Annual Report on the Federal Workforce

US Equal Employment Opportunity Commission

Special Topic: Women in STEM

Office of Federal Operations

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Executive Summary

As a supplement to the U.S. Equal Employment Opportunity's (EEOC) Annual Report on the Federal Workforce Fiscal Year 2019, EEOC's Office of Federal Operations (OFO) presents this report of its research on the participation and experiences of women who work in Science, Technology, Engineering, and Mathematics (STEM) within the federal government. Although there has been a great deal of focus on women in STEM in the private sector, little has been reported on the diversity and experiences of women working in STEM in the federal sector.

As such, we offer this report as an examination of this population. To produce this report, the EEOC focused on the occupational job series identified by the United States Office of Personnel Management (OPM) as STEM occupations. The EEOC gathered and analyzed information from numerous federal sources, including: (1) OPM's Enterprise Human Resources Integration (EHRI) data; (2) EEOC Form 462 (EEO complaint) data; and (3) select OPM Federal Employee Viewpoint Survey (FEVS) responses. The EEOC combined the data to form several datasets, which we then analyzed to learn about these employees, focusing on the following metrics: Demographic composition by race, age, national origin, sex and disability; representation in leadership positions; employee viewpoints; thoughts about leaving their current agency; and the general nature of the complaints filed with the EEOC. In formulating our findings, we generally compared the women in STEM to their male colleagues. These findings appear below.

Findings

- Overall, women accounted for 29.3 percent of STEM federal workers. Science occupations had the most (49,546), while math occupations in the federal sector had the fewest number of women (6,469). There were significantly fewer women in Technology and Engineering than expected.
- The overall average age of women in STEM occupations in the federal sector was 45.5 years, compared to an average age of 47.4 years for men.
- Most of the women working in STEM in the federal sector were White (66.02 percent). By comparison, 14.58 percent were African American or Black, 9.76 percent Asian, 6.42 percent Hispanic or Latina, 0.97 percent American Indian/Alaska Native, and 0.28 percent Hawaiian or Pacific Islander. In addition, 1.98 percent indicated they were more than one race.
- Approximately 10.7 percent of women working in STEM were individuals with disabilities and 1.2 percent of those women had a targeted disability.[1]
- The largest percentage of women working in entry-level STEM occupations were working in Science occupations. Similarly, the largest percentage of experienced women, which includes Grades 8 through 12, worked in Science occupations.

[1] A targeted disability is a type of disability deemed to potentially have a profoundly limiting impact on an individual's opportunity to gain meaningful employment.

- For senior professionals (Grades 13 through 15), the largest percentage of women in STEM were in Science occupations; in contrast, the male senior professionals were evenly split between Science and Engineering.
- There was a total of 16,454 women in leadership roles compared to 47,167 men; only 25.9 percent of all STEM leaders were women.
- In FY 2019, 34,483 women were counseled and 14,096 female federal employees filed formal complaints, which is important to understanding the experience of women in STEM work environments.
- Despite the belief that sexual harassment is the foremost type of discrimination raised by women, generalized harassment was actually a larger issue in FY 2019—with 1,986 complaints filed, compared to 358 complaints for sexual harassment.
- There was a strong relationship between women's intentions to leave their current agencies and complaint activity; the more sex-related complaint activity, the more likely women were to state an intention to leave.
- Women's belief that their supervisors were committed to a diverse workforce was significantly correlated with fewer numbers of individuals receiving counseling and to fewer formal complainants.
- There was no apparent impact of the level of representation of women in STEM occupations at a given agency and the number of individuals counseled or number of formal complainants filed.
- After taking pay into account, women were about 40 percent less likely to work in Engineering, 33 percent more likely to work in Math, and nearly 92 percent more likely to work in Science than in Technology jobs.

This report presents an important examination of women working in STEM occupations within the federal government. This report is intended to assist federal agencies' continuing efforts to make the federal government a model EEO employer.

Introduction

The U.S. Equal Employment Opportunity's (EEOC) is responsible for providing guidance to federal agencies on all aspects of the federal government's equal opportunity program and assisting agencies in their efforts to become model EEO employers. In keeping with this responsibility, the EEOC researches and issues reports on various topics of interest to the federal sector community. Such reports may focus on a single agency or topic or may encompass a governmentwide trend or issue. As a supplement to the EEOC's Annual Report on the Federal Workforce Fiscal Year 2019, EEOC's Office of Federal Operations (OFO) presents this report of its research on the participation and experiences of women who work in STEM within the federal government. Although there has been a great deal of focus on women in STEM in the private sector, little has been reported on the diversity and experiences of women working in Science, Technology, Engineering, and Mathematics (STEM) in the federal sector. As such, we offer this report as an examination of this population.

Part I of this report provides the rationale and a review of the relevant recent literature. Part II sets forth the EEOC's research objectives and methodology. Part III presents Women in STEM federal employee demographic data by age, sex/gender, race, national origin, disability, and leadership diversity. Part IV provides comprehensive data and analysis on complaint activity and its relationship to the experiences of women working in the federal government. Part V presents data on pay and the relationship between pay, gender, and STEM occupational group membership. Part VI sets forth recommendations and is followed by a Conclusion.

I. Research Context

For many years, the STEM workforce in the United States has been predominately male, and overwhelmingly White and Asian. Though their numbers have been growing in recent decades, women make up only 26 percent of employed scientists, with minority women representing only 11 percent of that total (National Academy of Sciences, National Academy of Engineering; Institute of Medicine, 2011). There are especially broad gender gaps in some of the fastest growing and highest paid industries, such as computer science and engineering (AAAW, 2020). Given the need for creative responses to modern day trends such as terrorism, pandemics, climate change, and an increasingly diverse U.S. population, it is imperative that both the federal government and the private sector diversify their STEM workforces to respond effectively to problems both at home and abroad.

The pipeline into STEM careers begins to leak as early as high school and college. Despite a reversal in the gender gap in terms of undergraduate enrollment, women still enroll in STEM majors at lower rates than their male counterparts (Legewie & Diprete, 2014; Riegle-Crumb, King, Grodsky, & Muller, 2012). Women are also less likely to pursue

postgraduate degrees in STEM fields, and less likely than their male counterparts to work in STEM after graduating – male college graduates are more than twice as likely to work in STEM fields after receiving their degree as female college graduates (Lim, Haddad, Butler, & Giglio, 2013; Strayhorn, DeVita, & Blakewood, 2012). Researchers point to students' concerns regarding work-life balance, gender bias and sexual harassment within their programs, and a limited pool of female role models and mentors at the academic level as culprits (Tan-Wilson & Stamp, 2015; Leaper & Starr, 2018; Strayhorn, DeVita, & Blakewood, 2012).

There is also a significant racial disparity in the STEM education pipeline, though part of this is due to gaps in educational attainment that are not necessarily STEM-specific (Lim, Haddad, Butler, & Giglio, 2013). Students from minority ethnic groups are less likely to have access to high school math and science courses that allow them to build the skills necessary for STEM degrees. As with women, both racial stereotypes and a lack of diversity in mentorship are cited as obstacles for students of color studying STEM (Grandy, 1998; Strayhorn, DeVita, & Blakewood, 2012). Though nearly two-thirds of students who initially major in STEM have not dropped that major three years later, the percentage of Black and Hispanic students who graduate with a STEM degree is far lower than the number who showed interest in STEM fields upon entering university (Anderson & Kim, 2006).

Even graduating with a STEM degree does not necessarily translate into a STEM career. A longitudinal study comparing the trajectories of women in STEM-related occupations to other professional occupations found that women in STEM were significantly more likely to leave the STEM field than other professional women, even as neither group exited the labor force (Glass, Sassler, Levitte, & Michelmore, 2013). The reasons women leave STEM professions are myriad. As work-life balance becomes a top priority for many people entering the workforce, both men and women believe STEM to be less family-friendly fields than other potential career options; women, more so than men, worry that careers in science will prevent them from having a family (Mason, Goulden, & Frasch, 2009, Tan-Wilson & Stamp, 2017). In a study of physics and chemistry doctoral students, women were more likely than men to make choices in order to meet familial obligations that would compromise their careers (Wyss & Tai, 2010).

Work-life balance is not the only reason for the gap, however. A survey done by the Pew Research Center in 2017 found that half (50 percent) of women in STEM jobs say that they have been discriminated against at work because of their gender, compared to 41 percent of women in non-STEM fields, and 19 percent of men in STEM fields (Funk & Parker, 2020). Women in STEM experience sexist comments, a lack of trust in their experience or skills, and the feeling of being "outsiders" in a male domain. A significant number of women in STEM careers report being subjected to sexual harassment within their workplace; sexist comments have been found to have a negative effect on women's motivation to remain in the field (Leaper & Starr, 2018; Aycock et al., 2019; Burke, 2017). In addition to gender discrimination, women of color also report instances

of racial discrimination and racist remarks in their workplaces (Burke, 2017; Funk & Parker, 2020).

Finally, while the gender wage gap is a problem across industries, it is particularly pronounced in STEM occupations, both in the public and private sectors. Early in their careers, female STEM graduates earn less than their male counterparts, a gap that only widens as women experience additional earning penalties upon having children – penalties that male workers do not (Xu, 2016; Lim, 2016). In a 2017 Pew Research Center survey on men and women in STEM, 29 percent of women found themselves earning less than a man for doing the same job. Women, especially women of color, are also more likely to be overlooked for promotions and other opportunities for advancement (Funk & Parker, 2020). Such discrimination also varies based on the type of STEM field. In the public sector, men were more likely to be paid more than women – even at the same pay grade, and with the same individual characteristics, when employed in the science fields that are perceived as "masculine" (such as physical sciences and engineering), (Smith-Doerr, Alegria, Fealing, Fitzpatrick, & Tomaskovic-Devey, 2019).

From their initial experiences in the workforce, women in STEM face a long list of limiting factors that can prevent them from pursuing a STEM career, continuing in the field, or advancing to high-level STEM positions. As the United States attempts to diversify its STEM workforce from its historically White and male roots, it is imperative to research, understand, and mitigate these biases.

II. Research Objectives

The goal of this report is to provide useful information to federal EEO Directors, Chief Human Capital Officers, and Chief Information Officers, on women working in STEM within the federal government, and to facilitate mission readiness and the delivery of services that are dependent upon advancement in STEM applications. Accordingly, this research report addresses several important questions:

1. What is the demographic makeup of the women and men within the federal STEM workforce?
2. What are specific demographics of the women and men within each STEM occupational category (i.e., in Science, in Technology, in Engineering, and in Mathematics)?
3. What is the expected participation of women within each STEM category?
4. Is there a relationship between EEO complaint activity and gender composition within agencies that have predominately male STEM workforces reporting more gender/sex-related complaints?
5. For women working in STEM within the federal government, is there a relationship between employee perceptions, as measured by the FEVS, and sex/gender-related complaints?
6. For men and women, what is the average pay by STEM occupational category?

7. Do gender and pay predict an employee's STEM category?

Data and Methodology

To better understand the population of women working in STEM, we analyzed FY 2019 data from the following sources:

- Office of Personnel Management (OPM Enterprise) Human Resources Integration (EHRI) data (December 2018 Status Data);
- EEOC Form 462 EEO complaint data; and
- Select OPM Federal Employee Viewpoint Survey (FEVS) responses.

An effort was made to gather data on all federal agencies from the sources listed above. We did not have data on Women in STEM contractors working in federal agencies. Some agency data was unavailable (e.g., FEVS data was not available for all federal agencies).

We combined the data obtained to form several different datasets, which were analyzed to answer specific research questions. For example, the EEOC complaint data and OPM EHRI data were combined to examine potential relationships between complaints and the relative representation of women in STEM occupations. Likewise, FEVS data was combined with complaint data to analyze the potential relationship between specific EEO-related viewpoint questions and complaint data.

Not all data could be combined to research all questions of interest, as not all the data sources contained the same identifiers required to combine the data. For example, the FEVS data was reported at the agency level and not the individual employee level; thus, it is not possible to combine that data on a one-to-one basis with EHRI data, which is individual level data. Furthermore, EEOC complaint data does not include occupation; thus, it is not possible to report the number of EEO complaints that are specific to Federal Women in STEM employees. Also, as noted above, this report examines only full-time, permanent federal employees in OPM classifications identified as STEM occupations; the list of STEM occupations was obtained from FedScope and may be reviewed there.[2]

III. Federal Women in STEM Workforce Demographics

OPM EHRI data for STEM occupations was analyzed in order to discover important information concerning the demographics of the overall federal STEM workforce.

[2] The list of occupations was obtained from https://www.fedscope.opm.gov. FedScope is a public data warehouse for federal employment data. The data that EEOC receives from OPM is similar to that provided via FedScope.

Demographic Overview

Before delving into specific demographic characteristics of women in STEM occupations, it is necessary to understand the basic participation of women in STEM occupations, relative to men. Table 1 below provides the overall STEM demographics for women in STEM occupational groups.

Table 1: STEM Job Category by Gender

STEM Job Category	Male/Man	Female/Woman	Total
Science	**70,568**	**49,546**	**120,114**
Percent	21.04%	14.77%	35.81%
Row Percent	58.75%	41.25%	
Column Percent	29.75%	50.43%	
Technology	**63,599**	**23,378**	**86,977**
Percent	18.96%	6.97%	25.93%
Row Percent	73.12%	26.88%	
Column Percent	26.82%	23.79%	
Engineering	**89,447**	**18,855**	**108,302**
Percent	26.67%	5.62%	32.29%
Row Percent	82.59%	17.41%	
Column Percent	37.72%	19.19%	
Math	**13,550**	**6,469**	**20,019**
Percent	4.04%	1.93%	5.97%
Row Percent	67.69%	32.31%	
Column Percent	5.71%	6.58%	
Total	**237,164**	**98,248**	**335,412**
	70.71%	29.29%	100.00%

Math has the fewest number of women (n=6,469), while Science has the most (n=49,546).

Demographic Characteristics of Women in Federal STEM Occupations

When examining the overall participation of women in STEM occupations, it is important to understand the specific demographic composition of the women STEM occupational group.

Age

The overall average age of women in STEM occupations is 45.5 years compared to the average age of 47.4 years for men. Figure 1 below demonstrates that women in STEM occupations are, on average, younger than their male counterparts. Women in engineering are the youngest (x=42.68 years), while women in Technology (x=49.74 years) are the oldest.

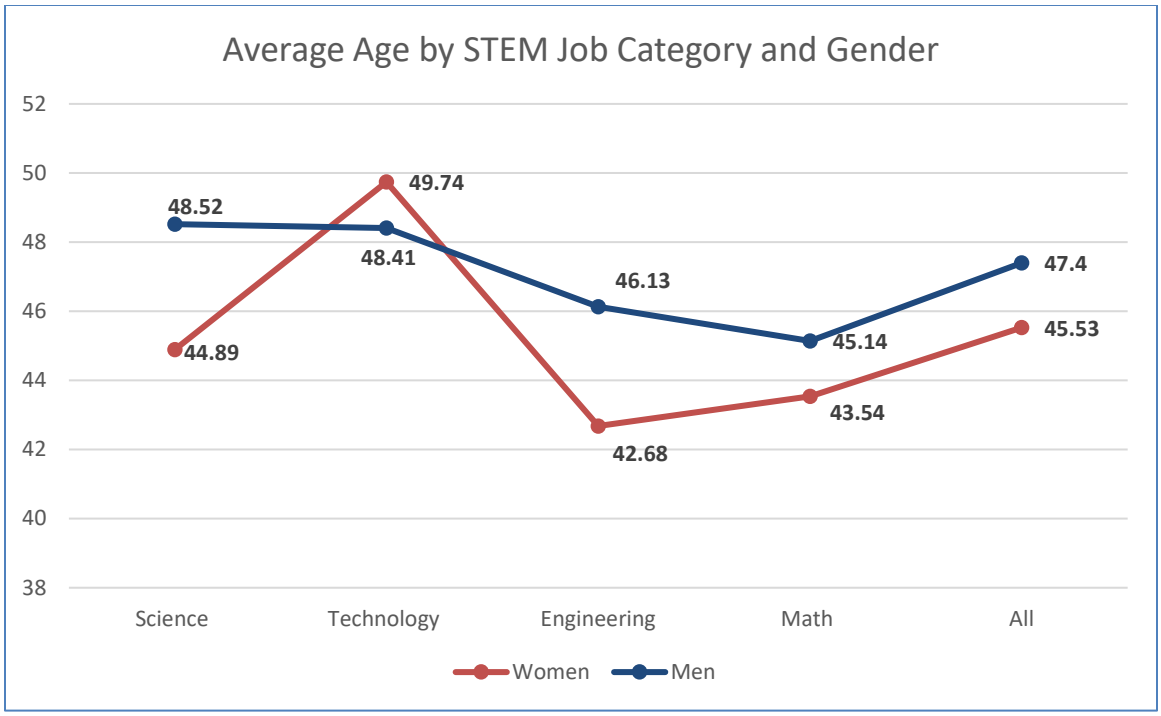

Figure 1: Average Age by STEM Job Category and Gender

Table 2 below provides the average age of women in the different STEM occupational groups.

Race and National Origin

Table 2: Race and National Origin for Women in STEM

Race/National Origin	Women	Men	Total	% Women
African American/Black	14,066	19,256	33,322	42.2%
American Indian/Alaska Native	932	1,856	2,788	33.4%
Asian	9,423	19,926	29,349	32.1%
Hawaiian/Pacific Islander	268	697	965	27.8%
White	63,710	169,030	232,740	27.4%
More than one race	1,910	3,956	5,866	32.6%
Hispanic/Latinx	6,198	14,139	20,337	30.5%
Total	**96,507**	**228,860**	**325,367**	29.7%

Women in STEM have diverse racial and ethnic backgrounds, however, most of the women working in STEM are White (66.02 percent). Comparatively, there were: 14.58 percent African American/Black, 0.97 percent American Indian/Alaska Native, 9.76 percent Asian, and 0.28 percent Hawaiian/Pacific Islander women. There were 1.98

percent who indicated they were more than one race, while there were 6.42 percent STEM employees who identified as Hispanic/Latina.

Disability

Approximately 10.7 percent of women working in STEM are persons with disabilities (PWD), in comparison to 12.8 percent of men with disabilities. Furthermore, only 1.2 percent of women working in STEM have a targeted disability (PWTD)[3], compared to 1.5 percent of men. These percentages do not meet the federal goals of 12 and 2 percent for hiring PWD and PWTD, respectively.[4]

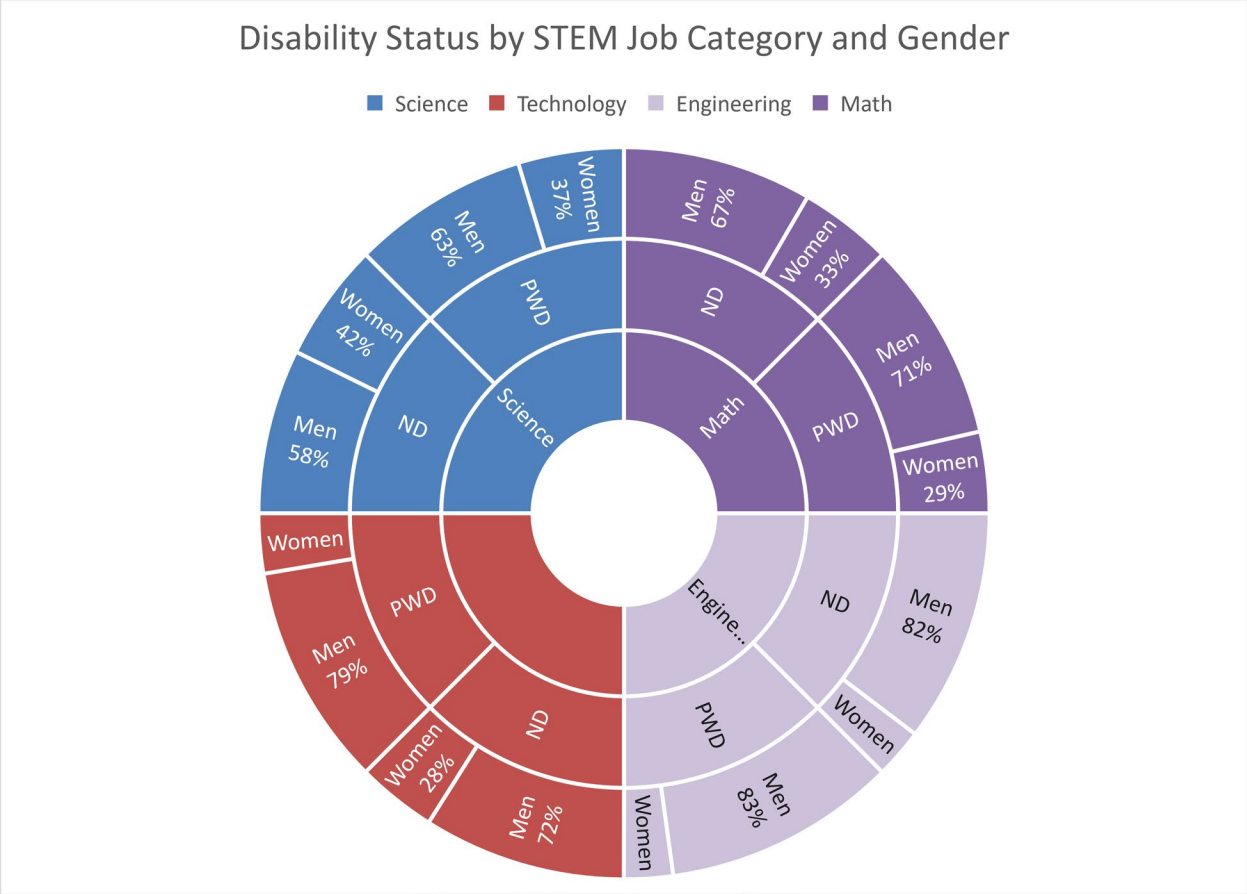

Figure 2: Disability Status by STEM Job Category and Gender

[3] A targeted disability is a type of disability deemed to potentially have a profoundly limiting impact on an individual's opportunity to gain meaningful employment. For specific examples of targeted disabilities, see OPM Standard Form 256 at: https://www.opm.gov/forms/pdf_fill/sf256.pdf.

[4] EEOC's Final Rule on Affirmative Action for People with Disabilities in Federal Employment established participation goals. https://www.eeoc.gov/laws/guidance/questions-answers-eeocs-final-rule-affirmative-action-people-disabilities-Federal

Figure 2 depicts disability status (PWD or Non-Disabled/ND) by STEM occupational group. The largest number of women STEM employees is in Science occupations, which includes the largest number of women with disabilities.

Within Science, Technology, Engineering, and Math, women with disabilities represent 9.7, 14.2, 8.9, and 10.6 percent, respectively.

Table 3 below presents the complete participation of persons with disabilities in STEM occupations.

Table 3: Women with Disabilities Working in STEM Occupations

Gender by Disability Status	Science	Technology	Engineering	Math	All
Total Persons with Disabilities (PWD)	**12,767**	**15,501**	**9,664**	**2,379**	**40,311**
Men with Disabilities	7,992	12,219	7,995	1,695	29,901
Women with Disabilities	4,775	3,282	1,669	684	10,410
Total Persons with Targeted Disabilities (PWTD)	*1,594*	*1,896*	*949*	*314*	*4,753*
Men with Targeted Disabilities	*1,051*	*1,500*	*798*	*219*	*3,568*
Women with Targeted Disabilities	*543*	*396*	*151*	*95*	*1,185*
Total Non-Disabled (ND)	**105,962**	**70,242**	**97,334**	**17,434**	**290,972**
Men with No Disability	61,663	50,439	80,290	11,686	204,078
Women with No Disability	44,299	19,803	17,044	5,748	86,894
All STEM Employees	**118,729**	**85,743**	**106,998**	**19,813**	**331,283**

More women with disabilities are needed within Science, Engineering, and Math occupations, since only the participation of women with disabilities in Technology met the 12 percent goal threshold for the federal workforce. None of the occupations met the 2 percent goal.

Experience and Leadership

Beyond the traditional demographic descriptors, it is important to understand both the experience level of women working in STEM and their representation in leadership roles. There are very few women in entry-level (Grades 1 through 7) jobs; the largest number of entry-level women are working in Science occupations. This is also true for experienced women, which includes Grades 8 through 12.

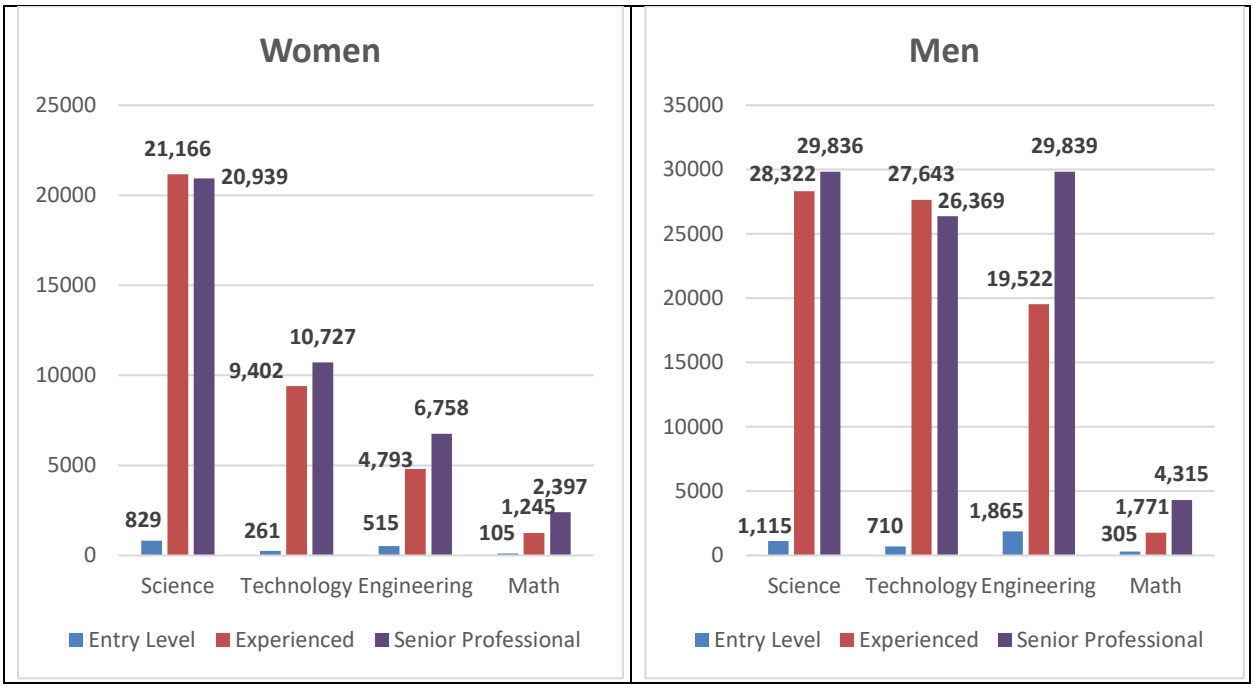

Figure 3: STEM Experience Level by Gender

For senior professionals (Grades 13 through 15), as shown in Figure 3 above, the largest number of women in STEM are in Science occupations; in contrast, the male senior professionals in STEM are most likely to be in Science and Engineering, closely followed by Technology. Figure 4 below shows that most leaders in STEM are men.

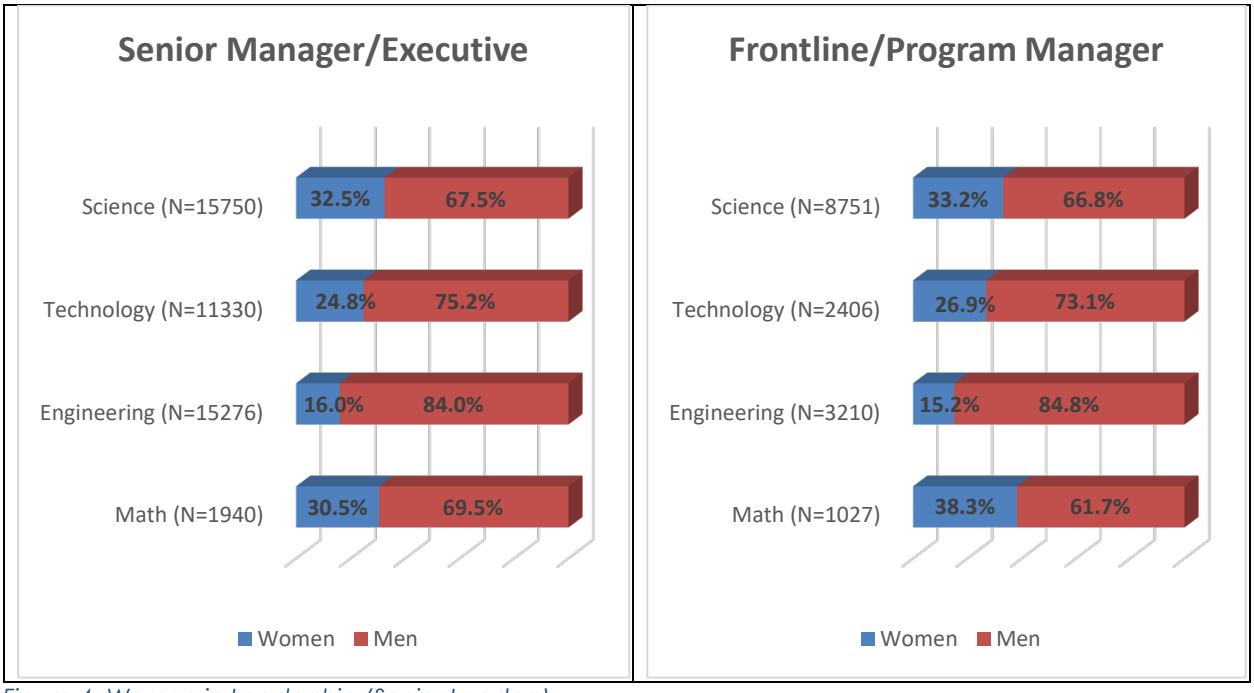

Figure 4: Women in Leadership (Senior Leaders)

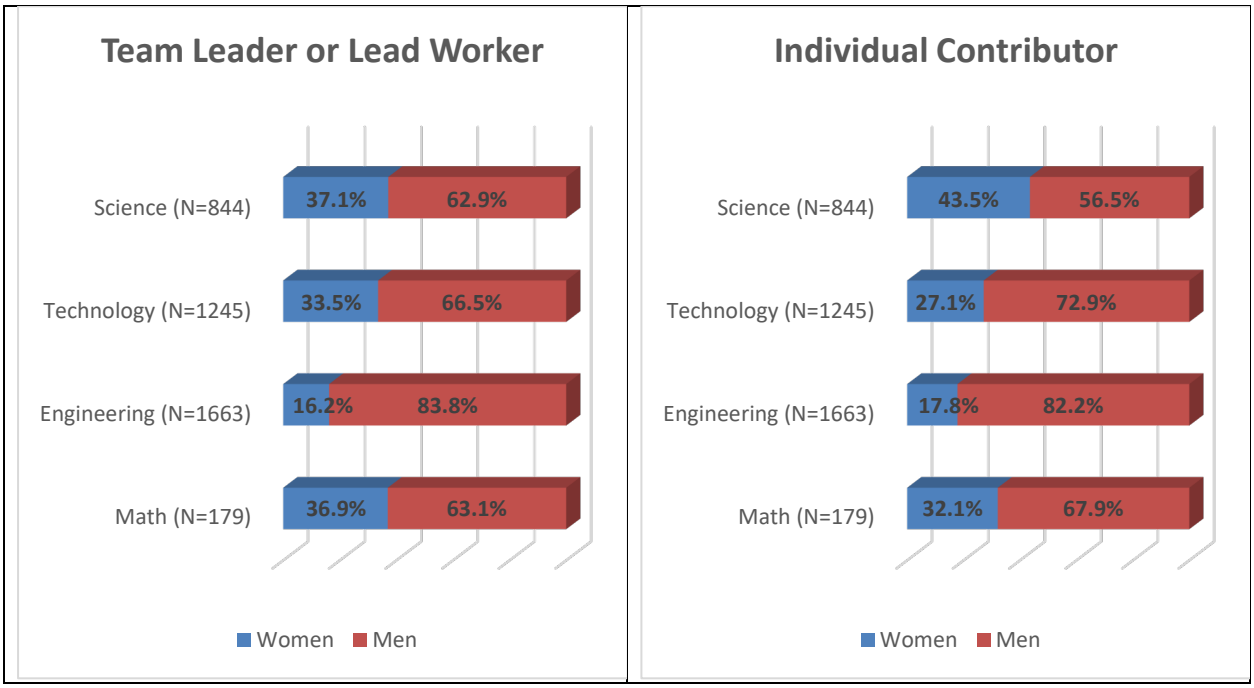

Figure 5: Women in Initial Leadership Roles

Figures 4 and 5 above indicate that there was a total of 16,454 women in leadership roles compared to 47,167 men; only 25.9 percent of all STEM leaders are women.

Expected Representation of Women in STEM Occupational Groups

In addition to understanding where women are currently working, it is important to understand where there should be greater female representation. Thus, we analyzed the expected participation of women in specific categories based upon their overall numbers in STEM occupations; the results are presented in Table 3 below.

Table 4: Expected Representation for Women in STEM Job Categories

Science			**Engineering**		
Women	49,546	**Women Expected 35,183**	Women	18,855	**Women Expected 31,724**
Men	70,568		Men	89,447	
Technology			**Mathematics**		
Women	23,378	**Women Expected 25,477**	Women	6,469	**Women Expected 5,863.9**
Men	63,599		Men	13,550	

The difference between the actual number of women and their expected participation rates was significant ($\chi 2$ (3, N=335412) = 16007.3164, p<.0001). There were significantly fewer women in Technology and Engineering than expected.

IV. Complaint Activity and Employee Viewpoints

Women may face discrimination and harassment in many forms. This report focuses on complaints related to sex, such as sexual harassment and pregnancy discrimination.

Sex-Based Complaints by Federal Employees

EEOC annually collects a variety of data from federal agencies on sex-related female complaint activity. [5] Key data concerning the number of counselings, formal complaints, bases, and issues for women-centered discrimination and harassment is presented in the following tables.

In FY 2019, there were 34,483 female federal employees counseled for EEO related matters. As table 5 shows, less than half (or 14,096) of those women decided to file formal complaints.

Table 5: Sex-Related Complaint Activity for Women in FY 2019

Female Complaint Activity	Total	Average Per Agency
Counselings Initiated	36,550	393.0
Individuals Counseled	34,483	370.8
Complaints Filed	14,637	157.4
Complainants	14,096	151.6

The vast majority of sex-related bases in EEO complaints stemmed from perceived violations of Title VII of the 1964 Civil Rights Act, as amended (table 6). By comparison, the other two clearly female-related bases—the Equal Pay Act (EPA) and the Pregnancy Discrimination Act (PDA)—had a relatively small number of complaints filed by women.

Table 6: Sex-Related Bases for FY 2019 Female Complaint Activity

Sex-Related Bases	Total	Average Per Agency
Title VII (Sex/Gender)	3,534	38.0
Pregnancy Discrimination Act	131	1.4
Equal Pay Act	34	0.4

The number of formal complaints filed for sex-related issues is presented in Table 7 below. Complaints based on promotion were included due to the previously presented

[5] As describe in the Methodology section of this report, EEOC does not collect complaint data by occupation.

analysis that shows underrepresentation of women in leadership roles within STEM occupations.

Table 7: Sex-Related Issues in FY 2019 Female Complaint Activity

Sex-Related Issues	Total	Average Per Agency
Total Harassment	2,344	25.2
• **Generalized Harassment**	1,986	21.4
• **Sexual Harassment**	358	3.8
• **Pregnancy Harassment**	60	0.6
Promotion	465	5.0

While sexual harassment is often perceived as the most common issue women face in the workplace, the data shows that generalized harassment was actually a larger issue in FY 2019. In total, female federal employees filed 1,986 complaints due to generalized harassment, compared to 358 complaints for sexual harassment. In addition, promotion was an issue in 465 complaints.

Women's Viewpoints on Federal Employment

In FY 2019, 227,506 women completed the Federal Employee Viewpoint Survey (FEVS). The FEVS data deemed most relevant to the goals of this report relate to employment practices and the employee viewpoints related to work environment, including promotional opportunities and job satisfaction. Although data for STEM occupations alone was not available, the FY2019 FEVS data—which includes all occupations for female federal employees—is instructive.

For example, about a third of these women (72,783) indicated that they intended to leave their current employer, either for another federal agency, the private sector, or for another unspecified reason (such as retirement).

The following FEVS questions may provide insights into the reasons why women choose to leave their current employer:

17. I can disclose a suspected violation of any law, rule or regulation w/o fear of reprisal.
20. The people I work with cooperate to get the job done.
22. Promotions in my work unit are based on merit.
38. Prohibited Personnel Practices are not tolerated.
45. My supervisor is committed to a workforce representative of all segments of society.
49. My supervisor treats me with respect.
55. Supervisors leaders work well with employees of different backgrounds.

69. Considering everything, how satisfied are you with your job?
70. Considering everything, how satisfied are you with your pay?
71. Considering everything, how satisfied are you with your organization?

Figure 6 below shows these data using ratings from 0 to 5. On average, female federal employees felt that merit-based promotions were an issue, giving it the lowest score (3.0) out of all the EEO-related FEVS questions. Satisfaction with pay and with the organization also got relatively low scores of 3.6 each. In contrast, women gave the highest score (4.2) to the question about supervisors treating them with respect.

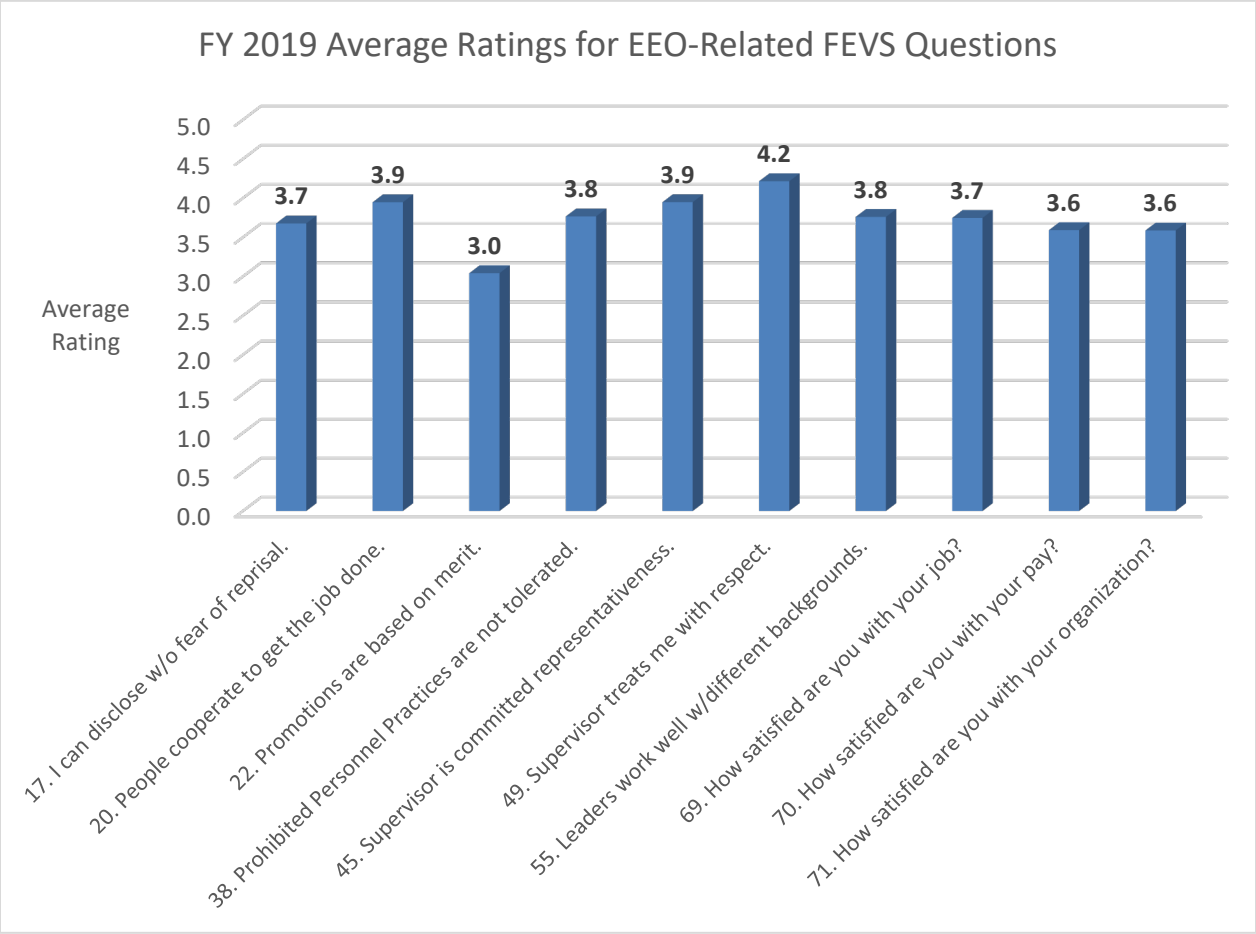

Figure 6: Average Ratings for EEO-Related FEVS Questions

Identifying issues regarding the retention of women in federal employment may help improve employee engagement and foster a better work environment. Such improvements could reduce the amount of complaint activity.

Relationship between Employee Viewpoints and Complaint Activity

While understanding both the EEO complaint activity and employee viewpoints of women working in the federal sector is valuable, it is equally important to know if there is a correlation (or relationship) between the views of women regarding their

experiences in federal employment and EEO complaint activity. Specifically, understanding the potential relationship between female employee perceptions (as measured by the FEVS) and sex/gender-related complaints could indicate if women believe that the federal sector is unwelcoming to them. We examine the same set of questions presented in Figure 6 above in order to determine any relationship between FEVS ratings and complaint activity.

For the intention to leave their current agency, there was a significant positive correlation[6] with all complaint activity analyzed. We found significant correlations for the number of formal complainants (.88), general harassment complaints (.88), individuals counseled (.85), sex-based complaints filed by women (.85), sexual harassment complaints (.81), promotion complaints filed by women (.79), EPA complaints filed by women (.71), and pregnancy complaints (.53). Larger correlations suggest a stronger relationship between the category and the intention to leave.

Women's view that the people they work with cooperate to get the job done was significantly and negatively related to the number of formal complainants (-.37), general harassment complaints (-.37), individuals counseled (-.36), sex-based complaints filed by women (-.36), promotion complaints filed by women (-.34), and sexual harassment complaints (-.32). The closer the correlation is to -1, the larger the negative effect. There was no correlation to EPA or PDA complaints.

Women's belief that their supervisors are committed to a diverse workforce was significantly and negatively related to the number of formal complainants (-.33), sex-based complaints filed by women (-.33), general harassment complaints (-.33), and individuals counseled (-.32). There was no correlation with EPA, PDA, sexual harassment, or promotion complaints.

Women's feelings that their supervisor treats them with respect were significantly and negatively related to the number of general harassment complaints (-.35), formal complainants (-.34), sex-based complaints filed by women (-.34), individuals counseled (-.33), and promotion complaints filed by women (-.31). There was no correlation with EPA, PDA, or sexual harassment complaints. It is important to note that the potential lack of correlation of EPA and PDA complaints with viewpoint data could be attributed to the very small number of complaints with those bases.

Promotions based upon merit, prohibited personnel practices, supervisors working well with diverse employees, being generally satisfied with their job, being satisfied with their pay, or being generally satisfied with their agency had no correlation with any kind of complaint activity. It is worth noting that feeling respected by a direct supervisor was more important to turnover intention than was believing that their supervisor works well with people of different backgrounds or being satisfied with the nature of their work or

[6] All described significant correlations are Pearson's r values with p-values of less than 0.05.

their agency. This seems to offer support for the old adage that an employee joins an organization, but they leave their boss.

Workforce Gender Composition and Complaint Activity

An analysis was conducted to determine if agencies with predominately male workforces within STEM have more complaint activity (i.e., both individuals counseled and formal complainants) than agencies which have more equal numbers of men and women working in their STEM occupations. A multiple analysis of variance (MANOVA), an analysis to look at relationships between multiple variables at once, was modeled using an indicator of the percentage of women working in STEM within federal agencies as a predictor of individuals counseled and the number of formal complainants. The analysis included 93 agencies with both complaint activity and EHRI data available. Agencies that were in the bottom 50 percent in terms of percentage of women working in STEM occupations were regarded as being predominately male agencies with respect to STEM employment.

The results of the MANOVA suggests that there is no impact on the level of representation of women in STEM occupations at a given agency and the number of individuals counseled [*F value* (1, N=93) = 1.10, p=.30]. The analysis didn't find a relationship for the number of formal complainants either [*F value* (1, N=93) = 1.18, p=.30].

V. Women's Average Pay in STEM Occupations

Examining employee pay offers some interesting information relevant to the value federal agencies place on their ability to recruit and retain female STEM workers. The average difference in pay between men (M= $88,914.40, SD= $26,769.80) and women (M= $84,608.60, SD= $25,244.20) is about $4,305.90 per year, which is a significant difference ($t(334{,}980) = 43.07$, $p < .01$).

Table 8: Average Base Salary by STEM Job Category and Gender

Women		Men	
STEM Job Category	**Average Base Pay**	**STEM Job Category**	**Average Base Pay**
Science	$81,623.40	Science	$87,929.12
Technology	$86,564.78	Technology	$84,555.97
Engineering	$88,364.34	Engineering	$92,220.63
Math	$89,423.85	Math	$92,660.56
All	$84,608.56	All	$88,914.45

N=335,412

Table 8 above demonstrates that women are paid, on average, less than men in Science, Engineering, and Math, but are paid more than men in Technology jobs

because women in Technology are fewer in number, but occupy higher grades, in contrast to the fact that there are much more men than women at all grade levels.

Relationship among Gender, Pay, and STEM Category Participation

Based on the results presented earlier in this report, a multinomial logistic regression was performed to determine if an employee's gender and pay could accurately predict their STEM category. There were 334,982 observations used because 480 observations were deleted due to missing values for the response or explanatory variables; the category counts used in the analyses for each category is as follows: Engineering (n= 108,251), Math (n= 20,000), Science (n=119,810), and Technology (n= 86,921). Technology was used as the reference group and Gender was dummy coded as 0= Man and 1= Woman. The results are presented in Table 9 below.

The analysis of the parameters shows that gender and average base pay do predict STEM occupational group membership. However, the effect of average base pay is potentially an artifact of the large sample size, as the estimates are extremely small, despite being highly significant. This is reflected in the fact that the odds ratios for Math, Science, and Engineering are all 1.00 with an invariant confidence interval (i.e., both the upper and lower bounds are 1.00).

Table 9: Pay and Gender Estimates for Predicting STEM Occupational Group

Analysis of Maximum Likelihood Estimates						
Parameter	STEM Occupational Group	DF	Estimate (β)	Standard Error	Wald Chi-Squared	Probability
Intercept	Engineering	1	-0.4445	0.0164	730.2912	<.0001
Intercept	Math	1	-2.4078	0.0282	7314.0214	<.0001
Intercept	Science	1	0.00783	0.0163	0.2309	0.6309
Gender (Female)	Engineering	1	-0.5266	0.0111	2238.7866	<.0001
Gender (Female)	Math	1	0.2955	0.017	302.0345	<.0001
Gender (Female)	Science	1	0.6512	0.00966	4544.953	<.0001
Average Base Pay	Engineering	1	8.83E-06	1.77E-07	2505.0457	<.0001
Average Base Pay	Math	1	9.65E-06	2.90E-07	1105.0596	<.0001
Average Base Pay	Science	1	1.09E-06	1.78E-07	37.4325	<.0001

Engineering (n= 108,251), Math (n= 20,000), Science (n=119,810), and Technology (n= 86,921).

With respect to gender and working in Engineering relative to Technology, the female parameter estimate (β= -.5266) is significantly different from zero, as is the case with

Math relative to Technology (β= .2955) and Science relative to Technology (β= .6512). This indicates that women are less likely to be expected to be in Engineering compared to Technology, but more likely to be expected in Math and Science, when salary is taken into consideration. To be more precise, the odds ratio for Engineering is 0.591, while it is 1.334 for Math and 1.918 for Science. This indicates that women are about 40 percent less likely to work in Engineering, while being 33 percent more likely to work in Math and nearly 92 percent more likely to work in Science than those working in Technology jobs. These results mirror the results depicted in Table 4, where women's actual participation in STEM occupations versus their expected numbers are presented.

VI. Recommendations

As a result of the above described research and analysis, we propose the following recommendations.

Recommendations

- Agencies should recruit more women in Technology and Engineering job series.
- Agencies should develop recruitment plans to target hiring more younger women into federal STEM occupations.
- Agencies should develop targeted recruitment plans for women from historically underrepresented racial and ethnic backgrounds.
- Agencies should ensure that all STEM occupational groups meet the 12 percent target for hiring women with disabilities.
- Agencies should create leadership development programs to help prepare women for leadership roles in STEM occupations.
- Agencies should conduct organizational assessments in STEM occupational groups to determine how to reduce the amount of sex-related complaint activity and improve women's viewpoints of their work environments.
- Agencies should collect and analyze exit interview data for women in STEM to determine if there were issues related to discrimination or harassment that led to their departure.
- Agencies should ensure that leaders in STEM demonstrate a commitment to a diverse workforce.

Conclusion

This report is designed to present an important examination of women working in STEM occupations in the federal government—who they are, their viewpoints, and workplace experiences concerning discrimination and harassment. We anticipate that the information and analyses herein will be helpful to federal agencies as they embark upon their own barrier analyses of Women in STEM occupations. In additional to barrier analyses, agencies should conduct other relevant analyses, such as salary studies and complaint audits. This report is intended to assist federal agencies' continuing efforts to

make the federal government a model EEO employer and able to compete with the private sector for critical talent.

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