

Commentary

Early career Latinas in STEM: Challenges and solutions

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Mexican, Puerto Rican, and Central American Ancestry (MPRCA) individuals represent 82% of US Latinos. An intergenerational group of MPRCA women and allies met to discuss persistent underrepresentation of MPRCA women in STEM, identifying multi-level challenges and solutions. Implementation of these solutions is important and will benefit MPRCA women and the entire academic community.

Introduction

Although Latinos represent a growing and significant demographic in the US, there is a notable underrepresentation of Latinas from Mexican, Puerto Rican, and Central American (MPRCA) ancestries in STEM professions. To understand the bases for this underrepresentation, an intergenerational group of 16 MPRCA Latinas (hereinafter MPRCA) and allies met to identify major challenges to persistence and success faced by MPRCA in their academic career trajectory from postdoctoral to tenured faculty. The group included postdoctoral researchers, early- and mid-career faculty, full professors, distinguished emerita faculty in STEM, and allies, who are predominantly biologists and biochemists from R1 and non-R1 institutions in California, Florida, Maryland, Michigan, New Mexico, Texas, and Washington. Among the group are two former Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SAC-

NAS) Presidents, two members of the National Academy of Medicine, Vice Chancellors, Deans, numerous American Association for the Advancement of Science (AAAS) Fellows, and the first Latina STEM faculty in the University of California system. Many are current or past recipients of awards from the National Institutes of Health (NIH), National Science Foundation (NSF), and other major funding agencies. Lastly, this group has mentored thousands of students, postdoctoral researchers, and faculty from all backgrounds. The unique aspect of our discussions was the informed dialogue between early-career and senior Latina faculty across institutions and disciplines. This approach allowed for a transparent conversation about the challenges that have impeded STEM Latinas for generations. In this commentary, we expand the diversity, equity, inclusion, and justice (DEIJ) discussion related to MPRCA scientists. We identify solutions to increase STEM representa-

tion and retention of MPRCA and other Latinas for institutions, department chairs, and mentors, as well as early-career Latinas themselves.

Demographics

In 2022, Latinos as a whole (see [Box 1](#)) represented [more than 19% of the U.S. population](#) or almost 64 million individuals. Thus, nearly 1 in 5 Americans is Latino, with individuals of Mexican ancestry comprising 62.3% of US Latinos and 11.5% of the US population. Puerto Ricans and Central Americans comprise 18% of all US Latinos and 1.7% of the US population. Together, the three subgroups represent 82% of all US Latinos.

Latinos [are underrepresented in every profession](#) in the US. This disparity is even greater [for Latinas in academia](#), where representation for both Latinas and Latinos is [relatively stagnant through all academic ranks](#) ([Figure 1](#)). In 2022, [Latinos earned 9.6% of all STEM PhDs](#) in the US. However, the even greater



Box 1. Definitions**Latina:** female, singular, of Latin-American ancestry.**Latino:** male, singular, of Latin-American ancestry.**Latinas:** female, plural, of Latin-American ancestry.**Latinos*:** male, plural; also, Latin-American ancestry individuals regardless of gender.**Latinos as a whole:** Latin-American ancestry individuals regardless of gender.**MPRCA:** Mexican, Puerto Rican, and Central American ancestry.**URM:** under-represented minority.

*Latinos, in the absence of a contrast between Latinos and Latinas, refers to the whole population.

underrepresentation of MPRCA Latinas in STEM is not generally acknowledged because the term “Latino” is a broad, pan-ethnic category that lumps together all Hispanics, including those with very different backgrounds from MPRCA, such as immigrants from South America with European ancestry, including from Spain, into one monolithic group. Thus, due to a lack of data on ancestry, MPRCA underrepresentation among US faculty or other professions remains unknown. Based on our experience, we estimate MPRCA to be much less than 1% of faculty and significantly less than their 7% representation in the US population. [Disaggregated demographic data as a function of Latino ancestry](#) is beginning to be available and is [proposed to be part of the 2030 Census](#). Access to disaggregated Latino ancestry and gender data related to education and academia would enable greater insight into the level of MPRCA underrepresentation in academia and other professions. Disaggregation of subpopulations within ethnic groups is an important step to understanding US demographic representation for Latinos and other ethnic and racial subgroups as well, including Asian-Americans,¹ a racial group representing many different ethnicities.

The lack of representation of Latinos in academia is due to many socioeconomic and environmental factors, including inequitable education in low-income areas and inadequate mentoring and encouragement from K-20 teachers, that reduce opportunities to pursue scientific careers.² Despite these challenges, both Latinas and Latinos show strong interest in STEM and have documented success as tenure-track faculty. The documented interest of MPRCA in STEM, the size of this group in the US, and the persistent underrepresentation of MPRCA in academia suggest that with more sup-

port, this group has the potential to rapidly contribute to innovation and growth at all levels of academia.

Here, we discuss the challenges faced by early career MPRCA, from postdoctoral fellows to tenured faculty. We also provide suggestions on how to increase the representation, persistence, and success of Latina PhDs in STEM. Challenges are divided into two categories: those that persist across all stages of the academic career ([Table 1](#)) and those that are specific to key stages of academic advancement ([Table 2](#)). These challenges are omnipresent in academia and can vary as a function of intersections of gender, race, and socioeconomic status, among others. The benefits of mentoring and networking also favor some groups more than others³ and often affect MPRCA to a greater extent than other groups. The solutions we propose are meant to enhance MPRCA success and advance their integration and success within the entire academic community ([Tables 1 and 2](#)).

Challenges across all stages of the academic career

Challenges that present barriers to MPRCA success, especially during the early stages of their careers, can be traced to the following: (1) financial concerns; (2) caregiving responsibilities; (3) community building and inclusion; (4) mentoring needs; and (5) safe and inclusive environments ([Table 1](#)). These challenges are central in academia and can either contribute to a successful career trajectory or derail the careers of MPRCA faculty at any stage.

Financial concerns

Wealth disparity and financial concerns present an enormous obstacle to academic careers for MPRCA and all Latinos. In 2019, [Latinos held only 2.9% of US wealth](#). This disparity increased in 2022 during the COVID pandemic, with

Latinas earning an average of \$723 per week, the lowest income for any group. [Latinas are paid 46% less than white men](#) and 26% less than white women. This [wage gap](#), resulting from the intersectionality of gender, race, class, and ethnicity, has existed for generations, and historically, Latinas, especially MPRCA, have experienced severe financial, wealth, and educational disadvantages. In 2020, median household income for [Latinos as a whole fell to approximately \\$55K](#) per year, almost \$20K less than white American households. While education can be a path to improved socioeconomic status, this path is costly, especially considering the long-term socioeconomic impact of student loans, providing for a family, and low starting salaries ([Table 1](#)).

Culture: Caregiving and family support

Many financial challenges are inextricably linked to the family obligations for MPRCA ([Table 1](#)). While all racial and ethnic groups are involved in caretaking, for Latinas pursuing STEM careers, financial and caretaking support for immediate or extended family can take a physical, emotional, and financial toll. [Latinos report a high percentage of caretakers \(21%\)](#), with this responsibility falling most often on Latinas. In a 2008 report on caregiving, [1/3 of Latino households reported at least one family caregiver, with 3/4 of these caregivers being female](#). [Forty percent of Latina and Latino caregivers](#) report having to make a workforce change, including decreasing hours or leaving their jobs entirely. Frequently, [Latinos as a whole ignore their own health during times of caregiving](#). Thus, caregiving is both a perceived expectation and obligation that can impact the daily responsibilities of Latinas, regardless of career stage. For example, the MPRCA co-authors of this paper have been caregivers throughout their careers from months to years. Financial and caretaking obligations reflect their strong family and community commitments.

Because of these cultural norms, MPRCA Latinas in STEM are often asked by students to be their mentors. MPRCA Latinas may also be the first to respond to departmental emergencies and continue to look for ways to bring

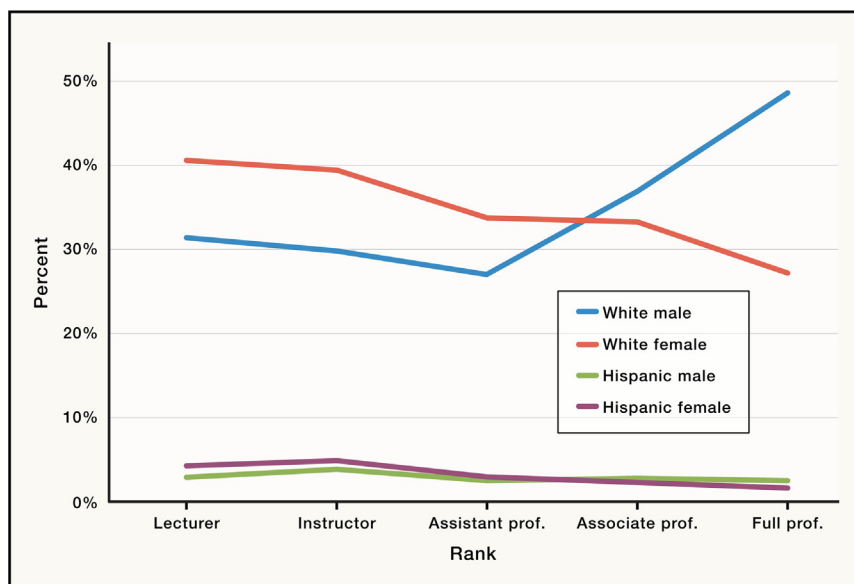


Figure 1. Percent representation of White and Hispanic males and females in 2021 by academic rank

colleagues together and create a sense of departmental community. MPRCA Latinas who are prepared for challenging times within their extended family can be more prepared and helpful when dealing with challenging times at work. MPRCA Latinas are likely to look for and find ways to connect community and academia. They may be offended when asked to do less service, especially when the service is one that is important to them or the community. In our experience, MPRCA Latinas are frequently visionaries who may see novel approaches to solving problems, and although [only 0.8% of top academic leaders are Latinas](#), they would make exceptional leaders.

Community building

The institutional culture of academia often negates or dismisses the importance of family and community support. Community is a high priority for all faculty but particularly important to MPRCA because academia is more of an individualistic rather than a collective profession. The absence of community in the laboratory, the lecture hall, and in departmental meetings, jointly with competition, fear of failure, and pervasive judgmentalism fostered by the ever-present peer review process and [racism in the laboratory](#), frequently creates an inhospitable, if not hostile, work environment.

Creating community enhances a sense of belonging and collegial relationships, as well as enhancing the quality of work-life balance and often productivity. These community skills are crucial in leadership positions and can be harnessed to open novel paths to solve institutional problems.

Solutions to address this challenge for retaining and promoting successful career pathways for MPRCA scientists include building stronger academic communities and incentivizing cooperation and community ([Table 1](#)). Opportunities to expand their networks across departments and colleges, e.g., meeting peer and senior faculty members in other departments who are Latino, Black, or Native American, can create support networks that are beneficial to all faculty members.

Mentoring

Skillful, cross-cultural mentoring can provide emotional support for MPRCA and other mentees at each career stage. In addition to academic requirements, mentees need someone unafraid and knowledgeable of the socioeconomic, first-generation, and race/ethnic biases in academia. Since underrepresented faculty often act as mentors, institutions should give this level of service recognition in tenure, promotion, and salary merit

decisions ([Table 1](#)). Without recognition and some level of reward, this service contributes directly to the “minority tax,” which places the burden of advocating for change predominantly on the people who could most benefit directly from that change.^{4,5} First-generation postdoctoral fellows need a mentor who can provide guidance on career paths, critical academic skills, and strategies for addressing cultural differences. MPRCA may need key mentors during the transition from graduate student to postdoc and from postdoc to faculty, especially in areas related to financial concerns, family obligations, navigating institutional cultures, and discussions about the value of service.

The positives of this type of mentoring are that the outcome can often lead to valuable, long-term friendships, important experiences, and learning for both the mentor and mentee. Stage-specific mentoring softens the landing, allows mentees to make informed choices, and provides an opportunity for senior mentors to contribute to the formation of the next generation of MPRCA scientists and leaders.

Inclusion: Representative leadership from top to bottom

Representation impacts the retention and success of underrepresented populations at all levels of academia (e.g., distinguished professors, department chairs, college deans, and university presidents).¹ [Representation of MPRCA administrators, faculty, and students is happening too slowly](#), and in the absence of significant change will not improve soon. Moreover, the recent elimination of affirmative action in admissions, which was a broad attempt to compensate for bias based on race or correlated with racial experiences, will likely slow needed change at all levels.

Bias: Implicit and explicit

Few words in the English language elicit as strong and negative a response as “bias.” Google defines “bias” as “prejudice in favor of or against one thing, person, or group compared with another, usually in a way considered to be unfair.” The intersectionality of gender, socioeconomic status, race, ethnicity, and other dimensions of inequality creates abundant opportunities for bias against Latinas, especially MPRCA, in STEM and

Table 1. Common, persistent financial, caregiving, community, and mentoring challenges and solutions of MPRCA Latina faculty

Challenge	Institutional solutions	Department-/mentor-based solutions	Individual solutions
Financial ● Generational wealth ● Salary and startup ● Student loan debt	● Competitive salary ● Adequate startup funding ● Provide “bridge” funding ● Subsidize housing rentals and/or home loans/incentives ● Student loan forgiveness	● Department “emergency” funds ● Fund managers/advisors ● Access to retirement and financial advisors	● Engage relevant mentors ● Negotiate for moving expenses, loan forgiveness, childcare allowance, etc. ● Build a strong relationship with dept. administrators at all levels
Caregiving ● Childcare ● Childbearing and family leave	● Childcare benefits ● Childbearing and family leave benefits ● Dependent care travel support ● Clear, uniform processes for requesting benefits and leave	● Provide knowledge of institutional benefits and support ● Provide guidance on protocols, benefits, and support	● Become aware of the institutional and departmental policies ● Advocate for new approaches and better policies ● Bring like-minded people together for discussions
Community building ● Inclusion ● Isolation ● Equity and justice	● Provide financial support for women of color and professional development programs ● Incentivize cooperativity, sharing, and collaboration ● Develop, fund, and measure impact of initiatives to enhance inclusion, equity, and justice	● Sponsor/nominate women for awards and leadership opportunities ● Implement and fund initiatives to enhance inclusion, equity, and justice ● Create reward structure to encourage collaboration ● Build a responsive network of faculty and stakeholders across campus	● Invite seminar speakers/visitors who can raise key issues and bridge divides at the departmental and institutional levels ● Join or start discussions and journal clubs that bring colleagues together ● Create a welcoming environment for students, faculty, and staff
Mentoring ● Effective mentorship ● Undue service	● Mandate that women faculty receive effective mentorship in research, careers, and navigating the institutional landscape ● Recognize community outreach, formal and informal mentoring, and other DEI work as valuable service	● Establish departmental faculty mentoring program ● Develop a culture of mentoring excellence ● Integrate different race, ethnicity, class, and gender perspectives into daily activities, classes, and meetings	● Connect with relevant mentors nationally, in your organizations, colleagues a year or two ahead of you, and more senior mentors ● Identify mentors who listen without projecting and who ask questions
Inclusive and safe environments	● Commit to demographic representation at all administrative levels ● Engage women of color in planning and decision making ● Develop clear, easily accessible policies, procedures, and contacts for reporting and resolving behavioral issues ● Establish training for building a respectful and inclusive culture ● Conduct anonymous climate surveys every 3 to 5 years	● Ensure demographic representation within both faculty and staff ● Increase awareness and discussions of creating safe and inclusive environments ● Establish a clear procedure for anonymous and non-anonymous reporting of behavioral issues for faculty and students ● Hold Department Chairs accountable for documenting and reporting behavioral issues	● Know the points of contact and protocols with respect to any questionable behavior ● If you are subject to bad behavior, document it and contact the appropriate person in your department or institution ● Get additional perspectives from external mentors ● Build faculty/staff networks within your institution, especially with experienced departmental administrators

elsewhere. Latinas experience a variety of challenges in the workplace, such as bullying, sexual harassment, and toxic

cultures of various kinds. Because of their gender, race, class, and ethnicity, they can experience the full spectrum of bias

ranging from implicit (e.g., “Sorry, I didn’t realize that was a pejorative term”) to explicit (e.g., “Our department doesn’t

Table 2. Challenges and solutions that impact hiring, retention, and promotion of Latina faculty

Stage-specific challenges	Institutional solutions	Department-/mentor-based solutions	Individual solutions
Hiring	● Fund cluster hiring initiatives using diverse search committees and best practices to mitigate bias ● Recognize that CVs and letters of recommendation elicit prestige bias ● Fund and support evidence-based faculty development programs to enhance research success, participation, and integration into the institution ● Be proactive in creating and building a welcoming environment for candidates	● Diversify search committees with members that value diversity and inclusion ● Use holistic approach and rubrics to evaluate faculty candidates' credentials in research, teaching, and contributions to diversity ● Use extensive outreach to networks and programs with diverse scholars	● Make a clear list of pros and cons of the position ● Discuss the position and offer with colleagues and mentors so you are prepared to negotiate ● Know your priorities and be prepared to discuss issues like service, family leave policies, and commitment to a diverse faculty
Negotiations* *Negotiations can be very difficult for Latinas, impacting startup packages, overall salary differences, etc.	● Strive to maintain new faculty hire salary equity across gender and race/ethnicity ● Ensure that appointment level is congruent with experience and years of training ● Provide transparency regarding startup packages and other institutional resources ● Provide access to information for other resources such as centers, core services, and training programs	● Be transparent with salaries, startup packages, and other resources offered to recent new hires ● Advocate for faculty candidate in negotiations by providing information about resources and training programs ● Introduce the candidate to others who have successfully negotiated competitive salary and startup packages	● Connect with mentors who are aware of national norms ● Talk with colleagues who are in or have recently been in negotiations ● Familiarize yourself with business principles of negotiations, available from journals like the Harvard Business Review or from national STEM organizations
Service	● Reward faculty that exceed normal service expectations ● Encourage non-minority faculty to work with URM faculty and contribute their time in developing mentoring for diverse student populations ● Mandate that non-minority faculty serve on DEI initiatives ● Recognize the significant value of service contributions through informal mentoring and other activities related to community outreach	● Monitor and reward service, especially service that exceeds that of non-minority peers ● Provide excellent letters of support that focus on research accomplishments ● Provide sound advice on limiting committee appointments ● Teach new faculty positive ways to say "no" to avoid overburden and burnout	● Learn successful ways to say no ● Keep your values, priorities, and career goals in mind, and ask yourself, "is this a valuable commitment to me?" ● Work with your chair and other senior women faculty to evaluate your service requests and commitments
Promotion and tenure	● Develop process to monitor faculty progression and intervene early with plan to address any weaknesses ● Require diverse representation by gender and race/ethnicity on promotion and tenure committees ● Ensure demographic representation on any committees that address P&T challenges	● Committees must include representation of faculty from diverse groups ● Mandatory annual reviews to identify weakness and plan to rectify issues ● Include rewards and service credit for community engagement and informal mentoring	● Identify and talk with successful colleagues a year or two ahead of you to set goals for publication and discuss issues ● Develop and maintain good communication with colleagues outside your institution who can provide external letters ● Work closely with your departmental and institutional mentors

need another affirmative action hire"). This causes Latinas in STEM to wonder, "Why me?" or "What did I do wrong?" Paradoxically, [Latinas and other faculty of color are frequently called upon to educate colleagues on these issues.](#)

Stage-specific challenges and solutions

Stage-specific challenges that impact the hiring, retention, and promotion of MPRCA generally occur during four transition periods: (1) applying for faculty positions; (2) the interview, hiring, and negotiation process for a faculty position; (3) mid-tenure and annual reviews and evaluations, especially with respect to service; and (4) the promotion and tenure process ([Table 2](#)). The faculty hiring process can be difficult for many reasons: finances, family, caretaking responsibilities, geographical location, careful selection of letters of recommendation (ensuring that they are strong, positive, and from individuals with academic visibility), lengthy applications, and finding suitable schools and departments that fit. Applicants need to sense the level of cultural connection between the department and themselves and be adept at interpreting cultural divergences during the interview. Hiring practices are still confounded by prestige bias (discussed below) and structural barriers that are extremely difficult to overcome. Bias at any stage of the hiring process can disadvantage those of MPRCA ancestry, whose intersectional socioeconomic status, [skin color](#), and ethnicity can predispose them to stereotypical bias and feelings of isolation. When institutions address bias and harassment, it is an opportunity for them to learn about differences and the need to continually disaggregate and explore the sources of bias in many academic traditions, such as hiring,⁶ nominations, awards, and appointments.

Applications and hiring

The biases that impact faculty hiring are well documented.^{6–8} Prestige bias in hiring contributes to 20% of schools (hereafter called prestigious schools) producing 80% of faculty in the US. Faculty from these relatively few, prestigious schools are not demonstrably more productive than faculty from other schools, but students who come from highly educated families are more likely to attend these prestigious schools (enhanced by legacy admissions),

which may be partly responsible for the fact that 25% of tenured faculty come from families where at least one parent holds a PhD.⁹ The inability to use affirmative action in holistic admission to the most selective schools has eliminated a tool that could help students from other backgrounds, [especially students from state schools.](#) This not only creates a hierarchy among faculty and institutions, but it also constrains the flow of creative ideas within academia, limits innovation and diversity, and has a significant, negative impact on the hiring of MPRCA Latinos, almost [half of whom begin postsecondary education at community colleges.](#) Unfortunately, prestige bias is not easily eliminated because most of the primary documents for the application, i.e., curriculum vitae and letters of recommendation, immediately indicate who you know and where you have been.

Institutions and national science organizations should complete an in-depth analysis of hiring bias, departmental and institutional culture, and structural barriers and share these findings with faculty, at least, to make the entire process more transparent, especially to tenure-track faculty themselves. Increasing faculty diversity brings individuals with different experiences and knowledge, which is critical for optimizing scientific creativity and innovation. New approaches to overcome hiring bias are being tested, such as diversity statements and other relevant essays from candidates, class lectures in addition to the traditional research seminar, and "cluster or cohort hiring." Because of the bias elicited by the required application materials and its impact on academic culture and innovation, as stated above, institutions need to think more creatively to implement mechanisms that mitigate bias, break down barriers, and allow departmental faculty to identify strong candidates. This could start by identifying the characteristics desired in a new colleague, e.g., creativity, innovative research ideas, communication across cultures, being a collaborative hub, providing stronger engagement with undergraduate students, and varied teaching perspectives within the faculty. Increasing ethnic/racial and gender diversity on search committees can be valuable, but faculty and administrators need to understand the dif-

ferences in backgrounds and experience between MPRCA and other self-identified Latinas from other parts of the world, who may differ significantly in socioeconomic status, race, and family education.

Once a job offer is made, the focus moves to negotiations and the offer letter. Some important negotiating points may be the rank being offered, starting salary, teaching loads, office and lab space, and lastly, the start-up packages for personnel salaries, supplies, and basic equipment; high-cost equipment may require separate negotiations with the Chair or Dean.

Negotiations over salary and start-up can be challenging for MPRCA. On the one hand, the candidate may have never made a realistic "how much are my skills worth" estimate based on their experience and knowledge as a professional researcher. On the other hand, if the MPRCA candidate feels distrustful of the negotiation, the hiring process can fail. Because of these challenges, it is crucial for the chair and the applicant to build trust ([Table 2](#)). Supporting the inclusion of trusted mentors, introductions to other underrepresented faculty, transparency in the negotiation, and maintaining resource equity can lead to a highly successful negotiation and long-term collegiality.

Tenure committees, chairs, and upper administrators often perceive the service commitment by Latinas to students and the community (the minority tax^{4,5}) as too much or the wrong kind of service (i.e., community outreach, mentoring). Institutional representatives must realize that through this work, these individuals and their institutions become known in broader academic circles and the community. Thus, this connection and service contributes significantly to universities' missions of diversity, innovative education, outreach, and responsibility to the community. University leadership at every level must recognize, rather than devalue, the opportunity created by this form of service and the faculty who are uniquely gifted in building these key relationships.

Family-work balance and caretaking is an essential part of the lives of many MPRCA faculty. Institutions must acknowledge this additional stress on faculty members and create protocols for supporting faculty members. When caretaking responsibilities emerge for a faculty member, chairs and administrators can make a

positive contribution to family-work balance by providing responsive support to manage their academic pursuits, including teaching and research, and maintaining good channels of communication.

The final set of early-career challenges for MPRCA are achieving tenure and promotion, a process that should be collegial, supportive, and fair. Institutions need to broaden their definition of success (i.e., achieving criteria for advancement and promotion) and the value placed on work that supports the institution's mission. A transparent and congenial atmosphere focused on the success of the faculty, as measured by teaching, research, and funding as well as positive tenure decisions, is important, particularly when discussions and decisions are made behind closed doors. For this reason, MPRCA faculty should have one or more trusted peer and senior mentors to help contextualize the tenure/promotion process and provide wisdom, solace, and even humor during these stressful early years to promote long-term success (Table 2).

Conclusion

The underrepresentation of Latinas in academia relative to their percentage of the US population and the high percentage of Latinas without advanced degrees reveal an important, untapped pool of talent within the US. The goal of this paper is to focus on approaches that will increase representation and persistence of MPRCA Latinas in STEM, whose commitments to scientific discovery, family, and social mobility compels them to pursue a career that is both tremendously demanding and rewarding. We have identified some of the key challenges that impact the success of MPRCA

STEM Latinas during their early careers, including financial challenges, intergenerational poverty, and wealth disparities associated with lower to middle socioeconomic status backgrounds, supporting community building and family care-taking commitments.

The steps we have addressed here, from postdoctoral researchers to tenured faculty, represent needed change and awareness in an entire educational ecosystem. While recent attention has been focused on the elimination of affirmative action, affirmative action was a remedy targeted at two transitions in a long process. It was never going to eliminate the impact of bias, cultural exclusion, and racism in our nation. Although these issues are long-standing, change is possible, and it starts with our own intention and commitment to making academia a more welcoming, supportive environment. We hope this paper contributes to the awareness that education is an ecosystem spanning early childhood to retired faculty and that significantly improving representation and success requires a much more thoughtful, emotionally intelligent, and inclusive process from top to bottom. We also hope that by providing insight into the cultural characteristics of Latinas, institutions, administrations, and departments will use this insight to understand, support, and experience the benefits of real diversity.

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DECLARATION OF INTERESTS

The authors declare no competing interests.

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