored CAHSI Scholar.

Students’ experiences with COVID-19
Findings from a survey administered in spring and summer 2020 suggest that students faced many academic, financial, and personal challenges during the covid-19 campus closures in spring 2020. Students expressed great anxiety, frustration, and difficulty in focusing academically, which was for many exacerbated by their home situations, available resources, and their health and financial circumstances. Some students, particularly women, struggled with mental health issues during the pandemic, such as increased depression, stress, and anxiety. Many students lost jobs or income during the stay-at-home order and faced difficulties in paying for housing, food, and other bills. Other students faced disruptions to their academic progress, such as delayed graduation, anxiety about grades, and concern about securing professional positions or careers. These concerns were most prominent among third- and fourth-year undergraduate students and Ph.D. students, as well as students from underrepresented groups in computing. Nearly half of students lacked reliable wifi and many did not have a quiet place to study during remote learning. Despite these myriad challenges, students reported that they maintained interest and commitment to their computing majors, with 85% of students reporting that their interest in computing was the same or had increased since covid-19. During the campus closure, students received the most support from their departments, and to a much lesser extent, university services and resources. Many students found that CAHSI faculty were an important source of support, communication, and guidance during a difficult time. Overall, faculty and peers were significant sources of support for students and may have served to sustain their interest in the discipline.
Mobilizing collective infrastructure to respond to emergencies
The COVID-19 pandemic tested the CAHSI INCLUDES Alliance partners’ abilities to work towards the shared vision of CAHSI. While some activities were paused or canceled, the Alliance infrastructure supported communication and action. Communication was disseminated through multiple channels about institutional, regional, and national resources available to faculty and students. Data were collected to support CAHSI’s understanding of student experiences with the health crisis, and programming was proposed, funded, and implemented to support student engagement and retention in computing.

Effective strategies for continuous communication
From participant observation and interviews, several promising practices were identified for effective continuous communication within the CAHSI network. By and large, interview participants reported that frequent regional meetings were the most effective way of sharing information and ideas among members and to facilitate collaborations. The following benefits that support collective impact work were documented from regular regional meetings: 1) Building relationships and developing trust amongst CAHSI members, 2) Developing and facilitating collaborations, 3) Sharing information and resources, 4) Sharing student and faculty opportunities, 5) Trouble-shooting/problem-solving, and seeking advice about challenges, 6) Sharing promising practices, 7) Setting goals and coordinating strategies, 8) Providing access to outside expertise through guest speakers and other sources, 9) Affirming, promoting, and reflecting on CAHSI’s vision, 10) Encouraging and motivating CAHSI participants, 11) Orienting and integrating newcomers into the region and the broader CAHSI community, and 12) Connecting the region to the backbone through the attendance of a backbone member at the regional meeting. Additionally, regional meetings and community of practice meetings, such as the problem-solving course group, fostered learning communities where participants can share best practices and strategies and grow in their understanding of equity and inclusion. Other important aspects of continuous communication were regular connectors and coordinators meetings, executive committee meetings, sub-regional meetings, student advocate meetings, and periodic all-hands meetings. Although collective impact work requires a tremendous investment in time and meetings, the regular communication is vital in assuring that activities are aligned with the CAHSI vision, for sharing information, ideas, and opportunities, and building productive, collegial relationships.

Growth in student clubs and CAHSI student chapters
Overwhelmingly, one of the most important accomplishments at the departmental level in the past year was the growth in student engagement, particularly through the increase in the number
of student clubs and CAHSI chapters. In fact, nearly half of CAHSI members replied in response to an open-ended question that student clubs or student development activities (e.g., hack-a-thons, trainings, workshops, etc.) were their most important achievement in the past year. The percentage of CAHISI departments with CAHSI chapters or student clubs rose from 55% to 83% in the past year. The growth was relatively even across regions. Additionally, 83% of departments also offered skill-building activities for students in the past year, such as hack-a-thons, interview workshops, and more. Even before covid-19, many of these opportunities were offered virtually so that students from across the region and across the CAHSI INCLUDES network could participate. In regional meetings and in interviews, CAHSI members articulated promising practices for promoting student engagement. Some of the practices that increased student interest and involvement were: 1) student visits in computing classes to promote CAHSI and student opportunities in the department, 2) local industry involvement and events (e.g., interview workshops, panels, etc.), 3) provide food at events and meetings, 4) have students design and develop programming and events, and 5) provide fun events in addition to professional development opportunities, such as parties or scavenger hunts to build community amongst students.

Growth in collaborative proposals and projects
In interviews and on the collective impact survey, there was a noticeable growth in the number of collaborative proposals developed that involved multiple CAHSI members across a region. Members who had been affiliated with CAHSI for a longer time were more likely to submit proposals related to CAHSI and its vision. For example, most CAHSI participants (80%) who had been involved with CAHSI for more than 6 years submitted a grant proposal related to CAHSI in the past year, while only 33% of those who had been involved for less than a year. Interviews with participants affirmed that many of these proposals involved multiple CAHSI departments and members coming together with a common purpose, such as supporting K-12 computer science teacher preparation in the northern California region. The west region has also been heavily involved in the CalBridge project which uses the APS Bridge INCLUDES Alliance as a model to create a pathway to Ph.D. programs for underrepresented students in computing in the California State University system. Many members of the west region were introduced to the CalBridge program through their affiliation with CAHSI and may not have been able to be involved with the program otherwise. A cross-regional grant proposal was submitted in the summer of 2020—the large US Department of Education grant would provide funds to develop computer science K12 teacher preparation utilizing the expertise of community college and 4-year faculty from New Jersey, California, New Mexico, and Texas. In addition, as the enrollment of Hispanics in east coast institutions rise, the number of institutions that are qualifying as HSIs are growing.
The North region has collaborated on multiple proposals with emerging HSIs and consider the collaborations as ideal methods for recruiting new membership.
Introduction

The Inclusion Across the Nation of Communities of Learners (INCLUDES) initiative is one of the National Science Foundation’s Ten Big Ideas with the goal of dramatically broadening participation in STEM fields by creating networked relationships among organizations and across sectors. The Computing Alliance of Hispanic-Serving Institution (CAHSI) INCLUDES community builds upon the success of CAHSI in the past decade in developing the organizational capacity and partnerships to promote the recruitment, retention, and advancement of Hispanics in computing. CAHSI INCLUDES uses the collective impact framework to bring together stakeholders across sectors to tackle the problem of the underrepresentation of Hispanics in computing.

This mixed-methods evaluation study contains formative, summative, and needs assessment elements. The evaluation goals are to provide summative results to assist CAHSI determine whether it is meeting its goals related to collective impact infrastructure and to provide formative information and feedback to help CAHSI INCLUDES in understanding the reach, capacity, connections, and strategic actions in its collective impact efforts. The evaluation data collected for this report includes participant observation at CAHSI INCLUDES events and meetings, stakeholder interviews, website and document analysis, social network and collective impact surveys of CAHSI members and affiliates, and case study data of particular initiatives. Survey results from scale-up efforts in the past year (Great Minds in STEM participant survey, PLTL survey, and problem-solving survey) will be included in an appendix to the report that will be submitted in early August. The evaluation questions addressed in this report are:

1) How has the CAHSI INCLUDES community developed the capacity, connections, and expertise to be able to work collectively across regions to achieve a common vision?

2) How has CAHSI utilized the collective impact model and its principles of effective practice to facilitate change?

3) In what ways does capacity and strategic planning differ by region and by the length of involvement of members in the CAHSI community?

4) To what extent has communication and trust developed across the network facilitated strategic planning and action?

5) In what ways has the Backbone functioned to support the growth and development of the CAHSI INCLUDES network in relation to the five elements of collective impact?

Rather than focusing on individual institutional results within regions, this report focuses on the work of the national CAHSI INCLUDES community in solidifying its vision and partnerships and advancing common goals. To this end, the evaluation focuses on the connections within the CAHSI network; the commitment, values, and organizational capacity of network members and
affiliates; and the strategic actions undertaken within the network. The evaluation focuses exclusively on capacity and activities of the regional and national network overall to implement strategic action and does not address individual or institutional outcomes related to achieving CAHSI’s vision. The CAHSI data management team will be responsible for tracking each institution’s progress towards reaching CAHSI’s vision and monitoring national benchmarks related to enrollment, graduation, and other metrics of Hispanic representation in computing. In turn, the external evaluation will focus on the health, growth, and capacity of the network overall. This report is framed within the five elements of collective impact to provide insight into the development of the CAHSI community as related to the five critical areas of collective impact work.

Evaluation Methodology: Data Sources for Annual Report

Collective Impact Survey
In the past few years, CAHSI made great progress in democratically and deliberatively developing vision and mission statements. In the second year of the INCLUDES grant, the focus has centered on continuing to expand to new institutions and partners, and expand CAHSI’s reach through sustained regional activities, and policy work and advocacy. One of the goals of the evaluation is to better understand how regional members participate in CAHSI, how they view the common agenda, the progress they have made in thinking strategically about working toward the common goals, how regional strategic planning is informed by CAHSI’s vision, and how implementation is guided by data. The evaluation also seeks to identify what is working well in encouraging regional relationships, communication, and strategies. To that end, the evaluators distributed the collective impact survey to all regional CAHSI participants which is framed within the five elements of collective impact and measures regional progress in achieving the outcomes laid out in the CAHSI Backbone visioning document. The survey was sent to all faculty, collaborators, and others who have attended CAHSI regional or national meetings or events within the past two years. The survey was sent to 120 CAHSI participants and 45 responded. Respondents were largely from the southwest region (46%) and west region (27%), but the north region (15%) and southeast region (12%) were also represented. Respondents primarily held tenured faculty positions or department chair positions (74%), although a few held dean or other administrative positions (10%). The remainder classified themselves as “staff” (largely connectors and coordinators).

Social Network Analysis
The social network analysis was developed to map the social network and its health throughout the life of the CAHSI INCLUDES Alliance grant. Year 1 data serves as baseline information about the functioning of CAHSI, and is further analyzed at the regional level. The evaluators utilized the
Partner tool, developed by Danielle Varda and her team from the University of Colorado, Denver. The tool was adapted to focus on computer science education and is based on the theory of social network management and optimization. Questions address whom is connected to whom and the quality of those relationships (e.g., trust, value), what contributions individuals bring to the collaborative, the extent to which the collaborative is reaching its goals, and how the change to collective impact might influence the CAHSI community. The evaluators utilized the analysis tools provided by PARTNER to develop social network maps on multiple variables, including types of joint activities with which members engage together and frequency of communication. See https://visiblenetworklabs.com/partner-tool-resources/ for more information on the resource.

The survey was distributed to backbone staff, regional leads, co-leads, coordinators and connectors electronically. The survey was held open for 3 months and reminders were sent to individuals who had not completed the survey. This year, 27 CAHSI staff and leaders took the survey out of a possible 31 who were asked to do so.

Interviews with Regional Leadership
CAHSI leads, co-leads, connectors, and coordinators were asked to participate in interviews with evaluation team members. Interviews typically lasted 60 minutes and were audio recorded and transcribed using an online transcription service. Transcripts were analyzed using content analysis methods and incorporating the 5 elements of collective impact as themes of interest. Interview data was utilized to illustrate and provide examples of how collective impact is understood from multiple perspectives within CAHSI, and quotes appear throughout the evaluation report, as they are relevant to the five elements of collective impact. Quotes are representative of the larger findings and themes that arose from the interview data. Because the interviews were lengthy and complex, there was not always a single quote that best typified the themes in the interviews, and therefore, interview themes may be discussed in broader terms and without representative quotes.

Participant Observation
CAHSI evaluators were present at all national meetings and many regional meetings throughout the year. At each of these meetings and trainings, CAHSI evaluators took extensive notes that were then analyzed using similar processes as interviews. Observation notes were searched for key themes and examples of each of those themes (e.g., regional communication, mentoring, strategic planning, etc.) were identified.

COVID-19 Survey
In response to the abrupt shift to remote learning and the personal and financial disruptions faced by many CAHSI students, the CAHSI evaluators administered a survey to 14 CAHSI departments in April through June of 2020. The survey was developed with National Science Foundation funding from a research grant of STEM transfer at diverse institutions (NSF EHR-DUE
The survey was modified and adapted based on interviews with regional leads, co-leads, coordinators and connectors so that the survey could be responsive to the experiences of CAHSI students and the needs of CAHSI departments. Survey domains included the impact of covid-19 on students’ financial, personal and emotional well-being, and students’ interest and commitment to the field. Students were also asked about sources of information and support during the shift to remote learning and for their feedback on the efficacy of various aspects of remoted learning. The demographics of survey respondents are profiled in the covid-19 survey section in the appendix of the report.

**Analytic methods**
The quantitative data were entered into SPSS or Microsoft Excel where descriptive statistics were computed. Frequencies and/or means are reported for most of the items. These items were rated on a 5-point or 7-point Likert scale. Centrality and density of the social network data were computed. Tests of statistical significance, such as t-tests or one-way ANOVAs, were not conducted because they were not appropriate given the data. Although inferential statistics were not computed, group differences are reported, when relevant, using descriptive statistics, such as crosstabs and means.

Write-in responses to the open-ended questions and stakeholder interviews were coded using domain analysis methods. Each new idea raised in a written response was given a unique code name. As these same ideas were raised by later respondents, each segment was added to an existing code reflecting that idea. At times the write-in answers were brief and represented a single category, but more frequently, responses contained ideas that fit under multiple categories, and these were coded separately. Codes were organized into larger, descriptive categories, or “domains.” Domains were generated deductively, from the research and evaluation questions and theoretical concepts guiding this study (e.g., five elements of collective impact), and inductively, from the data itself. The coding framework was organized into taxonomies linked by a semantic relationship, such as “a is a kind of b,” or “a is a result of b.” Componential analysis allowed for examination of outcomes and differences among groups, such as gender, ethnicity, organizational affiliation or career rank.

**Evaluation Findings**
The report is divided into sections based on the elements of collective impact: common agenda, mutually reinforcing activities, continuous communication, backbone support, and shared measures. Relevant data are described and discussed within each section. The report concludes with recommendations for future consideration as CAHSI continues to scale its efforts and expand its reach.
Common Agenda
Throughout the INCLUDES project, CAHSI made great progress each year in democratically and deliberatively developing vision and mission statements. In the past year, the focus has centered on solidifying regional networks, scaling CAHSI activities, and broadening the visibility and reach of CAHSI INCLUDES. Defining and promoting a common agenda, or vision, among members and participants is one of the key tasks of collective impact work. To that end, one of the goals of the evaluation this year was to better understand how members view the common agenda and the progress they have made in thinking strategically about working toward the common goals.

Common Agenda: Collective Impact Survey
The results of the collective impact survey demonstrate that the CAHSI INCLUDES community continued to make progress in putting CAHSI’s mission and vision into action through developing and implementing strategic action plans. Almost all survey respondents (85%, 38) had developed strategic actions during the past year. Therefore, CAHSI INCLUDES participants seemed to continue to engage in strategic planning—whether informally through meeting or dialogue or formally through the strategic action template—that they had initiated during the onboarding meetings in the first year of the INCLUDES grant. About the same number of survey respondents had implemented strategic activities, a higher rate than in the first year of the grant which suggests that CAHSI participants made more progress in the past year in putting their strategic plans into action. A majority of CAHSI participants also developed and sustained partnerships to advance CAHSI’s vision (76% managed cross-sector partnerships and 71% recruited new partners). To a lesser extent, regional CAHSI participants sought funders (43%).
There was little regional variation in designing or implementing CAHSI’s common agenda. All regions worked toward implementing strategic actions and all regions took steps to develop and manage local partnerships. Participants in the southwest region were slightly less likely to engage partners or to seek prospective funders; however, more CAHSI members from the southwest responded to the survey so the survey captured both highly involved and less involved participants.

The length of affiliation with CAHSI and attendance at regional meetings were more important for members’ actions to advance CAHSI’s common agenda. For instance, 100% those who attend every CAHSI meeting were involved in developing and implementing strategic
actions, while only 50% of those who do not attend meetings were similarly engaged. Likewise, 88% of those who attend every meeting were involved in managing cross-sector partnerships, while 38% of those who do not attend meetings and only 50% of those who attend some meetings were involved in partnerships to promote CAHSI’s vision.

Object 3: List of current and pending regional and national partnerships (sidebar)

Common Agenda: External Partners’ Voices
External partners were highly aligned with CAHSI’s vision and mission. Data were collected from some of CAHSI’s most significant external partners. The partners were asked about the nature of the partnership and how their efforts and mission align with the CAHSI vision. There was strong alignment in vision, goals, and strategies between CAHSI and its external partners. The following text boxes highlight some of the themes that emerged from CAHSI’s external partners.

For instance, external partners appreciated the personal touch within the CAHSI partnership and recognized that collective impact work can magnify reach and outcomes.

OUR COLLABORATION, AT FROM MY PERSPECTIVE, IS UNIQUE IN THAT IS INCREDIBLY HANDS-ON. WE HAVE STRONG PERSONAL RELATIONSHIPS WITH CAHSI-AFFILIATED FACULTY, WHEREAS FOR OTHER ORGANIZATIONS, OUR COLLABORATION CAN FEEL MORE BUREAUCRATIC AND IMPERSONAL. I’VE BECOME CLOSE WITH A NUMBER OF FACULTY WHO I HAVE BEEN CONNECTED WITH VIA OTHER CAHSI FACULTY. THIS IS MUTUALLY BENEFICIAL BECAUSE IT HELPS US GROW OUR PROGRAM AND AMPLIFY OUR IMPACT AND BRINGS US CLOSER TO THE FACULTY AND STUDENTS WITH WHOM WE ARE LOOKING TO CONNECT.
CAHSI makes it possible for us to communicate to many Hispanic-serving institutions at once without having to schedule time with each one individually. They also understanding our hiring objectives and spread the knowledge through their system of schools. I’m deeply satisfied with the amount of collaboration within CAHSI and willingness to share versus competitiveness.

From our perspective, the collaboration was beneficial because it gives us real insight into the needs of schools, faculty, and students that we might not otherwise have. Also, CAHSI’s name carries a fair amount of weight, and it gives us credibility to say that we’ve collaborated and makes it easier to work with schools. Additionally, we’ve benefited from CAHSI’s network and have been able to use it to promote programs we’ve launched.

Because so much of CAHSI’s infrastructure is already funded by the National Science Foundation, supporting CAHSI is a great way for us to impact women at many different institutions and different geographies at once. Funding CAHSI---building on something that already exists and that has such great leadership already—is a cost-efficient way for us to try to achieve our mission.

We’re always looking to scale out programs and CAHSI makes this possible with its intrinsic value of community amongst each other and willingness to share what they’ve learned.
Common Agenda: Implementing CAHSI’s Vision

CAHSI participants made progress in implementing strategic actions related to CAHSI’s vision. Length of involvement with CAHSI influenced individuals’ implementation of CAHSI’s vision. For example, 89% of those who had been involved with CAHSI for 6+ years were involved in developing strategic actions, and 64% of those who had been involved less than 3 years. Finally, most CAHSI participants (80%) who had been involved with CAHSI for more than 6 years submitted a grant proposal related to CAHSI in the past year, while only 33% of those who had been involved for less than a year and 52% of those who had been involved for 1-5 years. Therefore, regular, extended engagement in CAHSI was important for members to develop and implement action plans, partnerships, and proposals related to CAHSI’s common agenda.

CAHSI members, even newer members, generally demonstrated that they understood the vision, or common agenda, of CAHSI INCLUDES. In an open-ended survey question, CAHSI participants were asked to describe CAHSI’s vision in their own words. Most respondents wrote about the goal of increasing diversity in computing, particularly Hispanic/Latinx representation in computing fields. About a quarter of survey respondents focused on the charge to increase the national representation of Hispanic/Latinx computing professionals (i.e., moving the needle). About 1 in 5 survey respondents mentioned the network cultivated by CAHSI as an important goal to establish relationships and partnerships to increase diversity in computing. About the same number of respondents noted that CAHSI’s vision is to support students through programs and initiatives to increase their retention and success. Similar to the previous year, a few respondents noted the focus on Hispanic-Serving Institutions as a significant aspect of CAHSI’s vision, along with the focus on inclusion and equity within computing departments.
Object 4. CAHSI’s Vision and Mission: Response to Open-Ended Question

Following are some examples of participants’ responses about CAHSI’s vision. Some of the statements contain several themes and were coded as such.

**Diversity/Hispanics in computing**

Mission is to help underrepresented students enter the field of computing.

**Support students**

Developing best practices for inclusive learning community and increase the awareness, so students of underrepresented group receive proper support to be strong and generate more role models.

**National change in numbers**

To increase Hispanic participation in Computing from 9 to 20%. To align partners to recruit, retain and advance Hispanics in computing (CS, CE, Computational Math).

**Create network**

Networking to promote advancement of Hispanic participation in the technology (computer-related) workforce, research, and education.

**Support HSIs**

My definition of CAHSI is to mission to provide tools and create a network of HSIs to empower Hispanic students in their road to succeed in STEM. The vision must be to be a
lead partnership that helps in filling the research and opportunities gap between big Universities and small HSI's.

Equity/inclusion/cultural change

To help underserved students feel more welcome and engaged.

Below is a word cloud comprised of CAHSI members’ responses to the open-ended question that asked them articulate CAHSI’s vision/common agenda in their own words.

Object 5: Word cloud of CAHSI vision

Barriers to Achieving CAHSI’s Vision

Similar to previous years, the most frequently reported barrier to achieving CAHSI’s vision was a lack of support from faculty colleagues, and to a lesser extent, administrators/chairs. As
past evaluation evidence has shown, it is challenging for isolated faculty members to fully implement CAHSI’s vision, especially in terms of equity, climate, or systemic change. With that said, multiple CAHSI faculty and co-leads noted in interviews that they had achieved some success in promoting CAHSI within their departments and institutions and had generated more support and involvement amongst faculty as a result. Still, cultural change is a slow process in entrenched computing disciplines.

Other barriers were a lack of funding to implement strategic actions and a lack of time to develop and implement all desired strategic actions. A few respondents noted that they had limited access to external, local partners and limited economic opportunities in their local area which created challenges in getting students involved with industry and internships, not to mention career opportunities for students who want to stay in the area. A few CAHSI survey respondents also commented that covid-19 had emerged as a barrier because of the disruptions caused by the pandemic and the shift to remote and online environments, creating difficulties in planning and implementing student activities and events.

Sample responses about organizational barriers include:

_Before March 2020, we had no barriers...now with COVID19, we are facing barriers of offering summer (in-person) camps, workshops, STEM nights._

_Faculty resistance to change_
Lack of outside institutional connections. We have been growing our contact list with outside schools but competition between them makes it hard to work as a collective group.

Funding - we would love to send more students to GMiS and to host more on-campus events for our students & faculty. We would love to travel to meet with potential investors or partners, but we just don't have enough funding to do everything we'd like to do.

Very limited in personal time to contribute towards efforts

Getting faculty onboard with CAHSI's signature activities and getting them to participate in provided professional development opportunities.

Resources. Financial is part of that, but time is the bigger issue. Getting faculty time to support student activities is critical and hard to come by.

Benefits of Collective Impact for fulfilling the common agenda
In the social network survey, leadership and staff were asked to describe what the most important potential benefit of the collective impact approach could potentially be. The most common response was the increased sense of belonging among those who influence Hispanics, followed by an increased sense of urgency regarding underrepresentation in computing and improved communication across stakeholders.
Respondents to the CAHSI Social network survey described what aspects of the INCLUDES Alliance support its success. Nearly all options were selected by more than half of the respondents, indicating a fairly robust set of practices that support CAHSI in realizing the shared vision. In fact, having a shared mission and goals was most often selected as a contributing factor for success, followed by bringing together diverse stakeholders. A four-way tie was evident for using data to make decisions, sharing resources, exchanging knowledge and information, and meeting regularly.
Regional partners’ assets for contributing to CAHSI

In the social network analysis survey, participants were asked to describe the knowledge, expertise, actions, and networks they brought to bear on the CAHSI project, and how they were able to support the alliance. Results were broken down by region to understand how the larger network might supplement region assets based on strengths and weaknesses supported. The three attributes least reported across groups were connections to national industry, ability to facilitate/lead, and ability to train others on signature practices. See below.
Utilizing Collective Impact- the Case of COVID-19 in CAHSI

CAHSI was able to mobilize quickly during the pandemic to learn about their students’ needs and to create systems of support for those facing hardships. In this case, we document the timeline of actions CAHSI stakeholders took to realize the common agenda. We utilize the five elements of collaborative infrastructure described in the NSF INCLUDES Hub reporting webinar- Shared Vision, Partnerships, Goals and Metrics, Leadership and Communication, and Expansion, Impact and Scale, to analyze CAHSI’s response. This case is from the external evaluators’ point of view and based on participant observation of CAHSI efforts—it is possible we were not made aware of all efforts taken by CAHSI to address the COVID-19 health crisis. In summary, CAHSI mobilized to create online resources for students at the local and national levels, developed data collection and analysis methods to support understanding of the extent to which the COVID-19 health crisis was influencing students and staff, strengthened partnerships within the organization to better understand data from multiple sources, and developed new programming aimed to keep students engaged in their major through virtual REUs. See COVID Timeline visual in the Appendix.

Shared Vision-Maintaining student well-being while retaining students in the major

In early April, the executive committee met to discuss the need to address the pandemic through CAHSI. In this meeting, the leads from each region discussed what they noticed from their positions as faculty and/or department chairs and developed a plan for sharing resources for students across the organization. The first discussions of the virtual REU occurred as well. Later in the summer, when partnerships had been leveraged for student support, the data
management team, social science team, and evaluation team planned a colloquium in which the evaluation team would share what has been learned to date about students’ experiences. The purpose of the meeting is to triangulate data collected across groups and to expand knowledge of the impact of COVID-19 on CAHSI students.

**Partnerships leveraged and roles delineated for gathering local, national resources**

The backbone began engaging different partners across CAHSI to leverage resources. In late March, less than two weeks after closures began influencing student and faculty lives, the backbone met with the evaluators to discuss data collection options. It was difficult to decide whether brief, real time data was needed, or more comprehensive, mid-term data was more useful. The decision was made to use social media to gather “real time” data regarding student well-being and immediate needs (e.g., technological resources, mental health resources) and a student survey to document how the pandemic was influencing students during the spring semester.

In early April, the director of strategic initiatives gathered the CAHSI advocates (students who receive a stipend and serve as the CAHSI representative at each institution) to prepare for the development of CAHSI COVID-19 resources pages. The advocates were asked to promote the CAHSI Support Group Facebook page through the social media channels they used locally. At the same time, the deputy director charged the connectors and coordinators, CAHSI staff who are distributed across the network, with supervising the CAHSI advocates regarding the development of CAHSI COVID resource pages specific to the institutions. Conversations began amongst faculty implementing PLTL, a CAHSI signature practice, regarding best practices online, and faculty considered a workshop led by faculty and students who had begun PLTL in online formats.

**Goals and Metrics**

The evaluation team began drafting a COVID-19 survey in the first week of school closures, in Colorado this was the week of March 16th. In early April, the team conducted focus groups with connectors and coordinators to hear from them regarding how the health crisis was influencing their work and their connections with CAHSI departments. Staff overwhelmingly felt frustration, as new staff in particular were “just getting in the groove” of their positions within CAHSI and within their computing departments. Some had to cancel big events that had taken a lot of effort to put together. The survey was based on a survey developed through a different research grant, and then was modified and adapted from the feedback received from leaders, co-leads, connectors, and coordinators about the way they and their students were experiencing the pandemic. The data gathered from the focus groups informed the COVID-19 survey, as did a focus group with CAHSI faculty who teach problem solving courses at CAHSI institutions. The survey was launched in mid-April. Over 900 students across 14 CAHSI schools took part in the survey. Data analysis was completed in early June to support dissemination deadlines.
Leadership and Communication
In their meeting with the Deputy Director in mid-March, Connectors and Coordinators began discussions about what their institutions and departments were doing to support students impacted by the COVID-19 crisis. Resources such as laptop funds, internet funds, fee reimbursement, food pantry, emergency loans, and mental health services were discussed across regions. The CAHSI Support Group Facebook group was launched in the first week of April, and the CAHSI COVID-19 website by April 17th. In June, the director of CAHSI shared some of the results of the COVID-19 student survey with the CEOSE group at the National Science Foundation. Dr. Thiry presented the results of the survey to the Southwest region. The evaluators developed an abstract for Dialogs in Social Justice: An Adult Education Journal and are planning for wider dissemination at the Special Interest Group for Computer Science Education (SIGCSE) conference as well. The evaluation team and the social science and data management teams are in talks to develop a research proposal in fall of 2020 to study the impact of COVID-19 more extensively.

Expansion, Impact, and Scale
The CAHSI network made plans to support students through a variety of means, and in many cases, this meant forging new relationships for impact. Leadership in CAHSI developed a RAPID grant proposal to fund the preparation and maintenance of a virtual REU for students in CAHSI. More than sixty students and over 20 faculty are participating as of this writing. The proposal development, training for faculty and students, and related resources came from a cross regional CAHSI partnership. The timing of the REU, postponed because of the timing of funding received, will now run into the fall semester as an attempt to encourage retention through the fall semester. In addition, CAHSI increased access for students to institutional and national resources through its extensive COVID-19 support website, which was live by mid-April.

Rapid, Cohesive Action through Collective Impact
CAHSI was able to develop a plan for supporting students during this difficult time and utilized the CAHSI infrastructure to execute the plan, all in the name of the mission- to grow and sustain a networked community committed to recruiting, retaining, and accelerating the progress of Hispanics in computing. The established roles across the regions helped support rapid development and collaboration. As CAHSI grows, it will be important to maintain the structures to act quickly and uniformly in the face of adversity.

MUTUALLY REINFORCING ACTIVITIES: Broadening Participation Interventions
Strategic actions, in the form of mutually reinforcing activities or interventions to broaden participation in computing, are at the core of the work undertaken at the local and regional level. Mutually reinforcing activities must be guided by the common agenda with a clear link to how
the strategic action will help to achieve the vision and goals. Institutional and regional participants created strategic action templates that aligned their proposed activities with strategic goals and ensured that mutually reinforcing activities are based on evidence of efficacy. The recent expansion of the CAHSI network and the shift in focus beyond undergraduate education provide opportunities to expand the repertoire of practices and activities to support progress toward the vision.

**Mutually Reinforcing Activities: Collective Impact Survey**

The Collective Impact survey mapped the strategic actions and priorities undertaken within the overall CAHSI network and within each region. The findings provide an asset map of CAHSI’s strengths in strategic initiatives regionally and nationally and highlights areas where there is currently less collective effort. In this way, the survey results show the current landscape of CAHSI initiatives and efforts within the network to advance its vision. It is not practical to undertake all possible initiatives because of limited time and resources, so institutions and regions must prioritize their efforts.

**Top Priorities**

By and large, undergraduate education remains the central priority for CAHSI members. When asked to rank their top three priorities, nearly ¾ of survey respondents chose undergraduate education as their top priority, and the remainder chose it as the second priority. Although CAHSI has always had initiatives in other areas of the educational and career continuum, undergraduate education has always been a key focus. The second most prominent area of focus was workforce development. To a lesser extent, survey respondents focused on graduate education (9% chose as top priority and 11% chose as their second priority). K-12 education and K-12 teacher preparation also remained very important secondary priorities for many CAHSI participants. A few members chose faculty professional development as a tertiary priority, and a few also selected changing institutional policies to increase student retention and success. National or state policy is much less of a focus, but institutions and regions must choose where to focus their energy and efforts given limited time and resources to be able to prioritize every area equally. With that said, the backbone made strides in policy work in the past year through providing input to a minority-serving institutions STEM bill that was produced in the U.S. House of Representatives. Because of successes such as this, many regional participants noted in interviews that they expect the backbone to take on more of the higher-level policy work of the collective. Therefore, most members prioritize undergraduate education and workforce development, and to a lesser extent, K-12 education and graduate education.
Because of the general consensus that undergraduate education is a top priority, there were not significant regional differences in prioritization of different stages along the computing pathway. By and large, the majority of respondents in all regions chose undergraduate education as their top priority. On the other hand, respondents in the southeast and southwest more often chose workforce development as their top priority. Newer members in the north and west have been active in graduate education initiatives and were more likely to choose that as their top priority. The north region also has a distinct focus on K-12 teacher preparation. A few survey respondents in the southwest also chose K-12 education or faculty professional development as their top focus, but these areas were generally less prioritized within the CAHSI network.
The main differences in ranking priorities were by region, rather than length of involvement in CAHSI or frequency of meeting attendance. However, those who had a longer affiliation with CAHSI (6+ years) were more likely (80%) to choose undergraduate education as their top priority, as opposed to those with less than six years of affiliation with CAHSI who were more likely to prioritize graduate education (33% selected as top priority compared to 0% of those who had been involved with CAHSI for 6+ years). Therefore, newcomers to CAHSI bring different interests and activities and expand the focus of the network to include more stages along the educational and career pathway.

Similarly, those who regularly attend CAHSI meetings (all or most meetings) were more likely to prioritize undergraduate education (80%), compared to those who do not or seldom attend meetings (62% selected undergraduate education as a top priority). There is also more of a focus on K-12 education among those who regularly attend regional meetings (69% selected it as in the top three priorities) as compared to those who never or seldom attend meetings (25% selected it as in the top three priorities). Therefore, participants benefit from the expertise of others in the K-12 realm during regional planning and other CAHSI meetings. Those who rarely attend meetings may not necessarily be exposed to this expertise and may place less value on K-12 education as a focus of CAHSI’s collective efforts.
Mutually Reinforcing Activities: Signature Practices

Currently, CAHSI members remain engaged in CAHSI signature practices as newer members have had about a year to pilot and implement signature practices. Uptake of CAHSI signature practices is relatively high; in all, 83% of respondents reported engaging in at least one signature practice at their institution. The most common signature practice has become problem-solving courses, which has been facilitated by the Faculty-in-Residence program at Google and the community of practice that has been formed around the course. About 2/3 of respondents reported that they offer the problem-solving course(s) at their institution, about the same rate as in the previous year. On the other hand, implementation of peer-led team learning courses seems to have fallen slightly, from 73% of survey respondents last year to 50% this current year. Although, more respondents have adopted the ARG model in research or courses (rising from 45% to 55% of survey respondents. )Fellow-Net, though, has not seen widespread uptake, although uptake of the model has increased from 10% last year to 22% of survey respondents in the current year. Nevertheless, the model of introducing faculty to the problem-solving course and sustaining their engagement through an ongoing community of practice could be transferred to other signature practices to introduce them to newcomers and to enhance and sustain their uptake among the CAHSI community.

Object 12: Mutually reinforcing activities- Signature practices

There is some regional variation in the adoption of signature practices. In general, adoption in the southwest of several practices, such as PLTL or ARG, seemed to be lower than other regions, but this is likely because the survey response rate was higher in the southwest and
captured some CAHSI participants who have not yet taken up signature practices or who are generally less involved with CAHSI on a day-to-day basis. In contrast, the response rates from the north and southeast regions were lower and, therefore, only reflected the most highly involved and engaged participants. Respondents in the west were slightly less likely to be involved in a CAHSI community of practice or to implement the problem-solving course(s).

Object 13. Strategic activities of CAHSI members

<table>
<thead>
<tr>
<th>Strategic Activity</th>
<th>North (n=5)</th>
<th>Southeast (n=5)</th>
<th>West (n=9)</th>
<th>Southwest (n=19)</th>
<th>National Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participated in CAHSI community of practice</td>
<td>50%</td>
<td>75%</td>
<td>38%</td>
<td>84%</td>
<td>65%</td>
</tr>
<tr>
<td>Implemented problem-solving course</td>
<td>100%</td>
<td>50%</td>
<td>33%</td>
<td>68%</td>
<td>63%</td>
</tr>
<tr>
<td>Implemented PLTL</td>
<td>100%</td>
<td>100%</td>
<td>55%</td>
<td>32%</td>
<td>53%</td>
</tr>
<tr>
<td>Implemented ARG model in courses or research experiences</td>
<td>100%</td>
<td>100%</td>
<td>66%</td>
<td>32%</td>
<td>55%</td>
</tr>
<tr>
<td>Implemented/participated in Fellow-net</td>
<td>50%</td>
<td>0%</td>
<td>33%</td>
<td>16%</td>
<td>22%</td>
</tr>
</tbody>
</table>

There were few differences in adoption of CAHSI signature practices based on length of involvement in CAHSI or frequency of meeting attendance, indicating that newcomers are also beginning to engage in signature practices as they become integrated into the CAHSI community. However, those with more experience in CAHSI benefited from a deeper level of engagement in the community as they were more likely to be involved in a community of practice (80%) compared to those who had been involved with CAHSI for less than six years (55%). Additionally, those with a longer involvement with CAHSI (six years or more) were more likely to use the ARG model than newer members (80% compared to 33% of those with less than three years of involvement). Newer members (62%) were more likely to be involved with the problem-solving course(s) than the ARG model or PLTL (48%).

Mutually Reinforcing Activities: Student Support

CAHSI institutions continued to offer multiple mechanisms for student support, such as research experiences, hack-a-thons, conferences, workshops, clubs, and leadership positions. The student advocate program made great progress in the past year as almost all institutions now have active student advocates. Faculty also show a strong level of engagement with the advocates. The GMiS conference also remained a central component of student development and support (about 75% of survey respondents brought students or were otherwise involved with...
GMiS both in year 1 and in the current grant year). There was also tremendous growth in student clubs and CAHSI student chapters, rising from 55% to 83% of institutions. Similarly, about 80-85% were involved with other professional development initiatives or skill-building experiences for students (e.g., hack-a-thons, etc.). Therefore, most CAHSI participants report that they are highly engaged in student support activities at their institutions.

**Object 14. Mutually reinforcing activities: Student support**

Because adoption of student support activities was so widespread across the CAHSI network, there was little regional variation in access to student opportunities. For instance, at least 75% of survey respondents across all the regions were involved with student clubs and CAHSI student chapters. Additionally, nearly 80% of participants across all regions were involved with skill-building experiences for students in the past year. The north region displayed slightly less involvement with student advocates. Almost all survey respondents were involved with trainings and workshops for students. Participants in the west region were somewhat less likely to report that they had brought students to the GMiS conference, but this may be a result of the fact that many institutions in the west are relatively new to the CAHSI network.
Object 15. Strategic activities implemented

<table>
<thead>
<tr>
<th>Strategic Activity</th>
<th>North (n=4)</th>
<th>Southeast (n=5)</th>
<th>West (n=9)</th>
<th>Southwest (n=19)</th>
<th>National Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>% reported “slight extent” ”some extent” or ”great extent”</td>
<td>75%</td>
<td>100%</td>
<td>78%</td>
<td>84%</td>
<td>83%</td>
</tr>
<tr>
<td>CAHSI clubs/chapters</td>
<td>100%</td>
<td>100%</td>
<td>78%</td>
<td>79%</td>
<td>83%</td>
</tr>
<tr>
<td>Skill-building experiences</td>
<td>50%</td>
<td>100%</td>
<td>78%</td>
<td>89%</td>
<td>81%</td>
</tr>
<tr>
<td>Student advocates</td>
<td>100%</td>
<td>100%</td>
<td>78%</td>
<td>74%</td>
<td>80%</td>
</tr>
<tr>
<td>Professional development workshops</td>
<td>100%</td>
<td>100%</td>
<td>44%</td>
<td>79%</td>
<td>75%</td>
</tr>
<tr>
<td>GMiS conference</td>
<td>100%</td>
<td>100%</td>
<td>44%</td>
<td>79%</td>
<td>75%</td>
</tr>
</tbody>
</table>

Promising practices in student engagement

In regional meetings and in interviews, CAHSI members reflected on promising practices for promoting student engagement, creating community and generating greater student involvement in the department. A few practices emerged that have been successful in some CAHSI departments and could be scaled and adapted in other departments. For instance, UHD had students go to computing class sessions at the beginning of the semester to talk about CAHSI and student opportunities in the department. They generated a mailing list from students who were interested in learning more and becoming engaged and generated over 100 students. NMSU has had some success in bringing industry in which has generated student interest and involvement. UTEP has a long history of industry involvement in the department as well and Google workshops and other events are always well attended. A final mechanism for generating interest and involvement was to make club meetings and activities fun, such as hosting a Christmas party or scavenger hunt. Providing food at these events was another way to increase turn-out amongst students.

Mutually Reinforcing Activities: Computing Pathways

While undergraduate education remains the core focus of the CAHSI network, other stages along the educational pathway are relatively well represented among the mutually reinforcing activities undertaken by the CAHSI network in the past year. As demonstrated in the ranking of priorities, a fair number of individual CAHSI participants and institutions rank K-12 education, graduate education, or workforce development as top priorities. In line with this valuing of different stages of computing pathways, nearly 80% to 85% of survey respondents actively engaged in K-12 outreach or workforce development initiatives in the past year (rates similar to those of the previous year). About 40% of respondents were involved with graduate education initiatives in the past year (also similar rates to the previous year). And CAHSI members
remained involved in creating new degree pathways to open access to computing degrees for students (about 45% worked on new degree or certificate programs in the past year).

Object 16. Mutually reinforcing activities: Computing pathways

Expertise and engagement in different stages of the computing pathway was relatively well distributed across regions, in contrast to the previous year where expertise in some areas, such as graduate education, was largely centered on one region. All regions were relatively highly involved in workforce development and K-12 education activities. The southeast and southwest were somewhat less involved in graduate education initiatives in the past year, although the north region showed growth in involvement in this area. Finally, institutions in the southeast did not develop new degree or certificate programs but this is likely reflective of the dire political and economic landscape for higher education in Puerto Rico that is not conducive to the development and growth of new postsecondary programs.

Object 17. Computing Pathways Activities by region

<table>
<thead>
<tr>
<th>Activity</th>
<th>North</th>
<th>Southeast</th>
<th>West</th>
<th>Southwest</th>
<th>National Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>% reported &quot;to slight extent&quot; “to some extent&quot; or “to a great extent&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implemented workforce development initiatives</td>
<td>100%</td>
<td>100%</td>
<td>89%</td>
<td>74%</td>
<td>83%</td>
</tr>
<tr>
<td>Provided/coordinated K-12 outreach activities</td>
<td>100%</td>
<td>100%</td>
<td>66%</td>
<td>68%</td>
<td>75%</td>
</tr>
</tbody>
</table>
### Developed new degree/certificate programs

<table>
<thead>
<tr>
<th>Developed new degree/certificate programs</th>
<th>50%</th>
<th>0%</th>
<th>44%</th>
<th>53%</th>
<th>44%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implemented graduate education initiatives</td>
<td>100%</td>
<td>0%</td>
<td>56%</td>
<td>26%</td>
<td>39%</td>
</tr>
</tbody>
</table>

Participants with a deeper level of involvement with CAHSI (more frequent meeting attendance) were much more likely to be involved in non-undergraduate oriented initiatives, such as graduate education or K-12 education (averaging 80-90% of participants, as compared to 30-40% of participants who do not regularly attend meetings). In contrast, there was no difference in participants’ length of involvement with CAHSI and the likelihood that they are involved with other types of initiatives beyond undergraduate education, suggesting that depth of engagement is important for expanding CAHSI’s reach into other stages of the computing pathway.

### Mutually Reinforcing Activities: Faculty and K-12 Educator Support

Given limited time and resources, CAHSI participants generally focus more effort on student support than faculty or K-12 educator support; however, there are still ongoing initiatives in these areas. In the past year, survey respondents were most likely to engage in a research collaboration with other CAHSI participants or to have participated in a professional development training themselves (about 75% of participants for each of those activities). Only about 40% of survey respondents offered K-12 teacher preparation programs or trainings, although nearly 1 in 3 CAHSI participants is planning to offer K-12 teacher opportunities in the future. Additionally, about 60% of institutions offered or were involved with faculty professional development offerings in the past year.
Strategic actions related to faculty and educator support varied by region. CAHSI participants in the southeast region were less likely to have participated in faculty professional development or to have provided faculty professional development. Political and economic conditions in Puerto Rico may have contributed to challenges in engaging in professional development for faculty there. The covid-19 crisis and the subsequent shift to remote environments could provide an opportunity to offer virtual faculty trainings that are accessible across all regions that could increase access to professional development. CAHSI participants in the southwest were less likely to be involved with K-12 teacher preparation initiatives, while participants in the north region were highly involved in this area.

**Object 19. Activity implementation by region**

<table>
<thead>
<tr>
<th>Activity</th>
<th>North</th>
<th>Southeast</th>
<th>West</th>
<th>Southwest</th>
<th>National Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participated in professional development for faculty</td>
<td>100%</td>
<td>25%</td>
<td>78%</td>
<td>63%</td>
<td>72%</td>
</tr>
<tr>
<td>Engaged in research with other CAHSI members</td>
<td>75%</td>
<td>75%</td>
<td>55%</td>
<td>79%</td>
<td>72%</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Provided professional development for faculty</td>
<td>100%</td>
<td>25%</td>
<td>44%</td>
<td>58%</td>
<td>55%</td>
</tr>
<tr>
<td>Provided PD or training for K-12 teachers</td>
<td>75%</td>
<td>50%</td>
<td>55%</td>
<td>26%</td>
<td>42%</td>
</tr>
</tbody>
</table>

There were not many differences in faculty or K-12 educator support based on participants’ length of involvement with CAHSI or their depth of involvement. Participants who had been involved with CAHSI for more years (6+ years) participated in professional development at higher rates than those with less than six years involvement, although the difference was not major (80% compared to 62%). However, those with longer involvement in CAHSI were much more likely to engage in research collaborations with other CAHSI participants (80% compared to 40%), which suggests that longer involvement fosters deeper connections that can generate productive collaborations. Likewise, participants who regularly attended CAHSI meetings were much more likely to engage in research collaborations than those who never or rarely attend meetings (92% compared to 28%). Participants who regularly attend meetings also had greater access to professional development opportunities (72% had participated in professional development in the past year compared to 42% of those who do not regularly attend CAHSI meetings). Therefore, depth of involvement and length of involvement in CAHSI contribute to enhanced professional opportunities for participants, such as professional development and research collaborations.

**Mutually Reinforcing Activities: Policy and Systems-Level Change**

There has generally been less direct involvement in policy or systems-level change among CAHSI participants, as opposed to student programming and initiatives. Fewer CAHSI regional participants are actively engaged in policy initiatives, but the reported rates are similar to those from the previous year. This level of engagement might be expected given the time and resource constraints faced by many regional members which do not allow for them to focus on multiple areas. Also, this type of policy advocacy requires a deep level of knowledge, skill, and experience in policymaking and issues related to the Latinx population, higher education, and computing. Still, some participants engaged in policy work in the past year, especially at the departmental or institutional level (60%). Fewer waded into state policy (28%) which requires extensive networks in policymaking circles and a different type of expertise. As mentioned previously, because of the backbone’s success in influencing and providing input into U.S. House of Representative’s legislation on minority-serving institutions and other areas, many regional members expect that
the backbone will play a larger role in shaping national policy, so they prefer to focus on local and institutional policies.

Object 20. Mutually reinforcing activities policy and systems-level change

There were a few differences related to involvement in systems-level or policy initiatives among regions. The north region was most engaged in state-level policy work (50% of participants compared to 18-25% in other regions), largely because of Kean University’s advocacy for K-12 teacher preparation and education in the state of New Jersey. Otherwise, there were few regional differences in engagement in systems change or policy. Not surprisingly, those with the deepest level of involvement with CAHSI (10+ years) were more likely to be engaged in advocating for institutional or departmental-level change (78% compared to 42% of those with less experience with CAHSI).

Mutually Reinforcing Activities: Greatest Accomplishment

In keeping with regional members’ focus on student clubs and engagement, more than a quarter responded to an open-ended question that their greatest accomplishment in the past year was to provide student-centered activities, events, or opportunities. About a quarter of respondents (typically those who had a longer affiliation with CAHSI) wrote that they had recruited a new external partner to support their work with CAHSI, whether it is a regional higher education partner (e.g., local two-year college) or an industry or other partner to support CAHSI’s work. Some of these comments also related to promoting CAHSI in national or regional venues. About 1 in 5 respondents mentioned that CAHSI clubs or student groups had been a major
accomplishment; when combined with student development activities, nearly 50% of respondents noted that student engagement and co-curricular opportunities had been their greatest accomplishment in the past year. Others commented that they had been successful at promoting CAHSI within their own institution to inform students and faculty about the work of CAHSI and to recruit faculty colleagues to CAHSI activities. A few respondents noted faculty training, new degree pathways or programs, and strengthening of regional collaborations as major accomplishments.

Object 21. Greatest accomplishment in the 2019-2020 year

Following are a sample of comments:

Slowly changing faculty’s perception to improve student inclusiveness in classrooms

Obtaining a mobile computing & engineering lab to go out to the community and share the world of computing and engineering.

With another CAHSI member I assisted in presenting at the Explore CSR conference, and she taught me how to create and get funding for such a conference. I then assisted in getting funding and putting on an ExploreCSR conference at our local institution.

My department chair became aware of CAHSI and became a strong supporter. Dean has been supportive for Diversity and Inclusivity and Dean was very happy to see my involvement with CAHSI. Our student advocate set up HSiCS (Hispanic Students in CS)
student organization and about 20 students joined it. HSiCS gets connected alumni and industry around us and received strong encouragement and support.

Some participants commented on multiple accomplishments:

*Creating a CAHSI West Regional Family who are supportive/committed and in line with the overall vision of CAHSI* ToroHack conference was another successful event for our students starting to work on CS CalBridge program Computer Science Supplementary Authorization training K-12 teachers increasing the number of members and Student Advocates in the region.

**BACKBONE ORGANIZATION**

The Backbone organization provides the coordination and coherence within any collective impact effort. The Backbone is responsible for providing a guiding vision and strategy for local efforts, promoting and marketing CAHSI at a national level, supporting strategic actions, and establishing common measures.

**Backbone Organization: Collective Impact Survey**

In the past year, the CAHSI Backbone provided varied and high-level support to regional and local members and affiliates to support their strategic planning and actions, though the nature of this support has shifted slightly from the previous year. When asked to mark the most important areas that the Backbone has provided support, almost half of members marked that the Backbone had provided essential support in understanding their role and actions within the collective impact framework. In contrast, in the previous year, support in providing a guiding vision was the most important area for regional members. Data from the common agenda portion of the survey show that participants now understand and embrace CAHSI’s guiding vision, so they now need support in understanding their role in carrying out the vision. Nearly half of respondents marked that they depend on the backbone to communicate and coordinate strategies. About a third of respondents rely on the backbone for materials and resources related to signature practices and other strategic actions. Fewer respondents reported that the most important areas of backbone assistance were in securing or mobilizing funding (18%) or data use (11%).
Across the board, regions gained similar support from the backbone and placed the same amount of value on the support received. There were a few slight variations across regions, such as southwest participants were the only survey respondents to mark that the backbone had helped with advocacy or policy. CAHSI veterans (6+ years) generally marked that they received the most support from the backbone in higher-level elements, such as understanding their role in the collective impact framework (40%), securing funding (40%), and providing a guiding vision (40%). On the other hand, newcomers (less than 6 years involvement) were more likely to report that they depended on the backbone for day-to-day needs, such as communicating and coordinating strategies (60%), while no veterans marked that this was the most important type of support needed. Additionally, newcomers were more likely to mark that the backbone had helped with resources and materials (48% of newcomers and 20% of veterans). Therefore, the type of support that participants need may shift over time as their involvement with CAHSI deepens. As newcomers become familiar with the CAHSI community, they may need frequent communication about activities and strategies as well as resources and materials to carry out those activities. Veterans may need higher-level support, such as visioning, strategizing, and funding.

Support Needed from Backbone

In an open-ended question about how the backbone can better support local efforts, there was general consensus that the Backbone had provided important support for collective
impact work and respondents offered some suggestions about the most important types of support that they still need from the Backbone. The most common response was a request for more frequent communication about activities, events, deadlines, and opportunities. A fair number of participants would like guidance and assistance with writing and developing competitive proposals. A smaller number of respondents (18%) requested more resources and materials to support strategic actions, especially related to signature practices.

Object 23. Support needed from backbone

Sample comments are as follows:

[Support with] writing proposals, sometimes our team is too busy and it is almost impossible to write complicated proposals for NSF. Maybe a little guidance to start would be great.

Provide guidance on the common data each institution should strive to collect.

Helping to develop a pipeline for undergrad small research programs in collaboration with existing student REU’s and industry requirements.

Better communication in regard to opportunities for students and perhaps in how to better our respective roles within CAHSI.

Identify a shared platform for communication for regular (e.g., monthly) updates.
Sharing more information and resources in a timely manner to all CASHI regions

Backbone Support: Social Network Analysis

In collective impact, the backbone serves to support all members in improving the participation of Hispanics in computing. The degree centrality of two of the backbone members shows a shift in strategy—last year, both the director and deputy director reported direct connections to each member of the CAHSI leadership and staff network, yet this year the deputy director reports connections with nearly all 30 other participants, while the director had only 17 direct contacts. Social network theory describes those with high numbers of “non-redundant ties” as having the best opportunity for divergent ideas, as they are immersed in multiple communities across the network. The relative connectivity of the backbone is high compared to other members as would be expected given the role of support provided.

Backbone members earned the highest mean and median scores in overall value across all network roles. Nearly each score attributed by the CAHSI network is higher than the mean across the CAHSI leadership and staff network mapped in this social network, except for the newest member of the backbone to be added to the social network analysis, backbone 4. As CAHSI grows it will be important to consider how backbone staff might distribute connections to be more efficient—the step taken to decrease the director’s direct ties to each staff and lead is one way to begin this move. The redundancy in connections is valuable early on as CAHSI INCLUDES deepens work in partner organizations, but as it expands, the network will need to adjust to support larger numbers.

Object 24. Social network results

<table>
<thead>
<tr>
<th></th>
<th>Degree Centrality (max 30)</th>
<th>Non-Redundant Ties</th>
<th>Closeness Centrality</th>
<th>Relative Connectivity (1-4)</th>
<th>Overall Value (1-4)</th>
<th>Power/Influence</th>
<th>Level of Involvement (1-4)</th>
<th>Resource Contribution (1-4)</th>
<th>Total Trust (1-4)</th>
<th>Reliability (1-4)</th>
<th>In Support of Mission (1-4)</th>
<th>Open to Discussion (1-4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backbone 1</td>
<td>17</td>
<td>11.68</td>
<td>0.7</td>
<td>0.64</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3.89</td>
<td>3.75</td>
<td>4</td>
<td>3.92</td>
</tr>
<tr>
<td>Backbone 2</td>
<td>29</td>
<td>23.61</td>
<td>0.97</td>
<td>100%</td>
<td>3.75</td>
<td>3.8</td>
<td>3.81</td>
<td>3.63</td>
<td>3.83</td>
<td>3.88</td>
<td>3.88</td>
<td>3.75</td>
</tr>
<tr>
<td>Backbone 3</td>
<td>11</td>
<td>6.67</td>
<td>0.61</td>
<td>47%</td>
<td>3.82</td>
<td>3.73</td>
<td>3.91</td>
<td>3.82</td>
<td>3.78</td>
<td>3.82</td>
<td>3.9</td>
<td>3.64</td>
</tr>
<tr>
<td>Backbone 4</td>
<td>8</td>
<td>4.45</td>
<td>0.58</td>
<td>32%</td>
<td>3.67</td>
<td>3.43</td>
<td>3.86</td>
<td>3.71</td>
<td>3.79</td>
<td>3.86</td>
<td>3.67</td>
<td>3.86</td>
</tr>
</tbody>
</table>

While cross-regional ties exist, they are least common in the network-the structure is under way, yet not fully developed for communities of practice across CAHSI. In the cases where strong cross-regional relationships exist for leads and co-leads, a community of practice (problem solving) or
an intensive professional development program (Google Faculty in Residence) created the impetus for building a relationship. Similarly, leadership calls across the regions create opportunities to share knowledge across regions. At this time, coordinators and connectors within regions are communicating more with one another, for example, some reach out to one another for guidance over email or telephone call, and some meet separately within their region from the regular large group meetings. With increased opportunities to build rapport with their peers in informal ways, connectors and coordinators may assist in transmitting the network’s knowledge across regions.

**COMMON MEASURES**

The use of data and common measures to track progress, inform decisions, and improve practice is central to the work of collective impact initiatives. The data management team is responsible for developing common metrics and tracking institutional, regional, and national progress in achieving enrollment, graduation, and other goals. Additionally, the data management team will measure departmental climate as another outcome metric to track CAHSI’s progress in creating equitable, inclusive learning environments for students and faculty.

**Collective Impact Survey: Common Measures**

At this point in time, CAHSI members are more likely to share information about already proven, evidence-based strategies than to use data to make decisions or identify needs. As CAHSI regional networks have strengthen and deepened, participants are more likely to share evidence-based strategies with one another than they were in the previous year (85% currently and 69% in the previous year). Similar to the previous year, a relatively high number of regional participants use data to improve programs (72%). Some CAHSI participants are quite experienced in using data from a programmatic or evaluative standpoint, but they are still becoming familiar with using data to track regional or national progress of collective impact efforts. As such, fewer CAHSI regional participants (63%) used data in the past year to track progress in meeting CAHSI’s vision, slightly lower than the proportion who reported in the previous year that they used data to track progress of collective impact efforts (74%). The percentage of respondents who have used data to identify local or regional needs is similar to the previous year (71% in current year and 76% in previous year). There were no regional variations in data use, indicating some growth among regions as there were sharper contrasts amongst regions in the previous year. There were also few, to no, differences in data use based on length of involvement with CAHSI, suggesting that newcomers are beginning to use data to inform their decisions at rates equivalent to CAHSI veterans. Therefore, the majority of CAHSI regional participants report that they used data in the past year to identify needs and improve programs, although only about a quarter of participants report that they use data “to a great extent.”
CONTINUOUS COMMUNICATION AND DISSEMINATION OF INFORMATION

Through its collective impact effort, CAHSI INCLUDES has broadened and expanded its reach to new departments and partners in the Southwest, Southwest, Northeast and West regions. The national CAHSI INCLUDES community, spearheaded by the efforts of the backbone, offers the opportunity for the regional networks to come together to build consensus on a common mission and goals, identify and align common strategies and activities, and to improve practice and strategies through common measures. In the past year, the CAHSI network focused more on regional collaboration than national collaboration. Most regions met regularly to plan, strategize, and share practices and ideas. The southwest and west region met more consistently than the other regional networks, but the Puerto Rican universities have an active network and the north region, which is more geographically dispersed, met and collaborated as needed. Additionally, the backbone hosted regular calls with the regional coordinators and connectors to disseminate information and problem solve. The backbone also hosted regular, virtual office hours to provide guidance, advice, and problem-solving to the connectors and coordinators.

COLLECTIVE IMPACT SURVEY: CONTINUOUS COMMUNICATION AND DISSEMINATION OF INFORMATION

While the social network survey measured the strength and frequency of the relationships and interactions within the network, the collective impact survey measured the
dissemination of information within and beyond the network. The most frequent communication and dissemination action measured by the survey was to identify and share opportunities for students within regions (84%). CAHSI regional members also disseminated CAHSI’s accomplishments and practices to computing audiences in publications and presentations (72% of survey respondents, a rate similar to the previous year). Given the focus on the region as the locus of strategic planning and action, participants were more likely to coordinate activities within regions (75%) than with the backbone (64%). One of the least common activities was to disseminate CAHSI’s practices or achievements to non-computing audiences (66% of survey respondents). Thus, the primary form of information sharing within the CAHSI network was internal communication related to educational and professional opportunities for students. External communication outside the network about CAHSI’s vision or practices was slightly less common, and participants reported slightly less intensity in external dissemination as compared to internal and regional communication.

Object 26. Continuous communication and dissemination

<table>
<thead>
<tr>
<th>Continuous Communication and Dissemination</th>
<th>Did not do this</th>
<th>Plan to do this</th>
<th>To a slight extent</th>
<th>To some extent</th>
<th>To a great extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identified and shared opportunities for students</td>
<td>8%</td>
<td>8%</td>
<td>22%</td>
<td>61%</td>
<td></td>
</tr>
<tr>
<td>Disseminated CAHSI in pubs/pres to computing audiences</td>
<td>19%</td>
<td>8%</td>
<td>31%</td>
<td>8%</td>
<td>33%</td>
</tr>
<tr>
<td>Coordinated actions/events with the Backbone</td>
<td>25%</td>
<td>11%</td>
<td>14%</td>
<td>22%</td>
<td>28%</td>
</tr>
<tr>
<td>Identified and shared professional development opportunities for faculty</td>
<td>14%</td>
<td>3%</td>
<td>22%</td>
<td>36%</td>
<td>25%</td>
</tr>
<tr>
<td>Coordinated actions/events with regional partners</td>
<td>22%</td>
<td>3%</td>
<td>8%</td>
<td>44%</td>
<td>22%</td>
</tr>
<tr>
<td>Disseminated CAHSI through social media</td>
<td>17%</td>
<td>11%</td>
<td>19%</td>
<td>36%</td>
<td>17%</td>
</tr>
<tr>
<td>Disseminated CAHSI in pubs/pres to non-computing audiences</td>
<td>26%</td>
<td>8%</td>
<td>26%</td>
<td>29%</td>
<td>11%</td>
</tr>
</tbody>
</table>

For the most part, participants from each region reported similar rates of communication and dissemination of activities. However, participants from the west were somewhat less likely to report that they coordinated with the backbone (33% compared to 60-70% in other regions). Across all regions, about 70-80% of participants reported that they regularly communicated and coordinated within their region. There were no differences in communication across regions.
based on length of involvement with CAHSI; however, those who had been with CAHSI for 6+ years were more likely to coordinate activities with the backbone (80% compared to 60%), perhaps because many of them held regional leadership positions. There was no difference in dissemination to computing audiences based on length of involvement with CAHSI, indicating that newcomers are also contributing to promoting CAHSI through publications or presentations. However, CAHSI veterans (those with 6+ years experience) were more likely to disseminate CAHSI’s activities to non-computing audiences (80% compared to 40% of newcomers).

Not surprisingly, participants who regularly attend regional and other CAHSI meetings were substantially more likely to communicate within their region and to disseminate beyond CAHSI. For instance, 100% of regular meeting attendees reported that they regularly coordinate activities and plans within their region, while only 28% of those who do not frequently attend meetings reported the same. Likewise, 100% of participants who regularly attend meetings share student opportunities with other CAHSI participants, while only 58% of those who do not regularly attend did so. Finally, 81% of participants who attend every meeting disseminated CAHSI to computing audiences in the past year, while only 32% of those who do not regularly attend meetings did so. Therefore, continuous communication through regular meeting attendance is critical for achieving other collective impact objectives, such as sharing ideas and activities and disseminating outcomes.

Continuous Communication: Effective Practices
In participant observation during CAHSI meetings and in interviews with backbone and regional participants, an array of promising practices for effective collective impact communication emerged. Continuous communication has been documented by researchers as one of the more difficult aspects of collective impact efforts, and CAHSI has been able to adjust and hone their communication strategies over the last several years. There was general consensus among interviewees that the following communication practices were effective in building relationships, trust, and facilitating productive collaboration:

Regular regional meetings: Almost all regional members who participated in regular regional meetings commented on their value for sharing information, facilitating collaboration, promoting learning and development among members, and sharing ideas and best practices. Participants commented that the meetings were most effective when held with regular frequency, such as the biweekly meetings held in the southwest region. For example, after campus closures, several regional meetings were devoted in entirety to discussing and sharing campus and departmental situations, sharing ideas for maintaining effective learning, especially in PLTL sessions, and strategies for supporting students. Without the CAHSI INCLUDES network, departments would not have been able to quickly and efficiently share practices and strategies for supporting students during covid-19.
In general, one of the participants described the value of regional meetings: “the biweekly meetings we’re having with everyone, that really helps. We see what others are doing. And they have ideas and, ‘Oh, wow, that’s good. I didn’t even think about that’ and the resources that are provided are helpful.” Regular regional meetings also helped participants to better understand the collective impact model, as noted by a CAHSI member: “I’d say my understanding [of collective impact] has increased. I don’t know that I completely understand everything about it, but I think having those in-person meetings, every time we have something like that where we’re all together, we’re all talking about it, I think I understand a bit more each time.” Most of all, the meetings allow for collaborative brainstorming, sharing, and problem solving as described by a CAHSI member: “I can’t even imagine doing this work without the region because they’re kind of our pulse. They give us a lot of information and guidance and support and like "You guys got this" and we talk. I love these web calls and these meetings, but I just want to get us all in the room for a day because so much goes on and there’s so many great ideas.”

Participants also described best practices for regional meetings, including sending out important information, hand-outs and an agenda beforehand and using the meeting time to go more in depth into the materials and information.

In interviews, CAHSI members identified the following benefits of the regular regional meetings:

1. Building relationships and developing trust amongst CAHSI members
2. Developing and facilitating collaborations
3. Sharing information and resources
4. Sharing student and faculty opportunities
5. Trouble-shooting/problem-solving, and seeking advice about challenges
6. Sharing promising practices
7. Setting goals and coordinating strategies
8. Providing access to outside expertise through guest speakers or other sources
9. Affirming, promoting, and reflecting on CAHSI’s vision
10. Encouraging and motivating CAHSI participants
11. Orienting and integrating newcomers into the region and the broader CAHSI community
12. Connecting the region to the backbone through the attendance of a backbone member at the regional meeting

Provide continual opportunities for learning and development within meetings: There were many manifestations of learning communities within CAHSI meetings. For one, the problem-solving community of practice has emerged as a significant source of faculty professional development by providing a forum for faculty to discuss strategies, pedagogies, learning goals, and challenges in the problem-solving course. Additionally, the southwest region has regularly hosted guest speakers that have provided learning opportunities through discussion and presentation, such as hosting the president of the New Mexico Computer Science Teacher’s
Association to discuss K-12 strategies and policy, or hosting an associate with the National Center for Women in Information Technology to share best practices and facilitate discussion related to recruiting women into computing. To affirm the importance of these opportunities for learning and growth, a regional participant described the value of the problem-solving meetings as: “creating those relationships. So, if there were different activities to share or problems that we were trying to solve, best practices or anything, to have meetings for people just to discuss that. The people on the call are a lot more invested in that topic, and you’ll get a whole lot more conversation.”

**Regular sub-regional meetings:** The CAHSI regions are quite expansive and collaboration, particularly in-person, can be difficult across such vast geography. Some regional members noted that they also met regularly with other members in a sub-region (e.g., northern California or southeast Texas) and these meetings helped to strengthen bonds among members and institutions that are in closer proximity to one another and allowed them to plan, strategize, and share local opportunities and resources with one another.

**Regular backbone meetings with coordinators and connectors:** In the first year of the grant, the coordinators and connectors gradually came to understand their role and the vision of the CAHSI. The meetings between the backbone and coordinators and connectors provide a regular opportunity for coordinators and connectors to reflect on their role, learn from peers, and for the backbone to share critical information that impacts students or the region.

**Regular backbone meetings with student advocates:** One of the largest areas of growth for CAHSI in the past year was the growth in the number of departments with student advocates. Regular advocate meetings that are facilitated by the backbone provide structure and clarity to the advocate role and provide an opportunity for advocates to learn from one another. Some regional participants suggested, however, that they could be updated more frequently about the content of the meetings and the communication between advocates and the backbone so they are informed and can better support the advocates in their home department.

**Regular executive committee meetings:** Executive committee meetings can assure that regions and the backbone are aligned in vision, goals, and strategies. They also serve an important purpose of sharing information and opportunities and prioritizing goals. Participant observation at regional meetings demonstrated that regional leads would communicate information with the region that they had gained from the backbone as well as emphasizing certain priorities valued by the backbone, such as branding or promoting CAHSI.

**Periodic all-hands meetings:** While regional meetings have become the primary venue through which participants engage with CAHSI, many CAHSI members noted in interviews that they appreciated the periodic all-hands meetings and that they would welcome more opportunities for collaborating and networking across all of the regions of CAHSI. For example, a CAHSI member commented: “I also like the once or twice a year meetings with the Backbone and the all-hands meetings; they have been helpful. So that’s something I really want to happen, at
least once a year. Traveling has overhead but even with the overhead, meeting people in person has been very fruitful. And a lot of the all-hands activity, whenever I attend it, it has been educational and informational.”

**Continuous Communication: Social Network Analysis**

The tables below show the network relationships as they relate to individuals’ involvement with colleagues in CAHSI. First, we present the whole network at the level of leads, co-leads, connectors, coordinators, and backbone staff. There is a separate table for each region, in which backbone respondents are also included. The colors indicate region or belonging in the backbone. The first imagine shows the whole network in terms of its connections involving communication once per month.
At this level of interaction, we note how colors remain relatively concentrated, densely connected with arrows in both directions, particularly with one’s own region. There is some intermingling between southeast and southwest regions, and the backbone participants are bridging the regional relationships in most cases. Similarly, the most connected node within each region is in most cases the Lead who attends the executive committee meetings. One set of connections that is cross-regional is the problem-solving community of practice—this leads to a series of direct connections from faculty involved with the meetings to faculty who serve as representatives from other regions.
As would be expected, weekly communication was less common, though many of the connections seen in the monthly map remain in the “weekly communication” map.

Object 28. Social network national communication, weekly

The social network analysis includes items regarding how participants interact with other participants, and the extent to which they engage deeply through cooperative, low-commitment activities (level 1, e.g., sharing information about REUs) through integrated activities (level 3, e.g., developing shared content like the GMiS conference workshops) The table below defines the types of relationships CAHSI stakeholders may have with one another.
Object 29. Network depth of activities

- **Cooperative Activities:** involves exchanging information, attending meetings together, and offering resources to partners. (Example: Informs other departments of a national or regional event for computing students)

- **Coordinated Activities:** include cooperative activities in addition to intentional efforts to enhance each other’s capacity for the mutual benefit of programs. (Examples: Sharing curriculum materials, discussing shared mentoring practices, sharing evaluation materials.)

- **Integrated Activities:** in addition to cooperative and coordinated activities, this is the act of using commonalities to create a unified center of knowledge and programming that supports work in related content areas. (Example: Working together to fund, provide content, and recruit participants for a co-sponsored event.)

Object 30. Regional networks mapped to cooperative activities

- Backbone (yellow) and **West Region** (green) mapped by cooperative activities
- Backbone (yellow) and **Southwest Region** (purple) mapped by cooperative activities
- Backbone (yellow) and **North Region** (blue) mapped by cooperative activities
- Backbone (yellow) and **Southeast Region** (orange) mapped by cooperative activities
At the level of integrated activities, we note the ways in which network maps change dramatically across the board. Most of the clusters that can be seen below are “sub-regions” - specifically visible in the southwest map. Those in the west with no arrows are staff with very few hours allocated to the project and new “co-leads” added to the SNA by the evaluators who considered them engaged more deeply than most partners. It appears that those who are not named as official co-leads may not have as much of a role in the development of integrated activities as we suspected. As regions move forward with plans for strategic action, it is possible they will create richer, more connected networks with appropriate redundancy.

Object 31. Regional networks mapped to integrated activities

![Network maps](image-url)
Network comparison over time- year 1 to year 2

The overall network scores show similarities in density, with a slight increase in the number of possible connections that are fulfilled by participants (i.e., 1.3% more of the possible one to one connections have been made this year in comparison with last year). The decentralization of the network has gone down, yet the variability in the number of participant links is relatively high. This is by design—for example, the role of the connector is such that we would expect a large number of connections for those in that role, similar to the backbone, yet co-leads and coordinators are not expected to have as many one-to-one connections across the network, as they are designed to be ending nodes in the distribution structure. Trust, which was already quite high within CAHSI, has climbed to 91.6% out of a possible 100%. The next section will detail each element of trust more specifically.

Object 32. Network scores compared year to year

<table>
<thead>
<tr>
<th>Network Scores</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Density:</strong> Percentage of ties present in the network in relation to the total number of possible ties in the entire network.</td>
<td>32.50%</td>
<td>33.80%</td>
</tr>
<tr>
<td><strong>Degree Centralization:</strong> The lower the centralization score, the more similar the members are in terms of their number of connections to others (e.g. more decentralized).</td>
<td>72.60%</td>
<td>67.20%</td>
</tr>
<tr>
<td><strong>Trust:</strong> The percentage of how much members trust one another. A 100% occurs when all members trust others at the highest level.</td>
<td>86.00%</td>
<td>91.60%</td>
</tr>
</tbody>
</table>

Object 33. Network connectivity

<table>
<thead>
<tr>
<th>Network connectivity values</th>
<th>2019 results, mean values</th>
<th>2020 results, mean values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Degree Centrality:</strong> # of connections to other members of the network</td>
<td>8.79</td>
<td>10.13</td>
</tr>
<tr>
<td><strong>Non-redundant ties:</strong> shows the number of non-redundant ties in relation to the other members that each organization is connected too.</td>
<td>5.57</td>
<td>6.25</td>
</tr>
</tbody>
</table>
Closeness Centrality: Measures how far each member is from other members of the network in terms of # of links between each member. A high score (close to 1) indicates members who have the shortest 'distance' between all other members.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closeness Centrality</td>
<td>0.61</td>
<td>0.61</td>
</tr>
</tbody>
</table>

Relative Connectivity: Based on measures of value, trust, and # of connections to others, the connectivity score indicates the level of benefit an organization receives as a network member, in relation to the member with the highest level of benefit (100%).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Connectivity</td>
<td>0.36</td>
<td>0.36</td>
</tr>
</tbody>
</table>

Value Scores: an average of the ranking given by all other members for that organization along three dimensions: power/influence, level of involvement and resource contribution. Scale of 1-4.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Value (1-4)</td>
<td>3.16</td>
<td>3.48</td>
</tr>
<tr>
<td>Power/Influence (1-4)</td>
<td>2.86</td>
<td>3.30</td>
</tr>
<tr>
<td>Level of Involvement (1-4)</td>
<td>3.42</td>
<td>3.72</td>
</tr>
<tr>
<td>Resource Contribution (1-4)</td>
<td>3.21</td>
<td>3.42</td>
</tr>
</tbody>
</table>

Trust Scores: an average of the ranking given by all other members for that organization along three dimensions: reliability, support of mission, and open to discussion. Scale of 1-4.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Trust (1-4)</td>
<td>3.58</td>
<td>3.75</td>
</tr>
<tr>
<td>Reliability (1-4)</td>
<td>3.53</td>
<td>3.66</td>
</tr>
<tr>
<td>In Support of Mission (1-4)</td>
<td>3.65</td>
<td>3.84</td>
</tr>
<tr>
<td>Open to Discussion (1-4)</td>
<td>3.56</td>
<td>3.75</td>
</tr>
</tbody>
</table>

**Recommendations**

The following recommendations are provided based on evaluation results from the second year of the CAHSI INCLUDES grant. Overall, the health of the network and participation in strategic activities is quite robust, although there were a few areas identified by participants as possible areas of growth or focus in the coming years as CAHSI continues to gain visibility and expand its reach.

**Funding and proposals**

While grantwriting activity within the CAHSI network increased in the past year, in interviews and on the collective impact survey, many CAHSI members noted that they could benefit from assistance in writing and developing proposals. Many of these members were newcomers from institutions without a strong history of NSF or other grant support and they stated that they
needed capacity-building in proposal development. The backbone may consider a more formal mechanism or infrastructure for actively assisting in proposal support and development, such as designating a backbone member as the point person to contact for proposal development and review and having that backbone member regularly conduct outreach related to proposal development. Other possibilities may include hosting regular webinars or information sessions to build capacity in proposal development or hosting periodic office hours related to proposal development where members can seek support, feedback, and have questions answered. Webinars or office hours could be scheduled to correspond with specific NSF, or other funding agencies, grant deadlines to allow plenty of time for planning, writing and support (e.g, host a webinar or office hours 2 months prior to CS for All deadline and then again one month prior, etc.).

**Continuous communication**

Despite many successes in developing a regional infrastructure for communication, CAHSI members articulated several communication needs in interviews and on the collective impact survey. Members stressed the importance of the timeliness of information and providing enough lead time for them to be able to respond and engage students. Due to the necessity of involving students in so many of CAHSI’s opportunities, plenty of lead time is needed to maximize the ability of departments and students to participate in opportunities. Regular, brief updates with upcoming calendar events over the next several months sent to all CAHSI members may help ensure the communication flow and that all members are up-to-date with upcoming events and deadlines. There are already mechanisms in place to provide this information, but the network is complex, and redundancy seems to be essential for communication, especially concerning important opportunities and deadlines. The deepening structure for student advocates may support the timeliness of information, as the connections between faculty and student advocates have been fortified through new expectations and the advocates are meeting more regularly.

Newcomers to CAHSI, even those who have been with the network for more than a year, are still becoming accustomed to the organizational structure of CAHSI and the nature of collective impact work. Within CAHSI most of the communication is focused in the region and members within regions generally have fewer opportunities to network and collaborate with members outside their regions. Several members suggested that an organizational chart with names attached to the positions would help them to better know the larger network beyond their region. Additionally, some members felt it would be helpful to attach a list of responsibilities to each of the backbone members so newcomers know who to turn to in the backbone if they have a particular question or need support in a certain area that needs to be provided by the backbone.
Following the dissolution in December of the main communication tool used by the network, CAHSI members suggested that CAHSI finalize a communication infrastructure for synchronous and asynchronous communication across the network so that regions can better collaborate and communicate with the backbone and with each other. While conversations with Backbone staff indicate a solution was developed, at the time of the interviews in March and April the partners were unaware of the plan. Regions have adopted certain preferred modes of communicating within their region, but some members suggested that a broader CAHSI communication infrastructure that would allow for instant messaging, direct messaging, posting documents, etc., such as Slack or Microsoft Teams, could support improved communication across regions.

**Backbone Support**

Results from the collective impact survey highlighted the different types of backbone support needed from CAHSI participants based on their length of involvement with CAHSI. Newcomers to CAHSI (within the last few years) needed different guidance and support than those who were more familiar with CAHSI and had been involved for a longer time. Newcomers to CAHSI needed an introduction to the CAHSI vision, training in CAHSI signature practices and activities, and mentoring in the use of the collective impact model. As newcomers become familiar with the CAHSI community and practices, they needed more frequent communication about activities and strategies as well as resources and materials to carry out those activities. Veterans and CAHSI leaders needed higher-level support from the backbone, such as aligning regional and national visioning, strategizing, advocacy, and mobilizing funding and national partnerships.

**Partnerships**

There is strong interest among CAHSI members in generating local industry support and seeking local funders, yet there is still a need for capacity building in this area. Members noted that they could benefit from coaching in how to approach industry and establishing connections, and from clarification regarding when to engage national leadership during the process of relationship building with industry. Brief highlights of successful, CAHSI related regional partnerships written as cases might help CAHSI staff and co-leads feel more comfortable with developing industry partnerships in the right way. Some members also commented that they would like a simple one-page document or infographic that describes CAHSI’s vision and accomplishments that could be shared with potential funders or industry partners when making introductions. A short, simple document of highlights could generate interest and motivate potential external partners by helping them to realize the benefits of collaborating with an impactful national network.
Seeding cross-regional collaborations
Social network data indicate that CAHSI staff and co-leads have limited reach beyond their regions, yet specific data regarding CAHSI co-leads who participate in the problem solving community of practice show strengthened relationships across regions because of the practice—co-leads who engage in the community have much stronger density scores, and more “non-redundant ties” within the national network, making them more valuable members. The time may be right for promoting online community formation and engagement as well as promoting online training options for signature practices, as most meetings and workshops are occurring online, and participants as well as facilitators are getting used to the medium. This would address uneven access in regions to trainers as well.
Appendix A: COVID Survey Results

CAHSI COVID-19 Survey Findings
In spring of 2020, the CAHSI evaluators administered a survey to CAHSI computer science departments. There were a total of 918 respondents, with a modal item response of 738. Respondents were all attendees at H.S.I.s, and 48% identified as Hispanic (13% Hispanic female, 35% Hispanic male). Ten percent were Asian female students, 18% Asian male students, 5% Caucasian female, 17% Caucasian male, 2% African American female, 4% African American male, and 15 students self-identified as American Indian/Native American/ Pacific Islander/Native Hawaiian (note that some respondents marked multiple races/ethnicity). Participants in the survey were most often 4th year students (373, 41%) and 3rd year students (277, 30%), though second year (137, 15%) and first year students (79, 9%) also participated. Six percent of respondents were graduate students (51 students).

CAHSI students described their experiences with the remote/online learning that ended the spring 2020 semester so abruptly across the nation. Students described the context within which they took classes, the communication they received from their institution and department, the effectiveness of the teaching received, and the way they perceived their worlds during the health crisis. Students expressed great anxiety, frustration, and difficulty in focusing academically, which was for many exacerbated by their home situations, available resources, and their health and financial circumstances. For the most part, students found that their departments and institutions were good sources of support, communication, and guidance during a difficult time.

Student contexts
As might be expected, students had a variety of living situations during the campus closures. About 1 in 8 students needed to move residences because of the pandemic (89, 14%). Most students lived with family (504, 78%) during campus closures and many of these students already lived with family so there was less disruption to their living situation. Nearly half of the students reported living with school-aged children (267, 42%), whose schooling had also been interrupted by the COVID-19 health crisis. Students who lived with school-aged children in the house were much less likely to have a quiet place to study (71% did not have a quiet place to study, as opposed to 58% of students without children in the house).

Some students continued to work in paid positions, while others were laid off or furloughed from their jobs. Nearly 1 in 5 students continued to work in their essential jobs (108, 17%), while another 7% (45) continued to work outside the home in a non-essential position. About 1 in 5 students continued their employment at home (129). Students also lost income during the pandemic through layoffs, furloughs, or reduced hours. About 1 in 8 students reported they had been laid off or furloughed (90, 14%), while another 15% had lost income or reduced hours at
their work (96). More than 1/3 of students were not affected because they stated that they did not work (256, 39%).

**Information**

Students were asked to describe their most important sources for information during the COVID-19 health crisis and were asked to select 3 choices. They found campus-wide university emails (569, 80%), faculty/instructors (403, 57%), peers and friends (352, 49%) and emails from their major department (331, 47) to be the most important sources of information during this time. A few students noted that the CAHSI website (18, 3%) and CAHSI student advocate (10, 1.5%) had been important sources of information during the pandemic.

Students rated the information that they received from these various sources as helpful (mean of 3.75 on a 5-point scale, where 3=somewhat helpful and 4=helpful). There were some regional variations as the SE region students rated the information they received as less helpful, but this was likely skewed by a much lower survey response rate in that region. Students received better information about accessing online courses (95% rated it as “somewhat helpful” or better) and turning in assignments (95%) than accessing campus services (86%). Therefore, students were largely satisfied with the information they received about their courses and grades, but they were slightly less satisfied with the amount and quality of information that they received about other university services and resources.

**Object 34. Helpfulness of information received, covid-19 survey**

<table>
<thead>
<tr>
<th>Helpfulness of Information Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE region</td>
</tr>
<tr>
<td>3.19</td>
</tr>
</tbody>
</table>

Mean of student responses
5-point scale, 1=not helpful, 5=very helpful

**Access to Resources**
Just as faculty were an important source of information for students, they also provided the most support to students. Indeed, nearly 2/3 of students reported that they had sought help from faculty during the pandemic. Students sought out faculty support at equal rates across regions (65%-66% of students for each region). Students also turned to peers for support, demonstrating the importance of the strong peer networks encouraged within CAHSI departments. To a lesser extent, students sought help and support from their advisors (major advisors or graduate advisors), or TAs and peer leaders. While only a quarter of students sought help from TAs or peer leaders, not all students were enrolled in courses or had access to TAs. Students also received help from office staff in their major department and clubs/programs in their major. Students accessed university-wide services (e.g., financial aid, tutoring, food pantry, etc.) to a much lesser extent. Therefore, the department was a more important source of students’ academic and social support than the broader university during the pandemic and they utilized the resources available to them within their departments, for the most part.

Object 35. Resources that Students Accessed, covid-19 survey

**Effectiveness of Institutional Support Received**

Students who sought support mostly found the support to be effective. Students were most satisfied with the help received from their department as compared to the support they received from university services. For instance, students were mostly satisfied with the help they received from faculty (88% reported the support was at least somewhat helpful), peers (88%), advisors (84%) and TAs/peer leaders (83%). In contrast, students were less satisfied with the help they received from university-wide resources, such as the financial aid office (69% found it to be at least somewhat helpful), university tutoring or math center services (69%), the career center
(68%), campus health services (65%), and disability services (58%). Students only rated the services and resources that they had accessed during the pandemic.

When students’ ratings of help and support were grouped together into one scale, the mean rating of all of the sources of help and support lay between “somewhat helpful” and “helpful.” There were no regional variations as students generally rated the support they received as effective. There were also no meaningful differences between groups of students, such as gender, race/ethnicity, etc. in their ratings of the support they received from their departments and institutions during the pandemic.

Figure 36. Effectiveness of Support Received, covid-19 survey

Effectiveness of Support Received

Students were asked to rate the effectiveness of different aspects of remote learning on a 5-point scale, from “not effective” to “very effective.” Mean scores were highest for help received by faculty/instructors during class sessions (mean= 3.48), with peer study groups outside of class coming in second (mean= 3.38) and help from faculty/instructors outside of class or office hours third (mean = 3.35). Next in ratings of effectiveness were collaborative work or assignments with peers (mean = 3.21) followed by peer interaction in class sessions (mean= 3.2). Although students valued certain aspects of the remote learning environment, such as interaction with faculty in synchronous class sessions, they rated the overall transition to online learning and teaching lower (means= 2.78, 2.82 respectively). Still, more than half rated the teaching and the transition at least somewhat effective. Additionally, students valued the support from faculty that they received in class while they found interaction with peers to be
more effective outside of class. Below is a figure which details students’ ratings of the aspects of the remote learning environment (the % of students who found the learning element to be at least somewhat effective).

There were a few differences among different student populations in their perceptions of the effectiveness of the shift to remote learning, while there were no regional differences. However, first-generation college students were significantly less likely to find remote learning to be effective ($t=-2.037, df=698, p=.042$). Likewise, underrepresented minority students were also significantly less likely to feel that remote learning was effective ($t=-2.238, df=665, p=.026$). Therefore, more vulnerable students may have been more affected by the abrupt shift to remote learning and may have found various aspects of the remote learning environment to be less effective compared to in-person learning environments. These particular student groups also faced greater life disruptions and financial stress during the campus closure which also may have affected their remote learning experiences.
Online engagement and participation
Students generally seemed to prefer in-person learning environments to remote learning as many reported that they were less comfortable with online engagement and had trouble staying motivated. For instance, only 20% of students felt they were able to engage with peers more easily in an online learning environment. A small minority of students felt more comfortable in online learning environments (30% felt more comfortable participating in class, while 25% felt more comfortable in general with the format), although the majority of students felt more uncomfortable in remote learning environments. Conversely, 71% of students had trouble staying motivated with remote learning, with a full 39% of students “strongly agreeing” that they struggled with motivation. Additionally, a majority of students (57%) had difficulty organizing their work in online courses. In all, students seemed to greatly prefer in-person instruction and learning environments, although a small subset of students thrived in the remote learning environment. There were a few differences in comfort level among different student groups, although White and Asian students (mean=2.95 on the cluster of items related to students’ comfort with remote learning) were more comfortable than historically underrepresented students (mean=2.7 on the 5-point scale), a statistically significant difference (t=-2.990, df=691, p=.003). There was little gender difference in comfort level, although women (mean=2.88) were somewhat more comfortable than men (mean=2.78) in participating in remote learning environments.

Object 38. Student Engagement During Remote Learning

![Student Engagement During Remote Learning](chart)

Technical problems and issues
As courses moved to online environments, students began coursework from their homes which presented challenges. Students were asked to mark the technical challenges that they
faced during remote learning and they averaged 1.75 technical or study issues each. Students reported (51%, 342) that they had no place to study that was free of distractions at home. More than a third (252, 38%) had unreliable wi-fi where they live, while some students had no wi-fi at home (65, 9%). Therefore, nearly half of students experienced internet issues that made remote learning difficult. Nearly 1 in 4 (153, 23%) had trouble downloading software/applications they needed for class. A small number of students received support from their institution or department in fulfilling the technical needs described—7% were furnished with a laptop (45), 6% received help getting a hotspot (42), 4% received funding for internet access (25), and 13% got support from the technology office to get online (84). There were regional issues related to technology. For instance, students in the Southwest region were more likely to lack access to wi-fi (14%), compared to the North (11%), West (6%) and Southeast (0%). Students in the southwest region also reported less reliable wi-fi; these differences may be because there are more rural students in the southwest region, compared to the other regions which are clustered around larger, urban areas. Low-income students also had more technological problems than students who were not receiving Pell grants (Pell students averaged 1.9 technical problems and students without Pell averaged 1.65).

Object 39. Technical and Study Issues

<table>
<thead>
<tr>
<th>Technical and Study Issues</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No quiet place to study</td>
<td>54%</td>
</tr>
<tr>
<td>Unreliable wifi</td>
<td>38%</td>
</tr>
<tr>
<td>Difficulty downloading apps or software</td>
<td>22%</td>
</tr>
<tr>
<td>Old or broken computer</td>
<td>15%</td>
</tr>
<tr>
<td>No wifi</td>
<td>9%</td>
</tr>
<tr>
<td>Problems with security</td>
<td>6%</td>
</tr>
<tr>
<td>No computer</td>
<td>2%</td>
</tr>
</tbody>
</table>

Interest and commitment
Students’ long-term interests and intentions remained stable amid the disruptions and campus closures from the pandemic (i.e., 80-85% responded “remained the same” or “increased” to the items related to long term interest and intention in computing). Therefore, the vast majority of students maintained or increased their interest in computing and their commitment to a computing career. Students remained more committed to a computing career (only 14% had less intention), to a greater degree than they sustained general interest in their major (21% did report a loss of interest in the computing major from the pandemic). Because students generally maintained strong intentions in computing, there were no differences in interest or intentions among different student populations or across regions.

Object 40. Changes in Students’ Interest and Intentions

<table>
<thead>
<tr>
<th>Changes in Students’ Interest and Intentions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention to pursue a career in my major</td>
</tr>
<tr>
<td>Much less</td>
</tr>
<tr>
<td>6% 8% 66% 8% 12%</td>
</tr>
<tr>
<td>Intention to stay at this university</td>
</tr>
<tr>
<td>8% 8% 69% 6% 10%</td>
</tr>
<tr>
<td>Intention to stay in my major</td>
</tr>
<tr>
<td>6% 8% 68% 8% 10%</td>
</tr>
<tr>
<td>Interest in my major</td>
</tr>
<tr>
<td>9% 13% 61% 9% 8%</td>
</tr>
</tbody>
</table>

Self-efficacy

Despite students’ widespread sustained interest in computing, many students did experience lower self-efficacy in computing from the pandemic and campus disruptions, meaning that students experienced a loss of confidence that they could be successful in their coursework and the in the field of computing in general. Students experienced the greatest loss in feeling that they comprehended the computing concepts in their courses (57% experienced a decline, mean of 2.39 on 5-point scale, or between “slightly less” and “remained the same”). Perhaps because of their decreased understanding of their coursework, students also reported declines in their ability to maintain their grades (52% reported a decline, mean of 2.49). Likewise, a similar number of students experienced declines in their confidence that they could succeed in their coursework. Therefore, about 50%-60% of students experienced lower confidence and decreased self-efficacy in computing from the pandemic.
Impact on students' academic and professional pathways

Students’ access to academic and professional pathways as well as their abilities to persist in computing shifted over the COVID-19 health crisis. Students were asked about the impact of COVID-19 on their computing pathway and were asked to mark any of 16 potential negative impacts that they experienced. More than 70% of students experienced at least one negative impact to their computing pathway; on average, students marked 1.6 negative impacts each. Students were affected academically and professionally by disrupted and cancelled activities. As a result, fifteen percent (103) have considered not continuing their studies, nine percent (58) were unable to complete required courses for their major, and 4% plan not to continue their studies in the fall (26). Additionally, 8% had to withdraw from at least one class (55) and 6% had one or more of their classes cancelled (44). Still more will not be able to graduate when planned (12%, 85). Students have lost opportunities in the health crisis, including jobs offers that were rescinded (55, 8%), as well as internship or research opportunities that were cancelled (95, 14%). Many students took at least one class “pass/fail” (173, 25%). Students also worried about graduate school or job security in the future (178, 25%).
Some student groups were disproportionately impacted by the pandemic. For instance, Ph.D. students reported an average of 2.67 negative impacts to their computing pathways, while master’s students only reported an average of .97; however, there were few Ph.D. student survey respondents so this may not necessarily be representative of all Ph.D. students’ experiences. Additionally, juniors and seniors were more negatively impacted than freshman and sophomores (the former group averaged 1.68 negative impacts, while the latter averaged 1.45). First-year students experienced the least impact to their computing pathway, averaging 1.27 negative impacts. Other student groups were also disproportionately affected. Low-income students and historically underrepresented students (American Indian, African-American and Latinx) were also more negatively impacted than their counterparts. For instance, students receiving Pell grants had significantly more negative professional impacts than those who do not receive Pell (t=2.664, df=701, p=.008; Pell average=1.76, non-Pell average=1.38). Additionally, Latinx students (average=1.78), African-American students (average=1.68) and American Indian students
(average=2.63) were more negatively impacted academically and professionally than their white (average=1.56) and Asian (average=1.33) peers.

**Students’ personal experiences of COVID 19**

Almost all students reported mental health and emotional struggles related to the COVID-19 health crisis and the resulting campus closures. In all, 91% of students experienced emotional and personal challenges and 52% of students were severely impacted (reported 3 or more mental health challenges related to the COVID-19 pandemic). Students’ averaged 2.62 negative mental health impacts each. Consequently, the pandemic overwhelming influenced students’ mental health and well-being; nearly ¾ of students reported greater stress (476); nearly 2/3 described greater anxiety (408, 63%) , and 42% said they were experiencing more loneliness (270). Over one in three have faced depression (251, 39%) and nearly a third expressed greater fear (226, 35%). A small minority turned to increased drug and alcohol use as a coping mechanism (68, 11%). Because emotional struggles were so pervasive, there were few differences across student groups; however, women were significantly more likely to struggle with multiple mental health issues than men (t=-4.405, df=695, p=.000), as men averaged 2.41 negative impacts and women averaged 3.1 negative mental health impacts.

Students also experienced severe financial consequences from the COVID-19 pandemic because of the shutdown of businesses and workplaces during stay-at-home orders. In all, 83% of students experienced at least one negative financial impact from the pandemic, with an average of 1.7 negative impacts per person. Nearly 2/3 of students said that they worry more about money (403,62%), 41% reported their family members have been negatively affected.
financially (264), and about 1 in 5 have had trouble paying for housing and other bills (135, 21%). Some students experienced food insecurity (102, 16%). Low-income students (as measured by being Pell recipients) actually experienced less financial distress than their peers (averaging 1.5 impacts instead of 1.7), suggesting that the Pell grant, although small, insulated students from some of the more dire financial impacts of the pandemic. For instance, 14% of Pell grant recipients had trouble paying for their studies during the pandemic, while 25% of those without Pell grants reported the same. There was no difference between the groups in ability to pay for food or housing, so the Pell grant seemed to protect students from negative impacts to their ability to pay their tuition and fees.

**Student Voices**

Student descriptions of their experiences were varied—most students experienced negative academic, personal or financial impacts—some severe—while the changes were not problematic for others. Given the dynamic nature of the pandemic, students’ responses depended on a variety of factors, such as their prior financial well-being and mental health, students’ work and family situations, their prior academic success, the extent of the outbreak in their region, and their personal and campus support systems. A selection of quotes below are meant to capture the diversity of experiences with COVID-19.

![Financial Impacts from COVID-19](image)
“It basically made me fail all my classes. I was sort of struggling before this happened. Once it happened, I got more lost and then I got COVID-19 and missed a lot of class and now I’m basically screwed.”

“Before COVID 19, I was balancing my classes and grades very well. Now I have lost motivation and don’t have the same support as I would on campus.”

“It’s made life really hard. Not only do I work 2x more now but it’s harder to keep up with online course work. I’m heavily considering just joining the military.”

“I had to move out of town since I couldn’t work anymore. I had no access to the internet or a Windows computer for almost 3 weeks. I hadn’t missed any course work (before then) and now I’ve turned in a lot of late assignments and missed some even.”

“It was hard for me to adjust. My grades went down because of it and because I had to start working to support my family since people started to lose their jobs.”

“I am a firefighter/EMT working every other day for 24 hours for the past 2 months. I miss a lot of schoolwork and classes, and am dealing with COVID-19 patients daily. Learning online is NOT the same as learning in the classroom—it is much harder.”

“I currently work at a grocery store so the increased need for me at work has caused me to spend more time there than on my studies.”

“Financial aid is a big problem. I was not able to turn in FAFSA papers, so I will not be getting summer or fall financial aid.”

“It hasn’t. I really enjoy taking classes online and I feel like it is more effective than in person classes.”

“(My biggest struggles have been) receiving news that one of my family members has the virus and keeping all the little ones engaged in their studies as well while attending online classes myself.”

“I need a classroom setting to focus. My family life has shifted drastically to compensate for COVID-19. My motivation and ability have declined. I feel unable to control what is happening and my mental state most definitely has been affected by this.”
“My sister caught the virus from a patient at her work, so I moved to my car in order to continue my schooling in a safe environment. I stayed in the car for the next 20 days and moved back into the house a few days ago.”

“Initially, I lost my job and lived without power for two weeks, so I had to go camping till I saved up some money.”

“I can’t concentrate as much at home due to the rest of my family being here too. They too need laptops to access school and I find myself sharing laptops with others in order to do our schoolwork. A class I found to be easy in person became difficult learning online. It’s not the same learning process.”

“I’m in no danger of failing classes but I do feel like I’m learning less. Instead of engaging with the information I’m just going through the motions and turning things in without really understanding what it is that I just did or what I should have learned from it. It’s just more difficult to absorb the information.”

“When everything got shifted online it became really hard for me because I do better in the classroom environment with face to face interactions. I also rely on my classmates to help me study and it’s a lot harder now that everything is online.”

“I started to question whether my chosen major was a suitable choice.”

“COVID-19 affected my academic and career goals in which my future internship opportunity got cancelled and turned down. This internship was going to be the start to my career, and it is gone. I’m still very sad about this.”
<table>
<thead>
<tr>
<th>CAHSI COVID RESPONSE TIMELINE</th>
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<tbody>
<tr>
<td><strong>March</strong></td>
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<tr>
<td>SHARED VISION</td>
</tr>
<tr>
<td><strong>Campuses announce online and remote learning for students</strong></td>
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<tr>
<td><strong>March</strong></td>
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<tr>
<td><strong>April</strong></td>
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<tr>
<td>PARTNERSHIPS</td>
</tr>
<tr>
<td><strong>CAHSI backbone staff organize meetings with evaluators, leads to discuss CAHSI response 3/25</strong></td>
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<tr>
<td><strong>CAHSI deputy director charges connectors and coordinators with supervising the COVID resource pages for each institution 4/7</strong></td>
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<tr>
<td><strong>Dialog begins among faculty, staff who practiced PLTL online. Interest among the regions communicated in learning how to do PLTL online. 4/17</strong></td>
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<tr>
<td><strong>Most CAHSI institution COVID-19 resource pages have been developed by advocates, faculty, and CAHSI connectors and coordinators 4/29</strong></td>
</tr>
<tr>
<td>GOALS AND METRICS</td>
</tr>
<tr>
<td><strong>CAHSI evaluators begin to draft survey regarding COVID-19 and its influence on students 3/19</strong></td>
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<tr>
<td><strong>Faculty engaged in problem solving dialogs regularly discuss the issues they and their students are experiencing with COVID-19 informative feedback for the evaluators to consider with</strong></td>
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<tr>
<td><strong>External evaluators launch survey to all CAHSI computer science departments, coordinating multiple distribution methods and channels. Some institutions choose not to utilize the survey, in some cases because of conflicts with their own</strong></td>
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<tr>
<td>LEADERSHIP AND COMMUNICATION</td>
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<tr>
<td>--------------------------------</td>
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<tr>
<td>CAHSI Backbone-call with regional coordinators and connectors to discuss student resources 3/17</td>
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<tr>
<td>Facebook support group for students was made available by the backbone 4/3</td>
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<td>regard to the survey. 4/14</td>
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## CAHSI COVID RESPONSE TIMELINE

<table>
<thead>
<tr>
<th>May</th>
<th>June</th>
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<tbody>
<tr>
<td><strong>SHARED VISION</strong></td>
<td><strong>Data management team lead, Social science lead, and evaluation team plan first CAHSI Colloquium to share results teams and discuss implications for addressing the problem of underrepresentation during the COVID-19 health crisis 6/22</strong></td>
</tr>
<tr>
<td><strong>PARTNERSHIPS</strong></td>
<td><strong>The overall CAHSI COVID-19 survey results are shared with the backbone team. 6/3</strong></td>
</tr>
<tr>
<td><strong>GOALS AND METRICS</strong></td>
<td><strong>CAHSI lead shares data with the NSF Committee on Equal Opportunity in Science and Engineering (CEOSE) in a virtual round table. 6/11</strong></td>
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<tr>
<td><strong>LEADERSHIP AND COMMUNICATION</strong></td>
<td><strong>Student applications for virtual REU opportunities are distributed 6/16</strong></td>
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<tr>
<td><strong>EXPANSION, IMPACT, AND SALE</strong></td>
<td><strong>CAHSI receives email that suggests the Virtual REU may be funded by NSF. Faculty recruitment begins, and planning between backbone and leads for a faculty orientation commences. 6/29</strong></td>
</tr>
</tbody>
</table>

- **May 22:** SHARED VISION
- **June 3:** PARTNERSHIPS
- **June 11:** GOALS AND METRICS
- **June 29:** LEADERSHIP AND COMMUNICATION
- **June 16:** EXPANSION, IMPACT, AND SALE