Measure

Sociodemographic Status Measures

There are 13 measures for sociodemographic status. The Age variable is a 1-item continuous measure asking the year of birth. The Sex variable is an 1-item categorical measure with response male/female/other. The race/ethnicity measure is a 2-item categorical measure asking if the faculty is hispanic/latino origin, and specific race. The marital status is an 1-item categorical measure with 7 choices numbered from 1 to 7: never married, separated, married living with spouse, married not living with spouse, widowed, divorced, living with partner. The variable “Has Children" is a 1-item categorical measure asking whether the faculty member has children. The Annual Income measure is a categorical measure asking for what category individual annual income falls in, with 8 response options from $0 to $35,000, $35,001 to $50,000, $50,001 to $70,000… until $130,001 or more. The Home Ownership measure is a yes/no categorical measure asking whether or not the faculty member owns their house. The Household Net Worth is a categorical measure asking for an estimate of their current household net worth with 10 response options from $0 to $30,000, $30,001 to $60,000, $60,001 to $90,000… until $400,001 or more. The country of birth variable is an open-ended question. The parents' educational attainment is a measure of the highest level of education completed by parents, namely mother’s education and father’s education. The academic rank variable is categorical measure for employment position with the response option of associate professor or assistant professor. The First Generation is a yes/no categorical measure asking whether they were first generation college students.

Employment and Educational Background Measures

There are 4 measures for employment and educational background. The academic discipline variable is a categorical measure for academic department appointment. The Research Hours is a categorical measure asking for an estimated number of hours dedicated to research per week with response options 0-20 hours, 21-30 hours and 31+ hours. The Teaching Hours is a categorical measure asking for an estimated number of hours dedicated to teaching per week with response options 0-10 hours, 11-20 hours and 21+ hours. The Service Hours is a categorical measure asking for an estimated number of hours dedicated to university service per week with response options 0-5 hours, 6-10 hours and 11+ hours. The Outside Hours is a categorical measure asking for an estimated number of hours dedicated to outside professional activities per week with response options 0-5 hours, 6-10 hours and 11+ hours. The Joint Appointment measure is a yes/no categorical response of whether the faculty has a joint appointment with 1 = No and 2 = yes. The Administrative Appointment measure is a yes/no categorical response of whether the faculty has an administrative position with 0 = No and 1 = yes.

Mentoring Measures

There are 9 measures for mentoring. The *Formal Mentoring* variable is a categorical measure for whether the faculty has participated in formal and/or informal mentoring programs. There are 5 categorical variables about demographic characteristics of a mentor: whether the faculty has had a mentor in the last three years, whether they currently have a mentor, number of current mentors, gender of current mentors, and race/ethnicity of current mentors. The *mentor*

facilitated activities (Robert Wood Johnson Foundation, 1995) measure is a 6-item categorical measure with yes/no options asking for engagement in six activities, including Journal Editorial Boards, Invitation to Conferences, Chairing of Conferences, Opportunities for Research Collaboration, Co-authoring, and Reviews Career Annually. The *Inadequate Mentoring* is a categorical measure on a 5-point scale of very significantly to not at all asking if the faculty believes inadequate mentoring has impeded their career. The measure frequency of mentoring is a 5-item from 1 = never to 5 = always continuous measure that indicates the frequency with which current mentoring activities. The *Cronbach's Alpha for* the measure is 0.918. A total composite score of these frequencies named "Sum of Frequency" was calculated ranging from 0 to 25.

Perceived Gender, Race, Ethnicity, and Class Bias Measures

There are 7 measures for perceived gender, race, ethnicity, and class bias. The bias includes *Racial/ethnic bias by superior or colleague, Gender bias by superior or colleague, Class bias by superior or colleague, Left out of opportunities based on gender, Left out of opportunities based on race/ethnicity, and Left out of opportunities based on class* (Robert Wood Johnson Foundation, 1995). The 7 bias measures are all categorical measures on a 4-point scale from 1 = never to 4 = always, with higher scores indicating higher perceptions of bias and discrimination.

Family-personal Work Balance Measures

There are 5 measures for family-personal work balance. The Helping Family and Friend Regularly is a yes/no categorical question asking if they are now helping at least one sick, disabled, or frail family member or friend. The next measure asks for how often they helped this friend or family member in the past 4 weeks. The satisfaction between balance is a categorical measure on a 5-point scale of very dissatisfied to very satisfied asking about how satisfied they are with the balance between professional and personal or family. The supervisory support is a categorical measure on a 5-point scale of rarely or never true to true most of the time asking if their department chair is respectful of their efforts to balance work and family, to measure supervisory respect toward balance. Institutional policy support is a categorical measure on a 5-point scale of rarely or never true to true most of the time to measure institutional policies (e.g. family leave, paid maternity leave) toward balance.

Stress-inducing Work Roles Measures

There are 3 measures for stress-inducing work roles. The OSI-R *Role overload* (Osipow, 1998) measures the extent to which job demands exceed resources (personal and workplace) and the extent to which the individual is able to accomplish workloads using 5-point response scale of 1 = rarely or never true to 5 = true most of the time. A continuous total composite score named Role overload was calculated ranging from 0 to 50. The Cronbach's Alpha for Role Overload is 0.697. The *Vocational strain* (Osipow, 1998) measures the extent to which the individual is having problems in work quality or output. Vocational strain is a 10-item categorical measure using a 5-point response scale from rarely or never true to true most of the time. A total composite score named Vocational strain was calculated ranging from 0 to 50. The Cronbach's Alpha for Vocational Strain is 0.04.

Life Events

There is 1 measure for life event stress. The *life event stress* (Berkman and Syme, 1979) is a 12-item categorical measure that measures stressful life events within the past year with yes/no response. The life events include "Death of close friend or family member or have serious illness", "Major problems with money", "Major conflict with colleagues", "Family member or close friend lost job or retire", "Divorce or break-up of family member or close friend", etc. A composite score named *Life Events* is calculated with higher scores indicating a higher number and intensity of upsetting life events.

Outcomes Measures

There are 2 measures for outcomes. The 8-item Center for Epidemiologic Studies Depression Scale (CES-D) is a continuous measure for major components of depression with an emphasis on affective components (Radloff, 1977). It consists of 20 self-reported items scored on a 4-point scale, which measures the various dimensions of depression related experiences. The CES-D measure scoring is based on a Likert-type scale ranging from 0 (rarely) to 3 (most days), with scores ranging from 0 to 24. Higher scores indicate higher levels of distress. A score greater than or equal to 7 suggests a clinically significant level of psychological distress. The Cronbach's Alpha for CES-D is 0.867.

Medarating Resources Measures

There are 2 measures for mederating resources. The Self-care is a 10-item continuous measure that measures the extent to which the individual regularly engages in personal activities that reduce or alleviate chronic stress using 5-point response scale of rarely or never true to true most of the time, with total scores ranging from 0 to 50. The Cronbach's Alpha for Self-care is 0.784. Social support is a 10-item continuous measure that measures the extent to which the individual feels support and help from those around him or her using a 5-point response scale of rarely or never true to true most of the time, with total scores ranging from 0 to 50. The items for Social Support include "I have help with tasks around the house", "There is at least one sympathetic person with whom I can discuss my work problem", "If I need help at work, I know who to approach", etc. The Cronbach's Alpha for Social Support is 0.876.

Analytical Strategy

Descriptive statistics are an integral part of any research analysis, as they provide a preliminary glimpse/summary into the characteristics of the intended measures of the study. Since the measures from this research are both quantitative and qualitative in nature, the types of descriptive statistics reported will also differ. To measure the central tendency and spread of quantitative data, we have elected to utilize mean and standard deviation - for the total sample, as well as for the sub-samples of heterosexual and sexual minority faculty. The combination of both of these statistics enables us to explore the differences between the distributions of heterosexual and sexual minority faculty. In order to evaluate qualitative data which are grouped into various categories, we have decided to report the frequencies (as a percentage) for each sub-group. Again, like the quantitative data, this will allow us to compare the distributions of the

measure for heterosexual and sexual minority faculty. In the context of this study, these analyses are merely exploratory, and we will attempt to outline the formal statistical methods for assessing the significance of a difference/association between two variables in the sections below.

Two-Sample T-Test

To formally quantify if there are any differences between the numerical/quantitative measures from the heterosexual faculty with the sexual minority faculty, we will conduct a 2-sample t-test on all of the corresponding variables (*Age, Individual Annual Income, Household Net Worth, Life Events, Self Care, Social Support, Depression Scale - Numeric, Mentoring Relationship Scale, Mentoring Frequency Sum, Respectful Department Chair, Institutional Policies, Discrimination, Role Overload, Vocational Strain, Role Ambiguity, Sum of Bias, Satisfaction of Balance*) . A 2-sample t-test is a statistical test that is used to compare the means of a continuous numerical variable between two independent groups. The null hypothesis of the test states that there is no significant difference between the means of the two groups, while the alternative hypothesis states that there is a significant difference. In order to test the hypothesis, the t-statistic, calculated as the difference in the sample means divided by the standard error, and the degrees of freedom, calculated as the sum of sample sizes minus 2 are used. In this study, the difference is classified as significant if the p-value (obtained from the t-statistic and degrees of freedom) is less than 0.05, and the null hypothesis is rejected. It is important to note that this test assumes that the observations are i.i.d (independent and identically distributed), the data are normally distributed in each group, and that the variances are equal. However, assuming these conditions are met, the performance of these tests on the numerical measures in this study will allow us to identify potential disparities in faculty members of different sexual orientations, and gain insight into how the significant variables might impact the experiences they have in academia.

Chi-Squared Test

To quantify the association between the qualitative/categorical variables (*Sex, Race, Marital Status, Has Children, Home Ownership, Academic Rank, First Generation, Depression Scale - Binary, Participation in Formal Mentoring, Mentor in Last Three Years, Currently Have a Mentor, Number of Mentors, Gender of Mentor, Race of Mentor, Mentoring Activities, Inadequate Mentoring, Research Hours, Teaching Hours, Service Hours, Outside Hours, Academic Department, Joint Appointment, Administrative Appointment*), we will conduct a chi-squared test for independence between the heterosexual and sexual minority samples. The chi-squared test calculates the expected frequencies for each category in the constructed contingency table and compares them to the actual observed frequencies. The null hypothesis of the test states that there is no association between the two groups, while the alternative hypothesis states that there is. In order to test the hypothesis, the chi-squared value, calculated by summing the squared differences between the observed and expected frequencies for each category, and dividing by the expected frequency for that category, and the degrees of freedom, calculated by the number of rows - 1 multiplied by the number of columns - 1 of the contingency table are used. If the calculated p-value is less than 0.05, then we are able to reject the null hypothesis and conclude that there is association for a specific categorical variable among the

two groups. It is important to note that this test assumes independent observations and sufficiently large sample sizes. Like the numerical variables above, the results from the chi-squared tests will inform us if there are any significant associations between the characteristics, experiences, or behaviors of faculty with different sexual orientations.

ANOVA and Simple Linear Regression

In addition to quantifying the associations/differences between the measures of the two sub-samples (heterosexual and sexual minority), this study also includes a stratified analysis of the association between a continuous depression variable and all other variables (for just the sexual minority group). Essentially, an effort was made to evaluate what characteristics and experiences of a sexual minority faculty contributes to depression. To conduct this stratified analysis, a 2-sample t-test was used when a variable had two categories (*Sex, Has Children, Home Ownership, Academic Rank, First Generation, Depression Scale - Binary, Participation in Formal Mentoring, Currently Have a Mentor, Mentor in Last Three Years, Gender of Mentor, Joint Appointment, Administrative Appointment*), a one-way ANOVA was utilized when a variable had three or more categories (*Race, Marital Status, Individual Annual Income, Household Net Worth, Number of Mentors, Race of Mentor, Mentoring Activities, Inadequate Mentoring, Research Hours, Teaching Hours, Service Hours, Outside Hours, Respectful Department Chair, Institutional Policies*. *Academic Department, Satisfaction of Balance*), and for continuous variables (*Age, Life Events, Self Care, Social Support, Depression Scale - Numeric, Mentoring Relationship Scale, Mentoring Frequency Sum, Discrimination, Role Overload*) , simple linear regression was performed. One-way ANOVA is a statistical test used to determine if there are significant differences in the means of three or more independent groups, while simple linear regression is a technique used to model the relationship between a dependent variable (CESD) and one independent variable. Both of these techniques, along with the 2-sample t-test, allow us to compute a p-value to determine whether or not to reject the null hypothesis that there is no association between CESD and all measures in this study. The results from this analysis may allow us to identify specific factors of influence in depression, and may provide a foundation for further downstream analysis.

The entire analysis of this study was conducted using R version 4.2.1, with the RStudio IDE.

Results

Table 1

Sample Sociodemographic Characteristics Organized by Sexual Minority Status

Variables	Total Sample (n = 596), 100%	Sexual Minority (n = 81), 14%	Heterosexual (n = 515), 86%	P-value
Age [M, (SD)]	454, 100%	57, 13%	397, 87%	0.1048
Sex	596, 100%	81, 14%	515, 86%	0.873
Male	369, 62%	49, 13%	320, 87%	
Female	227, 38%	32, 14%	195, 86%	
Race	584, 100%	77, 13%	507, 87%	0.4908

White	126, 21%	15, 12%	111, 88%	
African American/Black	302, 52%	38, 13%	264, 87%	
American Indian/Alaska Native	21, 4%	4, 19%	17, 81%	
Asian	1, 0.2%	0, 0%	1, 100%	
Native Hawaiian/Pacific Islander	1, 0.2%	1, 100%	0, 0%	
Some other race/mixed race	133, 22%	19, 14%	114, 86%	
Marital Status	592, 100%	81, 14%	511, 86%	0.01008
Never married	96, 16%	20, 21%	76, 79%	
Married/living with partner	406, 69%	56, 14%	350, 86%	
Separated/widowed/divorced	90, 15%	5, 6%	85, 94%	
Has Children	595, 100%	81, 14%	514, 86%	< .001
Yes	355, 60%	23, 6%	332, 94%	
No	240, 40%	58, 24%	182, 76%	
Individual Annual Income	594, 100%	80, 14%	514, 86%	0.03673
$0 to $35,000	0, 0%	0, 0%	0, 0%	
$35,001 to $50,000	14, 2.5%	2, 14%	12, 86%	
$50,001 to $70,000	190, 32%	33, 17%	157, 83%	
$70,001 to $90,000	156, 26%	18, 12%	138, 88%	
$90,001 to $115,000	118, 20%	17, 14%	101, 86%	
$115,001 to $130,000	32, 5.5%	4, 13%	29, 87%	
$130,001 or more	61, 10%	4, 7%	57, 93%	
Prefer not to answer	22, 4%	2, 9%	20, 91%	
Home Ownership	592, 100%	80, 14%	512, 86%	0.08702
Yes	435, 73%	52, 12%	383, 88%	
No	157, 27%	28, 18%	129, 82%	
Household Net Worth	597, 100%	89, 13%	508, 87%	0.03602
$0 to $30,000	90, 16%	21, 23%	69, 77%	
$30,001 to $60,000	27, 5%	0, 0%	27, 100%	
$60,001 to $90,000	44, 7%	6, 14%	38, 86%	
$90,001 to $125,000	78, 13%	9, 12%	69, 88%	
$125,001 to $150,000	46, 8%	10, 22%	36, 78%	
$150,001 to $200,000	61, 10%	9, 15%	52, 85%	
$200,001 to $300,000	47, 8%	4, 9%	43, 91%	
$300,001 to $400,000	36, 6%	3, 8%	33, 92%	
$400,001 or more	90, 14%	12, 13%	78, 87%	
prefer not to answer	78, 13%	15, 19%	63, 81%	
Academic Rank	563, 100%	77, 14%	486, 86%	1
Associate Professor	273, 48%	37, 14%	236, 86%	
Assistant Professor	290, 52%	40, 14%	250, 86%	
First Generation	553, 100%	73, 13%	480, 87%	0.7847
Yes	262, 47%	33, 13%	229, 87%	
No	291, 53%	40, 14%	251, 86%	

Life Events [M, (SD)]	574 [16.90592, 3.755373], 100%	79 [17.79747, 4.026769], 14%	495 [16.76364, 3.694658], 86%	0.03457
Self Care [M, (SD)]	573 [28.68237, 7.354913], 100%	79 [28.91139, 6.911881], 14%	494 [28.64575, 7.429316], 86%	0.7542
Social Support [M, (SD)]	573 [41.34031, 7.925863], 100%	79 [41.67089, 7.24608], 14%	494 [41.28745, 8.03481], 86%	0.6681
Depression Scale - Numeric [M, (SD)]	572 [4.190559, 4.62352], 100%	79 [5.468354, 5.4369], 14%	493 [3.985801, 4.451843], 86%	0.02344
Depression - Binary	579, 100%	79, 15%	491, 85%	0.02721
Not Depressed	422, 73%	50, 12%	372, 88%	
Depressed	148, 27%	29, 20%	119, 80%	

Table 1

Table 1 include all sociodemographic characteristics organized by sexual minority status. These measures include age, sex, race, marital status, annual income, medarating resouces, and depression scale. Among these measures, *Marital Status, Has Children, Individual Annual Income, Household Net Worth, Life Events, Depression Scale - Numeric, Depression Scale - Binary* have p-values smaller than 0.05, indicating these variables being statistically significant at 0.05 level. The measure *Home Ownership* has p-value less than 0.10. The Chi-Square result for *Martial Status* is (X^2 = 9.1937; *df* = 2; *p* = .01008). The Chi-Sqaure for *Has Children* is (X^2 = 36.605; *df* = 1; *p* = 1.447e-09). The ANOVA for *Individual Annual Income* is (*t* = 2.114; *df* = 112.29; *p* = .03673). The ANOVA for *Household Net Worth* is (*t* = 2.1245; *df* = 102.97; *p* = .03602). The ANOVA for *Life Events* is (*t* = -2.1426; *df* = 100.08; *p* = .03457). The ANOVA for Depression Scale - Numeric (CESD) is (*t* = -2.3031; *df* = 95.486; *p* = .02344). The Chi-Square result for Depression Scale - Binary is (X^2 = 4.8774; *df* = 1; *p* = .02721). The Chi-Square result for *Home Ownership* is (X^2 = 2.9286; *df* = 1; *p* = .08702). Since the p-values are smaller than 0.05, we reject the null hypothesis that there is no difference between heterosexual and sexual minority. There are statistically difference between heterosexual and sexual minority faculty in terms of their marital status, whether they have children, individual income, household net worth. For Martical Status, compared to heterosexual minority, sexual minority faculty has a larger porpotion of never married, and smaller proportion of being separated/widowed/divorced. For *Has Children*, a large proportion of sexual minority faculty does not have children, while large proportion heterosexual faculty have children. For *Individual Income*, only a small proportion of sexual minority faculty have annual income $130,001 or more, while this proportion is larger for heterosexual. For Household Net Worth, the proportion of sexual minorities with household net worth $200,001 to $300,000 and $300,001 to $400,000 is smaller than the proportion for heterosexual, which means heterosexual faculty are more likely to have expensive houses. For *Life Events* and *Depression Scale*, sexual minority faculty is more likely to encounter stressful life events within the past year, and has a higher depression scale than heterosexual faculty.

Table 2

Sample Higher Education Mentoring Experiences Organized by Sexual Minority Status

Variables	Total Sample (n = 596),100 %	Sexual Minority (n = 81), 14%	Heterosexual (n = 515), 86%	p-value
Participation in Formal Mentoring	573, 100%	80, 14%	493, 86%	1
Yes	139, 24%	19, 14%	120, 86%	
No	434, 76%	61, 14%	373, 86%	
Mentor in Last Three Years	588, 100%	80, 14%	508, 86%	0.1358
Yes	321, 55%	37, 12%	284, 88%	
No	267, 45%	43, 16%	224, 84%	
Currently Have a Mentor	587, 100%	80, 14%	507, 86%	0.0650
Yes	280, 48%	30, 11%	250, 89%	
No	307, 52%	50, 16%	257, 84%	
Number of Mentors	278, 100%	30, 11%	248, 89%	0.9724
0-1	77, 28%	9, 12%	68, 88%	
2	97, 35%	10, 10%	87, 90%	
3-5	89, 32%	9, 10%	80, 90%	
>6	15, 5%	2, 13%	13, 87%	
Gender of Mentor	278, 100%	30, 11%	248, 89%	0.4
Male	142, 51%	18, 13%	124, 87%	
Female	136, 49%	12, 9%	124, 91%	
Race of Mentor	279, 100%	30, 11%	249, 89%	0.551
White	157, 56%	13, 8%	144, 92%	
Black/African American	59, 21%	10, 17%	49, 83%	
Hispanic/Latino	14, 5%	1, 7%	13, 93	
Native American/Alaska Native	6, 2.5%	1, 17%	5, 83	
Asian/Pacific Islander	37, 13%	4, 11%	33, 89	
Other	6, 2.5%	1, 17%	5, 83	
Mentoring Activities	568, 100%	58, 10%	510, 90%	0.1701
Journal Editorial Boards	42, 7%	5, 12%	37, 88%	0.9226
Invitation to Conferences	119, 22%	11, 9%	108, 91%	0.1623
Chairing of Conferences	36, 6%	5, 14%	31, 86%	1
Opportunities for Research Collaboration	157, 28%	18, 11%	139, 89%	0.4414
Co-authoring	126, 22%	13, 10%	113, 90%	0.2887
Reviews Career Annually (Yes)	88, 15%	6, 7%	82, 93%	0.0658
Inadequate Mentoring	579, 100%	80, 14%	499, 86%	0.9289
Very Significant	144, 25%	21, 15%	123, 85%	
Somewhat	193, 33%	27, 14%	166, 86%	
Not at all	242, 42%	32, 13%	210, 87%	

Mentoring Relationship Scale [M, (SD)]	562 [12.75801, 5.785083], 100%	78 [11.61538, 5.091962], 14%	484 [12.94215, 5.87312], 86%	0.0390
Critique the mentee scholarly work	559, 100%	77, 14%	482, 86%	0.0226
Promote visibility outside institution	559, 100%	78, 14%	481, 86%	0.0104
Prospectively advise criteria for promotion	557, 100%	78, 14%	479, 86%	0.221
Hold progress meeting about criteria for promotion	557, 100%	78, 14%	479, 86%	0.0839
Provide emotional support and inspiration in relation to the mentees academic career	569, 100%	78, 14%	482, 86%	0.1385

Table 2

Table 2 includes all Higher Education Mentoring Experiences Measures Organized by Sexual Minority Status. These measures include whether the faculty participate in formal mentoring, whether they have mentored in the last three years, whether they have a mentor currently, mentoring activities, number of mentors, gender and race of mentor, whether the faculty believe inadequate mentoring has impeded their careers, mentoring relationships scale, and frequency of mentoring activity. Among these measures, *Mentoring Relationship Scale* has a p-value smaller than 0.05. *Currently Have a Mentor, Reviews Career Annually in Mentor Activities* are significant at 0.10 significance level. The ANOVA for *Mentoring Relationship Scale* is ($t = 2.0882$; $df = 112.73$; $p = .03903$). The Chi-Square result for *Currently Have a Mentor* is ($X^2 = 3.404$; $df = 1$; $p = .0650$). The Chi-Square result for *Reviews Career Annually in Mentor Activities* is ($X^2 = 3.3841$; $df = 1$; $p = .0658$). We reject the null hypothesis that there is no difference between heterosexual and sexual minorities. There are statistically differences between heterosexual and sexual minority faculty in terms of their mentoring relationship and mentoring frequency. Sexual minority faculty has a lower mentoring relationship compared to heterosexual faculty. For *Currently Having a Mentor,* the proportion of sexual minority faculty who do not currently have a mentor is larger than those of heterosexual faculty. For *Reviews Career Annually in Mentor Activities*, the proportion of sexual minority faculty who responded that their mentoring activities include reviews career annually is lower than those of heterosexual faculty.

Table 3

Sample Higher Education Institutional Experiences Organized by Sexual Minority Status

Variables	Total Sample (n = 596), 100%	Sexual Minority (n =81),14 %	Heterosexual (n =515),86%	P-value
Research Hours	569, 100%	78, 13.7%	491, 86.3%	0.0731
0-20 hours	342, 60%	48, 14%	294, 86%	

21-30	130, 23%	23, 18%	107, 82%	
31+	97, 17%	7, 7%	90, 93%	
Teaching Hours	569, 100%	79, 13.9%	490, 86.1%	0.1578
0-10 hours	193, 34%	22, 11.4%	171, 88.6%	
11-20	239, 42%	41, 17.2%	198, 82.8%	
21+	137, 24%	16, 11.7%	121, 88.3%	
Service Hours	548, 100%	79, 14.4%	469, 85.6%	0.6219
5 or less hours	254, 46%	36, 14.2%	218, 85.8%	
6-10	170, 31%	22, 12.9%	148, 87.1%	
11+	124, 23%	21, 16.9%	103, 83.1%	
Outside Hours	453, 100%	67, 14.8%	386, 85.2%	0.1557
< 5	272, 60%	45, 16.5%	227, 83.5%	
6-10	132, 29%	13, 9.8%	119, 90.2%	
11+	49, 11%	9, 18.4%	40, 81.6%	
Respectful Department Chair	566, 100%	79, 14%	487, 86%	0.3149
Rarely or never true	69, 12%	13, 18.8%	56, 81.2%	
Occasionally true	101, 18%	16, 15.8%	85, 84.2%	
Often true	101, 18%	11, 10.9%	90, 89.1%	
Usually true	128, 23%	17, 13.3%	111, 86.7%	
True most of the time	167, 29%	22, 13.2%	145, 86.8%	
Institutional Policies	559, 100%	76, 13.6%	483, 86.4%	0.3848
Rarely or never true	87, 16%	14, 16.1%	73, 83.9%	
Occasionally true	121, 22%	16, 13.2%	105, 86.8%	
Often true	117, 21%	19, 16.2%	98, 83.8%	
Usually true	132, 23%	14, 10.6%	118, 89.4%	
True most of the time	102, 18%	13, 12.7%	89, 87.3%	
Role overload [M, (SD)]	576 [32.68, 7.64], 100%	79, 13.7% [32.99, 8.93]	497, 86.3% [32.63, 7.47]	0.7393
Academic Department	561, 100%	78, 13.9%	483, 86.1%	0.0221
Professional Schools	105, 19%	12, 11.4%	93, 88.6%	
Health Professions	98, 17%	8, 8.2%	90, 91.8%	
Education	50, 9%	5, 10%	45, 90%	
STEM	42, 7%	1, 2.4%	41, 97.6%	
Arts & Humanities	125, 23%	28, 22.4%	97, 77.6%	
Ethnic Studies	33, 6%	7, 21.2%	26, 78.8%	
Social Sciences	108, 19%	17, 15.7%	91, 84.3%	
Vocational Strain	574 [18.68, 5.58], 100%	78, 13.6% [19.92, 6.65]	496, 86.4% [18.54, 5.43]	0.0833
Joint Appointment	589, 100%	80, 13.6%	509, 86.4%	0.4171
Yes	135, 23%	15, 11.1%	120, 88.9%	
No	454, 77%	65, 14.3%	389, 85.7%	
Sum of Bias	576	79, 13.7% [14.72,4.93]	496, 86.3% [14.24, 4.88]	0.9517

	[14.17, 4.82], 100%			
Racial/ethnic bias by superior or colleague	575, 100%	79, 13.7%	496, 86.3%	0.9517
Never	188, 33%	27, 14.4%	161, 85.6%	
Rarely	194, 34%	25, 12.9%	169, 87.1%	
Often	167, 29%	24, 14.4%	143, 85.6%	
Always	26, 4%	3, 11.5%	23, 88.5%	
Gender bias by superior or colleague	576, 100%	79, 13.7%	497, 86.3%	0.7691
Never	98, 17%	13, 13.3%	85, 86.7%	
Rarely	224, 39%	27, 12.1%	197, 87.9%	
Often	200, 35%	31, 15.5%	169, 84.5%	
Always	54, 9%	8, 14.8%	46, 85.2%	
Class bias by superior or colleague	574, 100%	79, 13.8%	495, 86.2%	0.8577
Never	123, 22%	15, 12.2%	108, 87.8%	
Rarely	253, 44%	34, 13.4%	219, 86.6%	
Often	138, 24%	20, 14.5%	118, 85.5%	
Always	60, 10%	10, 16.7%	50, 83.3%	
Left out of opportunities based on gender	569, 100%	79, 13.9%	490, 86.1%	0.3585
Never	204, 36%	25, 12.2%	179, 87.7%	
Rarely	217, 38%	27, 12.4%	190, 87.6%	
Often	117, 21%	21, 17.9%	96, 82.1%	
Always	31, 5%	6, 19.4%	25, 80.6%	
Left out of opportunities based on race/ethnicity	564, 100%	75, 13.3%	489, 86.7%	0.8751
Never	241, 43%	31, 12.9%	210, 87.1%	
Rarely	178, 32%	24, 13.5%	154, 86.5%	
Often	122, 22%	18, 14.8%	104, 85.2%	
Always	23, 3%	2, 8.7%	21, 91.3%	
Left out of opportunities based on class	564, 100%	75, 13.3%	489, 86.7%	0.6591
Never	162, 29%	19, 11.7%	143, 88.3%	
Rarely	204, 36%	32, 15.7%	172, 84.3%	
Often	150, 26%	18, 12%	132, 88%	
Always	48, 9%	6, 12.5%	42, 87.5%	
bias7	562, 100%	74, 13.2%	488, 86.8%	0.5238
Never	279, 50%	34, 12.2%	245, 87.8%	
Rarely	188, 33%	23, 12.2%	165, 87.8%	
Often	72, 13%	13, 18.1%	59, 81.9%	
Always	23, 4%	41, 17.4%	19, 82.6%	
Satisfaction of Balance	574, 100%	79, 13.8%	495, 86.2%	0.0533
Very dissatisfied	98, 17%	21, 21.4%	77, 78.6%	
Somewhat dissatisfied	195, 34%	22, 11.3%	173, 88.7%	
Neural	89, 16%	16, 18%	73, 82%	

Somewhat satisfied	149,25%	17, 11.4%	132, 88.6%	
Very satisfied	43, 8%	3, 7%	40, 93%	
Administrative Appointment	596, 100%	81, 13.6%	515, 86.4%	1
Yes	450, 76%	61, 13.6%	389, 86.4%	
No	146, 24%	20, 13.7%	126, 86.3%	

Table 3

Table 3 includes all higher education institutional experiences measures organized by sexual minority status. These measures include research hours, teaching hours, service hours, outside hours, academic department, role overload, vocational strain, etc. Among these measures, *Academic Department* has a p-value smaller than 0.05, indicating these variables being statistically significant. *Research Hours, Vocational Strain, Satisfaction of Balance* has p-values smaller than 0.10. The ANOVA for *Academic Department* is (t = -2.3239; df = 104.76; p = .02206). The Chi-Square for *Research Hours* is (X^2 = 5.231; df = 2; p = 0.073). The ANOVA for *Vocational Strain* is (t = -1.751; df = 93.83; p = .0833). The ANOVA for *Satisfaction of Balance* is (t = 1.9547; df = 105.47; p = .0533). We reject the null hypothesis that there is no difference between heterosexual and sexual minority for *Academic Department*. Sexual minority faculties have larger proportions in Arts & Humanities, Ethnic Studies, and Social Sciences, whereas heterosexual faculties have larger proportions in Professional Schools, Health Professions, Education and STEM. For *Research Hours*, a larger proportion of heterosexual faculties have research hours of 31+, while this proportion for sexual minority faculties is lower. For *Vocational Strain*, sexual minority has a higher total score of vocational strain than heterosexual faculty. For *Satisfaction of Balance*, sexual minorities have a larger proportion of very dissatisfied than heterosexual faculty, and a lower proportion of very satisfied than heterosexual faculty.

Stratified Analysis

Table 4

Association between CESD and other measures for Sexual Minority

Variables	P-value
Age	0.343
Sex	0.551
Marital Status	0.167
Has Children	0.969
Individual Annual Income	0.870
Home Ownership	0.043
Household Net Worth	0.071
Academic Rank	0.028
Primary Academic Disciplines	0.695
Research Hours	0.744
Teaching Hours	0.504
Service Hours	0.712

Outside Hours	0.008
Participation in Formal Mentoring	0.036
Mentors in Last Three Years	0.996
Currently Have a Mentor	0.891
Number of Mentors	0.307
Gender of Mentors	0.727
Race of Mentors	0.967
Mentor Activities	0.314
Inadequate Mentoring	0.087
Helping Family/Friends Regularly	0.536
Helping Family/Friends Last 4 Weeks	0.135
Satisfaction of Balance	0.052
Respectful Department Chair	0.159
Institutional Policies	0.195
Mother's Education	0.765
Father's Education	0.335
Role Overload	0.053
Life Events	< .001
First Generation	0.648
Self Care	0.022
Role Ambiguity	< .001
Vocational Strain	< .001
Social Support	< .001
Growth Impeded	0.246

For sexual minority faculty, the association between CESD (depression scale) and variables *Home Ownership, Academic Rank, Life Events*, *Outside Hours, Role Ambiguity, Vocational Strain, Social Support, Participation in Formal Mentoring,* are significant.

The t-test result for association between CESD and *Home Ownership* is (t= -2.0914; *df* = 38.192; *p* = .04319). Faculty who do not own homes have a higher depression scale. The t-test result for association between CESD and *Academic Rank* is (t= -2.2445; *df* = 68.002; *p* = .02806). Faculty who are assistant professors have a higher depression scale than faculty that are associate professors. The linear regression result for association between CESD and *Life Events is (B* = 0.5357, *p* = .000295). Faculty with higher Life Events Stress scores have a higher depression scale. The regression result for association between CESD and *Vocational Strain* is (B = 0.38912; p =1.21e-05). Faculty with higher *Vocational Strain* scores have higher depression scales. The regression result for association between CESD and *Social Support* is (B = -0.33325; p = 4.13e-05). Faculty who have higher Social Support scores, meaning they feel they received more social support, have lower depression scales. The t-test result for association between CESD and *Participation in Formal Mentoring* is (t= 2.1777; *df* = 35.861; *p* = .03609). Faculty who do not participate in formal mentoring programs have a higher depression scale.

Limitations

Methodological

There are several methodological limitations in this study, including the non-random procedure of networking sampling, the presence of a plethora of self-reported measures, and the voluntary nature of participation. Networking sampling is a non-probability technique, where participants of the study were selected based on a network of individuals, such as academic listservs, participant referrals, personal contacts, or academic websites. While this technique is an appropriate method for analyzing a target population that is difficult to access (marginalized or hidden populations), there still exists some biases with this process. For example, sample bias may be introduced to the data, since the non-random nature of the selection process creates a potentially non-representative sample of the target population. Furthermore, generalizability is decreased, as the ability to assess the differences across ethnic and racial groups at the population level is limited. Another limitation of the study is the presence of self-reported measurements with different categorical or likert scales. Self-reported measurements are often subjected to both recall and response bias, as the participants may not remember or interpret the questionnaire correctly. Therefore, this may skew the results that involve these measurements, and researchers should be cautious when interpreting these metrics. These findings are further limited by the voluntary nature of participation and potential selection bias among the participants. Despite the limitations that should be considered when evaluating the results, this research is still incredibly relevant for peering into the experiences of sexual minority faculty versus heterosexual faculty in academia.

Analytical

In addition to methodological limitations, several analytical limitations also exist, such as the presence of imbalanced classes and the cross-sectional nature of the research. Imbalanced classes refer to situations in which the distribution of a target variable is heavily skewed towards one class (heterosexual faculty), while the other class (sexual minority faculty) only accounts for a small proportion of the data. While this study does not attempt to use any machine learning algorithms to model the relationship between the collected metrics, for any further downstream analysis, it is important to note that machine learning models tend to be biased towards the majority class, potentially leading to poor performance in the minority class. Furthermore, standard evaluation metrics such as precision, accuracy, and recall may be misleading in this context. In order to address this issue, researchers may choose to resample the data (undersampling the majority and oversampling the minority); however, it is important to understand that oversampling often leads to overfitting, while undersampling leads to the loss of information. Other ways to combat imbalanced data is to use cost-sensitive learning or ensemble methods such as bagging or boosting. Another analytical limitation is the cross-sectional nature of this study. A study is classified as cross-sectional if data is collected from a group at a single point in time. Since this study cannot track changes over time, causality cannot be firmly established, as it is nearly impossible to isolate the effects of the exposure variable on the outcome variable. Furthermore, this type of study may not capture the full range of behaviors or

experiences, and will have a much more limited scope than longitudinal studies, which track changes over time. Again, while some limitations exist in the analysis of the data, this research is still relevant in the comparison between heterosexual and sexual minority faculty in academia.

Conclusion

Our analysis found out that these variables are statistically significant at 0.05 significance level: *Marital Status, Has Children, Individual Annual Income, Household Net Worth, Life Events, Depression Scale, Mentoring Relationship Scale, Academic Department.* These variables are significant at 0.10 significance level: *Home Ownership, Currently Have a Mentor, Reviews Career Annually in Mentor Activities, Research Hours, Vocational Strain, Satisfaction of Balance.* We can conclude that there are significant differences between the heterosexual faculties and sexual minority faculties.

We notice that the mean depression scale for heterosexual faculties is 3.986, and for sexual minority the depression scale is 5.468. Based on the survey results, 8.11% of heterosexural faculties responded that they have a CESD score of 12 or above, indicating that they have relatively high psychological distress. However, 16.5% of sexual minorities responded that they have a CESD score of 12 or above. The mental health of underrepresented sexual minority faculties need to be concerned about. Besides, we notice that the *Mentoring Relationship Scale, Currently Have a Mentor, Reviews Career Annually in Mentor Activities* are lower than those for sexual minority faculty, indicating that these are variables in Higher Education Mentoring Experiences that sexual minority faculty do not have enough engagement as much as heterosexual faculty. For example, some sexual minority faculty may not have a mentor, do not have annual career reviews as part of their mentoring activities, or do not keep mentoring relationships as well as heterosexual faculties do. Further actions need to be taken to increase the engagement of mentoring experiences for sexual minority faculty and improve the relationships with their mentors.

Regarding the analysis of associations between depression scale (CESD) and every other variables for sexual minority faculties, *Home Ownership, Academic Rank, Outside Hours, Participation in Formal Mentoring, Life Events, Vocational Strain, Social Support* have p-values smaller than 0.05, indicating that the association of Depression Scale and theses variables are significant at 0.05 significance level. We notice that the Stress-inducing Work Roles Measures, including *Role Ambiguity, Vocational Strain, Social Support*, are important factors that significantly impact faculties' mental health. Besides, whether or not they have participated in formal mentoring also affects the mental condition of sexual minority faculties. Further actions need to be taken to ensure that more faculties can participate in mentoring programs.

Next Steps

Throughout this research study, we have primarily been focused on quantifying the differences in characteristics between heterosexual and sexual minority faculty in academia - using statistical techniques such as the chi-squared test, t-test, and ANOVA. The logical progression for the next steps of this research would be to build robust models to accurately predict certain characteristics of sexual minority faculty in academia. As an example, since we briefly conducted a stratified analysis with depression as a response variable, we can now advance this methodology to build complex machine learning models to predict the depression scale of a given faculty, based on inputs of sociodemographic, mentoring, and institutional experiences. Should this potential future model prove to be high-performing, it can serve as a tool to provide more inclusivity to the academic world. By gaining insight into the mental health of incoming faculty members, the academic institution may be able to provide more accommodation with services such as increased counseling sessions, more mental health awareness, and targeted assistance for those in need. There are certainly more routes of advancement for this field of research, and our study lays the foundation for any further analysis.

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