

## **Supplementary Material**

### **Occupational and environmental factors influencing morale of United States federal wildland firefighters**

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**Table S1.** Survey questions and summary data. Those questions with a (\*) were not analyzed in this manuscript. Likert data was collected on a 5-point scale where 1 = strongly disagree and 5 = strongly agree unless otherwise noted. “No.” is the order in which the item was presented on the original instrument. “No. Res.” = Number of Respondents. M = mean Likert Score. SD = standard deviation. All data were grouped by construct, but not all items were used in statistical analysis of the construct. Figure 1 indicates items used for analysis.

Items Grouped by Construct	Format/Options Presented	No. Res.	M	SD	No.
<b>DEMOGRAPHY</b>					
How do you define your gender identity?	male, female, non-binary, other (open response)	695	n/a	n/a	1
How do you define your sexual orientation?	straight, LGBTQIA+, other (open response)	707	n/a	n/a	2
Ethnicity - Check all that apply	Asian, Black, Hispanic, American Indian/Alaskan Native/Native Hawaiian/Pacific Islander, White, other (open response)	693	n/a	n/a	4
Are you a veteran?	yes, no	706	n/a	n/a	5
Are you a person with a disability protected under the ADA?	yes, no	701	n/a	n/a	6
Highest level of formal education completed	GED/high school diploma, associate degree, bachelor's degree, master's degree, PhD, post-doctoral, technical school	708	n/a	n/a	7
Marital status and family status (check all that apply)	single, married, divorce, widowed, have children	702	n/a	n/a	8
Select the year range in which you were born.	1945-1964, 1965-1974, 1975-1984, 1985-1994, 1995-2004	707	n/a	n/a	9
Career path. If not currently in wildland fire, please list your most recent job title.	primary fire, secondary fire, other	699	n/a	n/a	10
Current job title. If not currently in wildland fire, please list your most recent job title.	open response	708	n/a	n/a	11
Current GS level. If not currently in wildland fire, please list your most recent GS Level.	GS-3, GS-4, GS-5, GS-6, GS-7, GS-8, GS-9+	708	n/a	n/a	12
Employment status. If not currently in wildland fire, please list your most recent career status.	full time permanent, permanent seasonal, temporary seasonal (1039), other	697	n/a	n/a	13
Highest operational fire qualification.	FFT1/IC5, single resource, DIVS/IC3, TFLD, anything above DIVS	644	n/a	n/a	14
Which agency do you currently work for?	Bureau of Indian Affairs, Bureau of Land Management, National Park Service, US Fish & Wildlife Service, US Forest Service, I no longer work in federal wildland fire, but previously worked as a federal wildland firefighter	704	n/a	n/a	15
<b>RECRUITMENT</b>					
Wildland fire jobs are well advertised. People who are not familiar with this field have an easy time finding this career path.	Likert Scale	708	2.07	0.904	16
Wildland fire job postings are open at a time of year when I can easily access a computer	Likert Scale	708	1.92	1.038	17

to apply.					
I know when each region is hiring for fire positions before jobs open.	Likert Scale	708	1.96	0.905	18
Wildland fire job postings are open long enough for me to apply.	Likert Scale	708	2.58	1.091	19
My fire resume was straight-forward to create.	Likert Scale	706	2.68	1.169	20
I understand how hiring officials rate my resume for wildland fire positions.	Likert Scale	708	2.57	1.224	21
I understand the hiring process for wildland fire positions.	Likert Scale	708	3.05	1.171	22
I usually know where I will be working next summer at least 6 months in advance.	Likert scale	707	2.86	1.329	23
I usually know what kind of pay/amount of overtime I'll be receiving at the start of fire season.	Likert Scale	707	2.16	1.117	24
I've had issues accessing USAJobs.gov or other wildland fire hiring website. This includes accessibility issues such as pages timing out before you have time to respond, dyslexic-adapted fonts, complex navigation paths, etc.	Likert Scale	706	3.30	1.169	25
I've coordinated a base tour to visit potential workplaces in an unpaid capacity.	Binary Scale	703	n/a	n/a	26
I've spent money or missed work in order to visit potential duty stations for recruiting purposes.	Binary Scale	703	n/a	Na	27
I am usually aware of job postings I would be interested in on USAJobs.gov or other wildland fire job site.	Likert Scale	707	2.85	1.010	29
My supervisor lets me know when jobs I am qualified for are on USAJobs.gov or other wildland fire job site.	Likert Scale	708	3.05	1.224	30
I have access to hiring contacts in the wildland fire community.	Likert Scale	708	3.29	1.091	31
I have received a job or promotion based on application alone - I had not worked for the module or known an employee of theirs previously.	Binary Scale	697	n/a	n/a	32
I have received a referral from an employee in fire that helped me get a job offer in fire.	Binary Scale	691	n/a	n/a	33
I have received a job or promotion as an inside hire (previously employed by the module hiring).	Binary Scale	700	n/a	n/a	34
I have missed out on jobs because I misunderstood the application process and/or the application process was not clear.	Binary Scale	707	n/a	n/a	35
I have missed out on jobs because of mistakes that Human Resources made. This does not include situations where you were missing application materials due to misunderstanding the requirements posted in the job announcement.	Binary Scale	703	n/a	n/a	36
I have experienced a delayed start date due to issues with Human Resources.	Binary Scale	707	n/a	n/a	37
What are 2-3 actions agencies can take to improve the hiring process?*	open response	591	n/a	n/a	39
What challenges have you experienced gaining employment in fire? What helped you overcome those challenges?	open response	519	n/a		40
What successes have you experienced gaining employment in fire? What helped you achieve that success?	open response	496	n/a	n/a	41
<b>RETENTION</b>					
What are the most important changes your employer can make to keep you in wildland fire?	Each of the below options has a 1-5 Likert Scale	n/a	n/a	n/a	42
Increased hourly rate	Likert Scale	705	4.80	0.478	43

Increased time off between assignments	Likert Scale	702	3.97	1.007	44
Time away from work in the off season	Likert Scale	700	4.08	1.005	45
Paid parental leave	Likert Scale	704	4.10	1.035	46
Flexible work schedule	Likert Scale	702	4.02	0.980	47
Cash bonuses	Likert Scale	697	3.83	1.109	48
Affordable quality health insurance	Likert Scale	702	4.66	0.636	49
Improved retirement benefits	Likert Scale	705	4.65	0.611	50
Portal to portal (24 hour) pay	Likert Scale	700	4.36	0.900	51
Better access to training opportunities	Likert Scale	703	4.31	0.769	52
Clear career development path	Likert Scale	702	4.36	0.768	53
Praise or recognition for accomplishment	Likert Scale	701	3.71	1.086	54
Strong leadership from supervisors	Likert Scale	703	4.61	0.636	55
Positive work environment	Likert Scale	701	4.59	0.635	56
Change job title to better reflect duties	Likert Scale	703	4.15	1.034	57
Eliminate 2-hour callback/unpaid standby	Likert Scale	701	4.03	1.033	58
A safe and equitable workplace	Likert Scale	701	4.24	0.847	59
Retirement buy back	Likert Scale	704	4.24	0.876	60
Accurate locality pay	Likert Scale	704	4.67	0.637	61
Reduced government housing costs	Likert Scale	699	4.18	0.978	62
<b>WORK-LIFE BALANCE</b>					
My work-life balance is healthy.	Likert Scale	706	2.43	1.142	63
I have time to attend important family events, even during fire season.	Likert Scale	707	2.07	1.117	64
I can usually schedule my fire assignments ahead of time.	Likert Scale	707	1.54	0.851	65
My schedule is flexible when I'm not on a fire assignment.	Likert Scale	705	2.60	1.168	66
Unique work schedules due to wildland fire do not impact my life choices.	Likert Scale	705	1.73	0.929	67
The number of overtime hours I need to pay my bills throughout the year is:	1-300h, 301-600h, 601-900h, >900h, no overtime needed	703	n/a	n/a	68
Greatest number of consecutive days worked (not including paid R and R):	0-16, 17-26, 27-36, 37+	707	n/a	n/a	69
I am subject to 2 hour callbacks (unpaid standby) on days off.	Binary Scale	706	n/a	n/a	70
Over the course of a fire season, I am asked to break 2:1 work-to-rest ratio:	0-3 times, 3-10 times, 10-20 times, > 20 times	704	n/a	n/a	71
I have affordable childcare options.	Likert Scale	319	1.99	1.036	75
My base hourly rate compensates me fairly for the level of risk my position entails.	Likert scale	707	1.39	0.691	78
My workplace provides flexible scheduling options when not on fire assignments.	Likert Scale	698	2.44	0.951	138
<b>WORKPLACE CULTURE</b>					
I receive regular feedback on my work performance.	Likert Scale	704	3.38	1.061	145
My supervisor cares about their work.	Likert Scale	702	3.97	1.007	146
I spend time with my colleagues outside of the workplace in a mentally and physically safe environment.	Likert Scale	704	3.53	1.141	147
My coworkers ask me how I'm doing with genuine interest.	Likert Scale	704	3.33	1.035	148
My colleagues pronounce my name correctly.	Likert Scale	704	4.25	0.743	149
I feel comfortable talking about mental health at work.	Likert Scale	702	3.27	1.140	150
If on a local district, my District Ranger understands the challenges we face as wildland firefighters.	Likert Scale	617	2.69	1.341	151
My Forest Supervisor understands the challenges we face as wildland firefighters.	Likert Scale	644	2.60	1.345	152
We make time for group activities at work on a regular basis. Group activities can include PT, cookouts, card games, etc.	Likert Scale	704	3.96	1.061	132
My workplace is accessible and provides reasonable accommodation for all employees.	Likert Scale	702	3.67	0.954	133

We PT as a group at work and it is scalable - reasonably performed by all team members.	Likert Scale	650	3.68	1.085	136
People are recognized for accomplishments large and small in my workplace.	Likert Scale	702	3.25	1.086	137
My work has a meaningful impact in the world.	Likert Scale	701	3.79	1.059	144
My workplace facilities have adequate bathrooms, food storage, and personal gear storage.	Likert Scale	706	3.03	1.329	76
If you stay or have stayed in government housing, it provided adequate heating/cooling, food storage, bathroom facilities, and sleeping privacy.	Likert Scale	679	2.94	1.173	77
My job title accurately represents the job that I perform.	Likert Scale	706	1.76	1.009	79
I am treated as a valued and respected employee.	Likert Scale	707	3.19	1.223	80
I know how to contact my union representative.	Likert Scale	702	2.36	1.23	81
<b>HEALTH &amp; WELL-BEING</b>					
Do you identify as neurodivergent? Check all that apply.	Multiple options. autism, ADHD, dyslexia, anxiety, depression, bipolarity, Asperger's syndrome, and Tourette syndrome.	699	n/a	n/a	3
I have adequate healthcare coverage.	Likert Scale	706	3.02	1.275	72
I can seek mental health help if I need it, even during fire season.	Likert Scale	706	2.82	1.196	73
I have had mental health issues that are caused or worsened by the stresses of wildland fire. Check all that apply.	Suicidal thoughts, depression, anxiety, PTSD				74
I have suffered a work-related injury or illness while working in wildland fire.	Binary Scale	705	n/a	n/a	82
If yes, did you report your injury to your employer?	Binary Scale	489	n/a	n/a	83
If you were injured and reported it, were you satisfied with the way your injury/illness was handled?	Likert Scale	425	2.57	1.237	84
<b>TRAINING AND PROMOTION</b>					
My supervisor allows me to have ownership in my roles and responsibilities.	Likert Scale	706	3.99	1.036	105
My supervisor supports my success in this field.	Likert Scale	706	4.05	1.036	106
Have fire assignments ever negatively impacted your ability to participate in training?	Binary Scale	700	n/a	n/a	107
S Classes filling up have prevented me from entry.	Likert Scale	705	3.52	1.115	108
Priority lists created at the district or forest level have prevented me from obtaining training.	Likert Scale	703	3.55	1.113	109
Cost of S Classes or associated travel have prevented me from receiving training.	Likert Scale	704	3.08	1.141	110
I am usually aware of training opportunities that may benefit me.	Likert Scale	705	3.15	1.142	111
I have the same opportunities as my peers for training opportunities.	Likert Scale	705	3.48	1.009	112
My home unit can send me to attend training and still have adequate staffing.	Likert Scale	705	3.05	1.221	113
My home unit supports me in pursuing classes and training.	Likert Scale	704	3.75	1.008	114
I have attended a formal training session outside of an S Course (e.g., EMT, Apprenticeship Academy, Redmond IHC, Asheville IHC, PFTC, etc.).	Binary Scale	704	n/a	n/a	115
I was unable to attend an S Course due to lacking the prerequisites.	Binary Scale	701	n/a	n/a	116
I have paid for my own training out of	Binary Scale	701	n/a	n/a	117

pocket with no reimbursement from my employer.					
I have attended training on an unpaid basis.	Binary Scale	704	n/a	n/a	118
My supervisor supports me in attending additional training opportunities.	Likert Scale	705	3.94	0.903	119
I seek out additional training opportunities on my own.	Likert Scale	705	4.12	0.876	120
I have received as many training opportunities as my peers.	Likert Scale	705	3.48	1.009	121
I can see a clear path forward for career advancement. For example, there are primary fire positions at the GS 6/7/8 levels so that I can realistically become a fire manager at the district level.	Likert Scale	704	3.03	1.167	122
I have my EMT.	yes, no, expired	701	n/a	n/a	123
If you have your EMT, how did you pay for it?	myself, VFD, employer, military, college, other	291	n/a	n/a	124
I have my CDL.	yes, no, expired	643	n/a	n/a	125
If you have your CDL, how did you pay for it?	myself, VFD, employer, military, other	248	n/a	n/a	126
Have you experienced someone withholding training opportunities for any of the below? Select all that apply	supervisory bias, ink in a task book, staff shortages, hiring process, time in grade, S-class availability, training assignments	702	n/a	n/a	127
Have you experienced someone else placing limits on career advancement or withholding training opportunities? If yes, please elaborate. What was your relationship to the individual?*	open response	208	n/a	n/a	128
Have you ever had a formal or informal mentor? If yes, please elaborate. How did you meet them? How have they helped advance your career?*	open response	404	n/a	n/a	129
How else can your employer improve access to career development opportunities in fire?*	open response	313	n/a	n/a	130
My team participates in formal and informal team building and group training.	rarely if ever, annually, monthly, weekly	700	n/a	n/a	131
<b>SAFETY</b>					
Inappropriate behavior is addressed appropriately and in a timely manner by supervisors. Inappropriate behavior may present itself as unwanted advances, jokes that make you feel uncomfortable, use of racial slurs, politics talk, etc.	Likert Scale	702	3.41	1.112	139
Inappropriate behavior is addressed appropriately and in a timely manner by my peers. Inappropriate behavior may present itself as unwanted advances, jokes that make you feel uncomfortable, use of racial slurs, politics talk, etc.	Likert Scale	701	3.44	1.059	140
Do you trust your team to keep you safe on the fire line? Why?*	open response	551	n/a	n/a	103
Have you experienced feeling unsafe (mentally, emotionally, physically) in the workplace outside of suppression operations? Explain.*	open response	396	n/a	n/a	104
My supervisor makes an effort to prevent inappropriate behavior.	Likert Scale	701	3.79	1.006	141
My coworkers make an effort to prevent inappropriate behavior.	Likert Scale	703	3.77	0.928	142
If something makes me feel uncomfortable, I can discuss it openly with my colleagues.	Likert Scale	703	3.69	1.034	143
My workplace provides safe bathrooms for all genders.	Likert Scale	702	3.99	0.927	134
My workplace provides a safe environment to dress down for PT.	Likert Scale	705	3.71	1.115	135
Have you experienced inappropriate	Binary Scale	n/a	n/a	n/a	88

behavior at work?					
Jokes or comments that made me uncomfortable	Binary Scale	677	n/a	n/a	89
Threatening or hostile behavior including physical contact (e.g., fighting)	Binary Scale	686	n/a	n/a	90
People under the influence of drugs or alcohol on the clock	Binary Scale	679	n/a	n/a	91
Any type of unwanted touch of a sexual nature or sexual assault	Binary Scale	679	n/a	n/a	92
Staring, comments or unwanted sexual advances that don't include physical touch	Binary Scale	683	n/a	n/a	93
If you answered yes, what was your relationship to the person acting inappropriately?	Binary Scale	n/a	n/a	n/a	94
Jokes or comments that made me uncomfortable	subordinate, peer, superior				95
Threatening or hostile behavior including physical contact (e.g., fighting)	subordinate, peer, superior	278	n/a	n/a	96
People under the influence of drugs or alcohol on the clock	subordinate, peer, superior	281	n/a	n/a	97
Any type of unwanted touch of a sexual nature or sexual assault	subordinate, peer, superior	93	n/a	n/a	98
Staring, comments or unwanted sexual advances that don't include physical touch	subordinate, peer, superior	172	n/a	n/a	99
I have made a formal complaint about someone acting inappropriately.	Binary Scale	698	n/a	n/a	100
If you have made a formal complaint about someone acting inappropriately, were you satisfied with the outcome?	Binary Scale	191	n/a	n/a	101
I feel mentally as well as physically safe in my workplace.	Likert Scale	706	3.26	1.009	85
I have experienced implicit or explicit bias from my supervisor. Explicit bias - discrimination conducted with intent to harm. Implicit bias - unintentional prejudice (ex: lack of training because of perceived language barrier).	Likert Scale	706	2.68	1.329	86
I have experienced implicit or explicit bias from my peers.	Likert Scale	706	2.87	1.329	87
I have experienced implicit or explicit bias during the hiring process in wildland fire. Explicit bias - discrimination conducted with intent to harm. Implicit bias - unintentional prejudice (ex: a woman is pushed to work on an engine due to perceived differences in physical abilities).	Likert Scale	707	2.82	0.478	38

**Table S2.** All significant demographic predictors observed in this study. Significance is defined as  $p < 0.05$ . Mean values are either Likert Scores or percentages of respondents, depending upon question type. See Appendix I for question types.

<b>Demographic</b>	<b>Significant Association</b>	<b>Mean values</b>	<b>P-value</b>
Age class	Respondent experienced threatening or hostile behavior in the workplace that included physical contact (e.g., fighting) while working in wildland fire	< 1974 = 52.7% 1975-1984 = 42.1% 1985-1994 = 38.8% 1995-2004 = 39.7% * = significantly different	p = 0.033
Employment Status	Occurrence of supervisor making jokes or comments that made respondent uncomfortable	Permanent Full Time* = 39.7% Permanent Seasonal = 48.2% Temporary Seasonal = 49.5%	p = 0.008
Ethnicity	Respondent made a formal complaint about inappropriate behavior	White = 25.6% Not White = 16.4%	p = 0.0208
Ethnicity	Occurrence of injury or illness while working in wildland fire	White Not White	p = 0.0018
Ethnicity	Occurrence of supervisor making jokes or comments that made respondent uncomfortable	White = 42.2% Not White = 61.5%	p = 0.0489
Gender	Respondent is unmarried	Female = 67.6% Male = 56.6%	p = 0.0201
Gender	Respondent has no children	Female = 81.3% Male = 68.2%	p = 0.0037
Gender	Respondent has affordable childcare options	Female = 1.78 Male = 2.10	p = 0.0048
Gender	Respondent received a job based on application alone	Female = 52.7% Male = 63.1	p = 0.0062
Gender	Respondent experienced threatening or hostile behavior in the workplace that included physical contact (e.g., fighting) while working in wildland fire	Female = 19.9% Male. = 11.3%	p = 0.0179
Gender	Respondent made a formal complaint about inappropriate behavior	Female = 31% Male = 22.4%	p = 0.0468



**Figure S1.** Older respondents were more likely to have experienced threatening and/or hostile behavior while working than younger respondents. Approximately 52.7% of respondents born prior to 1974, 42.1% of respondents born between 1975-1984, 38.5% of respondents born between 1985-199, and 39.7% of respondents born after 1995 had experienced threatening and/or hostile behaviors.

**Figure S2.** Female respondents (19.9%) were more likely to directly report experiences of fighting and/or hostile behavior that included physical contact at work than male (11.3%) wildland firefighters.

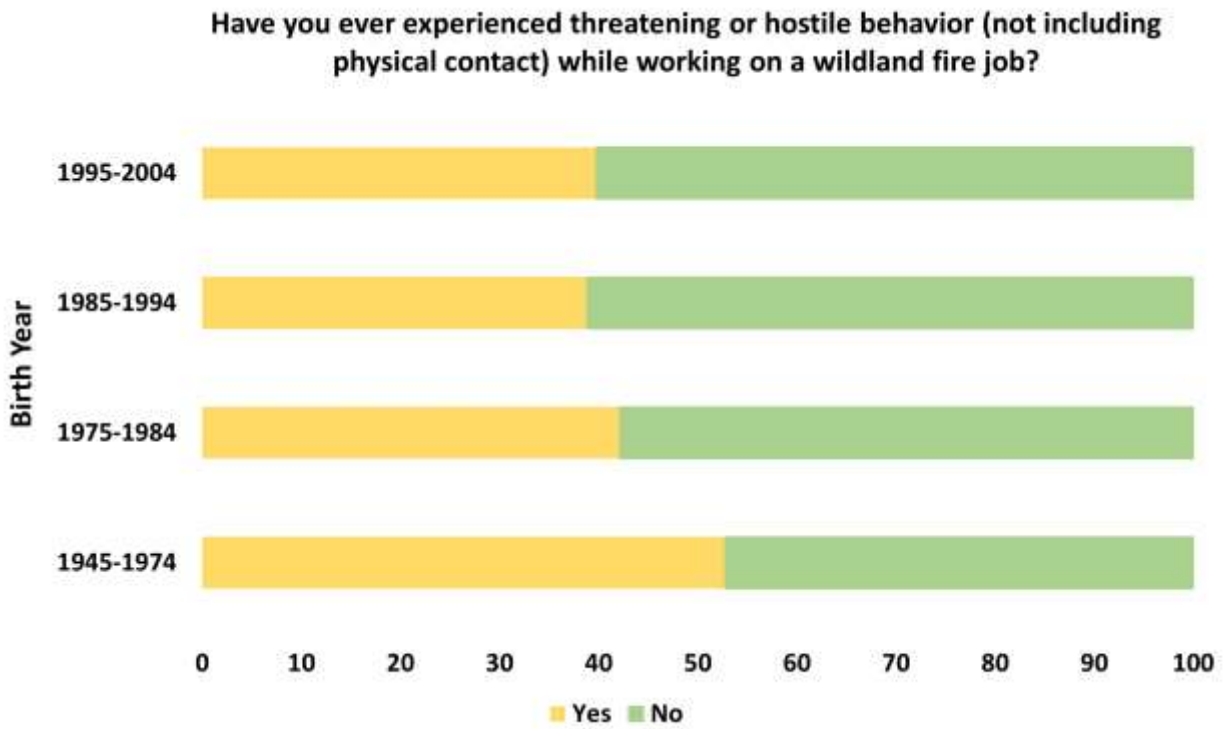
**Figure S3.** When uncomfortable jokes or comments were made in the workplace, non-white (61.5%) respondents were more likely to report that these jokes and/or comments came from a superior or boss than white (42.2%) respondents, and seasonal employees.

**Figure S4.** Female (31.0%) and white respondents (25.6%) were more likely to file formal complaints than male (22.4%) or non-white (16.4%) respondents.

**Figure S5.** Top barriers to career advancement as identified by respondents. Respondents were able to select more than one response.

**Figure S6.** Female respondents were less likely to receive a job based on application alone relative to their male peers. Female Yes = 52.7%. Male Yes = 63.1%.

Figure S1.



**Figure S2.**

Have you ever experienced threatening or hostile behavior to include physical contact (e.g., fighting or sexual contact) while at work on a wildland fire job?

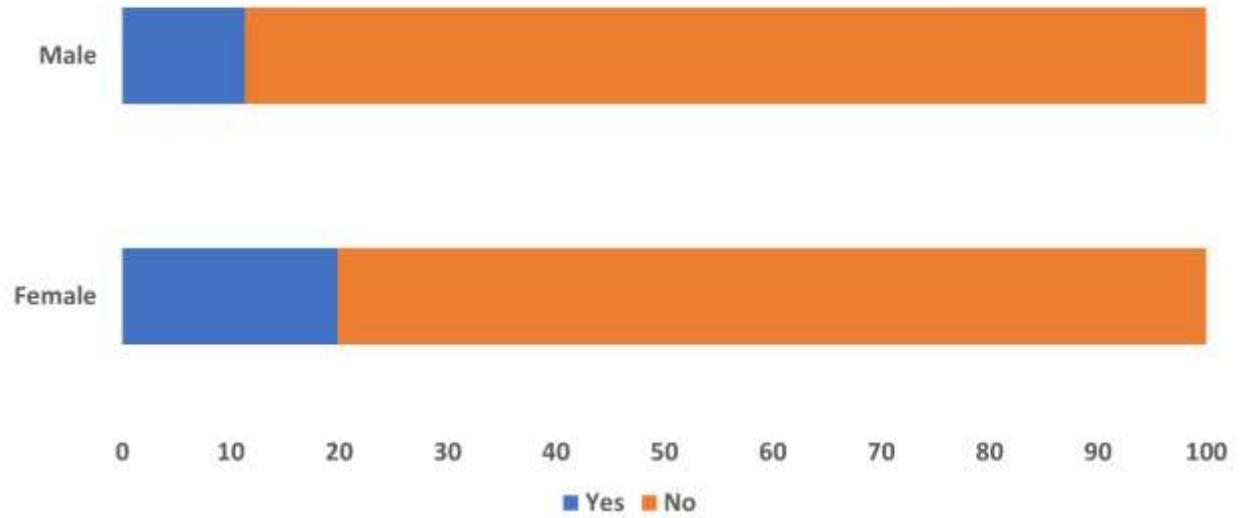


Figure S3.

When I experienced jokes or comments that made me uncomfortable, what was the relationship of the person committing these actions relative to me?

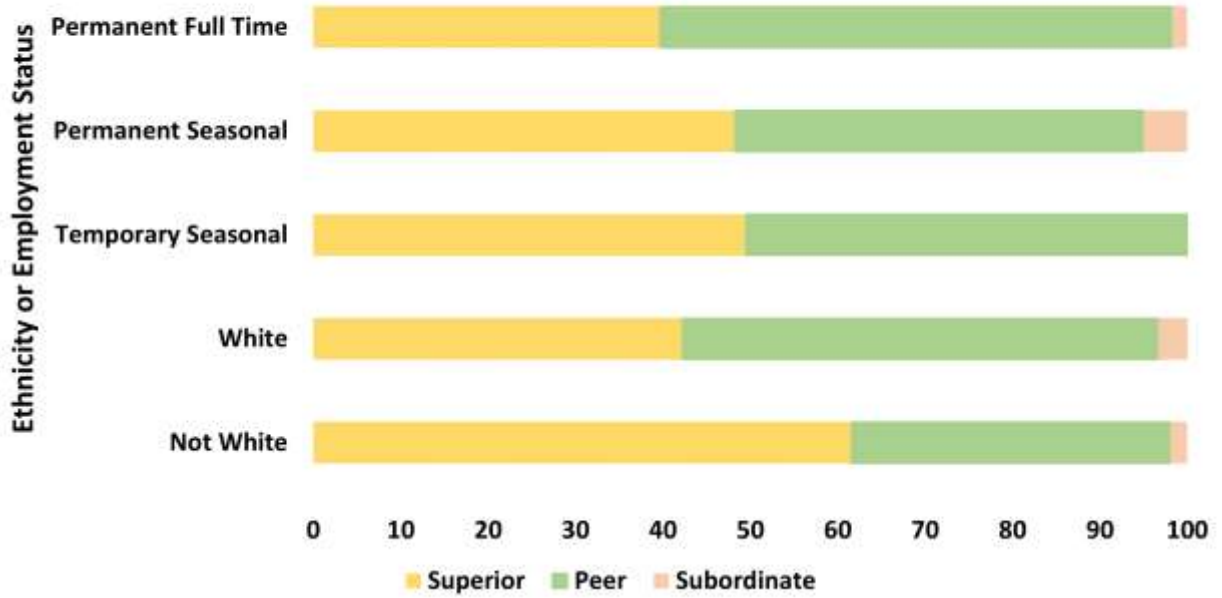


Figure S4.

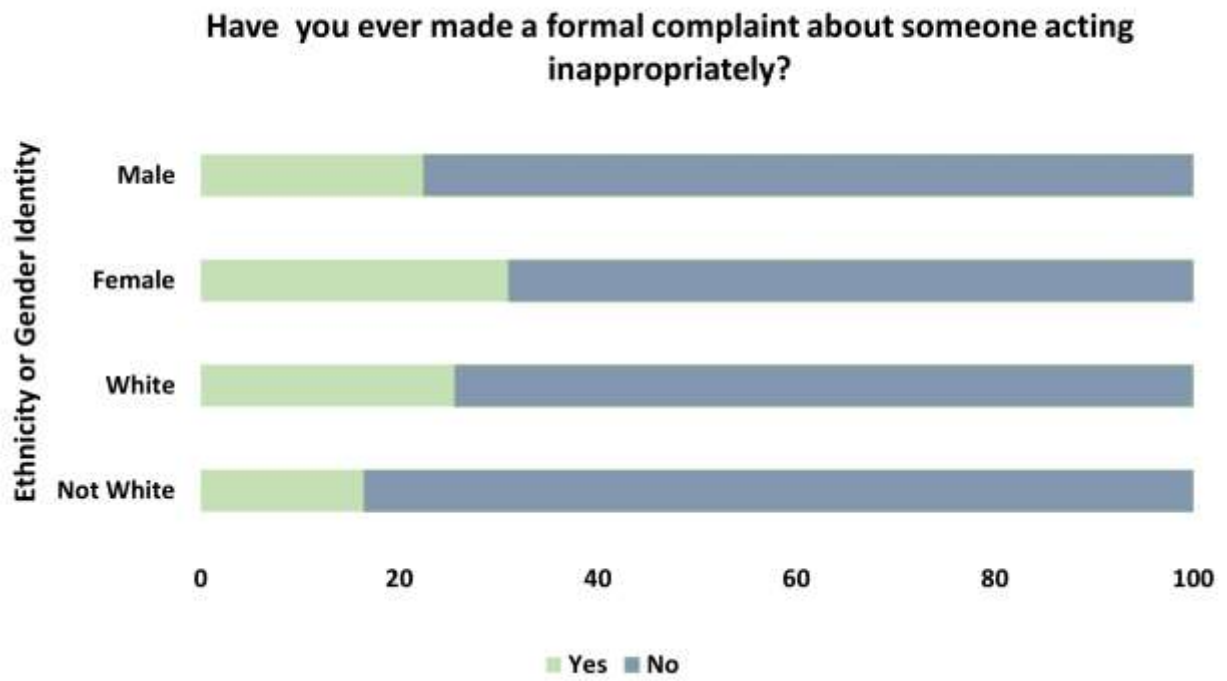
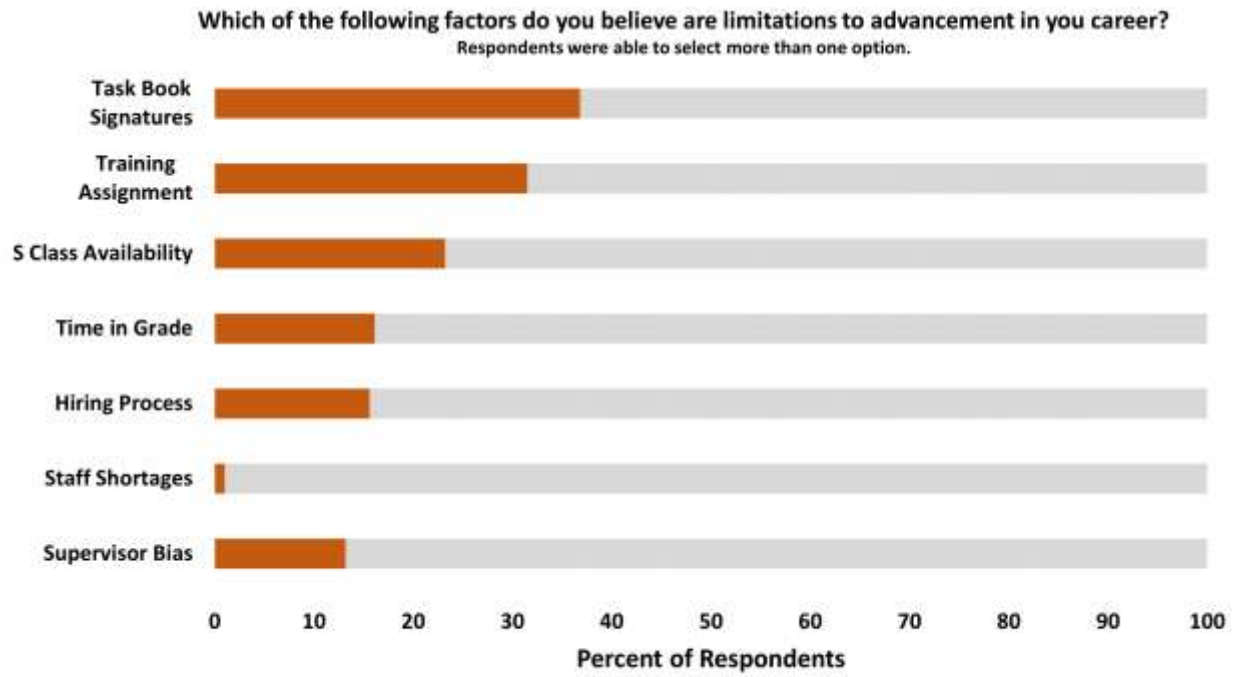


Figure S5.



**Figure S6.**

Have you ever received a job or promotion based on application alone (e.g., had not worked for the module or known an employee previously)?

