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Understanding the Experiences of Early Career Women in STEM

In Partnership with Rewriting the Code

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August 2024

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EXECUTIVE SUMMARY

Introduction

This study was conducted to understand the experience of early career women and gender-minoritized individuals (WGMI) in computing careers. It is also meant to inform potential programs or interventions in how they could support the entry, persistence, and success of WGMI in computational careers. This study is a research/practice partnership between Rewriting the Code (RTC) and Duke University's Social Science Research Institute (SSRI).

Evaluation Context and Methods

This study took a close contextual view on experiences of WGMI who have recently entered engineering and technology careers (entering in 2021/2022) using qualitative data. This study examined challenges experienced in the field; decision-making factors as women navigate their early career and industries; and facilitators of success in career satisfaction, retention, and advancement. In addition, it explored what specific supports would be beneficial for early career WGMI in tech, particularly related to community-building.

To gain an in-depth understanding of respondents' experiences, researchers conducted and thematically analyzed 14 focus groups with a total of 54 participants, of which 63% were RTC members. There was an even split between those with 1-2 years of tech work experience and 3-4 years of tech experience. The majority of participants were White/European American (33%) and the rest of the racial/ethnic distribution was approximately evenly split: Black/African American: 19%, Hispanic/Latino: 20%, Asian/South Asian/Asian American: 26%. The ages of participants ranged from 23 to 39 with the average age being 26. The most common company type was Big Tech (29%) and the most common role was software developer (47%).

Findings

- **Overall Job Satisfaction:** While many respondents were satisfied in their current roles, most respondents reported at least one challenge; many of these challenges were related to gender.
- **Finding Jobs:** Respondents discussed challenges cold applying to jobs in the technical field as well as positive and negative experiences of gender bias; organizational supports and intrapersonal supports emerged as particularly helpful for finding jobs.
- **Starting Jobs:** Challenges with onboarding emerged from unclear or confusing processes; respondents felt more comfortable at companies with more comprehensive onboarding processes that included attention to building relationships across the organization.
- **Upskilling:** Several respondents lacked the ability to focus on upskilling, and select respondents attributed this lack of support to gender bias; supportive managers and company-provided resources gave respondents the time and support to grow their skills successfully.

- **Advancement:** Several respondents reported confusion and frustration regarding asking advancing their careers, and select respondents experienced gender-based promotional biases; clear guidelines and supportive managers allowed respondents to feel more comfortable discussing advancement.
- **Imposter Syndrome:** Most respondents reported feeling imposter syndrome in their tech career so far based on gender identity and representation as well as gaps in computer science knowledge/background; time and supportive interpersonal relationships helped respondents develop self-confidence.
- **Gender bias**: Many respondents discussed changing their personalities to deal with gender-based assumptions and male-focused company cultures; though supports were limited, increased diversity and community-building helped respondents better cope with bias.
- **Isolation:** Many respondents, particularly those in remote jobs or less diverse workplaces, struggled with forming connections; developing small group connections with like-minded colleagues and others in tech alleviated loneliness.
- **Retention:** Respondents were more willing to stay in their current roles when they had supportive managers and high salaries; interest in tech, salary, concerns over layoffs and other challenges, including difficulty raising families, emerged as primary factors for long-term retention in the tech field.
- **Interpersonal Supports:** Interpersonal relationships played a critical role in supporting respondents when facing the challenges described above.

Recommendations

For companies

- **Clearly document the timeline in which an individual can expect promotions** throughout their career at the company, accompanied by specific skills or competencies required to receive each promotion; consider how all work, even that typically considered "non-promotable" can relate to an individual's advancement.
- **Develop clear and thorough onboarding processes for new hires**; consider onboarding new hires together in a cohort to reduce imposter syndrome and facilitate connections.
- **Designate time for employees to focus on "upskilling;"** also consider providing paid opportunities for "upskilling;" such as through courses, guest speakers, and conference attendance.
- **Provide trainings to managers on how to identify and avoid gender and racial bias on their teams.**
- For companies who have ERGS, **support ERGs by ensuring that they are active, that they are a safe space to share concerns, and that ERGs leaders are recognized for the time they spend facilitating these spaces.** For companies who do not have ERGs, consider **encouraging or funding individuals to participate in identity-based support organizations or conferences to facilitate connections.**
- **Develop formal mentorship pairing processes** that, when feasible, prioritize similarities in identity, technical skills, and career track. For those individuals who are questioning what career path to follow, find mentors who can specifically focus on the pros and cons of multiple paths. Be sure that potential mentors understand the time commitment necessary to be of service.

For RTC

- **Consider creating a career growth "blueprint" or "map"** that illustrates key career milestones and when they should be achieved; this map should, when relevant, be tailored to specific roles. Included in this could be a list of questions/topics to discuss with a manager or mentor at each stage in an individual's career.
- **Continue to provide in-person and virtual opportunities for early-career WGMIs to connect with others,** particularly those with similar interests, career tracks, or identities. While some of these opportunities could be more structured and skill based (for example, a presentation on how imposter syndrome is normal), some should be more free-form to foster connections organically.

For Evaluation to Further Inform RTC

- **Refine the early-career WGMI survey** to include questions that still remain from this report, such as: how respondents find second and third jobs, the different career pathways RTC members are interested in, etc.
- Once early-career specific activities or programs have been developed, **consider evaluating the experience and outcomes of those programs for participants.**

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INTRODUCTION

Overview

This study was conducted to understand the experience of early career women and gender-minoritized individuals (WGMI) in computing careers. It is also meant to inform potential programs or interventions in how they could support the entry, persistence, and success of WGMI in computational careers. This study is a research/practice partnership between Rewriting the Code and Duke University's Social Science Research Institute.

Women in Computational and Technical Careers

Science, Technology, Engineering, and Mathematics (STEM) professions offer many opportunities for advancement, and income; however, these opportunities are not evenly distributed to the population with White men making up 51% of STEM occupations (Alfred et al., 2019). In comparison, white women make up 20%, where Black and Latina women make up 2% respectively (Alfred et al., 2019). Though the number of women in these fields has increased over the last 40 years, there is still disparity (Alegria, 2019). This disparity is continued in one subset of STEM professions: computer science/computational jobs. The demand for these jobs has only grown, yet women and historically marginalized people are still underrepresented. The percentage of computing occupations held by women has decreased since 1991 and only 3% of jobs are held by Black women and 1% by Latina women (Ashcraft et al., n.d.).

This phenomenon is not simply found in the job market, but begins in the classroom with men outnumbering women 3:1 in computer science classrooms (Dasgupta & Stout, 2014), and less women and people of color completing CS degrees to graduation (Chang et al., 2014). Nevertheless, there are many benefits to diversity in coding. Other than the importance of equitable access to the benefits of lucrative computational careers, having varied perspectives increases potential for innovation and fights against biased technologies made by the majority white male field (DuBow, 2022; Verdin & Godwin, 2018). However, there are many barriers that prevent women and historically marginalized people from entering the computational field.

Barriers for WGMI in CS and Computing

WGMI face a multitude of barriers from K-12 all the way to early career and on in the coding field based on the expectation of a 'coding professional' being a White male. Starting in K-12, girls are inundated with implicit and explicit messaging that they do not belong in CS classrooms or fields. Girls are communicated that they don't belong due to classrooms with male gendered decorations, not being called on in class, and a lack of girls being present in the elective CS classes (Kordaki et al., 2020; Rodriguez & Lehman, 2017; Sax et al., 2017). Barriers continue into college leading to lack of belonging, decreased self-confidence/efficacy,

increased anxiety, unwelcoming environments, overt sexism/bias, and lack of mentors or role models that show them that it is possible to succeed (Casad et al., 2019; Dasgupta & Stout, 2014). Professional barriers continue from the collegiate barriers leading to reduced pay, exclusion from informal networks, and being looked over for hiring and promotions (Alfred et al., 2019; Ashcraft et al., n.d.; González-González et al., 2018). These barriers are worse for WGMI of color who face a 'double bind' of sexism and racism leading even more bias and lack of belonging (Eisenhart & Allen, 2020; Leigh et al., 2022). Due to their intersecting identities, even programs that attempt to increase WGMI of color in coding tend to be less applicable because they either focus on gender or race, but rarely the intersecting impact of those identities (Helman et al., 2020).

Factors for Retention of WGMI

Nevertheless, there are various factors for increasing interest in coding in K-12, matriculation for college women, and retention in the coding field. Many studies point to the importance of gender/race/ethnicity matched mentors and role models as key to persistence in CS and computing jobs for WGMI and WGMI of color (Clarke et al., 2023; Hodari et al., 2014). Mentors provide a safe space for women to share their experience and provide guidance on how to deal with bias/discrimination/stereotypes (Robinson et al., 2016). Role models provide an example to women and women of color that succeeding in the tech and coding field can be accomplished (Agosto et al., 2008). Other factors to success are providing CS opportunities (such as research) to girls and girls of color, increase self-efficacy in coding and supporting WGMI's voices, and positive coding environments in the workplace and classrooms (Agosto et al., 2008; Alexander & Hermann, 2016; Clarke et al., 2023).

Study Context

Rewriting the Code (RTC) is a non-profit organization focused on supporting and empowering women in tech from college to early career through use of communities, mentorship, industry experience, and educational resources. They provide resources such as resume review, skill building sessions, career summits and community subgroups to prepare women for the tech workforce. A major focus is additionally on community building with other women in tech.

In 2023, RTC partnered with Duke University's Social Science Research Institute (SSRI) to conduct a qualitative study investigating the experiences of early career WGMI in technology-related careers. The findings from this study supports Rewriting the Code's ability to advance WGMI in technology and institutional and cultural change, and need to facilitate equitable inclusion to promote industry excellence. Additionally, it aims a field of research on WGMIs experience in computational science careers.

Evaluation Process, Focus, and Methodology

Evaluation Process and Driving Questions

This study took a close contextual view on experiences of WGMI who have recently entered engineering and technology careers (entering in 2021/2022) using qualitative data. This study examined challenges experienced in the field; decision-making factors as women navigate their early career and industries; and facilitators of success in career satisfaction, retention, and advancement. In addition, it explored what specific supports would be beneficial for early career WGMI in tech, particularly related to community-building.

Within the focus on early career WGMI in tech, this study had an added lens on understanding experiences within and across a) members of minoritized subgroups (e.g., Black, Latinx); and b) stage in early career (i.e., 1-2 years into career vs. 3-4 years into career); and c) workplace type (e.g., organization size, sector).

Driving Questions:

Q1: What are the experiences of women who recently entered technical careers (e.g., engineering, computing, technology), specifically around entry to the field, career satisfaction, advancement, and retention?

- What factors influence decision-making as women navigate their early career and industries? What are challenges experienced in the field? What are facilitators of success?
- How does this vary by minoritized subgroup, stage in early career, and workplace type?

Q2: What types of valued supports and opportunities, particularly related to community-building, are provided by independent support organizations (including RTC and others) and by tech companies? How effective are these supports?

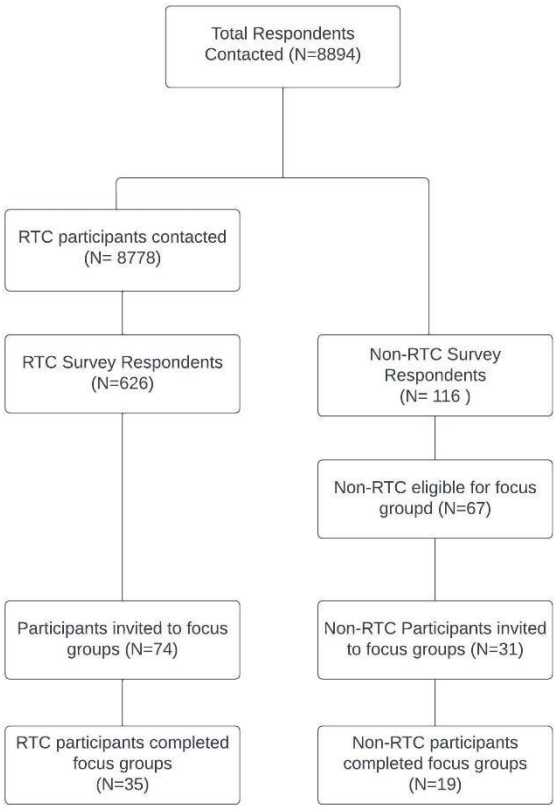
- What added supports or opportunities would provide value to early-career women currently in tech? For community-building, specifically?
- How does this vary by minoritized subgroup, stage in early career, and workplace type?

Empirical Processes

This study used qualitative research methodology to gain an in-depth understanding of respondents' experiences; qualitative data also provides a critical exploratory perspective as well as a direct lens on process, decision-making, and influence of context. Specifically, researchers conducted focus groups with those who had engaged with RTC as well as those who had not. All focus group respondents received $50 for their participation.

Recruitment

Figure 1. Recruitment flowchart



To recruit RTC participants, RTC provided a list of those who had participated in programming (see Figure 1). Researchers invited participation in focus groups using targeted emails via Qualtrics. A total of 8778 RTC participants were invited in December 2023. A total of 626 RTC participants expressed interest in participating in a focus group.

Non-RTC participants were recruited through a combination of snowball (i.e. asking RTC respondents for names of friends and colleagues) and purposive sampling (i.e. positing on reddit and sharing with companies and support organizations) Even though non-RTC participants were recruited through varying channels, there were notably fewer respondents who expressed interest in participating in a focus group.

The focus group scheduling form included a short survey which collected demographic information (i.e., years of experience, gender identity, race/ethnicity, and age), as well as details on their workplace and context (i.e., current employer, industry, role, and certainty they would pursue a career in tech). For RTC participants, it also asked about their engagement with RTC (i.e., duration and timing of their engagement).

Respondents for focus groups were selected based on their availability, career stage (i.e., early career [2 or fewer years of experience] or early-mid career [3-4 years of experience]), as well as their participation in RTC affinity groups (Black Wings, Latinas de RTC) and/or racial and ethnic identity.

Data Collection

Overall, researchers conducted 14 focus groups with 54 respondents, which were divided between RTC and non-RTC participants. Among RTC participants, researchers conducted 10 focus groups with a total of 35 respondents, which were stratified across career stage and race/ethnicity: three focus groups were with early career respondents, three were with early-mid career respondents, two were with members of Black Wings or Black-identifying respondents, and two were with members of Latinas de RTC or Latinx-identifying respondents. These focus groups were conducted between December 2023 and February 2024.

Among non-RTC participants, researchers conducted four focus groups with 19 respondents. Given the lesser number of potential respondents, these focus groups were not stratified by career stage or race/ethnicity. These focus groups were conducted in February 2024.

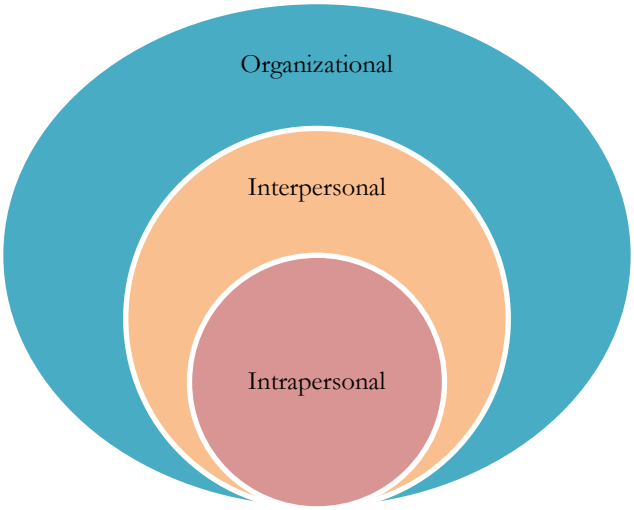
For accessibility and convenience, given that respondents were located across the US and Europe, all focus groups were held virtually using Zoom. Each focus group lasted 90 minutes, was led by a facilitator (aligned with racial/ethnic identity where possible) and supported by a notetaker. The focus groups were recorded and transcribed.

Analysis

Data were analyzed using NVivo 14, a qualitative data analysis software. Researchers used a combined deductive and inductive coding approach, and developed a coding schema based on the driving questions and inductive consideration of the study data. Analysis used a thematic content analysis approach; it addressed key constructs and themes emerging from the data, frequency of reference, relationships between key constructs, and difference by subgroup and respondent characteristics.

After data was coded, it was structured using the socioecological model (Figure 2) which uses varying concentric levels of impacts on WGMI. These include intrapersonal (aspects within the self), interpersonal (impacts from those around the individual) and organizational (impacts from larger organizations). Organization of data in this way clarifies where RTC can have an impact and to what degree on WGMI.

Figure 2. Socioecological Framework



Organizational	Company			Support Organizations	
Interpersonal	Managers	Mentors	Role Models	Peers in Tech	Friends/Family
Intrapersonal	Confidence, Resilience, Self-Advocacy, Technical Skills, Non-Technical Skills				

Description of Sample

We performed 14 focus groups with a total of 54 participants, 10 focus groups with Rewriting the Code participants and 4 focus groups with non-Rewriting the Code participants. There was approximately an even split between those with 1-2 years of tech work experience and 3-4 years of tech experience. The majority of participants were White/European American (33%); however, the distribution was approximately evenly split: Black/African American: 19%, Hispanic/Latino: 20%, Asian/South Asian/Asian American: 26%. The ages of participants ranged from 23 to 39 with the average age being 26. The majority of participants were between 23-24 (54%). The most common company type was Big Tech (29%) and the most common role was software developer (47%). Of these participants, 65% are a part of Rewriting the Code (N=35) and 35% are **not** a part of Rewriting the Code (N=19). Of the Rewriting the Code participants, the majority had 2 to 5 years of RTC membership (N=21, 60%), with most beginning while they were in their undergraduate degree (N=26, 74%).

Table 1. Respondent Demographics

	#	% of respondents
RTC vs. Non-RTC		
RTC	35	65%
Non-RTC	19	35%
Career Stage		
Early (2 years or less)	28	51%
Early-Mid (3-4 years)	26	49%
Gender Identity		
Female	52	96%
Non-Binary	2	4%
Race/Ethnicity		
White	18	33%
Asian	15	26%
Hispanic	11	20%
Black	10	19%
Age		
Average	26	n/a
Youngest	23	n/a
Oldest	39	n/a
Length of RTC Involvement		
0-1 years	6	17%
2-5 years	21	60%
5+ years	8	23%
Beginning of RTC Involvement		
Undergrad	26	74%
After graduation	9	26%

Empirical Findings

Findings, below, address distinct but related aspects of early career employment in the tech sector for WGMI. Finding 1 discusses overall experience and basis for challenges. Findings 2-5 speak to challenges related to specific aspects of work (e.g., finding work, starting jobs, advancement), and findings 6-8 address broader challenges that influenced many aspects of respondent experience (e.g., imposter syndrome, bias); these findings will include summaries of the challenges reported as well as relevant supports at the intrapersonal, interpersonal, and organizational level. Finding 9 indicates how the above challenges effect WGMI retention in tech. Finally Finding 10 provides a more detailed examination of key interpersonal supports.

Finding 1. Overall Job Satisfaction: While many respondents were satisfied in their current roles, most respondents reported at least one challenge; many of these challenges were related to gender.

Many respondents reported very positive experiences overall with their current or past employers and many others reported positive experiences with specific aspects of their job. Yet most respondents reported at least one negative aspect of their experience. Given the research focus, respondents were prompted to consider challenges related to their gender; therefore, many of the negative experiences reported were directly related to gender, such as difficulties connecting with male colleagues and instances of bias; in total 78% of respondents reported a negative or mixed experience related to gender. Select respondents were also prompted to consider challenges related to their race[1]; the experiences reported by these respondents reflected the specific challenges of Black and Hispanic WGMIs (as opposed to Black and Hispanic individuals in general). Respondents also raised other more general negative experiences, such as those related to onboarding or remote work, or those related to being early in their career. Though we delineate gender and race-based challenges throughout this report, it is possible that gender, race, and other aspects of identity play a role in many of these challenges, even if not overtly.

Finding 2. Finding Jobs: Respondents discussed challenges cold applying to jobs in the technical field as well as positive and negative experiences of gender bias; organizational supports and intrapersonal supports emerged as particularly helpful for finding jobs.

<u>Challenges</u>

Respondents described varied experiences finding employment in the technical field. Time and effort needed when cold applying was a key challenge to getting technical roles. One respondent noted they had sent out one hundred resumes and had "one percent success rate." Another noted, "I spent months and months trying to land a technical role and had no success."

Difficulty getting hired into a full-time role in the industry without prior work experience also surfaced as a challenge. For example, one respondent noted "I felt like it was something you needed to have was at least one internship. And also getting that internship would be, it would be a more easier, more linear way into

[1] Respondents were prompted to think about challenges related to race in the four race-focused homogenous focus groups; however, challenges related to race also came up naturally in other focus groups.

getting a full time role." Another respondent echoed this experience, noting that they worked as a contractor since they had not completed an internship, and was then hired into a full-time position.

Challenges: Gender

Some respondents described experiencing bias when applying for their roles. One respondent noted that she felt she had not been chosen for roles due to her gender, explaining:

> *Personally, I had a challenge looking for a job and some people tend to think that women cannot do as much as men can. Sometimes you'd see like people just putting you off, maybe for no apparent reason. You have the papers, you are confident, but people may sometimes think that they would, they would actually prioritize men more than women. I felt like I was in some interviews I was not picked basically because I was a woman.*

Another respondent working her first position in tech in a small, male-dominated company did not experience bias during the interview process, but she learned that it had been present after being onboarded. She described how they eventually shared with her that,

> *They literally had a conversation before they hired me like to say, "should we hire a woman?" Which to me was very shocking… the fact that they were just open to share that to me was already so weird, like they didn't even think that was a weird thing to do. So, I also told them like yeah, I don't think that's how you're allowed to, to hire people.*

Conversely, other respondents described how being a WGMI had helped them find roles. For example, one felt "I do think my minority status did play a role in getting my roles… it was noticeable that they didn't have as many women in my departments or maybe people my age either." Another described that, upon reflection, "in all of my work experience I have gotten the role either outright because I'm a woman or because I applied through a DEI type program." While diversity initiatives are helpful in that they get more WGMIs in tech roles, they can lead WGMIs to question their overall worth and competence (see Finding 6 on Imposter Syndrome).

Supports

The most frequently mentioned supports for finding a role were **organizational**, including prior engagement with the company, career fairs, and conferences. Being at the company previously, such as through internships or contract roles was among the most frequently mentioned approaches; roughly 30% of respondents noted this was how they were successful in finding a role. Career fairs and conferences helped respondents make contact with potential employers. The Grace Hopper conference was highlighted as particularly useful when looking for internships and jobs, as was Rewriting the Code.

Interpersonal supports, such as recruitment and referrals, were also noted as successful routes for finding roles, including through the use of social media (i.e., Twitter, LinkedIn). The use of referrals was discussed as much more successful than cold applying (though some did find a position with this approach). For example, one respondent explained, "I tell people it's like not even worth applying if you don't have a referral. I think that's kind of like my two cents on some of that. Like you're kind of sending it into a black hole."

Though there are limited data on how respondents found second or third roles in tech, two respondents noted the value of using their network for referrals. One described how:

> *The first data job I had, which was my second job, I got it through an alumni that was like posted in our alumni group, saying, hey, I'm hiring someone. So that was great cause I didn't have to apply, because I think I was applying, and it was not as successful. And then in this job, the hiring manager reached out to me on LinkedIn… I think if I was like reaching out, sending out resumes, it's a lot harder. So, I would say, these two jobs that I got were really through somebody being interested in me. I think that was really important.*

Another respondent highlighted that in getting a job at their second company, "it was referral and I feel like that was enough like in terms of the vetting process, like it wasn't even an intense like coding interview or anything." This suggests the value of building a network and community within the industry when looking for jobs.

Finding 3. Starting Jobs: Challenges with onboarding emerged from unclear or confusing processes; respondents felt more comfortable at companies with more comprehensive onboarding processes that included attention to building relationships across the organization.

Challenges

Several respondents reported challenges with onboarding after successfully finding a job in tech. These challenges primarily emerged from unclear onboarding processes. For example, one respondent described how a poorly formulated onboarding exacerbated **intrapersonal** challenges, specifically their feelings of imposter syndrome (see Finding 6) as a new employee:

> *So when I joined, I was the first new person that had joined in a while so there was no like onboarding documentation or just any resources when I started. So having to ask, always be the person that's asking questions or always confused, reaching out to people for help that is a lot of what contributed to my imposter syndrome, being like the youngest person on the team with the least amount of experience.*

Another respondent who was just starting their career described confusion around selecting benefits during the onboarding process due to being unfamiliar with terms and programs offered:

> *They're discussing things like, you know, healthcare plans and retirement plans and I'm like, I don't even know what half these terms mean. All the rest of people on the call are like in their thirties and their forties, they've already got a retirement plan… I just want to know the difference between an HSA and an FSA guys, I just want to know which one is which so I can figure out which one's best for me.*

These examples suggests that successful and positive onboarding is critical to supporting new employees in technical fields, and added education around how to evaluate and select benefits when starting a position is a potential area of needed support.

Supports

Respondents surfaced both **organizational** and **interpersonal** supports that made for a particularly successful onboarding; these included cohort programs, long onboarding periods, and attention to building relationships across the organization. Respondents from Google particularly praised the onboarding process at this company, explaining, "Google really does a great job of preparing for the job. You have six months on board and everyone on the team has been really accommodating and patient, which I really appreciate."

Another respondent at Google described how the company assigned them a near-peer buddy within their team and mentor outside of their team when onboarding, which functioned as **interpersonal** supports as they integrated into their new workplace. This respondent explained how her near-peer buddy, "helped me with a lot of onboarding stuff," and that this buddy was a supportive source of information, including around "how certain meetings work and just a lot of things that I, at the time, was not quite ready to kind of ask those kinds of questions within the bigger team meeting."

Multiple respondents named the value of cohort-based onboarding, an **organizational** support most common in larger companies. One respondent explained:

> *I entered in like what they call like the college hire program and so like they'll hold socials with all those like people like that class or like that age to like get to know each other and they're like all from different departments. So I feel like that helped with like the age gap, especially cause like the people on my team are a lot older, like in the data science group that I'm in, but just kind of having that like separate program where they like were cognizant like okay, like you guys just kind of graduated or like are like close to like the same graduation year. We're kind of going to like group you guys together in like different events.*

This example suggests that facilitating connections between new hires can not only help ease discomfort during onboarding but can help create lasting connections.

Finding 4. Upskilling: Several respondents lacked the ability to focus on upskilling, and select respondents attributed this lack of support to gender bias; supportive managers and company-provided resources gave respondents the time and support to grow their skills successfully.

Challenges

Having the time, support, and resources to develop new technical skills ("upskilling") emerged as a key need for many respondents. Several respondents noted that their companies did not provide opportunities for skill growth, such as through tuition reimbursement or paid conference attendance. Yet even when companies did offer these supports (see below), select respondents struggled to utilize them. A few respondents noted that even though they have the resources, they do not have the time to focus on learning skills:

> *The biggest challenge I would say to that is making the time to use those resources to upskill yourself and whatnot, because I feel like the workday isn't built around, hey, here's an hour for you to go ahead and do this course or here's a week for you to go attend this class, etc., etc., you really, it's dependent on you really paving the, paving out the time for yourself because you're saying hey, I'm worth it, I really want to do this so I'm going to make the time to do this.*

Select other respondents noted that even though companies had supports available for trainings, they could not use them without "manager approval;" unfortunately, several respondents reported having managers that were unwilling to support their skill growth, which many attributed to gender bias.

Challenges: Gender

A few respondents noted that their managers de-emphasized the importance or value of learning new skills with their WGMI employees. For example, this respondent received no feedback from here manager related to her technical skills:

In one of my first performance reviews the feedback was great but the feedback was you're nice, you're like fun to work with, like people like you and I turned around and was like, I got like really upset about it…my first thought was would you give that feedback to a man? This feels like not related to my skill development at all.

One respondent similarly noted that they had to fight for the opportunity to attend a training focused on leadership development, despite the relevance to her work: "This is something I kind of forced to happen but I wish the leadership training were something they were offering from the get go."

Some respondents similarly reported male colleagues that were unwilling to support skill growth. For example, one respondent shared, "I was signed up for like certain skills that I had to get trained on for my work ... I went and asked this particular scientist and he agreed to help me learn and then like the day of he just cancelled on me and he's like sorry, I'm too busy." Another respondent shared similar experiences trying to learn from her male colleagues:

I have no technical mentorship ... a lot of times if I do something wrong or say something wrong, like the men are just like, well, no, this is like, that's not how you do. It's like this and ... you can tell that there's like no opening for me to be like, "Hey, can you like teach me more about that?" Like they, they are not interested whatsoever about that stuff.

Together, these challenges meant that respondents were expected to focus on skill development "on [their] own outside of work," which, for select respondents, was not feasible. One respondent, a new mother, shared:

It sucks because it's like I want to work on something at night, and I can't, because I'm taking care of a baby and I have cried to my husband because I'm like, I just, I don't have the time that my co-workers have to learn these new technologies and I feel like I could do more if I wasn't also mom.

Supports

Respondents who described a positive experience with skill growth discussed both interpersonal and organizational supports. **Interpersonally,** managers and peers emerged as a primary support for skill growth for those individuals who had a positive experience. Select respondents described their managers supporting them in going to trainings and conferences and offering time for skill growth:

I also feel like I've had opportunities to like grow technically speaking, if I have an area I want to improve I feel comfortable sharing that with my manager and I'm sure like they would find a way to either get me to a team that I can learn that from or pay for me to go to a conference or workshop somewhere on that specific skill

Managers and team members also supported respondents in skill growth by pushing them along and being transparent in where they need to improve:

I've had good experiences with like co-workers and upper management kind of like pushing me along. If I come up with an idea they like help me if I want to see it through. Like if I need, I want to see a feature developed. They'll just be like like, oh, like you can create a team and develop it and that'll be like great exposure for you

Managers also encouraged respondents to grow in their skills by trusting them to do their work: "[my manager] has been awesome and super supportive… like design was kind of new and she was very like taking lead with me and it was really awesome. I've been learning so much on, on the job."

Several respondents reported **organizational** supports for skill growth, including time, resources, and funding**.** These included time during the work day to upskill ("they do a really good job at giving us time to learn... we get company-wide about eight hours a month to upscale but my area that I'm in gives us sixteen hours a month"), the provision of classes and licenses ("we get a lot of resources as far as licenses to like platforms to upscale"), bringing in speakers to teach skills ("they bring in, multiple times a year, they will bring in speakers from like Amazon or even I think Microsoft"), paying for conferences ("can go to conferences like once, once a year to get one to go to a weeklong conference") and keeping good documentation to learn from ("documentation is just so well maintained and ready, just for anyone to, to look at and so like for me it's really easy to find resources")

Select respondents also noted that their company provided support systems that were identity-specific and therefore provide comfortable spaces for trainings: "there are more events and like more mentoring circles and like more accelerator programs and more trainings specific to women available which I think really helps like inside the company."

Finding 5. Advancement: Several respondents reported confusion and frustration regarding asking advancing their careers, and select respondents experienced gender-based promotional biases; clear guidelines and supportive managers allowed respondents to feel more comfortable discussing advancement.

Challenges

Select respondents, particularly those who had been working for a few years, reported feeling "stagnant" in their current roles and ready to explore other, more advanced roles. Yet many of these respondents did not know what other roles in tech they might be interested in or how to pursue them. One respondent found herself questioning, "Do I want to become like, you know, like an engineering leader or do I want to be like a people leader?" She noted that she "doesn't have a lot of guidance right now" on this topic. Another respondent shared:

> *I am not like super interested in what I'm doing on my team so I'm trying to figure out ways to change up what I'm working on but it's hard to navigate that space. I feel like when your early career is like how to make changes at all it's a little scary.*

In addition to these big picture questions about their future in tech, many respondents reported challenges understanding and receiving promotions in their companies, often because of gender bias.

Challenges: Gender

Select respondents reported anxiety talking about promotions with their managers; these respondents wanted to avoid seeming like they "always talk about promotion" and "aren't actually doing anything" work-related. Unfortunately, these respondents reported that they had to initiate these conversations or promotions would not be discussed at all. For example, one respondent explained that it took them "finding another job, threatening to quit...giving my notice, sending in the resignation letter" before being able to discuss promotions.

Even when managers did talk about promotions, several respondents reported receiving vague or biased feedback. For example, one respondent noted that when she asked "what to do to be promoted," her

manager unhelpfully responded that she "just needed more people under her," even though that was something out of the respondent's control. Another respondent said her manager encouraged her to focus on non-technical role:

> *I've only been in tech a short time but there's already been comments made by my manager about me some day being a manager because I don't know. I really don't know why other than the fact that, you know, I think, I feel like women are perceived as having better soft skills or something.*

This type of feedback not only leaves WGMIs confused on how to advance into technical positions, but puts pressure on them to move into positions they may not be interested in.

Several respondents also reported challenges directly related to promotional bias, including direct preference for men in promotions and being asked to do non-promotable work, or work that helps the company but is not technical or project-related and therefore does not lead to promotions (e.g., being a meeting notetaker, making PowerPoints look pretty, participating in hiring panels, or leading ERGs to support company diversity initiatives). As an example, one respondent shared her confusing experience leading an ERG: "...[I] have been told like, hey, you know, it's good that you're involved in all these things but it's not what, you know, will get you promoted…the [ERGs] that build the culture internally are not seen as valuable." This work typically exists more in the background and was also reported, paradoxically, as making WGMIs "too valuable to promote," which keeps them stagnant in their current positions.

Several respondents observed that "promotions tend to happen mainly for men." Some respondents attributed this to the "old boys club," or the connections made in male-focused spaces, like a pick-up basketball game:

> *The relationships that were naturally formed seemed to be male/male and like we just had a PM who's more junior than any of the women on the team leapfrog all of us to be promoted to follow one of our managers onto a new, like a team lead on to a new team.*

Promotional biases were also attributed to minimization of the work done by WGMI, including the non-promotable work mentioned above:

> *It feels like sometimes the work that gets done is minimized based on who's working on it… one time this kept coming around for like promotion …some people just had like I think biases to like, yeah, like oh this person did that but like that's expected of them. If they're like a woman like me …you don't see what they're doing as like as extra.*

Supports

Many of the respondents who reported positive experiences related to advancement noted particularly supportive managers (**interpersonal**). These respondents described managers who prioritized talking about advancement ("we talk in our weekly one on ones about… more comprehensive feedback on where I'm going") and advocated for them to their superiors ("know he's advocating for me behind the scenes because promotions and raises have been like on track"). One respondent noted that "in a dream world," her manager "would guide us to know that these projects will lead you to a promotion or these projects are good for your career."

Respondents appreciated it when the processes and timelines for promotions were clear and transparent. For example, this respondent valued that her company publishes promotional guidelines so that she "can see for

[her]self okay, these are the things I still need to do to step up to that next level." At the **organizational** level, larger companies were more likely to have this level of standardization. One respondent astutely noted that having "transparent guidelines and rules" may help to offset some of the promotional and gender biases affecting WGMIs.

Other than a few examples of supportive mentors, respondents did not report existing supports for changing roles, which suggests that this is an important unmet need for early-career WGMIs in tech.

Finding 6. Imposter Syndrome: Most respondents reported feeling imposter syndrome in their tech career so far based on gender identity and representation as well as gaps in computer science knowledge/background; time and supportive interpersonal relationships helped respondents develop self-confidence.

Challenges

Half of respondents reported feelings of imposter syndrome, or doubts about themselves and their worth, at some point in their career so far. Several respondents attributed their imposter syndrome to a self-described lack of degree or specific knowledge in computer science. These respondents typically did not have a bachelor's degree in computer science and thus felt as if they did not have as much knowledge as their colleagues; this lead to feeling like they didn't deserve or could not do their job: "I just don't have a degree in this... like obviously you learn a lot by going through a bootcamp but I, I was still missing a lot of skills so I felt like there's no way like I should be here like earning this amount of money." Respondents in their first job, even those with computer science backgrounds, often felt the same way. For example, respondents sometimes felt like imposters when they noticed that they had the least experience among their colleagues, and felt like they were "always asking questions, always confused and reaching out to people for help." An added complexity for these respondents in particular is the balance between imposter syndrome and actual need for additional knowledge or skills: "I feel like I'm not a real data scientist all the time and I think I always balance between like is that imposter syndrome or is it just that there are certain skills I don't have and that's just a fact?"

Other respondents reported feeling imposter syndrome because they are not passionate about learning new technical topics: "I used to be very excited to learn all the things and do all the things and been having trouble keeping up that excitement to keep learning and I think that feeds into my imposter syndrome a lot. This is a field where you have to keep learning and so if you run out of energy to keep learning that can be hard." This lack of passion, which also emerged as a factor for WGMI retention in tech (see Finding X), was often discussed in comparisons to male colleagues.

Challenges: Gender

Respondents attributed much of their imposter syndrome to comparing themselves with others, particularly their male colleagues. For example, one respondent shared that because they are not passionate about tech like their male colleagues, they worry that they don't belong: "Do I seem like dumb because I don't talk about technical stuff all the time like in my one on ones with my manager. I prefer to talk about like life things, but I hear that my manager loves to talk about technical things with the males." Another respondent noted that she "wished [she] had the confidence" of her male peers who are "happy to give themselves credentials after such little work."

In addition, several respondents described imposter syndrome due to not seeing other women around them: "I do have moments where I have imposter syndrome and get overwhelmed and not seeing people who kinda resemble me, can feel a little bit discouraging at times." Some respondents also felt imposter syndrome due to tokenism, or feeling like they were hired because they were women or women of color. These respondents contributed them getting their job to diversity initiatives which makes them feel as if they may not be good enough for the position and were only hired because they filled a quota (see Finding 2):

> *There is this sort of stigma that some companies hire more women just to increase diversity in the company and like maybe there are like a male who are like more suited for the position… So it, it's like you never actually know whether you're good enough for the position or you were hired just because you're a woman. So then that imposter syndrome is always there.*

The result of all of these components of imposter syndrome was respondents feeling they had to prove themselves, which often meant taking on extra work: "I was once in a situation where I was doing extra...everything you put on the table for me I was doing because at the time I think I was just trying to prove myself that I'm capable." This leads to women putting extra mental pressure and stress on themselves, which could lead to low job satisfaction and burnout.

Supports

Self-confidence was the most frequently referenced **intrapersonal** support for imposter syndrome. Some respondents reported already feeling confident, or at least reported knowing how to act confidently. For example, one respondent shared how, when faced with men overreacting to her not knowing something, she decided: "I just have to be confident because I realize I could be prone to like stuttering like, oh, I could figure it out, I could do this, but I just have to be like no, I don't know." Another respondent noted that she reminds herself of her qualifications when she starts feel imposter syndrome: "it says computer science. It doesn't say female computer science. It doesn't say male computer science like, no matter what I graduated with the same degree that the guy is." Most respondents, however, reported that they were still growing in their self-confidence.

One of the most common supports for developing self-confidence was time: "I think I'm gaining more comfort and more confidence the longer I'm in the industry." One respondent noted that making mistakes and learning from them over time has been particularly helpful in gaining confidence: "the more that I'm in the position and the more I have things kind of go wrong and things to learn from I'll eventually start feeling like, okay, this is part of the process"

Interpersonal relationships also supported the development of self-confidence. For example, one respondent shared that because of a particularly supportive manager, she felt confident in her abilities: "I'm grateful that he chose me for this opportunity so I think that really, you know, helps just like my own personal confidence and really seems to believe in me, which at times I need." Select others shared that being in positions where they were asked to share their knowledge, such as during trainings or interview panels, increased feelings of confidence: "I kind of got a little bit more confidence in terms of like training other people and being able to share the knowledge that I had gained."

Having a community of WGMIs in tech, either internally or externally, also emerged as an important intrapersonal support for imposter syndrome. This was true for many respondents during undergrad ("I don't think I'd be where I am and have the level of confidence I have right now if I didn't have the community I

had while I was an undergrad") and select respondents in their early-career. One respondent shared that she did not feel like she belonged in tech because of her non-technical background, but this changed when she met someone with a similar background at a conference: "I met somebody with a very similar background to mine, a similar path to her role as I had to mine and a lot of similar experiences and I think just having met that one person following the similar trajectory helped me feel like I fit in a lot more." These examples speak to the importance of community for early-career WGMIs in tech, which can be fostered by both companies and external support organizations (see Finding 10).

Respondents highlighted several other **organizational** supports for self-confidence/imposter syndrome, including workshops, mentor programs, and women in leadership. Select respondents reported that having the time and opportunity to learn new skills (see Finding 4) helped with self-confidence: "In my company we have something we call workshops... I think it really boosts your, your work experience and your confidence." Another respondent noted that her company prioritized "that like [she] got mentors right away," which helped her "build up to a point where I felt confident." Some respondents shared similar experiences with company-sponsored mentorships programs, but these were not always feasible given the small amount of WGMIs, particularly WGMIs of color, in leadership positions. Given the role lack of diversity plays in imposter syndrome, an obvious organizational support would be to "have more women in higher up positions," but this is easier said than done. Support organizations could potentially play a role in introducing early-career WGMIs to other WGMI leaders, such as through the mentorship programs (see Finding 10).

Finding 7. Gender bias: Many respondents discussed changing their personalities to deal with gender-based assumptions and male-focused company cultures; though supports were limited, increased diversity and community-building helped respondents better cope with bias.

Challenges: Gender

Respondents reported experiencing the effects of gender bias; including dealing with gender-based assumptions, male-focused company cultures, and different treatments of male and WGMI employees. in 9 out of 14 focus groups, While these experiences did occur in companies with more equivalent gender representation, most occurred in companies or teams who lacked this diversity. Several respondents described instances in which their managers or colleagues treated WGMIs different than men, such as this manager "known to overwork everyone but especially women" or this respondent who has "received comments from [her] manager that other women on [her] team have received" but not "the males on the team."

Respondents also discussed challenges related to company preferences for - or expectations of – maleness. For example, one respondent observed that her company has "that tech Bro culture where people are just so overconfidently wrong all the time;" this respondent noted that she has "learned that you kind of have to match that energy sometimes" in order to get noticed or respected. Another example of a typically male – or at least "tech bro" – quality was not admitting when you are wrong : "Something I really worked hard on is being able to say I was wrong and that's something I bring when I make a mistake that I find my male colleagues don't do." Select respondents also noted that their colleagues had clear preferences for masculine ways of acting or dressing: "if you're effeminate in any way… you get flack that you would not get if you were a man."

In addition to dealing with preferences for male or masculine qualities, several respondents discussed challenges with female qualities others assumed they had, such as, such as the ability to make presentations "pretty" or the desire for leadership because of stronger people skills. Inherent in these assumptions is that WGMIs are not capable of performing stereotypically male tasks like leadership. One respondent described how as a female manager, she inherently receives less credibility at the start than her male colleagues: "the biggest challenge for me has been like as a PM is being able to develop trust and kind of have the respect that sort of my male product managers kind of get off the bat." Another respondent described being the first author of a paper, but her company wanting to send someone else to a conference to present because they could not believe she was first author.

To deal with these challenges, many respondents reported changing their personalities to become "someone else" by being "more aggressive", "ready to fight", and "putting their foot down". One respondent explained how different this is from their normal personality:

> *I'm generally like a very bubbly positive like person and like [their partner] would hear the difference in my tone of voice and he'd be like what happened like you actually sounded really rude and I'm like I don't know how else to, to get my point across because being my bubbly self didn't help it, it just made people think they, they could talk over me and then I, you know, I couldn't do anything.*

Another respondent shared that even though she is "super girly and fun outside of work" and "likes to wear makeup," she changes her style for the office: "when I come to the office like I don't do any of that. I like throw on my rattiest sweater and like my biggest, chunkiest glasses, because, like, I feel like that makes people take me more seriously."

WGMIs of color may struggle with changing their personalities even more than others given that they face assumptions related to their gender *and* race. For example, one Black respondent described their worry as coming across as aggressive, they felt increased pressure to change their style of talk to be indirect:

> *I get like stereotyped, like for example, like I would probably like make the same suggestion as someone else but I would probably get labeled aggressive because, I don't know, it's just like oh, like they don't expect me to say it like this … so I have to like add a bunch of filler words like 'maybe' and 'perhaps if we do this this way perhaps that would make it better'. So I have to like word things a lot differently than I would need to if I wasn't a Black woman.*

<u>Supports</u>

For WGMIs who face the effects of bias in their workplace, there were few supports noted as available. Respondents typically described more positive experiences with managers and teammates of the same gender/race, suggesting that one **organizational** support could be increasing gender and racial diversity in companies. Having more diverse employees may be particularly helpful in letting WGMIs be heard more easily. For example, one respondent shared that her WGMI manager has "that sense of like power in a conversation when you're having trouble in group settings. ...you bring them in and then your opinion is suddenly more valid and everything."

Several respondents suggested that their managers would benefit from sort of bias training to make them aware "of the biases they might have." Trainings like this could be provided by companies internally or by support organizations. Support organizations could also help connect WGMIs with like-minded individuals in tech to help them understand when bias is occurring. For example, one respondent discussed how being part of DevColor, an organization for black professionals in tech, has provided a platform to "cross check what is

normal and what isn't," particularly as it relates to conversations with managers. She role-played a conversation in which she asked, "my manager said this today, is that normal or is that not normal?" and her fellow community members responded with "no girl, that's not normal." The respondent noted that this has been particularly helpful because it's her first job, so she has not had other managers or experiences to compare to. Belonging to tech communities can also make WGMIs feel less alone (see Finding 8) which could help them better cope with experiences of bias in the workplace.

Finding 8. Isolation: Many respondents, particularly those in remote jobs or less diverse workplaces, struggled with forming connections; developing small group connections with like-minded colleagues and others in tech alleviated loneliness.

Challenges

Feelings of isolation or loneliness in the workplace were common among respondents; they were discussed without prompting in half of the focus groups conducted. These feelings resulted from a lack of company diversity (i.e. low numbers of WGMIs, racial minorities, or young people) and difficulties connecting with colleagues, either because of differences in identity or working remotely.

Respondents who worked remotely noted feeling particularly isolated ("it can be lonely with just me and my dog"), but even some of those who worked in person struggled to connect ("[the company] has all of their office buildings, every employee has their own office and their own doors so when I would go into the office I wouldn't really be talking to that many people outside of meetings.") Several respondents reported being able to successfully connect with their immediate teammates, but not with their team at large: "I never get to see people from other teams, except maybe on a Slack channel… making it harder for me to feel connected to them." This phenomenon in particular led respondents to feeling a lack of belonging to their company as a whole.

Several respondents also discussed struggling to connect with their colleagues due to differences in age: "the people on my team are definitely older than me, like in their 30's. They have kids. So it's a little bit harder for me to relate to them in that sense."

Challenges: Gender

Most respondents reported being one of the only WGMIs on their team or in their company; similarly, most Black and Hispanic respondents similarly reported being the only Black or Hispanic person or WGMI on their team/company. These respondents noted that being one of the only people of your gender or race can come with a sort of "culture shock" and can often feel lonely or uncomfortable. For some, this isolation came from not seeing others who looked like them ("it's very isolating to not really see Latina women"), which also resulted in imposter syndrome (see Finding 6). Others were made to feel isolated by the actions of others, such as when a respondent was "gawked at" when first joining her company as one of the only female and Hispanic members of the team, or when another respondent felt "singled out" during meetings when someone said "all right, guys…oh…and lady."

These feelings of isolation were exacerbated by struggles connecting with colleagues because of differences in identity. For example, several respondents reported specific difficulties connecting with their male colleagues because of a lack of common interests: "it's the tech/Fintech culture; they talk a lot about video games and

sports, neither of which I'm super into….so definitely more isolating." This difficulty was more pronounced in social environments outside of work:

> *I probably wouldn't feel comfortable, being on a one on one catch up with [my manager] at a bar but my other my other colleague will happily go on and catch up with my manager cause they're guys. I don't want to come as too forthcoming or like or like as if I'm hitting on someone or like I'm trying to use, being a woman or something like that…It's a very small concern but it is still a concern in the back of the mind. Like if you were organizing a social event after like, I don't know like a basketball event for a few after work I probably wouldn't go with just my manager because I wouldn't want to be one on one with a male lead, but if there were more female colleagues it might feel more normal.*

Not being able to connect with colleagues was not viewed as a problem for all respondents, particularly those with a strong sense of community outside of work, such as this respondent who said, "I'm not looking to be buddy buddy with everyone." But for some, this isolation and lack of connection was very difficult to deal with and made select respondents consider changing careers altogether. One respondent shared their struggles fitting in after relocating for her job:

> *After undergrad I like moved across the country and for this position that I'm in now and it was initially, I would say, pretty difficult, finding my community, especially just like kind of leaving home and my friends that I made in college and moving to a new location. I did feel a bit isolated and lonely at times and I was like wondering, did I make like the right decision, like this is a big shift from what I'm used to.*

These examples suggests that companies and support organizations should provide additional community-building supports for those struggling to fit in, such as those who are the only one of their race, gender, or age in the company, or those who are new grads or new to the area.

<u>Supports</u>

Respondents who worked at small companies were more likely to report feeling connected to their colleagues and companies. Similarly, respondents were more likely to report feeling connected to their teammates rather than their others at their company. Together, these findings suggest that it is easier to develop connections in smaller groups. For example, one respondent noted that even though they are the only non-binary individual on their team, they were able to connect with their teammates because they were the same age: "it's heavily male dominant but luckily most of us are hired like straight out of college so we are in like mid 20's to like 20's so and they actually, so they are actually my main friend group cause I hired… I appreciate that they give like a pretty good support system."

These connections may help WGMIs feel less alone socially and emotionally, such as this respondent who noted that participating in the focus group was particularly helpful because she realized that many "people are going through the same stuff" as her. Connecting with other individuals with shared characteristics and life experiences could also allow WGMIs to authentically share their challenges and be met with understanding and empathy: "it's hard [when I] talk with my friends who like weren't in tech about issues at work and I could tell they like sympathized with me but they couldn't really empathize cause they never been in a similar position."

Within companies, ERGs and, to a lesser extent, new hire cohorts, emerged as successful mechanisms for fostering small-group connections among employees. Support organizations, particularly those who hosted conferences or in-person events for early-career WGMIs, also emerged as being particularly helpful in

fostering these communities outside of the workplace. Finding 10 shares more details about how these mechanisms can foster community as well as support

Finding 9. Retention: Respondents were more willing to stay in their current roles when they had supportive managers and high salaries; interest in tech, salary, concerns over layoffs and other challenges, including difficulty raising families, emerged as primary factors for long-term retention in the tech field.

Though numerous respondents described work challenges and low job satisfaction, only a few discussed active plans to switch jobs or careers. Those that reported choosing to stay despite challenges cited two primary reasons for staying: supportive managers and satisfactory salaries and/or benefits. For example, one respondent noted that her managers were the "main reason I'm staying besides the paycheck," which speaks to the importance of understanding the qualities of a good manager (see Finding 10). Another infrequent reason that respondents reported staying in unsatisfactory roles was because of visa sponsorships.

When respondents were asked whether they planned to stay in the tech field long term, approximately one-third said yes, one-third said no, and one-third were unsure (e.g., "this question is my daily struggle!"). Of those who said yes, most reported that they would always stay in the tech field because they loved tech – "I'm a full-time tech girl" – or because they appreciated the salary and work/life balance. These respondents noted that though they may be interested in changing roles within tech, they were confident that they would not leave the field. Conversely, of those respondents who do not plan to stay in the tech field long term, the majority noted that they were not interested in tech as a field and would prefer to work more aligned with their passions. Most of these respondents were originally drawn to tech because of the salary and work/life balance but hoped to one day make enough money to follow other interests.

Of those respondents unsure of their long-term retention in tech, job security, raising a family, and challenges with bias emerged as key considerations. Several respondents noted that high job security was a priority in their future planning, and many were not sure if this could be guaranteed in tech, especially given the "volatility in working in technical roles, especially post pandemic in terms of job scarcity and layoffs." For example, one respondent noted that they would like to transition to the oil and gas industry because of the guaranteed job security. In addition to the volatility of the tech workforce in general, many respondents noted concerns about the challenges of working in tech as a WGMI specifically. Respondents were aware that many WGMIs do not stay in tech long-term: "I do think a lot of women leave tech after ten years, that's just a well-known statistic. I feel like it's not just about getting women into tech, it's about getting women to stay in tech." In addition, several respondents have experienced firsthand their WGMI role models, of which there are few, leave to start families or pursue other passions:

> *It's really difficult when I see a lot of the women that I used to look up to kind of start having families and then go on maternity leave and just decide to not come back to work. This director of engineering—that I really liked, too—was a gender minority. She also recently quit and decided to like pursue her hobby of becoming an illustrator. So I mean, I'm really happy for her personally but I think as an engineer, I'm just like, "Oh, all these really cool role models that I looked up to are all leaving. Will I end up doing the same in like 10 years?"*

Seeing these role models leave the industry, particularly to start families, reinforced many respondents' perception that it is not possible to be a woman in tech and have a family. For example, one respondent shared that it's "disheartening" to know that there are "structural and societal factors that could potentially

push [WGMIs] out of tech," particularly related to raising families. This respondent noted that they would like to stay in tech, but they are not sure if they will be able to if they decide to raise a family. Only one respondent in our sample was a mother, and she corroborated several of these concerns; she noted for example that she does not have the extra time to dedicate to work on upskilling (see Finding 4).

Concerns around the bias present in the tech field (see Finding 7) kept several respondents from being able to confidently discuss their future in the field. One respondent explained, "we all know the problems but I see very little effort from companies to fix them. I feel like in the long run, that's going to take a lot on my mental health, which I do not want to deal with." Many respondents agreed with this sentiment, though some disagreed and felt that companies have been making an effort to address these challenges. Respondents in their first jobs are not as able comment on the tech field more broadly due to their limited experience. For example, one respondent shared that "their experience has not been that bad but the stories I've heard from other people make me a bit wary and make me a bit hesitant to move forward." This suggests that perception of challenges and having to face them may play a substantial role in retention.

Together these findings provide several key insights into what **organizational** supports can (and cannot) do to support the short and long-term retention of WGMIs in tech. For example, companies should continue to make sure that salaries are competitive and that managers and supervisors are adequately trained. While support organizations like RTC cannot directly affect job security, they can help individuals find new jobs quickly if they are let go. Support organizations can also not directly affect maternity leave and family planning at specific organizations, but they could connect individuals with role models who are mothers and with other individuals in tech who are wanting to start a family.

Finding 10. Interpersonal Supports: Interpersonal relationships played a critical role in supporting respondents when facing the challenges described above.

Having either a supportive manager or a supportive mentor, friend, or colleague in tech was discussed as a support for almost every challenge surfaced in this report. Given that, this finding will focus on the qualities and characteristics of these individuals, as well as the mechanisms for cultivating these interpersonal relationships.

<u>Managers</u>

Table 2 shows the characteristics of managers that respondents mentioned as being particularly helpful.

Table 2. Characteristics of Supportive Managers

Understands challenges	*"My team is mostly male, but one of my managers is non-binary, and that's really cool…I think they really understand some of my frustrations."* *"When I have issues about the culture, the work culture…I can talk to my female managers and she will like relate and understand."*
Advocates for employees	*"He is trying to work on getting all of our salaries more evened out… I feel very comfortable that he's definitely on our side as a team and is advocating for us as opposed to being like a leader who's like really drank like the corporate Kool-*

	Aid, and is like you know, trying to just get himself promoted."
Provides technical support	*"He was wonderful…if I ever had a technical question, he would be right on a video call helping me debug."*
Cares about the "whole person"	*"he really looks out for like our mental health and like his goal is to make sure that we are not working too much.*
Understands importance of identity and the role of bias	*"I really appreciate that my manager can hold the different identities and kind of just hold space for that and just really understand like our different backgrounds and how that plays out in what we produce and how we, what we suggest or like our insights.*
Available to discuss challenges	*"He has an open-door policy, so all his workers know that if we need him, we can ping him or email him anytime and he makes time."*
Take concerns or advice seriously	*"I feel like I'm lucky to have managers who like listen to me, especially when I share concerns about how I feel about team dynamics or like when I have proposals about how things could be improved technically. I feel like my managers do listen to me and they do take me seriously."*
Promotes learning	*"Despite the pressures that come with being in a capitalist environment where it's all about getting things done quickly, he is so obsessed with me learning above everything and it's something that he tells me all the time. It's something he emphasizes, something that he shows through his actions a*

Respondents with WGMI managers or managers of color reported more positive experiences because their challenges were met with understanding and empathy. However, several respondents did have positive experiences with while, male managers, which shows that many of these qualities can be taught or trained.

Mentors

About half (52%) of respondents noted having a mentor at some point in their career post-college. Though not all respondents specified how they connected with their mentors, many discussed finding mentors in the workplace. For example, select respondents considered their managers to be their mentors, and many considered an older or more experienced colleague on their team to be their mentor. Of these workplace mentor relationships, approximately half were developed organically and half were developed formally. For example, some respondents were assigned a mentor upon joining the company, some could ask to join a mentorship program, and some were recommended a mentor by their managers. While many of these formal pairings were successful, some did not result in meaningful mentor relationships. For example, one respondent shared:

> *My company had a program you could sign up for to find like a mentor internally and I got connected to some random person and it was just like awkward, like I feel like me and her didn't really click and like a lot of the advice she gave was just stuff that I'd already read on Reddit and I was like I don't know, it's not bringing me much value.*

Select respondents participated in formal mentorship programs outside of their company and while most respondents found these helpful in undergrad, few found them helpful in their career currently. For example, one respondents discussed a negative experience with the Rewriting the Code mentorship matching program, saying they "did not make a good pair" and that their match was not an "active mentor."

This idea of being "active," represents one of the many qualities respondents appreciated in their mentors or were seeking in a mentor (see Table 3).

Table 3. Characteristics of Supportive Managers

Active or Invested	*"I've done a million and one mentorship programs and one really stuck and that just had to do with the level of investment of the mentor"*
Provides technical support	*"in such a small company, I'm the only one in my role, so I don't have people that I can relate to and talk through some of those nitty, gritty specifics that might not be appropriate for my manager"*
Discusses career growth	*"I want a mentor who can support you not just on the technical side but with the bigger picture as well."*
Helps navigate corporate world	*"How we can like move up into like, cause, you know, there's some people who want to move up in the corporate ladder and how, how can I move up in that corporate ladder? What's the space? How, like what's the etiquette of how to go, like what's the inside or like the, the unspoken word of how to go about it?*

Not all respondents reported having or wanting WGMI mentors or mentors of colors, but some noted that this could be helpful while also noting it could make finding mentors more difficult: "where am I going to find a black woman software engineer who's still in the industry, who's not super busy so they actually have time for me?" What emerged as more important for respondents was that their mentors have a similar career track to them, not only so that they could help with specific technical issues but could help navigate specific career milestones; as one respondent noted, "it would be extremely, extremely helpful and invaluable" to have a mentor with "alignment" in career track.

While organizational supports can certainly help early-career WGMIs in tech by providing formal mentorship opportunities, they could also play an instructional role in the development and maintenance of mentor relationships. Several respondents noted that, in absence of formal processes, they were uncomfortable asking someone to be their mentor: "How do you go from just casually talking to someone to being your mentor? That's a difficult process." Support organizations like RTC could perhaps offer resources for developing these relationships. Several respondents also noted that once they had a mentor, they did not always know how to best leverage them. One respondent shared that in her earliest years, she did not know what to talk about to her company-provided mentor:

> I wasn't really having a problem, I didn't have a major life decision, so I didn't really know what to talk to them about…I almost think that it would have been helpful to have templates for the kind of conversations to have"

Support organizations and companies could potentially create these templates to ensure that mentor/mentee meetings are useful and efficient (see Recommendations).

Employee Resource Groups

When WGMIs reported having a manger without some of the above qualities, many relied on employee-resource groups, or ERGS, for support and understanding. ERGs bring together employees based on some sort of shared characteristic, such as gender, race, or interests outside of the workplace, to discuss their work and engage socially. Most respondents reported having ERGs at their companies, but several noted that they existed more in theory than in practice. For example, one respondent shared that while she technically belonged to an Asian ERG, they only every sent out "Happy Lunar New Year" emails and never had meetings or events. However, many respondents did report positive experiences with ERGs, particularly those that were active. For example, one respondent shared how much she has enjoyed participating in an ERG for Hispanic employees:

> *I think I could count the number of Hispanic people on my hand and so when I got to my company I found out that they had this business resource group or employee resource groups and they like immediately, like in my first month they invited me to this like tech summit specifically for Latinos here, like in the northeast region and that was like the first time where I really felt like, Oh, my God, like this is amazing, you know. I can even speak in my native language like just like that, like comfort really that I had not experienced since when like childhood, because I was literally just not near any, you know, any people like me and so that, that really helped me*

Another respondent had a similarly positive experience with a Black ERG:

> *Yeah, we, we have ERG's but it's kind of the same and, and 100% they're very helpful. I think, for the community, the camaraderie, it's. it's incredible. It's so nice to be able to have access to all these black people who look like me and black women and people who, you know, just yeah, it's, it's really great.*

These examples illustrate how shared characteristics are the primary factor behind the success of ERGs. By seeing others like themselves, WGMIs are able to see themselves represented in the company, which could reduce imposter syndrome, connect socially, which could reduce loneliness, and talk more freely about their challenges. This also explains the success of the "new hire" cohorts discussed in Finding 3.

One characteristic – role type – was not always integrated into ERGs. For example, some large companies may have ERGs for Black women, but not all those women are in technical roles. Select respondents noted that this inhibits their ability to turn to their fellow ERG members for specific work advice: "it's unfortunate that I cannot lean on them for technical help…nobody in the community can actually help me." Given that lack of technical expertise was prevalent among managers and mentors, as well, support organizations like RTC who can bring people together based on role may be particularly helpful.

Most respondents noted that ERGs were most successful when they facilitated unstructured spaces to interact with peers socially, such as through shared meals, after-work celebrations, or attending conferences together: "being able to build connections with women and have fun opportunities is where you can get the most value…being able to candidly talk about problems, get real solutions to the issues, and form that sort of organic connection." This suggests that while there may be value in providing workshops or skill building sessions in ERGs, the social component should be emphasized so that genuine connections can form. Though the social component is more easily achieved in person, especially given "Zoom fatigue," select

respondents working remotely noted that virtual ERGs were still beneficial: during my time at my current company it has been pretty fully remote, which I think was difficult to find some belonging, but I do actually think employee resource groups were pretty helpful in like finding folks that I like felt a sense of community with."

Several respondents noted that they enjoyed being able to discuss work issues candidly with their fellow ERG members, but some respondents found this challenging, particularly when company leaders participated in meetings. For example, one respondent shared that her company has an ERG for gender minorities that "was really great at community building earlier on, when the company was still small." However, as the company grew, the "execs wanted more oversight," which meant the ERG leaders have to report back to leadership and some executives even have access to the ERG slack channel. Not surprisingly, this meant they "couldn't be as transparent and like honest with their problems and like getting advice and stuff like that." Another respondent shared similar frustrations at having her Asian ERG run by a white man in leadership.

While it is easy to recommend that all ERGs be run by a) someone who shares the characteristic represented in the ERG and b) is not in a leadership or decision-making position, this is more complicated in practice. As shown, many companies don't have enough WGMI or racial minorities to begin with. In addition, taking on the responsibilities of leading an ERG would leave WGMIs with less time for promotable work (see Finding 5) and emerged as a concern for select respondents. One respondent suggested hiring outside facilitators to run ERGs so that people could more candidly share their experiences and taking off the "added pressure of having to lead" these groups. The communities created by support organizations could also serve this purpose.

Community-building through support organizations

Support organizations such as Rewriting the Code have the ability to foster connections between early-career WGMIs in tech to create a global community of supportive peers. Almost all RTC respondents agreed that, in college, RTC facilitated a "really supportive community" and helped to "create a sense of belonging" in the tech space. These respondents in particular noted that RTC provided "a place to get insight and answer questions," facilitated new friendships, particularly at RTC conference meetups, and developed connections that led to many respondents' first jobs in tech (see Finding 2). Many respondents not involved in RTC also experienced similar benefits from other support organizations during undergrad; for example, one respondent shared how belonging to a group of other student engineers "was really helpful to kind of talk to, get advice about interviewing, and how to get into the industry. It felt like we were all trying to achieve something together and giving each other advice and so that was really helpful."

However, now in their early-to-mid stages of their careers, most respondents agreed that support organizations, including RTC, are less helpful in facilitating a community of peers in tech: "Rewriting the Code hasn't really been helpful in that sense of giving me that camaraderie with early career people so I would say maybe that's one thing I would change is I wish there was more programming and more events…catered to early career folks like there were for, for undergrad." Respondent particularly reported wanting support organizations to facilitate communities of individuals with shared characteristics, especially role type.

The majority of respondents noted that they would prefer in-person events for community-building, noting that being in-person can "feel more comfortable and natural," can better allow for "offside conversations," and allows them to get off their laptops. Respondents who reported positive community-building experiences with other early-career WGMIs noted that most of their interactions were in-person. One respondent

exuberantly discussed RTC events she has attended in NYC, including museum outings and self-sponsored dinners; she noted that the "in-person events were more valuable [than virtual offerings] and more personable, so it is easier to keep in touch with people." This quote suggests that in-person events can better support long-lasting community connections better than virtual events; it also suggests that RTC's in-person events for early career women have been particularly successful. Another respondent noted that their friend, an RTC member in Seattle, also enjoyed her in-person experiences and that she wished she lived somewhere where she could experience them, too.

While respondents preferred in-person events, many did also note that sometimes virtual events are easier. Select respondents noted that they prefer virtual events, particularly for those with other time-consuming responsibilities like, for instance, childcare. This suggests that support organizations should continue to offer virtual events, yet perhaps expect low turnout.

Another mechanism for early-career community-building is conferences. The RTC leadership team is currently considering offering a conference for early-career WGMIs. Without knowing this, one respondent noted that "if there was an in-person RTC conference like once a year [they] would definitely go" so that they could "meet people and learn technical and non-technical skills." Several respondents reported positive experiences at conferences, including Grace Hopper (more helpful in undergrad), the Society of Women Engineers conference, the Society of Hispanic Professional Engineers, AfroTech, and several role or industry-specific conferences. Given the preference for and benefit of in-person interactions, conferences that deliberately facilitate connections were preferred. A few respondents noted that when conferences are too big, it can be hard to make genuine connections.

One factor that may inhibit conference attendance is funding. Though many respondents reported that they could use company funds for conferences, not all respondents have these opportunities. One respondent explained that receiving funding and time off for conferences depends solely on their individual manager. They explained that within the same company, they were funded to attend Grace Hopper whereas someone with a different manager was not. Some respondents also noted that conferences like Grace Hopper offer scholarships for attendance, but that they are typically for undergraduates. Given this, to ensure a robust and equitable attendance, RTC may need to consider funding.

One mechanism for early-career community-building most respondents agreed was not helpful in its current state was Slack, specifically the RTC Slack channel. Most RTC respondents noted that they did not look at the Slack, noting that it "feels like so much effort." These respondents were honest in saying that, regardless of any changes that would be made to Slack, they were simply not interested in using it beyond "checking it a few times a year." Yet select respondents were interested in finding a way to use Slack more effectively. For example, one respondent noted that it would be interesting to have different channels for different interests, like "single parents" and "food lovers," and other respondent noted that they wished they could post anonymously for advice about troubling issues. Only one respondent noted a positive experience with Slack for community-building. They shared that they were curious about learning more about ADHD symptoms in women, so they reached out on the RTC slack and have now "been talking with some people that have responded" and that it has given her "the validation that I needed." This suggests that slack could be helpful for community-building, specifically for connecting people with similar interests or characteristics, but will likely not be the primary tool for community-building within RTC.

RECOMMENDATIONS

Below we provide select recommendations based on our analysis; given the unique position of RTC to consult and advise tech companies, we have organized programmatic recommendations into two categories: those clearly relevant to companies and those clearly relevant to RTC. We also include recommendations to inform ongoing research and evaluation efforts.

Recommendations

For companies

- **Clearly document the timeline in which an individual can expect promotions** throughout their career at the company, accompanied by specific skills or competencies required to receive each promotion; consider how all work, even that typically considered "non-promotable" can relate to an individual's advancement.
- **Develop clear and thorough onboarding processes for new hires**; consider onboarding new hires together in a cohort to reduce imposter syndrome and facilitate connections.
- **Designate time for employees to focus on "upskilling;"** also consider providing paid opportunities for "upskilling;" such as through courses, guest speakers, and conference attendance.
- **Provide trainings to managers on how to identify and avoid gender and racial bias on their teams.**
- For companies who have ERGS, **support ERGs by ensuring that they are active, that they are a safe space to share concerns, and that ERGs leaders are recognized for the time they spend facilitating these spaces.** For companies who do not have ERGs, consider **encouraging or funding individuals to participate in identity-based support organizations or conferences to facilitate connections.**
- **Develop formal mentorship pairing processes** that, when feasible, prioritize similarities in identity, technical skills, and career track. For those individuals who are questioning what career path to follow, find mentors who can specifically focus on the pros and cons of multiple paths. Be sure that potential mentors understand the time commitment necessary to be of service.

For RTC

- **Consider creating a career growth "blueprint" or "map"** that illustrates key career milestones and when they should be achieved; this map should, when relevant, be tailored to specific roles. Included in this could be a list of questions/topics to discuss with a manager or mentor at each stage in an individual's career.
- **Continue to provide in-person and virtual opportunities for early-career WGMIs to connect with others,** particularly those with similar interests, career tracks, or identities. While some of these opportunities could be more structured and skill based (for example, a presentation on how imposter syndrome is normal), some should be more free-form to foster connections organically.

For Evaluation to Further Inform RTC

- **Refine the early-career WGMI survey** to include questions that still remain from this report, such as: how respondents find second and third jobs, the different career pathways RTC members are interested in, etc.
- Once early-career specific activities or programs have been developed, **consider evaluating the experience and outcomes of those programs for participants.**