RESEARCH ARTICLE

Empowering Women for Leadership in Global Health (EMERGE): Pilot Evaluation Findings

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ABSTRACT

Background: Women are under-represented in global health leadership worldwide. Socio-ecological barriers may diminish women's institutional belonging, career aspirations, and leadership pathways.

Aims: In this pilot study, we describe and evaluate EMERGE, Empowering Women for Leadership in Global Health, a theory-based, multicomponent leadership development program for diverse women graduate students.

Methods: Emory graduate students who self-identified as women and engaged in global health were eligible to participate in EMERGE. Socio-ecologically grounded program components included: a three-day leadership development workshop; nine-month mentored team-challenge projects; monthly seminars by women leaders; social-media outreach; and project presentations with peers, mentors, and university leadership. We conducted a mixed-methods, single-group pretest-posttest evaluation that included a) four quantitative self-assessments on leadership capabilities over the program period and b) three focus groups with mentored teams that explored fellows' experiences applying leadership skills, managing team projects, and working with mentors.

Results: All 12 selected fellows self-identified as women from at least one other underrepresented group. Half originated from low- or middle-income countries. At baseline, completing the team project was a common short-term (12-month) aspiration. Managing and leading teams emphasizing equity, mentoring, and participatory problem solving were common longer-term (1-5-year) aspirations. At baseline, fellows were least confident about negotiating their interests and most confident about making ethical decisions. Overall, fellows expressed high satisfaction with instructors (mean 8.8 of 10) and content (mean 8.3 of 10) of the leadership development workshop as well as increased confidence and proficiency in most leadership, team-management, and mentor-related skills at month one. Reported confidence and proficiency in most skills declined by program midline and then increased and peaked at endline.

Conclusion: The EMERGE program supported sustained improvements in fellows' leadership capabilities. The program's multi-month and multi-component approach grounded in socio-ecological theory were key elements. EMERGE holds promise to train the next generation of women leaders in global health. Future work is needed to identify opportunities to support leadership pathways for women in global health in diverse work settings.

Introduction

Women comprise almost 70% of the global health workforce but hold only 25% of leadership positions[1]. This gap exists in nearly every category of global health leadership, from Ministers of Health and cabinet positions in governments, to executive and board positions in global health nonprofit organizations, to leaders of research teams[2,3], to invited experts on scientific panels—even to dean positions in academia[1,2]. Under-representation in global health leadership is even greater for women with marginalized identities related to race, ethnicity, caste, class, sexual orientation, religion, disability, and country of origin[1,4,5]. A scoping review of women's leadership progress in the health workforce in low-and middle-income countries (LMICs) reported that women often experience multiple burdens in their professional lives related to their gender, other marginalized identities, and their specific profession[5]. Recognizing these global gaps, United Nations Sustainable Development Goal 5 calls on the public and private sectors to "ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making…"[6] Universities are critical entry-points to nurture the leadership capabilities of diverse early-career women across sub-disciplines in global health.

Socio-Ecological Barriers to Women's Leadership in Global Health

Unlike in STEM fields generally, where women are a minority in the workforce and in leadership roles[3], the dearth of women leaders in global health is not a 'pipeline problem[7].' According to the World Health Organization, women's representation in four health professions has increased rapidly in recent decades, such that women ages 25-49 years now represent an aggregate majority of physicians, pharmacists, nurses/nurse-midwives, and dentists across 104 countries[7]. The availability of such talent in the global health workforce has prompted consideration of the complex challenges that diverse women face in the field. Socio-ecological models in public health assist in understanding the multilevel barriers to women's leadership in global health (Figure 1).
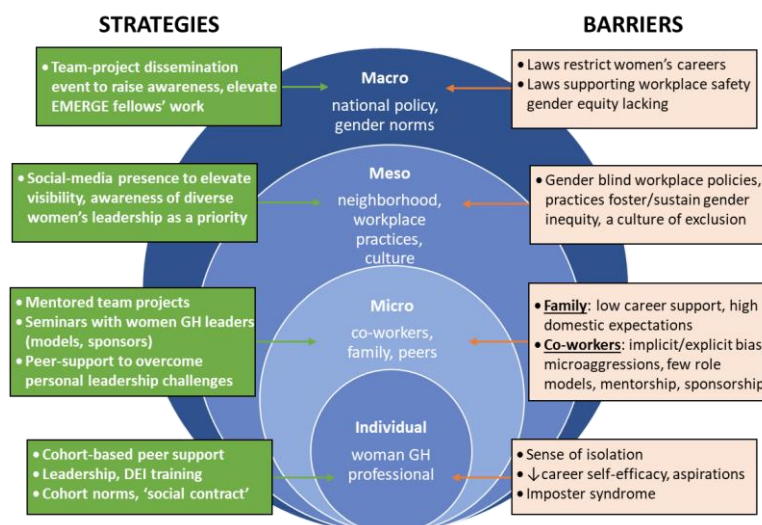

Figure 1. Socio-Ecological Model of Barriers to Women's Leadership in Global Health and Strategies of EMERGE

The model in Figure 1 situates an individual woman health professional within *micro-level* interpersonal relationships at work and in the family, *meso-level* neighborhood and workplace environments, and *macro-level* normative and policy environments. In this context, the potential barriers to women's leadership in global health become clearer. For example, at the micro-level, women may face persistent expectations in their families that their domestic and care work supersedes their career development[5,8,9], creating barriers to workforce entry and more time allocated to unpaid work for working women[5,10]. In the workplace, women health professionals may experience implicit and/or explicit biases from co-workers about their actual leadership role or potential leadership capabilities[11,12], which may influence their prospects for hiring and promotion[13]. Such biases may be heightened for women from historically underrepresented groups (HUGs)[12]. Diverse women health professionals also may experience microaggressions from their co-workers or patients[14], which may increase feelings of isolation and burnout as well as diminish emotional, physical, and mental well-being[15]. At the meso-level, women health professionals may experience inequitable institutional policies, human-resource practices, and cultures with respect to hiring, promotion, salary, opportunities for professional development, parental leave, or support for dependent care[10,16]. At the macro-level, existing laws may perpetuate norms about the gendered division of labor, for example, by restricting the kinds of work that women can do; whereas, laws to protect women from unsafe or inequitable work environments may be lacking[10,17]. Women's repeated encounters with systemic, intersectional forms of bias may increase feelings of isolation and burnout and lead them to doubt their own abilities, to the extent that their prior aspirations for leadership feel 'fraudulent[18].' Thus, advancing women's leadership in global health requires efforts to address these multilevel barriers while empowering individual women in collectives to achieve their potential.

Global Health scholars propose many strategies to advance women's leadership in global health. Most, however, are not fully grounded in a socio-ecological framework[19]. Existing strategies that tend to focus separately on women's leadership training[20] *or* women's network building[21,22] *or* mentoring[23] lack an integrated approach that is attentive to how a multi-faceted women's leadership program can contribute to individual, collective, and institutional change[19]. To fill this gap, **EMERGE: Empowering Women for Leadership in Global Health**, was designed to address specific barriers in the social ecology to advance diverse women's leadership in global health. Here, we describe the implementation of the EMERGE program and the experience and benefits of the program for the EMERGE fellows, who participated in the pilot mixed-methods evaluation.
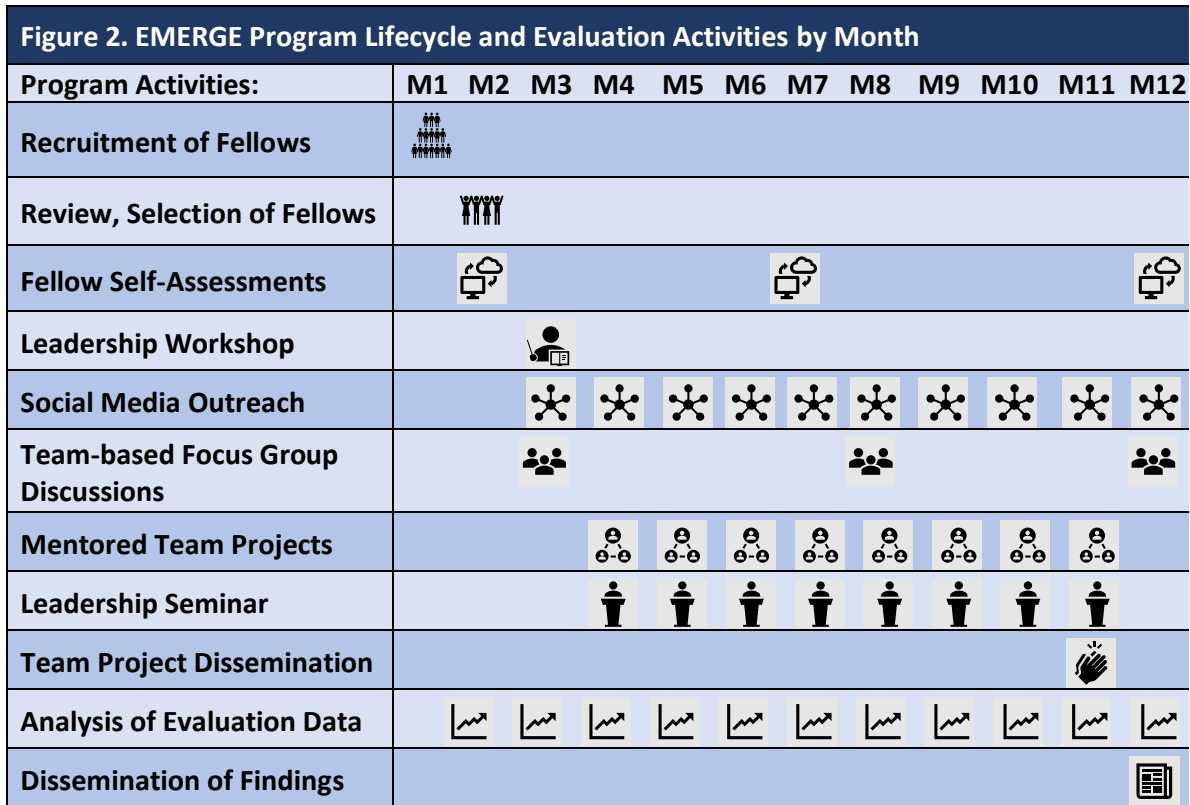
Methods

EMERGE PROGRAM LIFECYCLE

The EMERGE program had a 12-month lifecycle (Figure 2). A university-wide call for applicants was distributed through all Directors of Graduate Studies at Emory University, and prospective fellows were invited to submit an application with five

elements: 1) brief demographic survey to confirm eligibility (self-identified woman in a graduate degree program with prior and/or current experience in global health research or practice); 2) Curriculum Vitae; 3) statement of interest in the program and aspirations, if selected; 4) letter of recommendation from a current or former supervisor who is willing to serve as a project mentor; and 5) a 90-second video about a challenge related to women's leadership in global health. A diverse advisory board of academic leaders in global health reviewed and selected fellows, and selected fellows received a baseline survey assessment (described, below).

Figure 2. EMERGE Program Lifecycle and Evaluation Activities by Month												
Program Activities:	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**
Recruitment of Fellows	👥											
Review, Selection of Fellows		👤										
Fellow Self-Assessments		🖥️				🖥️						🖥️
Leadership Workshop			👨‍🏫									
Social Media Outreach			✳️	✳️	✳️	✳️	✳️	✳️	✳️	✳️	✳️	✳️
Team-based Focus Group Discussions			👥				👥					👥
Mentored Team Projects				👥	👥	👥	👥	👥	👥	👥	👥	
Leadership Seminar				🧍	🧍	🧍	🧍	🧍	🧍	🧍	🧍	
Team Project Dissemination											👏	
Analysis of Evaluation Data	📈	📈	📈	📈	📈	📈	📈	📈	📈	📈	📈	📈
Dissemination of Findings												📰

All fellows participated in a foundational three-day leadership development workshop covering topics to prepare them for an eight-month team project. Foundational topics included: representation of women in global health leadership; defining diversity, equity, and inclusion (DEI); understanding and addressing implicit and explicit forms of gender and intersectional bias; leadership styles; building and leading effective teams; making ethical decisions using emotional intelligence; negotiation and conflict management; navigating change; leading organizational collaborations; developing professional narratives and networks; and strategies for job interviews. During this stage, participants formed teams and selected team projects, then participated in a baseline focus group discussion to assess their team's aspirations, proposed project, planned member roles and responsibilities, planned milestones and timeline, and skills from the workshop they expected to apply in their teams.

The EMERGE leadership team then launched regular promotional events through internal and external communications platforms as the fellows achieved major milestones. Fellows continued their training with a monthly

women's leadership seminar, at which women leaders (and sponsors) in global health shared their leadership stories, challenges encountered, and strategies deployed to overcome those challenges. Additional leadership skills were covered to meet the needs of the cohort, as identified in the mixed-methods evaluation. Teams then took part in a final internal dissemination event, at which departmental, school, and university leadership learned about the findings from each team project. After the event, fellows were encouraged to work with their team mentors to prepare their projects for publications in a global health journal.

MIXED-METHODS EMERGE PROGRAM EVALUATION

For this pilot study, we used a mixed-methods longitudinal, single-group pretest-posttest evaluation design, with assessments administered individually and in groups at key stages of the program's lifecycle (Figure 2). Because this analysis entailed an institutional program evaluation, it was deemed exempt from human subjects' review. All participants consented to participate in the evaluation before receiving any evaluation forms.

Quantitative evaluation component

Quantitative data collection included an online questionnaire that was administered via REDCap[24] four times to EMERGE fellows, immediately before and after the leadership development workshop, at program midpoint, and at endline (Figure 2). Questions were adapted from prior surveys of graduate-student alumni of global health at Emory University (Appendix).[25] Primary outcomes, asked at all waves, were mean summative scores for fellows' ratings of how confident

and how proficient (1=not at all, 5=moderately, 10=extremely) they were with respect to 10 leadership skills, 13 team-management skills, and 10 mentorship-relationship skills. Fellows also rated how satisfied they were (1=not at all, 5=moderately, 10=extremely) with the leadership development workshop immediately after its implementation.

The quantitative data analysis entailed a univariate analysis of the demographic characteristics of participants reported at baseline and mean scores for participants' degree of satisfaction with the content and instructors immediately after the foundational leadership development workshop. We then conducted univariate analysis of responses to each question (or item) that operationalized a leadership, team-management, and mentorship-relationship primary-outcome domain. Pearson pairwise correlations (available on request) assessed the bivariate associations of items within each domain. Given the small, purposive sample of participants and pilot nature of the study, longitudinal analysis involved a descriptive assessment of changes in mean scores for each item across assessment waves to understand how fellows' leadership capabilities changed over their participation in the program.

Qualitative evaluation component

The qualitative research component included narrative answers to open-ended questions in the online survey and focus group discussions with project teams. Open-ended questions at baseline asked fellows to describe their greatest professional accomplishment to date; aspirations related to their participation in the program; definitions of success in the immediate, short-term, and long-term; skills

and mentorship experiences they were seeking from the program; and any feedback or concerns they may have. Open-ended questions at midline and endline asked fellows to describe their experiences interacting with team-project members, mentors, and sponsors to explore how their professional networks were evolving over the course of the program. Project teams also participated in three focus group discussions at baseline (after the leadership workshop, as soon as project teams had formed), at midline, and at endline, after the dissemination event (Figure 2). The focus group discussion guide included open-ended questions asking each team to describe their aspirations for the project, plans for team structure and management, and how fellows' knowledge, skills, and experience as team members and leaders evolved during the challenge. A graduate student trained in qualitative research methods facilitated the group discussions. The first discussion focused on initial expectations about and aspirations for the team projects. Midline and endline focus groups explored changes to the project (e.g., scope, timeline, milestones), changes to the team (e.g., structure, roles, communication, professional relationships among team members); challenges encountered, perceived causes of those challenges, whether/how challenges were overcome; and perceived changes in each team's relationship with their mentor(s). Discussions also explored the experiences of teams working with their project mentor(s) and lessons learned about cultivating mentor relationships.

The qualitative data analysis identified major themes related to women's leadership development that emerged from individual responses to open-ended questions in the online survey and focus-group discussions with leadership challenge teams. The analysis took a modified grounded theory approach[26]. One qualitative researcher reviewed each transcript multiple times and applied memos using "open" or line-by-line coding. The researcher then developed a codebook of deductive codes that captured ideas in the open-ended survey questions and focus-group discussion guides, as well as inductive codes that captured salient ideas that emerged spontaneously from participants' narratives. The researcher piloted the codebook, applying codes to text segments in single transcripts. Codes and their definitions were refined after applying them to each transcript. The researcher then identified themes in the data through a process of merging, splitting, or rearranging focused codes. The researcher interpreted and framed the emerging theory and wrote up the results with supporting quotes.

Results

CHARACTERISTICS OF EMERGE FELLOWS
During recruitment, 85 students accessed the online application, suggesting university-wide interest in the program. Through independent evaluation and joint deliberation, the advisory board recommended 12 fellows, all of whom self-identified as women (Table 1). Fellows were in their twenties and thirties, and most self-identified as belonging to at least one other historically under-represented group[27]. No fellows self-identified as belonging to an indigenous American group or as having veteran status. Half of EMERGE fellows self-identified as originating from a low- or middle-income country in South Asia, Africa,

and Latin America. At the time of applying to EMERGE, all fellows were at an early stage of their careers, with two thirds seeking an MPH degree, and one third seeking a doctoral degree. Programs of study ranged from the health sciences, social sciences, and basic sciences.

Table 1. Characteristics of the 2022 Cohort of EMERGE Fellows (N=12)	
Characteristic	N (% Yes) or Mean (Range)
Age in years, Mean (range)	28 (22-38)
Self-Identified HUG Affiliation(s), N (% Yes), multiple responses allowed	
African American or Black	5 (41.7)
Disadvantaged Economic Background	5 (41.7)
Asian or Asian American	4 (33.3)
Hispanic or Latinx	2 (16.7)
Underrepresented Religious Group	2 (16.7)
Adult Learner	1 (8.3)
Person with a Disability	1 (8.3)
Lesbian/Bisexual/Transgender	1 (8.3)
Other	3 (25.0)
Country of Origin, N (% Yes)	
Bangladesh	1 (8.3)
Colombia	1 (8.3)
India	1 (8.3)
Nigeria	2 (16.7)
Pakistan	1 (8.3)
Panama	1 (8.3)
United States	5 (41.7)
Highest Degree Completed, N (% Yes)	
Bachelors, BA/BS	7 (58.3)
Masters, MA/MPH	4 (33.3)
Doctoral (PhD/MD/JD)	1 (8.3)
Leadership Roles/Activities Before Emory, N (% Yes), multiple responses allowed	
Participant in a student or youth organization	10 (83.3)
Leader in a student or youth organization	9 (75.0)
Tutor	7 (58.3)
Student mentor or supervisor	7 (58.3)
Resident advisor	2 (16.7)
Volunteer or intern in a professional organization	8 (66.7)
Participant/member of a task force	5 (41.7)
Fulltime employee in a professional organization	9 (75.0)
Manager of others in a professional organization	4 (33.3)
Current Degree Program, N (% Yes)	
Masters (MPH)	8 (66.7)
Doctoral (PhD)	4 (33.3)
Program of Study, N (% Yes)	
Environmental Health Sciences	1 (8.3)
Epidemiology	4 (33.3)
Global Health	4 (33.3)
Microbiology and Molecular Genetics	1 (8.3)
Nursing	1 (8.3)
Sociology	1 (8.3)
Leadership Roles/Activities since joining Emory, N (% Yes), multiple responses allowed	
Participant in a student or youth organization	7 (58.3)
Leader in a student or youth organization	5 (41.7)

Tutor	2 (16.7)
Student mentor or supervisor	3 (25.0)
Volunteer or intern in a professional organization	6 (50.0)
Fulltime employee in a professional organization	3 (25.0)
Other leadership activity	3 (25.0)
No leadership activities	1 (8.3)

Before attending graduate school, participation in a student or youth organization was the most reported leadership activity (n=10, 83%), followed by leadership in a student or youth organization and full-time employment in a professional organization, both reported by 9 fellows (75%) (Table 1). Since attending graduate school, over half of fellows (n=7, 58%) reported participation in a student or youth organization, five (42%) reported leading a student or youth organization, three (25%) reported fulltime employment in a professional organization, one (8%) reported no leadership activity since attending graduate school, and no fellows reported managing others in a professional organization.

LEADERSHIP ASPIRATIONS OF EMERGE FELLOWS

Regarding baseline definitions of short-term program success, five fellows (42%) mentioned completing their team project (Table 2). Four (33%) mentioned having greater confidence in their leadership capabilities and ability to advocate for themselves. Three (25%) mentioned having greater voice, and three (25%) mentioned improved leadership skills. One mentioned taking on a leadership role, and one fellow mentioned submitting their team project for publication.

Table 2. Reported Aspirations for Success From Participation in EMERGE, Preprogram	
Short-term Success	"Completing a decent women's leadership challenge project"
	"Feeling confident enough … to communicate about global health goals."
	"Increased confidence"
	"Design and execute a leadership project successfully, feel confident in my abilities to negotiate a position and salary that I want."
	"confidence to speak up … about my opinions and to try new things"
	"To manage and lead a project efficiently"
	"…to improve my public speaking skills."
	"…the establishment of practical skills and techniques I can use when placed in a position to lead a Global Health program."
	"…improvement of my leadership skills based on the knowledge taught during the program."
	"having the experiences…feed into the current projects I am working on."
	"taking on more involved leadership roles…having a clearer career path."
	"…finishing the group-project and submitting it for publication."

Intermediate Success	"Knowing how to set realistic goals in global health research" "build up a team" "…having the experiences I gain enable me to…network for projects I plan…on in the next 2 or 3 years." "reaching educational goals" "publishing the project outcomes" "…having…the … training, skills, and connections to begin my career with strong leadership potential." "…more vocal during group collaborations…I tend to hold back…" "…assessment of the practical skills…on GH projects…outcomes can vary." "…working with global health task forces focusing on the Global South." "…feel challenged and … valued for my…abilities… secure a promotion or leadership opportunity…have at least one publication … design or be a part of multiple research projects." "Being seen as a leader within a workplace" "…formulation of projects and in the beginning of the application of leadership skills in work teams."
Longterm Success	"Being an empowered woman…aware of the gaps in global health research…attempts to pursue them…to help those … left behind…really understanding the problem…allowing those affected by it to share…in the process of learning how to solve it." "build up a high-performing team with achieving a goal" "…this experience can [help] support my team and to help improve the success of an intervention." "meeting professional goals" "…to lead teams in a global space and…to confidently call myself a PI" "…thriving in a career where I am … using my leadership abilities to build and drive a team forward." "…being more confident in my skill sets and leadership ability because I tend to not believe in those even though I have accomplished a lot." "…assessment of practical skills used on multiple projects and the outcomes are positive." "…holding a position of leadership in global health that has a large focus on mentoring other applicants from low- and middle-income countries." "Secure a promotion or leadership position in my company or successfully transition to another role with a higher salary and position. Successfully lead a team on a project or deliverable." "My network growing …, taking a leadership position at an organization" "…implementation of the projects and … fulfillment of…proposed goals."

Baseline definitions of *intermediate-term success of participation* in EMERGE were more varied (Table 2). Four fellows (33%) defined intermediate success as managing or leading project teams. Three (25%) each mentioned planning or meeting personal or career-related goals. Two each (17%) mentioned expanding their professional networks, participation in teams, feeling "seen" or "valued" in the workplace, and publishing their EMERGE team project or another publication. One fellow defined intermediate term success as having more voice in groups.

Baseline definitions of *long-term success of participation in EMERGE* were even more varied (Table 2). Seven fellows (58%) referenced leading teams, four (33%)

referenced career advancement with an emphasis on "thriving" in their career. Three fellows (25%) referenced taking on a leadership position in global health, and one emphasized a participatory approach to leadership in which "those left behind" have an opportunity to identify solutions. Three fellows (25%) still emphasized increased leadership confidence as a dimension of long-term success, with one of these fellows expressing the desire to "call herself" a leader. Three fellows (25%) saw long-term success as having a positive impact on public health and health equity. Two fellows (17%) emphasized the long-term importance of supporting team members and mentoring others, especially from LMICs. One fellow each defined long-term program success as filling global health research gaps, particularly for marginalized populations, further expanding one's career network, meeting project goals, and achieving a higher salary.

FOUNDATIONAL WOMEN'S LEADERSHIP TRAINING PROGRAM COMPONENT

Post evaluations for the three-day EMERGE leadership development workshop included satisfaction ratings with course modules and instructors (Table 3). Nine of 12 fellows completed evaluations. The mean satisfaction rating was 8.3 (range 7.5 to 8.9) for course modules and 8.8 (range 8.2 to 9.1) for instructors. Fellows were most satisfied with module content related to the team project working session (8.9), followed by the program introduction and background on women's leadership in global health (8.6), and the negotiation and conflict management session (8.5). With respect to instructors, fellows were most satisfied with instructors of the diversity, equity, and inclusion module (9.1), program introduction and background on women's leadership in global health' module (9.0), and negotiation and conflict management session (8.9).

Table 3. EMERGE Women's Leadership Development Training: Mean Satisfaction Ratings for Content and Instructor		
Satisfaction ratings: 1=not at all, 5=moderately, 10=completely	Module Mean (range)	Instructor Mean (range)
Program introduction on women's leadership in global health	8.6 (7,10)	9.0 (6,10)
Emotional intelligence and building teams	7.5 (6,9)	8.2 (6,9)
Diversity, equity, and inclusion	8.4 (7, 10)	9.1 (6,10)
Negotiation and conflict management	8.5 (7,10)	8.9 (6,10)
Professional networking	7.9 (2,10)	8.7 (6,10)
Team project working session	8.9 (7, 10)	8.7 (6, 10)
Overall ratings across all modules and all instructors	8.3 (7.5, 8.9)	8.8 (8.2, 9.1)

QUANTITATIVE FOLLOW-UP OF EMERGE FELLOWS OVER NINE-MONTH PROGRAM PERIOD

Confidence and Proficiency to Apply Leadership Skills Before, During, and After EMERGE

Figure 3, Panel 1 compares mean scores in fellows' reported confidence (left) and proficiency (right) in applying each of 10 leadership skills at baseline just *before* the foundational leadership development training, just *after* this foundational training, at the midpoint of the fellows' mentored team-challenge projects, and *after* presenting the results of their mentored team-challenge projects, at the end of the nine-month EMERGE leadership program.

Mean confidence scores to apply leadership skills increased for all skills from before to immediately after the foundational leadership training (Panel 1). Then, a slight decline in fellows' mean confidence scores was apparent at the mid-point of their mentored team-challenge projects. The declines did not dip to reported levels before the foundational leadership training, but were notable, nevertheless. Very interestingly, reported mean confidence scores of fellows to apply leadership skills rebounded for all leadership skills and peaked for 7 of the 10 leadership skills at the end of the EMERE program period (Figure 3).

A similar pattern was observed with respect to fellows' mean reported proficiency to apply leadership skills over the program period. Fellows' mean reported proficiency scores increased for almost all leadership skills from immediately *before* to immediately *after* the foundational leadership development training. A slight decline in fellows' mean

reported proficiency scores in applying leadership skills was apparent when fellows were in the midst of their mentored team-challenge projects. By the end of the EMERGE program period, a rebound was observed, such that fellows' mean reported proficiency scores for all leadership skills peaked after teams presented their mentored team-challenge projects.

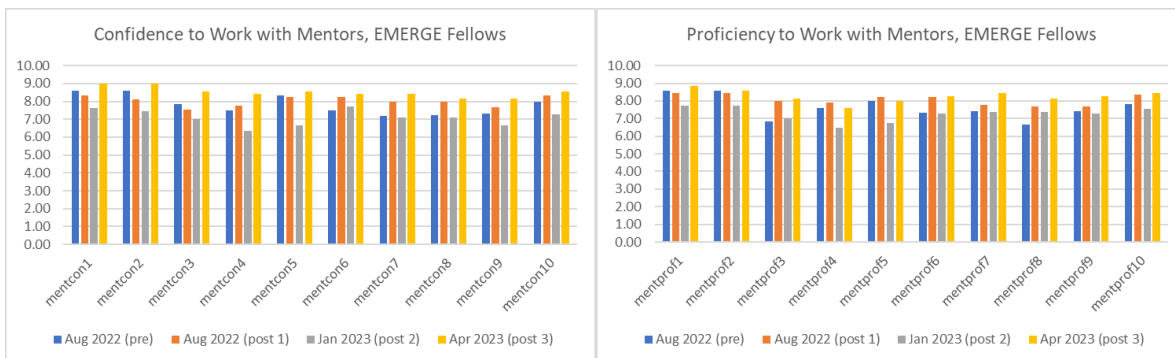### *Confidence and Proficiency in Managing Teams Before, During, and After EMERGE*

Figure 3, Panel 2 compares mean scores for fellows' reported confidence (left) and proficiency (right) in each of 13 team-management skills, before, during, and after their participation in EMERGE. Similar patterns as those described, above, were observed over the program period. In general, mean reported scores for fellows' confidence and proficiency in managing teams increased from before to immediately after the foundational leadership training. Mean confidence and proficiency scores, then, declined noticeably by the midpoint of the fellows mentored team-challenge projects. For some but not all team-management skills, mean scores for confidence and proficiency in managing teams were *lower* at the midpoint of the mentored team-challenge project than they were immediately before the start of the program (Figure 2). Interestingly, mean confidence scores for all team-management skills rebounded and peaked at the end of the program period. Equally interestingly, all mean proficiency scores rebounded, and 10 of the 13 peaked at the end of the program period.
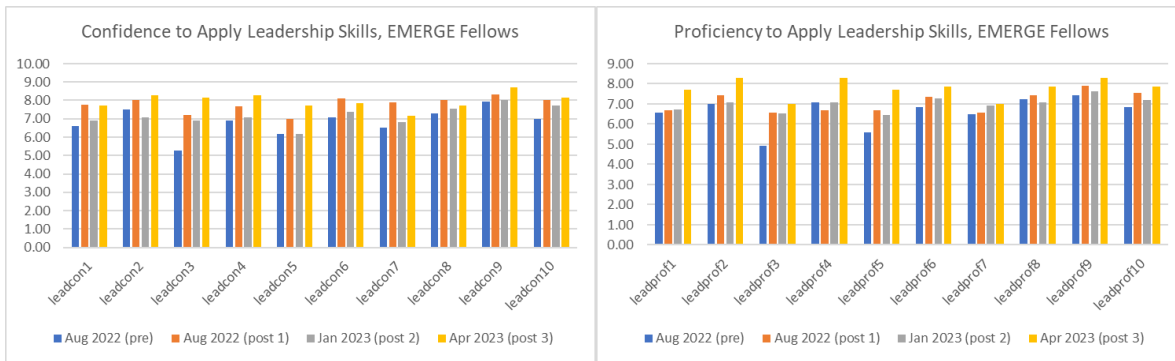
Panel 1. Mean Scores for Confidence and Proficiency in Leadership Skills
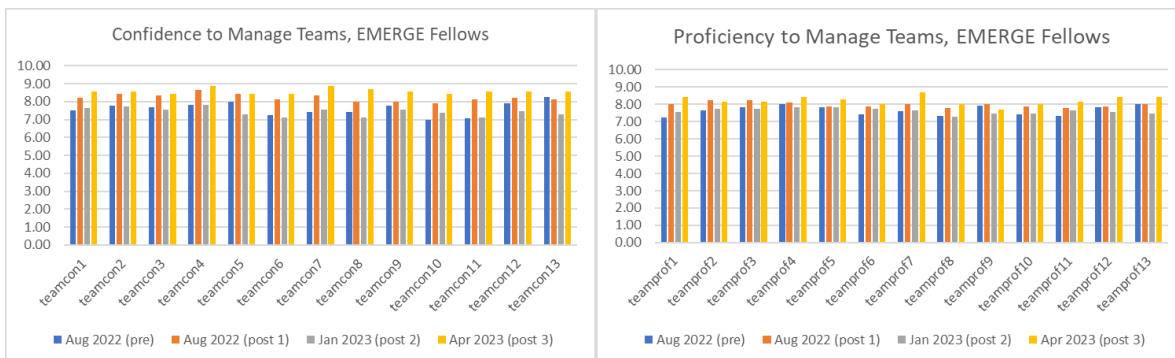
Panel 2. Mean Scores for Confidence and Proficiency in Managing Teams

Panel 3. Mean Scores for Confidence and Proficiency in Working with Mentors

Figure 3. Mean Scores for Confidence and Proficiency in Three Domains of Leadership, Reports from Fellows Before (blue), During (orange and grey), and After (yellow) the EMERGE Program

Confidence and Proficiency in Working with Mentors Before, During, and After EMERGE

Figure 3, Panel 3 compares mean scores for fellows' reported confidence (left) and proficiency (right) in each of 10 skills related to working with mentors, before, during, after participation in EMERGE. Fellows' confidence in their ability to work with mentors increased for more than half of the dimensions from immediately before to immediately after the foundational leadership development training. Interestingly, immediately after the leadership training, fellows reported slightly lower mean confidence in their ability to work with mentors in four specific capacities: communicating by email, scheduling regular meetings, clarifying expectations using a mentor-mentee agreement, and keeping their mentor informed of their progress (mentcon1, mentcon2, mentcon3, mentcon5). By the mid-point of the mentored team-challenge projects, confidence to work with mentors had declined to below pre-program levels for 9 of the 10 skills for working with mentors. By the

end of the program, however, mean confidence scores had rebounded and peaked for all 10 skills.

Mean reported proficiency scores for most of 10 skills related to working with mentors increased from immediately before to just after the foundational leadership training. Two exceptions, where no changes in mean scores were observed, were communicating by email and scheduling regular meetings (which had not yet started). At the midpoint of the mentored team-challenge projects, mean proficiency scores had fallen below baseline levels for most of the 10 skills for working with mentors. However, all mean scores for working with mentors had rebounded, and most scores peaked by the end of the EMERGE program period (Figure 5).

QUALITATIVE FOLLOW-UP OF EMERGE FELLOWS OVER NINE-MONTH PROGRAM PERIOD

Changes in Leadership Skills

Qualitative findings offer a nuanced understanding of quantitative trends. Over the course of the EMERGE program, fellows expressed increased knowledge of and ability to apply leadership skills. After the leadership development training, fellows expressed high enthusiasm for project objectives and opportunities to develop their leadership abilities through practice, perhaps reflecting the increased levels of confidence demonstrated in the quantitative analysis (described, above).

In the first focus group discussion, several fellows anticipated applying the leadership skills acquired during the leadership development training to their team projects. One fellow appreciated becoming more

familiar with different leadership styles:

[D]ifferent leadership styles, depending on what the need is, will come up …during our project… there will be periods of time where… we're gonna have to maybe be more authoritative. But, then, if we're working on something, and we want advice or we're collaborating on an answer to a question that maybe the IRB Advisory Board is asking, then that could be a little bit more of democratic. (FGD > MRCS1: 44–44 (0))

Fellows also mentioned applying flexibility, communication, cultural competency, networking, and conflict resolution skills, indicating a level of perceived proficiency in the leadership skills emphasized in the foundational leadership development training.

Some fellows expressed confidence in their leadership abilities. One fellow was excited to show others that she was capable of leading a successful project: "*you can give students these roles and … they are empowered and … able to do these things…*" (CATNL1, Pos. 88). Other fellows anticipated gaining confidence in their leadership skills because of the program. When asked what she would gain from participating in EMERGE, one fellow shared:

I know just the confidence to … have started and seen this project to completion, …and …to have been able to use your skills, hone your skills, you know, get confident in your networking… So that exposure, that impact, … that publication, …along the way comes that confidence in that- I guess assurance in your skill set that …, 'I can do this,' and I could repeat it. (FGD 1 > NIH1: 34-34 (0))

Another fellow felt less certain of her

leadership capabilities, stating *"You'd think after the leadership workshop I would embrace the term leader. But in fact, I'm just more scared"* (FGD 1 > CATNL1: 25-28 (0)).

At the midpoint of the EMERGE program, most fellows recognized the importance of using leadership skills proficiently, particularly to overcome challenges faced during program implementation. When experiencing time constraints, fellows leaned heavily on skills particularly related to communication and prioritization:

I think communicat[ing] and like understanding for each other, … I know we've all had things that have come up when [we] can't make a meeting or … something happens or … we want an extra meeting … we're all very flexible with each other, and I think we communicate … when something is going to get done, or when something is not going to get done. (CATNL2, Pos. 114)

there are times when … I don't have time to do this this week, and the other person happily picks up. And then we kind of compensate … And … in case one of us has missed the meetings, … then the other[s] …just filled us in, and nobody felt bad about it. We all felt comfortable in our spaces to ask for the time that we needed, and I think that's been really great that we've been able to use that skill. (NIH2, Pos. 42)

Another fellow described thinking back to the leadership training when facing challenging situations and reminding herself, *"oh, it's important to communicate, through what's happening"* (CATNL2, Pos. 110). A third individual noted, *"[I] think communication is definitely … a key skill that we've all been practicing and just from my standpoint I feel*

like our team does it pretty well" (NIH2, Pos. 41).

There was some variability in group experiences, as one group struggled more substantially to maintain group progress and cohesion. A member of that team recognized the challenges in applying leadership skills, admitting, *"I think … as we really got into the semester. Utilizing those [leadership] skills wasn't something I did as often. Emails have been sent out … I think it's picked up more recently, but I think it also had got down in the middle of the semester…"* (MRSC2, Pos. 114). Another team member suggested that the challenges her group experienced revealed the leadership skills she needs to develop:

the abilities that I need to develop. In my professional life. One of the things is when it's related to team work to take that initiative to lead things. That is something that I have to learn how to do, because at this moment I don't do that, then that is something that I have learned … in this project. (MRSC2, Pos. 124)

The same team did suggest that they had leaned heavily on being transparent with one another to keep up team cohesion.

At endline, fellows expressed increased confidence and ability to employ their skills. One fellow explained that her team learned *"to also be more comfortable with utilizing our own skills rather than asking for guidance when completing their project"* (CATNL FGD 3, Pos. 59). Fellows discussed utilizing prioritization, networking, and communication skills throughout the project to achieve their goals:

I definitely would say, decision making at some point, because, … when, … the rubber really met the road, we had to [say], feasibly, this is what we can do... But also … courage

to reach out to … professors … sending out initial emails … Those skills did get developed more through this program. (CATNL FGD 3, Pos. 56)

Fellows also highlighted the importance of and their ability to recognize their limitations as well as their strengths. One fellow stated, "*Coming to terms with our own limitations was something that was really helpful*" (NIH FGD 3, Pos. 67). Another fellow mentioned the importance of developing her leadership skills when her team was struggling, saying,

I learned the ability to just step up when needed, I think, and I feel like task delegation is very important…I also think leaders acknowledge their faults, or in a capability, incapability, so I feel like being able to know basically, what you're capable of and then acknowledging that I think is huge, because sometimes, especially in a team setting, what one person is not able to do, another person might have the capacity to do (MRSC FGD 3, Pos. 88).

The challenges and requirements of completing a rigorous mentored team-challenge project for the EMERGE program allowed fellows to apply and grow the skills in which they had been trained during the leadership development workshop.

Changes in team management skills

Fellows' team management skills followed a similar trajectory to that of their leadership skills, in that their perceived ability to manage teams and their own leadership projects increased. At the start of the program, many fellows expressed that they were looking forward to learning how to work with a team and manage a project of this scale. As their projects progressed, fellows felt more comfortable taking charge of project management.

After the leadership development training, fellows discussed their excitement to have the opportunity to develop project management skills by participating in EMERGE. Several fellows highlighted that managing a team project was a new experience for them and identified the need to develop team management skills. One fellow mentioned that "*leading a project from start to finish I think is like a really nice experience, to kind of add to my tool kit*" (FGD 1 > CATNL1: 94-94 (0)), indicating that they hadn't had the opportunity before. Through the program, one fellow expected "*to learn about how to make a project how …. I mean … to make our team work because it's my first experience*" (MRCS1, Pos. 51). Another fellow corroborated these desires, stating, "*I hope to learn how to like, do research with a team and … plan a timeline and everything. Because I usually just have been given those items and been told…do this, do that*" (FGD 1 > CATNL1: 86-86 (0)). Although prior experience with team management was limited at the start of the project, fellows expressed enthusiasm for developing these skills over the course of the program.

By the midpoint of the program, fellows had begun to build and put team management skills into practice. Fellows discussed the importance of using team and project management skills to move their projects forward. One fellow shared how her team approached team management, saying,

We all are our own personal project managers, but also we've all been um collaborating to manage this project. … to

make sure that we're still on task that we're still on focus, on scope. We haven't deviated too far... But having to manage it yourselves … I think we've done a really good job of that, as well, and also managing up. (NIH2, Pos. 43)

Another fellow stated that the project had given her "*a lot of practice learning … about group work which I know we do a lot of group work in school, but also … delegation of work… I remember I went into this, and … I wanted to practice more project management type stuff that's … a role … I was able to assume*" (CATNL2, Pos. 126). The EMERGE project gave her the opportunity to increase her proficiency with team management. Another fellow discussed that she was learning and applying skills for "*managing the project, managing each other, managing up*":

knowing these skills … makes it easier to…move the project along… now, moving forward, you know to anticipate things before they happen so you're not being reactive, you're being proactive. So I think that skillset goes far to even helping keep the dynamic of the team going and … in a positive direction. (NIH2, Pos. 53)

This individual attributed the progress of her team's project to the team management skills that the team was employing; however, team management skills also were learned because of challenges faced in team dynamics. One fellow described the team management strategies she utilized when trying to help her team get back on track with their goals and communication:

I have … shifted gears… and moved toward implementing my part of the project on a … timeline and I do think that some of the changes that I've implemented have been a

result of poor communication … *i've tried to reach out and offer support in different ways, and urge that we all take ownership … I did at some point feel the pressure to represent the team without actually being told to represent the team.* (MRSC2, Pos. 68)

Despite this individual's reluctance to take a leadership role, they were prepared to use team management strategies flexibly and effectively to advance the team project.

By endline, fellows displayed growth and confidence in their team management abilities. Fellows discussed working with their teammates to determine team management responsibilities. One fellow discussed feeling empowered to take a bigger role in team management, stating,

I think it was a lot … like realizing when … to step in … to like take care of my own responsibilities. When it's necessary to support our other team members. When it's necessary to speak up for team members. I think personally, I gained more like, I think it was a good experience to kinda develop the project and go from … scratch to … having … a finished project. (CATNL FGD 3, Pos. 53)

The fellow also attributed their skill development to being involved with all stages of the project, echoing sentiments expressed in the midpoint focus group. Another fellow mentioned learning "*a lot about like management tools*" (CATNL FGD 3, Pos. 50), suggesting she was actively involved in applying team management skills throughout the project. Ultimately, fellows felt that their participation in the EMERGE program allowed them to develop team management skills they hadn't gained through prior school or work opportunities.

Changes working with mentors

Working with mentors was a skill that most fellows indicated proficiency with from the start. Fellows applied their training and developed experience in leadership and team management skills to their relationships with their mentors. At the midpoint, one team of fellows faced challenges in their working relationship with their mentor caused by time constraints and a mismatch of mentor skills with the project's focus. Despite this challenge, this team demonstrated proficiency in managing relationships with mentors and advisors and were able to make the best of these circumstances. Fellows in the other two teams demonstrated proficiency and confidence in working with their mentors throughout all timepoints.

At the outset of the EMERGE program, fellows exhibited confidence and excitement for the prospect of working with a mentor. Fellows researched their mentors to understand their background, strengths, and potential areas for collaboration. One fellow mentioned this understanding, saying "*I'm really looking forward to this conversation with our mentor about … the [name] Fellows*" ((FGD 1 > CATNL1: 64-64 (0)), acknowledging her mentor's involvement with that other fellowship program at the university. Another fellow planned to ask her mentor for guidance about project scope, stating "*we were gonna converse with our mentor and see if it is feasible to do a mixed methods [analysis]*" (CATNL1, Pos. 36).

Fellows also discussed communicating strategically with mentors to create an effective working relationship. One fellow discussed how setting "*clear boundaries and stick[ing] with those boundaries,…our*

personal time …other commitments…" (NIH1, Pos. 22) would make their project more effective. Another fellow mentioned that their team would "*[hold] off on reaching out to our mentor until we can … all have … some timeframes*" (CATNL1, Pos. 53) developed, suggesting that they wanted to be prepared before reaching out to their mentor to be mindful of their mentor's availability. The relative ease and mindfulness with which fellows discussed working with mentors suggests that they felt confident and prepared to work with them effectively.

Fellows' proficiency in mentor relationships remained high at the midpoint. Confidence appeared to increase at the midpoint for fellows with positive mentor experiences, with one fellow sharing that their mentor relationship had "*made it easier to kind of expand out to other mentors…so you know that you're on the right track and you're showing up…in a way that you want to show up, and you're respectful of their time as well*" (NIH2, Pos. 53). Fellows continued to demonstrate successful relationship strategies, noting "*[the mentors] have been very gracious with their time. And so we have to find a way to be respectful of their time, while at the same time honoring our own boundaries and our capabilities*" (NIH2, Pos. 43). One team did struggle with their mentor relationship, noting "*new roadblocks that are being introduced to where it's like, hey? … we've had [a] lack of mentor communication*" (CATNL2, Pos. 124) which impacted their confidence in working with mentors. Despite this challenge, the team displayed their proficiency in managing this relationship by reaching out to other mentors:

a lot of brainstorming, together with different ways we could reach out to other professors to get more feedback. I know that [team members] talked to some [department] professors as well. And you know, like just trying to brainstorm different ways we could …get outside opinions on what we're doing. (CATNL FGD 3, Pos. 45)

The fellows on this team did not allow communication and time challenges to prevent them from looking for a beneficial mentor relationship.

At endline, fellows expressed an increased ability to manage and benefit from mentor relationships. A fellow on the team with mentor challenges said that through the project they learned to, *"[Navigate] … interpersonal dynamics …between us, and also with our mentors..."* Another team recognized that the successful mentor relationship they created allowed their mentor to help them complete their project:

[help] us steer the project in the right direction in an achievable manner… [help] us gain clarity and still [help] us. You know, [give] us the freedom to do what we wanted to do, and then that feedback was incorporated to get a sense of the final project product. (NIH FGD 3, Pos. 28)

Throughout the EMERGE project, fellows continued to use relationship skills to maintain effective relationships with mentors. One fellow mentioned that *"if there were months where none of us were able to make any progress, we communicated that with our mentors to be respectful of everybody's time..."* (NIH FGD 3, Pos. 59), demonstrating the team's proficiency with working with mentors. Ultimately, working with mentors was a learning opportunity for all EMERGE fellows.

Discussion

The EMERGE program is designed as a leadership development program for under-represented women graduate students in global health. The program is informed by a socio-ecological framework of the barriers to women's leadership in the field. This pilot study included a small number of fellows (N=12) who participated in a single-group pretest-posttest study design, so the findings presented here are tentative but promising. Fellows who participated in the program represented diverse historically under-represented backgrounds and were at the early stages of their careers in global health. At baseline, most fellows lacked any substantial leadership training or experience. Many fellows expressed aspirations that their fellowship would contribute to greater confidence and belief in their leadership ability, greater confidence to apply leadership skills and to communicate with others, a stronger sense of "feeling seen" and valued at work, having more voice in groups, and seeing oneself as a leader. These aspirations suggest that under-represented early-career women professionals may benefit from professional experiences and supportive work environments that build self-confidence and a self-image as a respected and capable leader in global health.

It is critical to situate fellows' aspirations to expand their leadership confidence, to elevate their voices, to "feel seen and valued" at work, and to "see themselves" as leaders in the global historical context of gender disparities in the healthcare workforce. Notably, the EMERGE program was launched amidst the backdrop of the COVID19

pandemic. The pandemic both exposed and exacerbated global (e.g., mask and vaccine) imperialism, anti-Asian and anti-Black racism, and intersectional health disparities[28-30]. Compared to men in the health workforce during COVID-19 and prior public health crises, women healthcare workers have experienced: a higher risk of exposure and infection; barriers to access personal protective equipment; increased workloads; decreased leadership and decision-making opportunities; increased caregiving demands when schools and childcare supports are restricted; and higher rates of mental ill-health[31]. A lack of attention to gender in the health workforce has persisted during times of crisis, as have substantial gaps in research on the experiences of women healthcare workers in LMICs[31]. For these reasons, the next generation of women leaders in global health needs to be trained with essential leadership competencies and skills in supportive environments with skilled mentors and sponsors who enable them to tackle questions of global health equity from fresh perspectives. In the current global context, theory-based multicomponent leadership development programs like EMERGE are essential to raise the future generation of women leaders in global health. However, very few programs have been developed for this specific pool of future global health leaders, making this program unique and timely. The high level of sustained participation in the program, as well as the high levels of reported satisfaction among fellows with the leadership training content and instructors suggests that the EMERGE program is both feasible and acceptable to implement with larger cohorts of similar

fellows. Considering the other positive program outcomes reported here, the expansion of similar training programs also warrants consideration.

Specifically, most fellows reported increases in their confidence and ability in the vast major of leadership, team-management, and mentor-related skills from before to after their participation in the EMERGE program. This consistent pattern across these domains illustrates the benefit of a leadership development program that combines foundational training with a multi-month mentored team-challenge project and monthly leadership seminars. The initial leadership training provided foundational learning about core leadership concepts and associated skills. The experiential component of the program—a nine-month mentored team-challenge project, coupled with monthly leadership seminars by women leaders—enabled fellows to practice the skills they had learned didactically at the outset. For many fellows, the team-challenge project was their first experience working in a team over multiple months to complete and to present publicly project findings. The project provided a critical opportunity to apply "classroom learning" in a mentored team of peers that enabled fellows to experience, trouble-shoot, and resolve the day-to-day challenges that arise for leaders in a time-bound, team-based project. The project required communication, coordination, and prioritization with team members to meet deadlines and to present findings publicly. The reported challenges that fellows faced may well have been the most salient and constructive learning acquired from the program. Notably, reported confidence and

proficiency in most focal skills not only rebounded, but peaked, by the end of the program period.

Implications for Research and Practice

Our findings are encouraging and suggest important research opportunities. One idea might be to survey participants further out from the end of the program, perhaps one, two, or even five years later. This follow-up could assess the extent to which the leadership skills become embedded in participant behavior long after the end of the training. A second idea, given the small sample of fellows included in this pilot study, would be to conduct a larger, controlled study that would allow us to evaluate the impact of the leadership training on leadership-related outcomes relative to a control group that has similar characteristics but does not receive any training. A third idea might be to expand this type of training to women professionals in LMICs and to other fields, like law and medicine, where women are in the majority overall, yet in the minority in terms of leaderships roles. A final idea would be to integrate meso-level training components that focus on the training of project mentors, directors of graduate studies, and departmental, school, and university leaders who may serve as sponsors of early-career women[32]. If larger, controlled studies of EMERGE demonstrate short-term and sustained effectiveness, the program model could be recommended as best practice to academic departments of global health around the U.S. and in LMICs.

Several implications for practice also arise from the results of our study. The first major implication relates to the recommended duration of leadership development programs, especially for under-represented women in global health. There is no shortage of global health leadership forums, workshops, and conferences that offer 1–3-day intensive training with few opportunities for continued mentorship or the intentional application of learned skills under supervision. Pedagogically, the results of this study show that levels of confidence and proficiency wax and wane during longer-term training and in the face of actual implementation of learned skills. Intensive short-term training may not be/is not enough because such trainings miss the natural fluctuations of constructs like "confidence" (as demonstrated in the graphs) when learners go to apply knowledge/skills and encounter challenges or roadblocks.

A second implication relates to the strength of the socio-ecologically informed design of EMERGE to account for barriers and structural factors that specifically disadvantage women. In general, leadership training programs often focus narrowly on specific levels of training. For example, companies invest great sums of money in women's leadership programs that emphasize skill-building in the workplace to advance their careers. While these programs are well-intentioned, training individuals who experience inequitable burdens of bias and exclusion may require a multi-level approach for the individual-level training to be effective. By theory and implementation, a multi-level approach to leadership development validates and enhances the capability of the individual, while actively addressing the known systemic barriers that may hinder them once they leave the instructional phase of the program.[23] While EMERGE may not directly change the actual research or practice

systems, the program is designed to teach trainees how to navigate existing systems in productive ways (e.g. how to effectively seek out and work with mentors) and raise the visibility of the program (by prioritizing leadership training for women). Our study shows promise for even more expanded multilevel training with project teams, faculty mentors, and university leaders. Such an approach would integrate individual skill-building with components that attend to meso-level dynamics, such as mentee-mentor relationships, team and organizational cultures, and to more macro factors like institutional policies that may disadvantage women in the workplace. This integrated approach may better help women understand the multi-faceted and complex ways in which gender dynamics affect their lives, and then participate in training that enables them to grow as leaders in more supportive workplace settings.

Conclusions

The need is great to train the next generation of diverse women graduate students for leadership in global health. The EMERGE program is grounded in a socio-ecological framework that recognizes the multilevel barriers that diverse, early-career women face with respect to leadership training opportunities, biases regarding their capabilities, access to safe spaces with peers for professional growth, opportunities to build critical relationships with mentors and sponsors, and experiences that strengthen capabilities for leadership that fellows can sustain across their careers. EMERGE holds tremendous promise as a best-practice leadership development program to enable diverse, early-career graduate-student women in global health to flourish in their careers.

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