PURM
Perspectives on Undergraduate Research & Mentoring

ÁNDALE: A Culturally Engaging Research and Training Program for Undergraduate Students Underrepresented in the Food, Agriculture, Natural Resources, and Human Sciences

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Introduction

Undergraduate research is known as a high impact educational practice (Lee et al., 2021), and its benefits among underrepresented minority (URM) students are well documented (Craney et al., 2011; Miller et al., 2019; Palmer et al., 2015; Wilson et al., 2018). URM undergraduate students experience improved sense of belonging (Miller et al., 2019), development of critical thinking and research skills (Finley & McNair, 2013), identity development (Palmer et al., 2015), persistence in their major (Craney et al., 2011), and success in graduate school admissions (Wilson et al., 2018). Students engaged in structured undergraduate research programs increase their confidence through faculty mentorship and gaining a network of like-minded peers (Brown et al., 2016), early exposure to research (Hernandez et al., 2018), and the opportunity to present at professional conferences and meetings (Garcia et al., 2021). However, certain features of traditional research training programs and higher education may prevent URM participation.

While early onset and longer duration (e.g., two semesters or more) research experiences among undergraduate students have demonstrated greater positive effects on academic and research outcomes than shorter research experiences (Gilmore et al., 2015; Hernandez et al., 2018; Jones et al., 2010), this isn't always possible for URM students who encounter a plethora of personal and educational barriers. Due to structural issues in the U.S., URM students may be more likely to live in lower socioeconomic conditions (Williams, 1999; Williams & Sternthal, 2010) and therefore have to contribute financially to the home (Raghavan et al., 2024), resulting in less time available to commit to research. URM students are often first-generation college students parents do not have a college degree from the U.S. (RTI International, 2021), lack awareness of research opportunities, knowledge of what research entails and its benefits, have limited knowledge about university research resources and opportunities (Healy et al., 2010; Copper et al., 2021), and may receive less parental guidance about college than their peers (Raghavan et al., 2024). The unique challenges experienced by URM students underscore the need for research training programs that are thoughtfully tailored to their educational contexts. This approach requires meeting students where they are by providing brief, culturally engaging research opportunities during the latter years of their undergraduate careers, along with financial support that alleviates the added burdens often associated with participation in research training programs.

Institutional Context and Program Goals

Implementation of the ÁNDALE Latino Research Training Program took place at California State University, Long Beach (CSULB), an accredited 4-year urban Hispanic Serving Institution (HSI) located in Southern California. The university enrolls over 30,000 undergraduates each year; over half of

students are low-income, 30.2% are first-generation educated, and 53% are Hispanic/Latinx, whereas 19% are Asian, 14% White, 4% Black, 5% two or more, and 6% other (CSULB Institutional Research & Analytics, 2025). The Center for Latino Community Health, Evaluation, and Leadership Training, housed within the university, serves as a student research and training site to meet the health needs of the increasingly diverse U.S. population by mentoring and training students to be culturally competent professionals.

The ÁNDALE program aimed to train fifty (50) URM undergraduate students in Latino-specific nutrition and health promotion, enhance their professional development, and engage them in research with a faculty mentor. The intent was to better prepare students, including those of URM status (of which Latinx students are a part), to enter graduate school or the workforce to address the high rates of chronic disease among the increasing Latino population. The ÁNDALE program was designed to fill two gaps: 1) the need for a culturally proficient health and nutrition workforce to address the high rates of nutrition-related chronic diseases, such as obesity and type 2 diabetes in the growing and aging Latino population in the United States (Office of Minority Health, 2025a; Office of Minority Health, 2025b; Livne, 2019; McDonald, 2001), and 2) the need for research opportunities to enhance the preparation of students, including those of URM status, in the food, agriculture, natural resources, and human sciences (FANH) at CSULB. While paid research opportunities (e.g., RISE, MARC, BUILD) are available at the university, the majority are intended for students in the STEM disciplines, require a 1-2-year commitment, and/or require the student pursue a doctoral degree. Therefore, the ÁNDALE program was designed for students in FANH majors who might not be eligible or have the ability to commit to an existing campus research and training program, while providing the unique opportunity to receive culturally responsive training to address the high rates of nutrition-related chronic conditions among Latino populations.

Purpose

The purpose of this study was to report on the ÁNDALE program implementation and evaluate its effectiveness. As part of these aims, the components were described within the context of a high-impact practices (HIPs) taxonomy to illustrate the structure and intentionality of the experiential design.

Methods

Study Sample

The study sample consisted of 53 URM undergraduate students. The majority (73.6%) were female, first generation college students (90.6%), with no prior research experience before starting the ÁNDALE program (66.0%). The majority of scholars identified as Latinx or Hispanic (71.7%), followed by Asian American (18.9%), Black/African American (3.8%), Middle Eastern (3.8%), and mixed (3.8%). Scholars represented various FANH majors including 49.1% from health science, 22.6% from nutrition and dietetics, 20.8% from kinesiology, and 7.5% from other fields like health care administration, psychology and sociology. Eligibility criteria were: 1) declared major in nutrition, health science, kinesiology or other health-related major; 2) minimum 3.0 GPA; 3) junior or senior standing; and 4) ability to commit to the one-week orientation and training and 10 hours per week of research for nine weeks. While Latinx identity was not a selection criterion, the applicants reflected the demographic profile of ÁNDALE. Four cohorts of approximately 10–15 students each participated from 2020-2023.

Program Recruitment & Selection

Students were recruited through various approaches including: 1) in-class presentations; 2) flyers and posters displayed around campus; 3) social media posts on student organization accounts; and 4) faculty and student referrals. Targeted recruitment efforts were implemented among groups who are underrepresented in research. Established relationships with faculty in the departments of

health science, nutrition, and kinesiology aided in successful student recruitment, while former scholars referred and encouraged their peers to apply for the program.

Students submitted an online application, personal statement, transcripts, resume, and one letter of recommendation from a faculty member or supervisor. The application packet was reviewed by the principal investigator (PI) and program manager for initial review of eligibility. Students who met the eligibility criteria were invited to a 25-minute interview via Zoom with the PI and program manager. Final selection of participants was made based on the strength of the application and interview and on the ability to match student research interests with available faculty mentors.

ÁNDALE Program Overview & Design

All scholars began the program with an intensive 5-day (35-hour) orientation and training prior to the start of the fall semester (See Table 1: Scholar Training Topics). This allowed students to fully engage in the training without worrying about academic coursework. The culturally engaging training provided students with an understanding of the research process and methods, specifically, community-based participatory research as it relates to nutrition and Latino health, responsible and ethical research conduct, and professional development topics. The training was delivered through a cultural wealth and asset-based lens that affirmed scholars' lived experiences to create an inclusive learning environment.

Scholars engaged in 10 hours of faculty-mentored research per week for the first nine weeks of the fall semester in addition to their regular academic coursework. No course credit was given, but the paid fellowship enabled them to reduce outside employment, which allowed time for participation. Scholars also received tailored, one-on-one mentoring from their faculty mentor and program staff during that time. Scholars were matched with faculty mentors based on research interest and major. Scholars also participated in three workshops on the development of elevator speeches, abstracts, and scientific posters. At the end of the nine weeks of research, scholars gave 10-minute oral presentations on their experience, including the research project, skills and knowledge gained, and future goals. Scholars had the opportunity to use travel funds within the academic year of their participation to present at or attend a professional conference to expose them to their professional field as well as to network with faculty and staff from graduate schools. Although all scholars engaged in a minimum of 90 hours of faculty-mentored research, some scholars were invited by their faculty mentors to continue research beyond the nine weeks of the program.

While the program was intended to be entirely face-to-face, restrictions due to the COVID-19 pandemic forced Cohort 1's entire participation to be virtual with trainings and meetings held via Zoom. Cohort 2 participated in a hybrid format with some activities via Zoom and some in-person following masking and distancing recommendations. Cohorts 3 and 4 participated entirely in person. All Scholars received the same training curriculum and research placement opportunities, whether delivered virtually or in person. In addition, program staff intentionally incorporated relationship-building activities in Zoom-based training sessions for Cohorts 1 and 2 to foster social connection, reduce isolation, and promote community.

Table 1. Scholar Training Topics

Orientation & Initial Training Topics	Academic Year Trainings/Workshops
1. Project Overview 2. Nutrition, Physical Activity, and Health Guidelines for Americans 3. The Latino Diet 4. Nutrition-Related Chronic Diseases Affecting Latinos 5. Nutrition for Health Professionals 6. Impact of Food Security on Nutrition and Health Outcomes 7. Community-Based Participatory Research (CBPR) 8. Working with Latino Communities 9. Social and Cultural Aspects of Foods 10. Culturally Responsive Nutrition Education Programs 11. *Promotores de Salud* (Community Health Workers) 12. Biopsychosocial Research 13. Quantitative Methods 14. Qualitative Methods 15. Developing Health Promotion Interventions & Programs 16. Institutional Review Board 17. Ethical and Responsible Conduct of Research 18. Data Collection Best Practices 19. Reading Scientific Literature 20. Resume & CV Development 21. Graduate School Planning & Student Panel 22. Professional Etiquette in Research 23. Expanding Your Network & Mentors 24. Connecting to Campus Resources 25. Owning Your Strengths and Values 26. Student Research Panel	1. Abstract Development 2. Scientific Poster Development 3. Elevator Speech

The ÁNDALE Latino Research Training Program consists of three high-impact educational practices including: 1) Common intellectual experiences: students received a 35-hour training on nutrition and chronic disease prevention among Latino communities; 2) Undergraduate research: students engaged in 90 hours of faculty-led research across nine weeks; and 3) Diversity learning: students engaged in learning experiences that explore Latino culture and health disparities and inequities. To illustrate the depth and breadth of the ÁNDALE program's implementation of these HIPs, Lee et al.'s (2021) Universal HIPs Taxonomy for designing and evaluating high impact practices was applied. Lee and colleagues developed the Universal HIPs Taxonomy consisting of eight key HIP elements to provide a measure of consistency and provide operationally defined milestones by which to tailor or assess student engagement in HIP experiences (Lee et al., 2021). The "rubric" consists of four milestones of increasing levels of student engagement for each of the eight key HIP elements. Lee et al. (2021) argue that each key element must achieve a minimum of Milestone 2 to be considered a high impact practice. A self-assessment was conducted by the project director, evaluator, and program manager to identify what the program entailed and what it achieved. They met to discuss the program components, map them to each of the eight key elements in the rubric, and assign a milestone rating, using an iterative process to reach consensus (since the assessment was conducted collaboratively, rather than through independent evaluations, inter-rater reliability was not relevant). The rubric was used to summarize each key HIP element with the respective ÁNDALE program component, noting the milestone achieved through the common program experiences (See Table 2. Key Elements of HIP).

Based on the program structure and required expectations of faculty and students, all key elements of the ÁNDALE program met at minimum milestone 2. Some scholars may have reached a higher milestone based on the level of engagement provided by their faculty research mentor during the research experience. For example, some faculty research mentors may have provided more regular opportunities than others for scholars to engage in activities and inquiry regarding diverse communities, cultures, and ideas within the research experience. However, at minimum, all faculty research mentors provided some opportunities to do so, confirmed by research engagement summaries provided by faculty mentors and the scholars' end of program presentations. The ratings for the milestone were based only on elements that were consistent across all scholar experiences. ÁNDALE required all scholars to review and sign a values and expectations agreement at the start of the program. The agreement ensured scholars were aware of the high standards expected during the program. For example, scholars were required to commit to full participation in the program (research, workshops, presentations), regular attendance at meetings with their research mentor and program staff, and maintaining open and ongoing communication to ensure timely completion of their research responsibilities.

The first week of the program entailed intensive daily trainings for five days. During the semester, scholars were expected to engage in a minimum of 10 hours per week across 9 weeks of mentored research training. At the same time, they received training and feedback on abstract development and submission, and research poster development to present their work, which could occur beyond the semester. Scholars had several opportunities to interact with their faculty mentor, program staff, as well as peers in their lab and in the program during the initial training and workshops throughout the semester.

During the one-week training, scholars learned about Latino-specific health, nutrition, and interventions. Relatedly, the majority of scholars worked on research projects that focused on ethnic minority and/or diverse populations. Notably, each cohort was comprised of scholars from varied backgrounds, providing opportunities to learn alongside and from diverse students.

Scholars met with their faculty mentors at least twice per month where they received feedback and followed up on issues from previous meetings; ÁNDALE staff also met with all scholars three times during the program and were available to meet with scholars if additional check-ins were needed. Scholars had the opportunity to apply their learning through activities during workshops that required them to put into practice what they had learned with some building across time (e.g., abstract to poster development); during their final presentations, scholars reflected on the knowledge and skills they learned during the program. Scholar placements with faculty mentors allowed them to apply the research skills they learned to real-world issues. At the end of their research placement, they were able to demonstrate competence to the public during presentations to their peers and the academic community.

Data Collection

Scholars completed consent, demographic, pre-, post-, and follow-up assessments online via Qualtrics (an online survey tool). Demographics, pre-test measures, and program agreements were completed prior to the program orientation. Post-tests were conducted within 2 weeks of program completion; follow-up measures were conducted at one-semester after program completion. Process data was derived from tracking logs maintained throughout the program. Transcripts were used to track student academic progress. Procedures and assessments were approved by the California State University, Long Beach Institutional Review Board for the Protection of Human Subjects.

Table 2: Key Elements of HIP Table

Key element of HIP	ÁNDALE component	Milestone met by ÁNDALE
Appropriately high-performance expectations	1. Values and expectations document 2. Signed program agreement	Milestone 4: Expectations for student performance are clear and appropriately demanding, with high standards in place
Significant investment of time/effort by students over extended time	1. 35-hour training on nutrition and chronic disease prevention among Latino communities, CBPR, research methods, and program planning[a,c] 2. Support for abstract and poster development[b] 3. Option to extend research experience to 16 weeks or 32 weeks[b]	Milestone 4: Structure encourages general studying, application of concepts, connections to self, and sustained inquiry
Faculty/peer interactions regarding substantive matters	1. Ongoing mentorship from faculty and staff 2. Biweekly meetings with faculty mentor 3. Peer interactions during training, workshops, research, and end of program celebration	Milestone 3: Regular opportunities for students to have meaningful interactions with others for a purpose related to learning outcomes
Experiences with diversity	1. Training in Latino-specific nutrition and chronic diseases[a,c] 2. Research engagement with ethnic minority and underserved populations[c] 3. Diverse students within each training cohort	Milestone 2: Some opportunities with a purpose directly related to learning outcomes
Frequent, timely, and constructive feedback	1. Ongoing meetings with faculty mentor 2. Meetings with program staff at the beginning, middle, and end of 10-week program 3. Check-in time during workshops 4. Program staff available for students as needed	Milestone 3: Summative and formative feedback, both one-way and two-way
Periodic & structured opportunities to reflect & integrate learning	1. Training application activities[a] 2. End of program presentations 3. Abstract and poster development[b]	Milestone 2: Prompts encourage connection to concepts and promote basic understanding
Opportunities to discover relevance of learning through real-world applications	1. Research engagement with a faculty mentor; working on real-world issues[b,c]	Milestone 2: Regular opportunities to actively apply concepts to real-world applications within instructor-provided parameters
Public demonstration of competence	1. Training discussions and content application activities 2. End of program presentations 3. Poster presentation	Milestone 2: Few explicit opportunities for students to publicly share knowledge

Note. The competencies listed for each HIP in column 3 are met at minimum by all ÁNDALE students. Some students achieved a higher milestone based on engagement with their faculty research mentor.
[a]HIP Type: Common Intellectual Experiences
[b]HIP Type: Undergraduate Research
[c]HIP Type: Diversity Learning

Measures

Academics

Student GPA, good academic standing, and graduation were derived from academic transcripts. Good academic standing was defined as a 3.0 GPA or above. Graduation was an indicator of retention.

Benefits of Undergraduate Research Experiences

Lopatto's (2004) Survey of Undergraduate Research Experiences (SURE) captured data on benefits scholars experienced from their research placements. Research related knowledge, skills and abilities (20 items) were assessed with 5-point Likert scale response options ranging from 1=strongly agree to 5=strongly disagree with an option to not answer. The scale was adapted to apply to research and the field of public health rather than being specific to field of science; wording was revised to "I" statements for clarity (e.g., "I have skill in science writing" was revised to: "I have skill in research writing"); and the response options were modified from the original, which asked about possible benefits of activities in terms of gains, ranging from no gain to large gain, as described above. Since not all scholars would have data analysis experience, the "skill in the interpretation of results" item was not included; instead, an item asked about having a clear understanding of the career opportunities in public health. An item on understanding science was changed to understanding public health, and learning laboratory techniques was changed to learning research practices. A single scale score was calculated by taking the mean of responses; internal consistency was high at pre-test (Cronbach α=0.893) and post-test (Cronbach α=0.947).

General Learning Experience

Five items from the SURE survey (Lopatto, 2004) measured feelings about research interactions with peers and supervisors with responses ranging from 1=poor to 4=excellent. Two items assessed the research environment and expectations of the research experience. Two items asked about the primary supervisor during the research experience. Six items asked scholars to rate mentor relationships, time spent in research, and mentor advice, with responses from 1=poor to 4=excellent. Finally, eight items asked about frequency of different experiences (e.g., feel part of a research community) with responses ranging from 1=none to 5=a great deal.

Latino and Cultural Knowledge

Items specific to workshops delivered regarding Latino health, nutrition and intervention research were developed specifically for the program. The three knowledge items ask about Latino specific nutrition-related chronic diseases, Latino socio-cultural determinants of health, and culturally and linguistically relevant interventions. Response options ranged from 1=strongly agree to 5=strongly disagree. Single items were analyzed descriptively.

Sense of Social Fit

Walton & Cohen's (2007) Sense of Social Fit Scale included 16 out of the 17 items which assesses how much a person feels they belong in a group. For this program, the group was defined as student's academic major. Due to survey errors, the item, "I belong in my major" was not included. The items were assessed with 7-point Likert scale response options ranging from 1=strongly disagree to 7=strongly agree, with an option to not answer. Five items were reverse scored so that a higher score indicated higher sense of fit. A single scale score was calculated by taking the mean of responses; internal consistency was high at pre-test (Cronbach α=0.903) and post-test (Cronbach α=0.884).

Belonging Uncertainty

The Belonging Uncertainty Scale (Walton & Cohen, 2007) was used to measure a person's perceptions of whether or not they fit in a group. The group was defined as the student's academic

major. The 3-item scale uses a 7-point Likert scale response option ranging from 1=strongly disagree to 7=strongly agree, with an option to not answer. A single scale score was calculated by taking the mean of responses; internal consistency was moderate at pre-test (Cronbach α=0.664) and low at post-test (Cronbach α=0.555).

Program Evaluation

Additional items were asked to assess overall program impact. Open ended items allowed for qualitative feedback. Two items asked whether the program better prepared them to apply for graduate school and to enter the workforce. Response options ranged from 5=strongly agree to 1=strongly disagree.

Analysis

Single items were analyzed descriptively, reporting frequencies and percentages for process data and post-test only items. For continuous outcomes, paired-samples t-tests were performed to assess change from pre-to-post. The sign test was used to report pre-post changes for ordinal data, since data were not symmetrical. IBM SPSS Statistics v.28 was used to conduct all statistical analysis, using an alpha of $p<0.05$ for statistical significance.

Results

The following sections provide results related to the eight key elements of high impact practices as well as overall program evaluation results. Given that not all key elements were specifically evaluated as outcomes, process data are provided for some elements to illustrate how they were implemented in the program. Program evaluation findings pertain to key outcomes related to the overall program goals.

Appropriately High-Performance Expectations

All ÁNDALE scholars were required to agree to and sign contracts that outlined values and expectations regarding their participation in the program (Supplemental Document S1). Program agreements asked scholars to initial next to a list of policies and expectations such as, “Participate fully in the one- week training from August 11th – 18th” and “Attend 3 workshops/training during the fall semester” for example. An Excel file was used to track participation in all required activities. Moreover, scholars were provided with a list of expectations regarding their performance in the program and with their faculty research mentor. Clarity on expectations is detailed by items such as, “Balance workload effectively; communicate frequently; provide support while carrying your weight; be receptive to constructive feedback” and “Understand your role and responsibilities; confidently carry out tasks; be resourceful with tools you have available.” Additionally, research faculty mentors were provided with an ÁNDALE Initial Mentor Checklist (Supplemental Document S2) to guide their first meeting with the ÁNDALE scholar and further discuss expectations and set guidelines for the research component of the program. The checklist included items such as, “How will we communicate between meetings?”, and “How will we exchange feedback?”

Significant Investment of Time/Effort by Students over Extended Time

All scholars completed the intensive one-week training and nine weeks of faculty-mentored research. Moreover, 26 out of the 53 students (49%) invested time in developing an abstract and presenting a poster at a local or national conference, providing an opportunity to further participate in the research process and dissemination of results. A total of 37 students (70%) continued engaging in research past the 9-week program with their faculty research mentor. Specifically, 34% of scholars continued through the end of the fall semester (16 weeks total), while 36% continued for an entire academic year (fall and spring semesters).

At post-test, scholars reported the degree to which they experienced various outcomes during their research experience. Table 3 includes results that demonstrate different ways in which students invested their time, applied concepts, connected experiences to themselves and sustained inquiry. Over 80% of students reported hands-on scientific/research experience at least "a fair amount" of the time and nearly 50% of scholars thought creatively about the project and tried out new ideas/procedures on their own "a great deal" of the time.

Table 3: Scholar Outcomes of Research Experience (n=53)

Outcome	None	A little	Some	A fair amount	A great deal
			n (%)		
Engage in real-world science/public health research? (n=52)	1 (1.9)	4 (7.7)	4 (7.7)	14 (26.9)	29 (55.8)
Feel like a scientist?	8 (15.1)	10 (18.9)	18 (34.0)	16 (30.2)	1 (1.9)
Think creatively about the project? (n=52)	1 (1.9)	6 (11.5)	10 (19.2)	9 (17.3)	26 (50.0)
Try out new ideas or procedures on your own? (n=52)	3 (5.8)	7 (13.5)	6 (11.5)	11 (21.2)	25 (48.1)
Feel responsible for the project?	4 (7.5)	4 (7.5)	5 (9.4)	18 (34.0)	22 (41.5)
Work extra hours because you were excited about the research?	7 (13.2)	7 (13.2)	13 (24.5)	14 (26.4)	12 (22.6)
Interact with scientists from outside your school?	36 (67.9)	6 (11.3)	3 (5.7)	5 (9.4)	3 (5.7)
Feel part of a research community? (n=52)	2 (3.8)	6 (11.5)	4 (7.7)	14 (26.9)	26 (50.0)

Faculty/Peer Interactions Regarding Substantive Matters

Scholars provided feedback regarding their research experience; the following report on outcomes related to faculty and peer interactions at post-test. About a quarter of the scholars (24.5%) worked individually, while the rest of the scholars worked with others on similar independent projects (37.7%) or a single project (37.7%). Some only worked with undergraduate (28.3%) or graduate (7.5%) students, while 39.6% worked with both undergraduate and graduate students. The majority (54.7%) of scholars reported that their direct or primary supervisor was a faculty member, while 35.8% reported this person was a professional researcher or practitioner. Nearly 70% of scholars rated their supervisor as outstanding, 24.5% rated them as above average and three (5.7%) rated them as average. Table 4 displays ratings for their research experience and mentor, related to interactions, with the majority of scholars indicating excellent experiences for all items.

Sense of belonging is often influenced by faculty and peer interactions. Between pre and post measures, there was a significant increase in sense of social fit (MD=0.16, SE=0.08; t(52)=2.08, p=0.043, d=0.29). There was no statistically significant change in belonging uncertainty (MD=-0.03, SE=0.13; t(52)=-0.24, p=0.809, d=0.03).

Experiences with Diversity

Forty-seven scholars (88.7%) worked on research projects focused on health disparities or working with ethnic minority and/or URM populations. Example research projects included factors affecting sleep health among Latino youth, physical and emotional health of underserved adolescent girls, physical activity and nutrition interventions for Latino and underserved youth and their families, addressing racism in sports and athletes, and evaluation of a multisite nutrition program for Latinos.

Scholars also rated their knowledge regarding diversity training received. At post-test, 80.6% strongly agreed that they knew about Latino specific nutrition-related chronic disease (13.2% somewhat agreed); 86.1% strongly agreed they knew about Latino sociocultural determinants of health (13.9% somewhat agreed); and 61.1% strongly agreed they knew about culturally and linguistically relevant interventions (36.1% somewhat agreed).

Table 4: Scholar Experiences in Research Interactions (n=53)

Research Experience	Poor	Fair	Good	Excellent
	n (%)			
My working relationship with my research mentor	0 (0.0)	3 (5.7)	12 (22.6)	38 (71.7)
My working relationship with research group members (n=50)	1 (2.0)	1 (2.0)	12 (24.0)	36 (72.0)
The amount of time I spent doing meaningful research	0 (0.0)	4 (7.5)	22 (41.5)	27 (50.9)
The amount of time I spent with my research mentor	0 (0.0)	8 (15.1)	18 (34.0)	27 (50.9)
The advice my research mentor provided about careers or graduate school (n=52)	1 (1.9)	5 (9.6)	9 (17.3)	37 (71.2)

Frequent, Timely, and Constructive Feedback

All scholars (100%) met one-on-one with program staff for a check-in on their academics and research placement three times during the program (beginning, middle, and end). Moreover, 43 scholars (81%) attended each of the three program workshops where 15-20 minutes were allotted at the start of the session to engage scholars in reflective exercises that would allow for peer-to-peer interactions, knowledge sharing, and support. The remaining scholars (19%) missed one or more workshops due to scheduling conflicts with course schedule or due to personal matters.

Scholars also received feedback and mentorship from faculty research mentors. Faculty were asked to complete a biweekly meeting checklist on Qualtrics to summarize mentorship meetings with their scholar during the 9 weeks. The mentor meetings were separate from their project, lab, or research team meetings and were meant to provide one-on-one time between scholars and faculty research mentors. While not all faculty submitted the checklists, data from complete surveys for 30 scholars demonstrate faculty met on average 2.5 times with their scholar (ranging between 1 – 4 meetings). Topics discussed during meetings included barriers and solutions to barriers in relation to time management, mental health, health-related issues, and stress. Other topics included professional development opportunities, career planning, graduate school planning, and research specific updates. Checklists often included developing short and long-term goals, creating action plans, and identifying additional resources or tools needed for success. Additional meetings with program and staff and faculty took place as needed for scholars requesting feedback on resumes, cover letters, personal statements, or graduate school applications.

Periodic and Structured Opportunities to Reflect and Integrate Learning

Table 5 outlines scholar benefits from the research experience evaluated at post-test. These results provide insight into the ways the structured opportunities contributed to the scholars' learning. Scholars were asked to reflect on their experience and discuss knowledge and skills gained in their concluding presentation at the end of the program. Scholars noted an array of soft and hard skills as well as knowledge gained. Soft skills often reported included gaining oral and written communication skills, improving collaboration and teamwork skills, and developing professional skills, including professionalism, learning the research process, networking, creating a research abstract and poster,

and developing an elevator speech, among others. The most widely reported hard skills included data entry and management, data collection and analysis, and literature search and synthesis. Scholars were engaged in codebook and database development on SPSS, outcome and process evaluation, data entry, tracking and organization, and focus group transcription. Moreover, scholars engaged in quantitative and qualitative data analysis using SPSS, Dedoose, and Excel. Other knowledge and skills reported include personal development (e.g., confidence, time management, prioritizing, asking questions), recruitment and eligibility screening, implementation of interventions, nutritional knowledge, community outreach and engagement, and diversity/cultural competency.

Table 5: Benefits of Research Experience (n=53)

Outcome	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
			n (%)		
I understand how knowledge is constructed	21 (39.6)	25 (47.2)	7 (13.2)	0 (0.0)	0 (0.0)
I have the ability to integrate theory and practice	15 (28.3)	23 (43.4)	13 (24.5)	2 (3.8)	0 (0.0)
I understand that scientific assertions require supporting evidence	33 (62.3)	19 (35.8)	1 (1.9)	0 (0.0)	0 (0.0)

Opportunities to Discover Relevance of Learning through Real-World Applications

Scholars' hands-on mentored research helped them see the benefits of these opportunities as indicated by changes in research-related gains. From pre-to-post-assessment, there was a significant increase in research knowledge, skills, and abilities ($t(52)=-7.28$, $p<0.001$, $d=1.0$). Examples include, "I understand how researchers work on real problems," "I have skill in research writing," and "I have the ability to work independently."

Public Demonstration of Competence

Fifty-two out of the 53 scholars (98.1%) presented a concluding presentation to peers, faculty, and staff at the end of the 10-week program. One student was provided an extension to complete their research hours and therefore did not have the opportunity to present to a larger audience. As noted previously, 26 students submitted research abstracts resulting in 28 peer-reviewed presentations (some students presented more than once) at local and national conferences, highlighting their ability to exhibit competence in scientific communication. Relatedly, there was a statistically significant increase in students' self-rating of their skill in giving effective oral presentations ($z=-3.26$, $p<0.001$).

Overall Program Outcomes

Over 90% of scholars agreed that the program better prepared them to apply for graduate school (69.2% strongly agree; 23.1% agree) and 92.3% agreed that ÁNDALE better prepared them to enter the workforce (67.3% strongly agree; 25.0% agree). Scholars reported gaining skills through research-related activities in the ÁNDALE program. For example, being able to effectively engage with literature was illustrated by items such as conducting a literature review and critically analyzing literature. Data skills were highlighted as well, including data entry and both quantitative and qualitative data analysis. Activities related to writing and presentations were also commonly reported (e.g., writing an abstract, developing a poster, and presenting to various audiences).

There was a broad range of results regarding the most important thing learned during the program. The most prevalent idea was related to social aspects such as connecting, teamwork and

networking. These ideas were applied to the importance of connecting with those you are working with (e.g., community members) as well as to peers and the support networks that are developed across people in the program (e.g., staff members, mentors). For example, a scholar shared, "I learned the importance of community building. Building community not only enhances your sense of belonging but also, provides you a network and emotional support." Teamwork was identified as key to ensure project success and feeling supported throughout the process. Networking was noted as important to current and future skills development, access to opportunities, and reaching academic/professional goals. Relatedly, the importance of communication, particularly asking questions and asking for help, was noted, sharing how important this was to project success; one student shared that, "The communication between my mentor and I was great and I felt really supported in all aspects within the 9 weeks." Scholars also stated that research could be fun and interesting despite the fact that it initially appeared challenging or intimidating. One student expressed, "I learned about what research as a public health career looks like. Previously, I honestly didn't know what it entailed, but now I know what it looks like and the different members and processes that it requires and involves."

The results also shed light on the scholars' career goals. For 25 of the scholars (47.1%), their career goals did not change. However, many noted some changes or revisions, such as adding/specifying interest in research or public health and wanting to pursue a PhD. A student shared, "My career pathway has not changed as I still want to go to graduate school and get matched to a dietetic internship. My career focus may have changed, as I am more interested in community nutrition as well." Some noted that the program confirmed or strengthened their interests in their original goals (e.g., wanting a master's degree, still wanting to become a physician assistant). One student shared, "The ÁNDALE research program has increased the desire of pursuing my graduate career and increased my desire to be involved in research." Ten scholars (18.8%) did note changes in their goals; many of these included the decision to pursue graduate education, others listed switching from registered dietician to researcher, more specific interest in researching mental health, and developing interventions/programs. For example, a student expressed, "I am considering careers that use research to develop interventions and programs."

Thirty scholars (60%) reported that the best experience while participating in ÁNDALE was related to the relationships they built, primarily with their peers in the program. Several who cited the week of training as the best experience noted that it was because of the social interactions they had during those sessions. Relatedly, some mentioned connecting with staff, participants and partner organizations. Six scholars identified their mentors (supportive, learning from them) and five scholars shared the final presentations were the best experience of the program. One student shared, "My best experience while participating in this program is having a mentor who guides me in accomplishing my personal and professional goals."

Academic Outcomes

During and post ÁNDALE engagement, all scholars remained in good academic standing, with the average cumulative GPA one-semester post program at 3.62 (SD=0.27) which was higher than the average GPA of their URM (M=3.14) and non-URM (M=3.45) counterparts at the university. Among scholars who completed their degree, the mean final GPA was 3.66 (SD=0.25). The majority of scholars (94%) graduated with their degrees, and the remaining 6% are on track to graduate.

Discussion

The study demonstrates that a short-duration undergraduate research experience like ÁNDALE may meaningfully enhance students' research preparedness, professional development, and sense of connection to the research community. Notably, the ÁNDALE applies three HIPs including common intellectual experiences, undergraduate research, and diversity learning, and it represents a

multifaceted approach that enhances preparation of URM undergraduate students in the FANH disciplines to enter graduate school or the workforce to address the high rates of nutrition-related chronic conditions among Latino populations. Although designed for students pursuing careers in the FANH fields, the program offers several transferable strategies that can inform undergraduate research programs across disciplines while intentionally incorporating HIPs.

The brief, front-loaded training approach consisting of a five-day intensive training prior to the start of the academic semester followed by nine weeks of faculty-mentored research appears to provide sufficient time for students to develop foundational research knowledge and skills to apply during the research experience. Because the training occurred prior to the start of the fall semester, students were able to immerse themselves in the training curriculum without competing coursework demands. Moreover, scheduling the five training days across two weeks with a weekend in between is recommended to allow students time to rest and process the material. For example, the ÁNDALE team facilitated training sessions from Wednesday through Friday, and continued Monday and Tuesday of the following week. For program trainings delivered virtually, incorporating 15-minute breaks between workshop sessions allows students to stretch and reduce screen fatigue; while incorporating brief team building activities throughout the training workshops helps foster a sense of community. Supplemental to training, clear student performance expectations (implemented as a values and expectations agreement) is also recommended. Written expectations set the tone for a high-quality research experience, reinforce professional development, and help promote student commitment, accountability, and responsibility.

An important feature of the program is its emphasis on intentional mentoring and community building. Students participated in nine weeks of faculty-mentored research with regular opportunities to engage with faculty, program staff, and peers and build professional relationships. Setting clear expectations for faculty about their roles as research mentors and for students as research mentees promotes a supportive environment in which students can thrive (Pfund et al., 2026). In the ÁNDALE program, the project director met with faculty research mentors via Zoom prior to the research experience to review mentor responsibilities, discuss student expectations, and answer questions to ensure a shared understanding of program expectations. Research mentors were emailed links to Qualtrics checklists to guide the initial scholar/research mentor meeting and the biweekly meetings. Use of checklists is recommended, as they provided a structured approach for the mentoring interactions while also generating process evaluation data for the program.

In addition to faculty mentoring, the program manager conducted 30-minute individual mentoring meetings with each scholar during weeks 1, 4, and 9 of the research experience. These meetings were guided by an Academic Success Incentive Plan in which scholars developed academic and research goals during the initial meeting and identified steps to achieve them. Subsequent meetings focused on reviewing progress towards goals, problem solving through challenges, and discussing career goals. The program also intentionally fostered peer connections. Team-building activities and reflective exercises were incorporated throughout the initial training week and the three workshops held during the research experience. Workshops included dedicated time for scholars to share updates on their research progress, encouraging peer support and collaboration.

Many participants identified relationships with faculty mentors and fellow scholars as the most valuable aspect of the program, reinforcing evidence that intentional community building promotes students' sense of belonging and persistence in academic pathways (Baixinho et al., 2022; Holloway-Friesen, 2021). Notably, 70% of ÁNDALE scholars choosing to continue their research beyond the formal nine-week placement suggests that the program successfully fostered sustained engagement in research. This continued participation may reflect the development of students' research identities, as prior studies have shown that meaningful faculty interactions and mentoring contribute

to science identity and persistence (Bennie et al., 2025; Thiry & Laursen, 2011). Together, these findings suggest that structured mentoring and opportunities for peer connection should be considered core components of short-duration undergraduate research experiences. However, we acknowledge that providing this level of individualized mentoring can be time intensive and costly depending on the number of students in the research program. We encourage institutions to leverage resources to provide this level of mentorship and support to students as it allows for relationship building and connection to maximize student engagement and outcomes.

Consistent with Dong et al. (2021), our findings support the value of undergraduate research regardless of program length, despite the literature demonstrating that earlier and longer research experiences may produce greater positive effects (Gilmore et al., 2015; Hernandez et al., 2018). ÁNDALE scholars reported developing qualitative and quantitative research skills, conducting literature reviews, and gaining a clearer understanding of the research process. These findings suggest that even relatively brief research experiences can foster meaningful gains in research competencies when students receive structured mentoring and clearly defined expectations. Importantly, it is still possible to incorporate key HIP elements into a short duration program meeting the definition of a HIP (Lee et al., 2021), and in so doing, to positively impact student academic success.

Within the context of nutrition and public health, the program also advanced its disciplinary goals of preparing culturally competent professionals to address nutrition-related chronic disease disparities among Latino populations. Scholars reported greater preparedness for graduate education and the workforce, increased knowledge of Latino nutrition, chronic disease, and the social determinants of health, and improvements in professionalism, teamwork, and communication skills. These findings are consistent with other URM training programs demonstrating that structured research and mentoring experiences strengthen students' confidence and career readiness (Garcia et al., 2021; Olorunyomi et al., 2025). While these outcomes have particular relevance for diversifying the FANH workforce, the broader implication is that intentionally designed undergraduate research experiences can simultaneously promote research competence, professional identity, and student persistence across disciplinary contexts.

Limitations

There are several limitations to be considered when interpreting these findings. First, due to the COVID-19 pandemic, participation for Cohort 1 was entirely virtual, whereas Cohort 2 participated in a hybrid format. While all scholars received the same training curriculum and research placement opportunities regardless of virtual or in-person delivery, these differences may have affected faculty mentoring, networking opportunities, social interactions with all stakeholders, and scholars' level of engagement. Any of these variations could have influenced the extent to which students benefited from program activities, and program outcomes such as sense of belonging may have been affected. Although efforts to enhance student engagement were implemented, given the small sample size, analyses comparing outcomes between virtual and in-person cohorts were not conducted, thus it is not known if any differences between cohorts may have resulted from the different formats.

Second, external validity of findings is limited to the sample demographics, wherein the ÁNDALE scholars were URM students (e.g., first generation, low-income) and were predominantly female (75%) (although this gender disproportion is typical for students in nutrition and public health disciplines). Additionally, the higher GPAs observed among scholars may be partially attributable to the program's minimum GPA requirement and competitive admissions process—a possible selection threat could be operating, such that participants were already high achievers, thus their high GPAs are likely attributable to other factors besides the program.

Third, the small sample size and implementation at a Hispanic Serving Institution may limit generalization to other training programs in different settings. Students who choose to participate in research training programs such as ÁNDALE may also differ from nonparticipants in ways that influence the outcomes examined. Furthermore, because this study did not include a control group, various extraneous factors cannot be ruled out as the drivers of change for our current outcomes.

Additionally, findings related to scholars' sense of belonging should be interpreted separately for the dimensions evaluated, as they represent separate constructs. The Belonging Uncertainty scale demonstrated low internal consistency at post-test, which may explain the null results for this dimension. Conclusions regarding increased belonging rely primarily on the Sense of Social Fit dimension, but do not imply that there should be a parallel decrease in belonging uncertainty. Importantly, the quantitative findings were supported by qualitative data, with many participants identifying relationships built with peers and faculty as one of the best experiences of the program.

Finally, the HIP taxonomy rubric ratings were based on self-assessment by the program team's review of the ÁNDALE program components. While consensus was obtained among the three team members, the results may be subject to bias, as they rely on internal subjective perceptions, without external ratings to further validate the ratings.

Despite these limitations, the findings highlight the value of implementing small, tailored research training programs focused on Latino health and nutrition to prepare culturally competent health professionals.

Conclusion

The success of the ÁNDALE offers several implications for short-term programs training and preparing URM students. Engaging URM undergraduate students requires approaches tailored to fit the unique challenges they face in navigating higher education, including factors such as family responsibilities and financial constraints. Providing students with positive social interactions with peers in a cohort model and collaboration with supportive faculty with experience in mentoring diverse students are practices that promote URM student success and retention. Gaining experience in research through real-world applications outside the classroom exposes students to potential career paths and experience in different work settings which can enable students to decide on their readiness to apply for a graduate program or enter the workforce.

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