Interference in Environmental Studies and Sciences: Understanding how Identity Factors Influence Experienced Interference

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Abstract

The ability for all environmental researchers to effectively practice and communicate their research is important because it can influence policy and decision-makers. However, my research found that interference in environmental studies and sciences is happening, and a researcher's identity was reported to influence the rates of experienced interference. For example, 53% of respondents indicated that they were constrained by their concerns about how they may be represented by media, and women-identifying respondents reported a statistically significant higher rate; and 24% of respondents indicated that they were constrained by senior management, and racial and visible minority respondents reported a statistically significant higher rate. My research also found that many of the marginalized groups in the survey were underrepresented compared to Canadian demographics. This is the first known study that compares the experiences of interference in environmental studies and science across identity groups.

Key words: identity factors, demographics, interference, environmental studies and sciences, environmental researchers, suppression, self-censorship, discrimination, quantitative research, Canada

Acknowledgements

Chapter 1: Introduction

1.1 Introduction

The ability for environmental researchers to effectively practice and communicate their research is important. This is because environmental studies and sciences research influences government and society who can, in turn, help to prevent and mitigate the impacts of climate change, environmental harms, and other ecological losses and changes (Driscoll, 2021; Westwood et al., 2019). Ensuring marginalized groups, such as Black, Indigenous, and People of Colours (BIPOC), women, and researchers with disability(s), voices are equally heard is important because diverse perspectives in research help to provide higher quality, quantity, and impact of the research, creating just workplaces, and, because of researcher identity, marginalized groups may be more likely to study marginalized communities who are more likely to be disproportionately impacted by climate change, environmental harms, and ecological losses and changes (Islam & Winkle, 2017; Masuda et al., 2008; Freeman & Huang, 2014; Massey et al., 2021, p.2; Hong et al., 2004; Fine et al., 2020). However, marginalized groups in Canada have been and are currently being discriminated against in workplace (Taylor, 2018; CBC, 2015; Employment and social development, 2019, p.18; Smith & Calasanti, 2005). This study compared experiences and prevalence of interference in environmental studies and science across different identity groups.

1.2 Purpose Statement

The purpose of this research was to analyse the relationship between identity factors and amount and type of interference experienced by environmental researchers in Canada. The independent variable, identity factor (also referred to as demographics), will be the different identity groups, based on gender, race and ethnicity, perceived race, sexual orientation, disability status, and visible religious signifiers. The dependent variable, amount of interference experienced, will be defined as any and all actions that may inhibit or the limit the abilities of environmental researchers and their ability to conduct and disseminate their work.

1.3 Background

Interference in environmental studies and sciences, for the purpose of this study, refers any and all actions that may inhibit or the limit the abilities of environmental researchers and their ability to conduct and disseminate their work. Examples of interference, based on the research, include, but are not limited to, political interference, muzzling and suppression, modification to

work, and unfair lack of funding (PIPSC, 2018; Driscoll et al., 2021; Heer & Girling, 2020; Smith et al., 2017). Interference in environmental studies and sciences is not a recent or new occurrence. From Iran to Canada, and many other places in the world, there have been numerous accounts of interference (PIPSC, 2018; Driscoll et al., 2021; Catanzro, 2019; Smith et al., 2017).

Interference matters because the knowledge and insight gained from environmental studies and science ensures that policies are scientifically based (National Research Council of Canada, 2018; Centers for Disease Control and Prevention, 2013). Policies can protect the environment and help to prevent and mitigate the effects of climate change, environmental harms, and poor environmental outcomes (Driscoll et al., 2021; Westwood et al., 2019). When interference occurs, it impedes researchers from being able to freely conduct and disseminate their work.

It has been well documented and generally understood, especially in the wake of MeToo, Black Lives Matter, and LBGTQ+ movements, that marginalized groups have experienced discrimination and barriers throughout society and the workplace (Green et al., 2019). Marginalized groups are defined as those that are "excluded mainstream social, economic, educational, and/or cultural life" and experience discrimination and exclusion due to unequal power relations in society (Sevelius et al., 2020, p.1; National Collaboration Centre for Determinants of Health, n.d). Marginalized groups in Canada include, but are not limited to, peoples such as women, people who identify as non-binary, people who identify as LGBTQ+ (lesbian, gay, bi-sexual, transgender, queer, and more), people with disability, BIPOC, and other visible minorities (Sevelius et al., 2020, p.1). The voices of marginalized researchers in environmental studies and sciences are important for three reasons; 1) as environmental studies and sciences are at the forefront of tackling complex global issues, such as environmental health, conservation, and climate change, diverse perspectives are needed as it is positively correlated with the quality, quantity, and impact of the research (Massey, 2021; Hong et al., 2004). 2) The establishment of just and equitable workplaces, which is necessary to creating barrier and discrimination free workplaces and increasing the well-being of all researchers (Fine et al., 2020). 3) As a researcher's identity can heavily influences a researcher's area of study and research processes, researchers from marginalized groups may be more like to study marginalized communities which is important because marginalized communities are more likely to be negatively impacted by climate change, environmental harms, and ecological losses and changes (Parker, 2020; McCorkel & Myers, 2003; Holmes, 2020; Massey et al., 2021, Islam & Winkle, 2017; Taylor, 2018; Masuda et al., 2008; Freeman & Huang, 2014)

1.4 Problem Statement

It is known from the literature that interference in environmental studies and sciences exists, and that marginalized groups continues to face barriers. However, there is a gap in the literature in Canada that connects interference in environmental studies and sciences and demographics. In my research I wish to bridge that gap to inform and compare the experiences and prevalence of interference in environmental studies and science across demographic groups.

1.5 Research Question

To what extent do identity factors play a role in the amount and type of interference experienced by Canadian environmental researchers? If so, are there patterns and/or differences in type and degree of interference experienced?

1.6 Hypothesis

Marginalized groups will experience higher rates of interference in their work compared to the typically predominant group in Canadian population in environmental studies and science in Canada.

Chapter 2: Literature Review

2.1 Interference in Environmental Sciences and Studies

Understanding the possible motivations for interference, sources of interference, and it's impacts on environmental studies and sciences is important. Suggested reasons behind interference of interference include political and financial motivations (Driscoll, 2021; Catanzro, 2019; PIPSC, 2018; Carter, 2018). Sources interference can be categorized into two groups, direct and indirect (Martin, 1999, Driscoll, 2021). The act of interference can take many shapes including modification to work, muzzling, or self-censorship (Driscoll, 2021, Westwood et al., 2019, PIPSC, 2018). Interference in environmental studies and sciences can have severe consequences, including eroded democratic processes, failing science-policy cycles, and negative personal and professional impacts on researchers themselves (Driscoll, 2021, Westwood et al., 2019). All of this, ultimately leading to poor environmental outcomes, see figure 1 (Driscoll, 2021). This section will explore the current literature that exists on the prevalence of interference in environmental sciences and studies, why it happens, and why it matters.
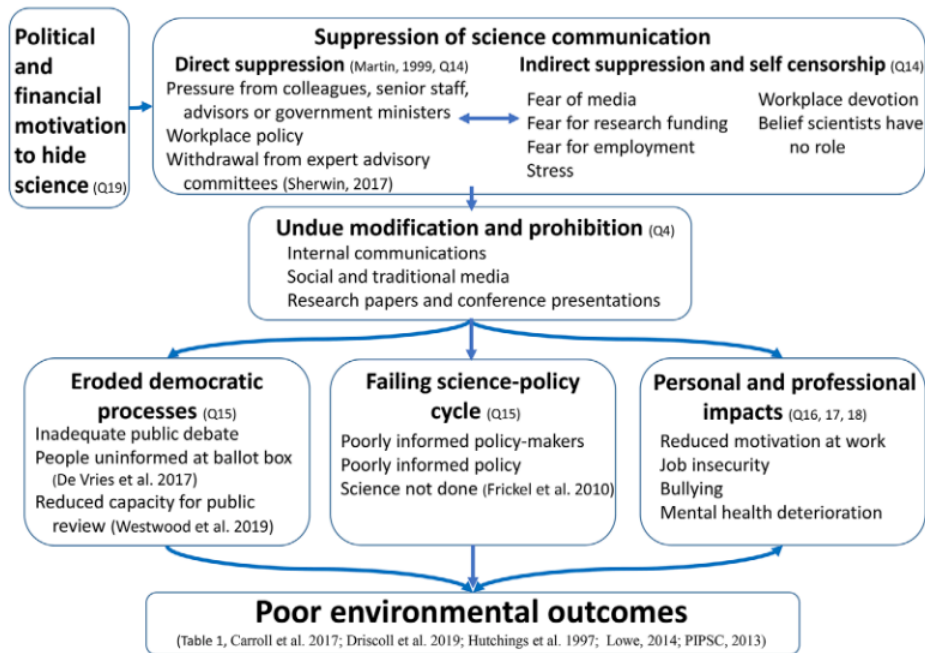
Figure 1: This diagram summarizes the process of interference leading to poor environmental outcomes. It identifies how there are two forms of suppression, direct and indirect, with political and financial motivations being a likely cause. This leads to undue modifications and prohibition of communications, research papers, and conference presentations. When undue modifications occur, it leads to eroded democratic processes, failing science-policy cycle, and has personal and professional impacts. Finally, all leading to poor environmental outcomes (Driscoll et al., 2021).

2.1.1 Definition of Interference

The term interference is broad and purposely so. It is meant to cast a wide net over any and all actions that many limit or inhibit the ability of environmental scientist to freely conduct and disseminate their research. There are three known major studies of interference in environmental studies and sciences, however, these have specifically looked at muzzling, political interference, and suppression, which are types of interference as they prevent scientists from conducting and disseminating work (PIPSC, 2013; Driscoll, 2021). Two of these studies were by the Professional Institute of Public Service of Canada (PIPSC), which is a federal organization that represents 40 federal departments and agencies. The first study was completed in 2013 during the Harper government, and the second, as a follow up survey, in 2017 to measure the progress of the Trudeau government in reversing the effect (PIPSC, 2018). PIPSC's twin surveys studied (1) muzzling, being prevented from speaking to media; and (2) political interference, in the Canadian federal government (PIPSC, 2013; PIPSC, 2018). The third study was by Don Driscoll and his team, in which they studied suppression in environmental science across government, university,

and industry in Australia. Driscoll defined suppression as "an active process to prevent data from being created, made available, or given suitable recognition" (Martin, 1999, Driscoll, 2021). Based on these studies and the objectives of this research, the word 'interference' was chosen as it broadens the scope to incorporate all forms of interference. Hence, for this research, examples of interference are, but are not limited to, suppression, muzzling, political interference, unfair lack of funding, prohibiting research communication, inappropriate modifications of research output, discrimination in the workplace, and self-censorship (PIPSC, 2013 & Driscoll, 2021).

2.1.2 Reasons/Motivations for Interference and Sources of Interference

Suggested reasons of interference include political and financial gains by governments and industry (Driscoll, 2021; Catanzro, 2019; PIPSC, 2018; Carter, 2018). In other words, interference can occur because there is pressure to protect government or industry from information that may expose, for example, government of an environmentally damaging policies or an industry venture that is negatively impacting a local wetland. Driscoll's paper found that 83% of interference is believed to be motivated by political or economic interests (Driscoll et al., 2021, pg 7). Similar results were found in the PIPSC studies with 71% in 2013 and 40% in 2017 believing that the ability to develop policy, law, and programs that are based on scientific evidence and facts have been compromised by political interference (PIPSC, 2018). In a more extreme example, in Iran eight conservationists were arrested; it is believed they were arrested because their research would have exposed the Iranian government of "worsening environmental issues" to the Iranian public and Western conservationist groups who have growing interest in the subject (Catanzro, 2019).

There are two sources of interference: direct and indirect. Direct interference refers to direct pressures put on the researcher that interfere with and prevent them being able to freely conduct and disseminate their work (Martin, 1999 & Driscoll et al., 2021). Indirect interference refers to indirect pressure put on researchers that prevents them from being able to freely conduct and disseminate their work typically through self-censorship (Driscoll et al., 2021). Direct interference can come from colleague pressure, senior staff, government policy, workplace policy, and withdrawal of expert advisors (Driscoll et al., 2021; Martin, 1999; Sherwin, 2017). Driscoll's study found that researchers from all sectors experienced interference through workplace policy, management, and minister's office; however, experienced to a significantly higher degree in government (Driscoll, 2021, p. 6). Specifically, respondents who indicated being suppressed by senior management was 82% in government, 42% in industry and 37% in university (Driscoll, 2021). The PIPSC studies found similar results, 48% in 2013 and 29% in 2017 of respondents

were aware of cases in which their department or agency has suppressed or declined to release information, and this led to incomplete, inaccurate, or misleading impressions by the public, regulated industry, the media and/or government officials (PIPSC, 2018).

Indirect suppression comes in the form of self-censorship. Self-censorship is the act of not presenting or publishing one's work or speaking publicly due to fear of retribution (Driscoll, 2021; Martin, 1999). By nature, this is a difficult area to research as there is a little data (Martin, 1999, pg 13). The PIPSC study, however, found that 86% in 2013 and 73% in 2017 felt they were unable to communicate with the public about a departmental decision or action that could bring harm to the public interest due to fear or censorship and retaliation (PIPSC, 2018). Similar results were found in the Driscoll study with between 50% and 75% of respondents stating that they avoided public commentary due to fear to retribution (Driscoll, 2021).

2.1.3 Impacts and Consequences of Interferences

Direct and indirect sources of interference can lead to undue modification of work and research or prohibition to communication (Driscoll, 2021). Undue modification is substantive changes to a text or story that downplays, masks, or misleads about environmental impacts (Driscoll, 2021; Pincock, 2009). Driscoll's study found 29% of respondents had experienced undue modification or prohibition to internal communications, 28% to traditional media communications, 11% to research articles, and 12% to conference presentations (Driscoll, 2021, p.4). The PIPSC studies found similar results as 37% in 2013 and 20% in 2017 of respondents were prevented from speaking publicly or to the media my management (PIPSC, 2018).

Undue modification and prohibition of communications can lead to eroded democratic processes, failing science-policy cycle, and has personal and professional impacts on the researcher (Driscoll et al., 2021). Firstly, democratic processes are based on public understanding and knowledge of government affairs and current events that are happening in their lives. When that knowledge is compromised, through interference in science, democratic processes are eroded (De Veries & Solaz, 2017; Driscoll, 2021). Driscoll's study found that 45% of all respondents believed that there was inadequate public discourse on policy (Driscoll et al., 2021, p 7). The PIPSC study found similar results with 48% in 2013 and 29% in 2017 stating that they were aware of cases where their department had suppressed or declined to release information, and where this led to inaccurate impressions by the public (PIPSC, 2018). This erosion is also based on the inability of the public to review and be consulted on incoming policy, which is important for democratic processes (Dricsoll et al., 2021; Westwood et al., 2019). Secondly,

incoming policies will be poorly informed as the researchers and their research were interfered with and possibly modified (Driscoll et al., 2021; PIPSC, 2018; Pullin & Knight, 2012). Driscoll's study found that 43% of government and 25% of industry and university respondents agreed that policy was "information starved" and inadequately informed (Driscoll et al., 2021). The PIPSC study found even more extreme results with 71% in 2013 and 40% in 2017 believing that the ability to develop policy, law, and programs that are based on scientific evidence and facts had been compromised (PIPSC, 2018). Lastly, personal and professional impacts of the interference on researchers. These personal impacts can be loss of employment, impacts to research career, and increased stress in the workplace (Pincock, 2009; Driscoll, 2021; Vasantha & Reddy, 2017). Driscoll's study found that 33% of respondents reported that they had experienced personal suffering associated with constraints (Driscoll, 2021).

These three consequences, eroded democratic processes, failing science-policy cycle and personal and professional impacts to researcher, can all result in poor environmental outcomes (Driscoll et al., 2021; Westwood et al., 2019; Carroll et al., 2017; Pullin & Knight, 2012). Which is particularly important as concerns regarding climate change, environmental harms, and ecological losses and changes continue to increase.

2.2 Marginalized Groups and Environmental Studies and Sciences

Marginalized groups experience increased barriers and discrimination in the workplace and in environmental studies and sciences that the predominant groups have not. This is due to a long history of racism, sexism, ablism, homophobia, and discrimination in Canada (Hanes, 2009; Rajan, 2021). There have been, and currently, are many efforts in many organizations to reduce these inequities; this is through increasing education, EDI (equity, diversity and inclusions) initiatives, and new policies (Lyle, 2021; Employment and social development, 2019; National Research Council of Canada, 2018; Taylor, 2018). These efforts, though not perfect, are important as the voices of marginalized researchers in environmental studies and sciences are crucial (Massey, 2021; Hong et al., 2004; Taylor, 2018; Fine et al., 2020).

Marginalized groups are defined as those that are "excluded mainstream social, economic, educational, and/or cultural life" and experience discrimination and exclusion due to unequal power relations in society (Sevelius et al., 2020, p.1; National Collaboration Centre for Determinants of Health, n.d). Marginalized groups in Canada include, but are not limited to, peoples such as women, people who identify as non-binary, people who identify as LGBTQ+,

people with disability, BIPOC, and other racial and visible minorities (Sevelius et al., 2020, p.1; Employment and Social Development Canada, 2020; Banting & Thompson, 2021).

2.2.1 Discrimination and Barriers in the Workplace and Environmental Studies and Sciences

Discrimination and barriers in the workplace come in many forms. Discrimination matters as it can result in serious personal and professional impacts on the researcher. Forms of discrimination and barriers in the workplace include, but are not limited to, microaggressions, being dismissed or "brushed aside", lower and unfair pay, bullying, lack of funding to research, sexual harassment, unfair work expectations, and isolation by co-workers (Brescoll, 2011; Funk & Parker, 2018; Ramlakhan, 2022; Weinberg & Fine 2022; Skinner-Dorkenoo et al., 2021; Santuzzi & Waltz, 2016; Gartner, 2020; McDonald, 2012). There have been many studies that have documented discrimination in the workplace, and though there has been fewer studies studying discrimination specifically in the field of environmental studies and sciences, they follow similar trends.

For example, in a study by Klara Wanelik and colleagues that studied barriers experienced by marginalized groups in their early career in the field of ecology and evolution, found that 10% of respondents had not been able to overcome barriers that they were experiencing (2020). Another study, by Katheryn Clancy and colleagues, that studied experienced sexual harassment and assault in fieldwork in earth and social sciences by trainees, found that woman trainees were disproportionately more likely to report sexual harassment or assault than their male counterparts (2014). A third study, that studied experienced discrimination of LGBTQ+ scientist in the physical sciences (which includes earth/environmental sciences), found that 16% of all respondents indicated that they had directly experienced exclusionary behaviour and 30% had witnessed such behaviour in the last 12 months (Dyer et al., 2019).

Discrimination can lead to personal and professional impacts on the researcher. These consequences include, but are not limited to, anxiety, burn out, lower job satisfaction, inability to advance in the organization, loss of employment, and generally reduced well-being (Basma et al., 2021; Weinberg & Fine 2022; Shipman, 2015; Santuzzi & Waltz, 2016; Ozeren, 2014).

Following the previous examples, Wanelik's study found that some respondents had either left the institution or academia all together because of experienced barriers (Wanelik et al., 2020). Clancy's study found that those who had experienced sexual assault or harassment were more likely to experience reduced job satisfaction, reduced commitment to work being conducted in the

field, and greater psychological harms (Clancy et al., 2014). Some of these consequences, specifically reduced commitment as Clancy notes, can have even further negative ripple effects on a researcher's career as field work is often essential to securing advanced job opportunities (Clancy et al., 2014; Chaudhury & Colla, 2020).

2.2.2 Why Marginalised Groups in Environmental Studies and Sciences Matter

The voices of marginalized researchers and proper representation of marginalized groups in environmental studies and sciences are important. Diverse perspectives are positively correlated with the quality, quantity, and impact of the research; representation and equity help to create just workplaces; and a researchers' identity can heavily influence a researchers' area of study and research processes (Hong et al., 2004; Fine et al., 2020; Parker, 2020; Holmes, 2020; Massey et al., 2021). Though there have been minimal studies in this area, there is also evidence, that suggests there is not yet equitable representation of marginalized groups in environmental studies and sciences (Maas et al. 2021).

As environmental studies and sciences are at the forefront of tackling complex global issues, such as environmental health, conservation, and climate change, diverse perspectives are needed as it is positively correlated with the quality, quantity, and impact of the research (Massey, 2021; Hong & Page, 2004; Freeman & Huang, 2014). In a study by Lu Hong and Scott Page, they found that a diverse group of problem solvers would outperform a group of best problem solvers (2004). Another study, by Richard Freeman and Wei Huang, suggested that diverse authorship allows for a more diverse perspectives which could then tap into different networks, thus improving the quality and reach of the paper (2014).

The voices of marginalized groups are important as they help to establish just and equitable workplaces. A just and equitable workplace is a workplace that is barrier and discrimination. Creating barrier and discrimination free workplaces helps to increase the well-being of all researchers (Fine et al., 2020). Beyond, well-being mattering for the general health of the researcher, studies consistently shown that well-being is also positively correlated with attitudes towards the job and organization and job performance (Tov & Chan, 2012).

Finally, marginalized voices matter because a researcher's identity can heavily influence a researcher's area of study and research processes. Hence, researchers from marginalized groups may be more like to study marginalized groups which is important because marginalized communities are more likely to be negatively impacted by climate change, environmental harms, and ecological losses and changes (Parker, 2020; McCorkel & Myers, 2003; Holmes, 2020;

Massey et al., 2021, Islam & Winkle, 2017; Taylor, 2018; Masuda et al., 2008; Freeman & Huang, 2014). For example, in a study by Sara Grineski and colleagues, they found that in Phoenix Arizona, marginalized groups were more likely to be exposed to air pollution (2007). On a broader scale, S. Nazrul Islam and John Winkel explain how societal and historical inequalities are leading marginalized groups to be more vulnerable to climate change (2017).

Though marginalized voices are important in environmental studies and science, there has been little research into the actual levels of representation. What has been completed suggest that marginalized groups are generally underrepresented (Massey et al., 2021; Maas et al., 2021; Clancy et al., 2014; Taylor, 2018). In one study, by Bea Maas and colleagues, they found that women and the authors from the global south are underrepresented among top publishing ecology authors (2021). Maas found that since the year 2000, only 15% of lead authors were women and that 75% of top-publishing ecologists are from UK, Australia, Germany, U.S.A and Canada (Maas et al. 2021).

2.3 Conclusion

To conclude, there is evidence that suggests interference in environmental studies and sciences is happening; this matter because it can ultimately lead to poor environmental outcomes (Driscoll et al., 2021; Westwood et al., 2019; Carroll et al., 2017; Pullin & Knight, 2012). Marginalized groups in environmental studies and sciences are also important because of the importance of diverse perspectives, the establishment just workplaces, and marginalized groups are more likely to be disproportionately impacted by climate change, environmental harms, and ecological deterioration (Hong et al., 2004; Fine et al., 2020; Parker, 2020; Holmes, 2020; Massey et al., 2021). Though important, literature also suggests that marginalized groups are underrepresented and more likely to experience discrimination and barriers in the workplace. There currently exist no known literature the connects marginalized groups and interference, and whether, and to what degree, identity may influence experienced interference.

Chapter 3: Methods

3.1 Context of Research

This research is a subset of a larger study, in which the lead researcher is Manjulika Robertson. The objective of the larger study is to characterize the perceptions of Canadian researchers in the environmental studies and sciences regarding interference in their work and

evaluate how these perceptions are impacted by job status, work sector, location, and seniority (Robertson et al, in press). The following section will outline the research design that was used for the larger study, as this research falls within it. My research is a quantitative study and analysis of interference experienced by environmental researchers based on identity factors.

3.2 Rational for Quantitative Design

A quantitative survey and research methods approach was chosen based on precedented research methods from relevant studies by Driscoll (2021) and PIPSC (2013, 2018) (Robertson et al, in press). This method was beneficial because it was a more tractable and pragmatic way draw a more holistic and broader picture of interference in environmental studies and sciences across Canada, sectors, and demographics (Robertson et al, in press; Creswell, 2013). This approach was also advantageous as it gave quantifiable and numerical results that could be consistently analyzed across all respondents (Creswell, 2013).

3.3 Participants

The study population included individuals living in, and employed in Canada, who are working in and conducting research in the environmental studies or sciences in any sector (government, academia, non-profit, industry, Indigenous organization or other). The purpose for this broad population is that it depicts a more holistic picture of the prevalence of interference in science across Canada by surveying more than exclusively individual sectors (Robertson et al, in press). Understanding and measuring experiences of interference among researchers by identity group, also enables us to determine in which groups the prevalence of interference is the highest.

3.4 Recruitment

Survey responses were collected through a phased approach, using purposive sampling to specifically target the population of interest (Anbleyth-Evans & Lacy, 2019; Peters et al., 2018; Young et al., 2016; Robertson et al, in press). Firstly, the lead researcher, Manjulika Robertson, established a list of environmental scientific societies in Canada. Societies were contacted via email, requesting that they distribute the survey to their membership and, if applicable, include mention of the survey in their regular virtual newsletter. Societies who agreed to distribute the survey were provided with a template email and text for dissemination and the link to the survey questions. Of the societies contacted, fifteen of the twenty-nine societies agreed to participate and disseminated the survey via newsletter, social media, or direct email (Robertson et al, in press). The societies were asked to provide their reach (number of individuals who received their

communication), but for many it was not known so it is not possible to estimate a response rate from this first distribution tactic.

Secondly, the Robertson worked in collaboration with project contributor Dr. Philippe Mongeon to distribute the survey directly via email to a list of qualifying researchers discovered using bibliometrics. Dr. Mongeon provided a map of all publications in the environmental research fields beginning in 2008 (software was updated and deemed more accurate after this date). These when then filtered to remove publications that were non-English, explicitly non-Canadian focused or non-journal type publications (e.g. conference proceedings, workshops, etc.). A list of potential survey participants was then obtained by retrieving the email addresses of the corresponding authors of these publications. The initial list of corresponding authors' emails was then further filtered by removing duplicates and any address that did not end in ".ca" to ensure the owner was affiliated with a Canadian institution. This tactic produced 43,969 email addresses, 37,494 of which were identified by Qualtrics as having 'received' the invitation to complete the survey (Robertson et al, in press). As it is an anonymous survey, the emails were not linked to the respondents who completed the survey.

After the dissemination of the survey there were two steps that needed to be completed and passed for the participant to be able to partake in the survey. Firstly, agreeing to the consent form (Appendix A) and secondly, that they identified as a researcher in the environmental studies or sciences, who is currently employed, living, and working in Canada. Those who failed to identify themselves as a part of the study population based on these questions, were screened out of the survey.

3.5 Privacy/security

Only Samantha Chu (researcher/author), Manjulika Robertson (lead researcher), Dr. Alana Westwood (supervisor), Dr. Anika Cloutier (contributor), had access to the data. The data was be kept confidential and stored on a password-protected computer.

3.6 Research Ethics

An ethics application was created and submitted by Manjulika Robertson before the dissemination of the survey. The ethics application was initially submitted in May. The application was approved on July 22, 2021. REB file number is 2021-5630.

3.7 Data Collection

The study was conducted through an anonymous online survey. Qualtrics was the survey platform used based on a suggestion by Dr. Anika Cloutier. The survey was available in English from August 3, 2021, to August 22, 2021. The survey asked participants about (1) their perceived freedom to communicate their scientific works; (2) their perceptions of managerial or political interference in their scientific work and its consequences to the public and/or environment; and (3) demographic and identity factors, see Appendix B. Some of the questions in the survey included those from the Driscoll et al. study (2021) and the PIPSC studies (2013; 2018). Other questions included identity factor questions that were either based on or taken from the 2016 Canadian census (Statistics Canada, 2015). The identity factors that were asked were gender, whether they identified as transgender, sexual orientation, race and ethnicity, visible race that they are most perceived as, whether they identified as having a visible and/or invisible disability, and whether they wore a religious signifier or not, see Table 1. It should be noted that Race and Ethnicity and Perceived Race were asked separately based on the distinction in the 2016 Census (Statistic Canada, 2017). The survey included both quantitative and qualitative questions, including Likert scale questions, yes/no questions, and open-ended questions. The survey was expected to take no longer than 20 minutes to complete, this is based on previous research which shows that a survey should be a maximum of 20 minutes (Revilla & Ochoa, 2017). After the survey was complete the data showed that the median length of time to complete the survey was 12 minutes.

Table 1: Identity questions used in the survey

Questions regarding identity in the survey	Responses
1. How do you identify your gender?	○ Woman ○ Man ○ Non-binary ○ Prefer not to say ○ *Text Fill*
2. Would you describe yourself as transgender?	○ Yes ○ No ○ Prefer not to say
3. Do you identify as a member of any marginalized group in terms of sexual orientation?	○ Yes ○ No ○ Prefer not to say
4. How do you identify in terms of racial and ethnic identity (select all that apply)?	Black, African-Canadian, person of African descent Indigenous (First Nations, Inuit, Metis) East Asian (including Chinese, Japanese, Korean, etc.)

		South Asian (including East Indian, Indian from India, Pakistani, Sri Lankan, Bangladesh, East Indian from Guyana, East Africa, Trinidad, etc.) South East Asian (including Burmese, Cambodian, Filipino, Laotian, Thai, Vietnamese, etc.) Non-White West Asian North African or Arab (including Afghan, Armenian, Algerian, Egyptian, Iranian, Israeli, Lebanese, Libyan, Palestinian, Syrian, etc.) Non-White Latin American (including indigenous persons from Central and South America, etc.) Pacific Islander White Canadian or of White European descent Prefer not to disclose
5.	How are you typically perceived in terms of racial and ethnic identity (select all that apply)?	Black, African-Canadian, person of African descent Indigenous (First Nations, Inuit, Metis) East Asian (including Chinese, Japanese, Korean, etc.) South Asian (including East Indian, Indian from India, Pakistani, Sri Lankan, Bangladesh, East Indian from Guyana, East Africa, Trinidad, etc.) South East Asian (including Burmese, Cambodian, Filipino, Laotian, Thai, Vietnamese, etc.) Non-White West Asian North African or Arab (including Afghan, Armenian, Algerian, Egyptian, Iranian, Israeli, Lebanese, Libyan, Palestinian, Syrian, etc.) Non-White Latin American (including indigenous persons from Central and South America, etc.) Pacific Islander White Canadian or of White European descent Prefer not to disclose
6.	Do you identify as an individual living with a disability (select all that apply)?	Yes, visible Yes, invisible No Prefer not to say
7.	In your workplace do you wear a visible signifier of a religious affiliation (e.g., hijab, cross, kippah)?	o Yes o No o Prefer not to answer
8.	Do you believe that your identity and/or demographics have influenced your experiences with interference in your research?	o Yes o No o Unsure

3.8 Data Analysis

The survey initially yielded 1,291 responses. Prior to analysis it was necessary to manually clean the data by removing records of respondents who did not pass the screening questions or who failed to complete the entire survey (Robertson et al, in press). A total of 741 responses passed and were used in the analysis.

Questions with only two responses were converted to binomial variables (Yes = 1, No = 2). Questions with three responses were converted into multinomials (Yes = 1, No = 2, Unsure = 3). Questioned that used a 5-point Likert scale were also converted to multinomial variables (Strongly disagree = 1, Somewhat disagree = 2, Neither agree nor disagree = 3, Somewhat agree = 4, Strongly agree = 5, Not applicable = 6). In conducting tests of statistical analysis, "Not applicable" and "Unsure" responses were later deemed to have limited meaning and were excluded.

In accordance with Public Services and Procurement Canada's standardized guidelines for protection of research participant confidentiality the responses of any group with less than ten individuals were not reported on (2020). In efforts to incorporate all the data, groups with less than ten, when possible, were categorized with other groups. Groups that were categorized together were respondents who identified as transgender and LGBQ+; race and ethnicity and perceived race based on geography (new groupings, when possible, were based on categorization in the 2016 Census); and respondents who identified having a visible disability and respondents who identified having an invisible disability, see Table 2 (Statistic Canada, 2017).

Table 2: Groups that were categorized together due to insufficient sample sizes.

Identity Factors	Old grouping	New Grouping
Transgender identity and sexual orientation	Transgender	LGBTQ+
	LGBQ+	
Race and Ethnicity and Perceived Race	Black, African-Canadian, person of African descent	Black
	Indigenous (First Nations, Inuit, Metis)	Indigenous
	East Asian (including Chinese, Japanese, Korean, etc.)	Asian
	South Asian (including East Indian, Indian from India, Pakistani, Sri Lankan, Bangladesh, East Indian from Guyana, East Africa, Trinidad, etc.)	
	South East Asian (including Burmese, Cambodian, Filipino, Laotian, Thai, Vietnamese, etc.)	

	Non-White West Asian	
	North African or Arab (including Afghan, Armenian, Algerian, Egyptian, Iranian, Israeli, Lebanese, Libyan, Palestinian, Syrian, etc.)	Arab
	Non-White Latin American (including indigenous persons from Central and South America, etc.)	Latin American
	Pacific Islander	
	White Canadian or of White European descent	White
Visible and/or Invisible Disability	Invisible Disability	Visible and/or Invisible Disability
	Visible Disability	
	Visible and Invisible Disability	

Analysis began with standard descriptive statistics, including means, standard deviation, degrees of freedom, and counts. This analysis was conducted in Excel or RStudio. RStudio is a user-interface program of R program (a programing language). RStudio was used to conduct data analysis and create graphs (RStudio, n.d). The data was then tested for statistical significance using Kruskal Wallis. Kruskal Wallis is a one-way ANOVA, nonparametric test and does not assume normal distribution of data (Xia, 2020). Statistical significance ($p = <0.05$) was used to determine whether difference in means was due to the independent variable (identity factors) or chance (Kenton, 2022). Inductive coding was used to analyze open-text questions (Q29). The responses were thematically coded based on a-posteriori themes.

Chapter 4: Results

4.1 Identity Factor Demographics

A total of 741 people completed the survey. Of the 707 respondents that chose to identify their Gender, 429 (61%) identified as a man, and 271 (38%) as a woman. Of the 704 respondents that chose to identify whether they identified as LGBTQ+, 651 (92%) identified as non-LGBTQ+, and 53 (8%) as LGBTQ+. Six-hundred and ninety-three respondents chose to identify their Race and Ethnicity. Eleven (2%) respondents identified as Arab, 60 (9%) as Asian, 13 (2%) as Black, 10 (1%) as Latin American, 26 (4%) as Multiple Ethnicities, and 567 (82%) as White. Regarding concerns of unequal sample sizes in the data, Race and Ethnicity was then further amalgamated into two groups: White and Racial Minorities. Racial minorities included Arab, Asian, Black, Latin American, Indigenous, and Multiple Ethnicities, 119 respondents identified as Racial Minorities (17%). Six-hundred and ninety-one respondents identified their Perceived Race that they are most commonly perceived as, 10 (1%) identified as Arab, 57 (8%) as Asian, 15 (2%) as Black, 13 (2%) as Latin American, 18 (3%) Multiple Ethnicities, and 574 (83%) as White. Regarding concerns of unequal sample sizes in the data, Perceived Race was then further amalgamated into two groups: White and Visible Minorities. Visible minorities included Arab, Asian, Black, Latin American, Indigenous, and Multiple Ethnicities, 116 respondents identified as Visible Minorities (17%). Seven-hundred and five respondents chose to identify whether they have a visible and/or invisible disability, 83 (12%) respondents identified as having a visible and/or invisible disability, and 622 (88%) identified no disability. Seven-hundred and twelve respondents identified whether they had a religious signifier, 13 (2%) of the respondents indicated that they did religious signifier, and 699 (98%) indicated that they did not. As mentioned in section 3.8 Data Analysis, in accordance with Public Services and Procurement Canada's standardized guidelines any groups with less than 10 individuals are not reported. Complete demographic results tables are included in Appendix C.

4.2 Internalized Sources of Interference

Internalized sources of constraint were reported to be sources of interference that prevented researchers from speaking to the media and public about their research. Six of the survey questions identified six different sources of internal constraint. Constraints included (Q16.2) concerns about how they may be represented by media (53% strongly agreed and somewhat agreed), (Q16.3) fear of being drawn to comment beyond expertise (54% strongly

agreed and somewhat agreed), (Q16.4) uncertainty about the boundaries of their expertise (29% strongly agreed and somewhat agreed), (Q16.6) stressful around discussing about contentious issues (35% strongly agreed and somewhat agreed), (Q16.7) fear of risk to funding opportunities (26% strongly agreed and somewhat agreed), and (Q16.9) fear of reduced opportunities for advancement (21% strongly agreed and somewhat agreed).

Table 3: Internalized Sources of Interference and Gender

Gender		Average	N	Average (man)	Average (Non-binary)	Average (Women)	std	df (IV-1)	p-value
	Q16.2	3.13	707	2.99	IS*	3.37	1.35	2	**<0.01**
	Q16.3	3.19	707	2.98	IS	3.51	1.33	2	**<0.01**
	Q16.4	2.51	707	2.40	IS	2.72	1.27	2	**<0.01**
	Q16.6	2.68	707	2.44	IS	3.05	1.34	2	**<0.01**
	Q16.7	2.35	707	2.25	IS	2.47	1.38	2	0.17
	Q16.9	2.19	707	2.09	IS	2.29	1.36	2	0.28

*Insufficient sample size (N<10)

Table 4: Internalized Sources of Interference and LGBTQ+

LGBTQ+		Average	N	Average (LGBTQ+)	Average (Non-LGBTQ+)	std	df (IV-1)	p-value
	Q16.2	3.13	704	3.15	3.12	1.35	1	0.90
	Q16.3	3.19	704	3.36	3.16	1.33	1	0.34
	Q16.4	2.51	704	2.85	2.49	1.27	1	0.07
	Q16.6	2.68	704	2.71	2.67	1.34	1	0.84
	Q16.7	2.35	704	3.00	2.28	1.38	1	**<0.01**
	Q16.9	2.19	704	2.96	2.10	1.36	1	**<0.01**

Table 5: Internalized Sources of Interference and Visible and/or Invisible Disability

Visible and/or Invisible Disability		Average	N	Average (Disability)	Average (No Disability)	std	df (IV-1)	p-value
	Q16.2	3.13	705	3.16	3.11	1.35	1	0.88
	Q16.3	3.19	705	3.16	3.20	1.33	1	0.82
	Q16.4	2.51	705	2.48	2.53	1.27	1	0.53
	Q16.6	2.68	705	2.81	2.67	1.34	1	0.51
	Q16.7	2.35	705	2.63	2.30	1.38	1	0.28
	Q16.9	2.19	705	2.53	2.12	1.36	1	0.21

Table 6: Internalized Sources of Interference and Religious Signifier

Religious Signifier		Average	N	Average (Religious Sig.)	Average (No Religious Sig.)	std	df (IV-1)	p-value
	Q16.2	3.13	712	3.36	3.13	1.35	1	0.37
	Q16.3	3.19	712	3.10	3.19	1.33	1	0.88
	Q16.4	2.51	712	2.00	2.53	1.27	1	0.18
	Q16.6	2.68	712	2.67	2.68	1.34	1	0.94
	Q16.7	2.35	712	3.50	2.32	1.38	1	**0.02**
	Q16.9	2.19	712	2.40	2.17	1.36	1	0.59

Table 7: Internalized Sources of Interference and Race and Ethnicity

Race and Ethnicity		Average	N	Average (Arab)	Average (Asian)	Average (Black)	Average (Indigenous)	Average (Latin American)	Average (Multiple ethnicities)	Average (White)	std	df (IV-1)	p-value
	Q16.2	3.13	693	2.27	3.54	2.45	IS	3.56	3.08	3.11	1.35	6.00	**0.02**
	Q16.3	3.19	693	1.80	3.37	3.00	IS	3.50	3.44	3.19	1.33	6.00	0.06
	Q16.4	2.51	693	2.30	3.00	2.55	IS	2.90	2.48	2.49	1.27	6.00	0.20
	Q16.6	2.68	693	1.70	2.90	2.27	IS	3.56	2.50	2.70	1.34	6.00	0.12
	Q16.7	2.35	693	2.00	3.04	2.09	IS	1.89	2.00	2.28	1.38	6.00	**<0.01**
	Q16.9	2.19	693	1.40	3.02	2.09	IS	2.25	2.24	2.09	1.36	6.00	**<0.01**

Table 8: Internalized Sources of Interference and Perceived Race

Perceived Race		Average	N	Average (Arab)	Average (Asian)	Average (Black)	Average (Indigenous)	Average (Latin American)	Average (Multiple ethnicities)	Average (White)	std	df (IV-1)	p-value
	Q16.2	3.13	691	1.80	3.42	2.77	IS	3.54	3.38	3.11	1.35	6.00	**<0.01**
	Q16.3	3.19	691	1.67	3.32	3.23	IS	3.50	3.76	3.19	1.33	6.00	**0.02**
	Q16.4	2.51	691	2.11	2.89	2.46	IS	2.79	3.18	2.48	1.27	6.00	0.13
	Q16.6	2.68	691	2.00	2.85	2.42	IS	3.38	2.88	2.67	1.34	6.00	0.32
	Q16.7	2.35	691	2.20	2.83	2.00	IS	2.08	2.73	2.27	1.38	6.00	**0.05**
	Q16.9	2.19	691	1.56	2.88	2.23	IS	2.17	2.63	2.07	1.36	6.00	**<0.01**

Table 9: Internalized Sources of Interference and Racial Minorities

Race and Ethnicity		Average	N	Average (Racial Minorities)	Average (White)	std	df (IV-1)	p-value
	Q16.2	3.13	693	3.21	3.11	1.35	1	0.44
	Q16.3	3.19	693	3.19	3.19	1.33	1	0.81
	Q16.4	2.51	693	2.72	2.49	1.27	1	0.20
	Q16.6	2.68	693	2.63	2.70	1.34	1	0.58
	Q16.7	2.35	693	2.58	2.28	1.38	1	0.10
	Q16.9	2.19	693	2.57	2.09	1.36	1	**<0.01**

Table 10: Internalized Sources of Interference and Visible Minorities

Perceived Race		Average	N	Average (Visible Minorities)	Average (White)	std	df (IV-1)	p-value
	Q16.2	3.13	691	3.15	3.11	1.35	1	0.81
	Q16.3	3.19	691	3.24	3.19	1.33	1	0.86
	Q16.4	2.51	691	2.76	2.48	1.27	1	**0.04**
	Q16.6	2.68	691	2.72	2.67	1.34	1	0.75
	Q16.7	2.35	691	2.62	2.27	1.38	1	**0.01**
	Q16.9	2.19	691	2.64	2.07	1.36	1	**<0.01**

Concerns about how they may be represented by media (Q16.2), was an internalized source of interference that was found to be statistically significant among Gender (p-values = <0.01), Race and Ethnicity (p-value =0.02), and Perceived Race (p-value = <0.01). Fear of being drawn to comment beyond boundaries of expertise (Q16.2), was an internalized source of interference that was found to be statistically significant among Gender (p-values = <0.01), Perceived Race (p-value = 0.02). Uncertainty about the boundaries of their expertise (Q16.4), was an internalized source of interference that was found to be statistically significant among Gender (p-values = <0.01), and White and Visible Minorities (p-value = 0.04). Finding it stressful to talk about contentious issues (Q16.6), was internalized source of interference that was found to be statistically significant among Gender (p-values = <0.01). Fear of risk to funding opportunities (Q16.7), was an internalized source of interference that was found to be statistically significant among respondents identifying as LGBTQ+ (p-values = <0.01), respondents who had a religious signifier (p-value = 0.02), Race and Ethnicity (p-value = <0.01), Perceived Race (p-value = 0.05), and White and Visible Minority (p-value = 0.01). Finally, fear of reduced opportunities for advancement (Q16.9), was an internalized source of interference that was found to be statistically significant among respondents identifying as LGBTQ+ (p-values = <0.01), Race and Ethnicity (p-value = <0.01), Perceived Race (p-value = <0.01), White and Racial Minority (p-value = <0.01), and White and Visible Minority (p-value = 0.01). See Appendix D for all graphs.
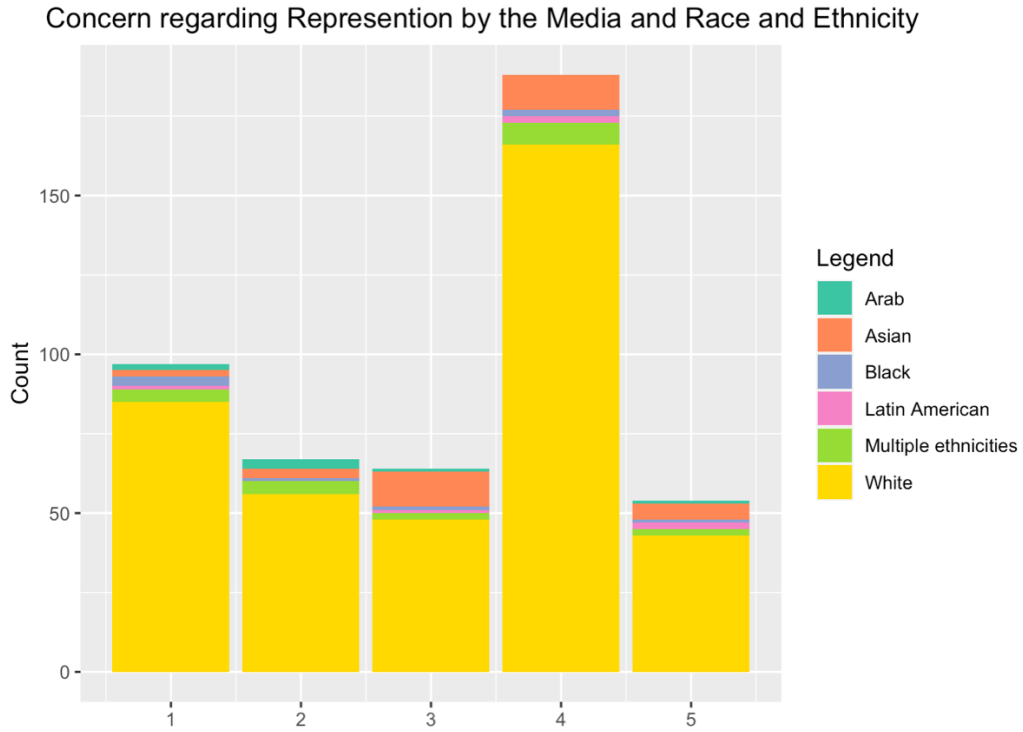
Figure 2: Responses to (Q16.2) fear of how they may be represented by media and Race and Ethnicity
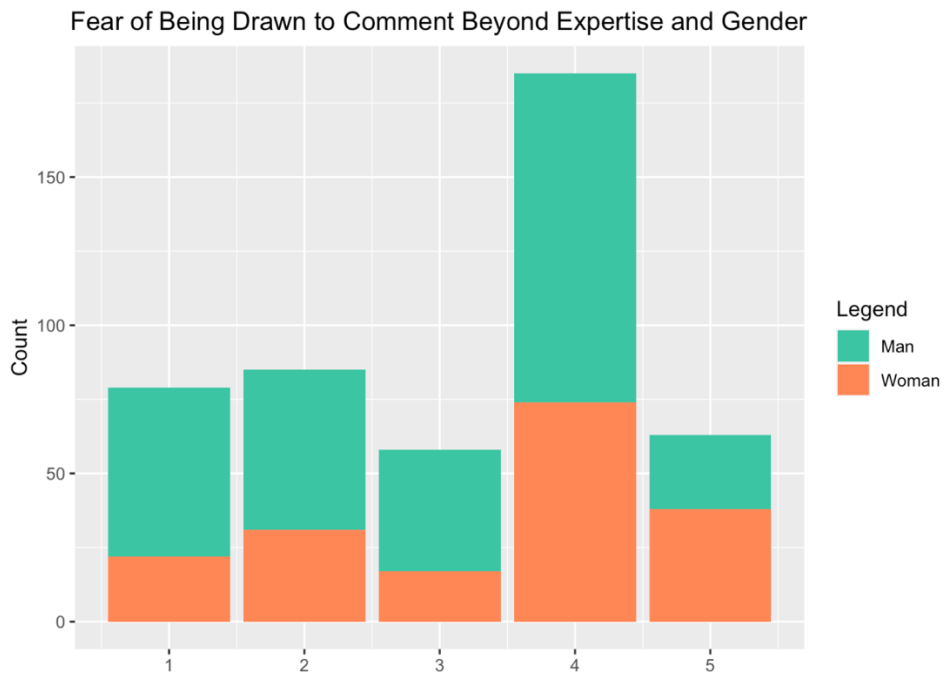
Figure 3: Responses to (Q16.3) fear of being drawn beyond the boundaries of expertise by Gender
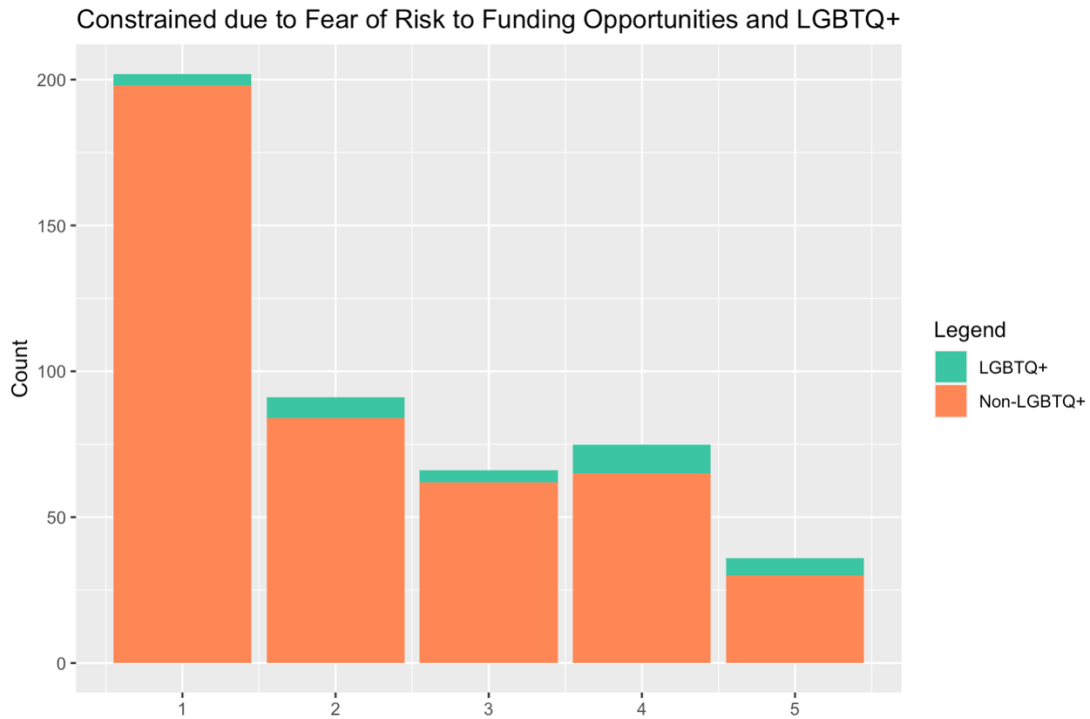
Figure 4: Responses to (Q16.7) Fear of risk to funding opportunities by respondents who identify as LGBTQ+.

4.4 Externally Imposed Sources of Interference

Externally imposed sources of constraint were reported to be sources of interference that prevented researchers from speaking to the media and public about their research. Externally imposed sources of constraints included (Q16.10) workplace colleagues/peer pressure/workplace culture (18% strongly agreed and somewhat agreed), (Q16.11) workplace policy (21% strongly agreed and somewhat agreed), (Q16.13) senior management (24% strongly agreed and somewhat agreed)

Table 11: Externally imposed sources of constraint and Gender

Gender		Average	N	Average (man)	Average (Non-binary)	Average (Women)	std	df (IV-1)	p-value
	Q16.10	2.08	707	1.94	IS*	2.21	1.29	2	**0.02**
	Q16.11	2.15	707	2.13	IS	2.12	1.42	2	0.97
	Q16.13	2.23	707	2.18	IS	2.23	1.45	2	0.91

*Insufficient sample size (N<10)

Table 12: Externally imposed sources of constraint and LGBTQ+

LGBTQ+		Average	N	Average (LGBTQ+)	Average (Non-LGBTQ+)	std	df (IV-1)	p-value
	Q16.10	2.08	704	2.33	2.03	1.29	1	0.12
	Q16.11	2.15	704	2.18	2.12	1.42	1	0.59
	Q16.13	2.23	704	2.38	2.19	1.45	1	0.29

Table 13: Externally imposed sources of constraint and visible and/or invisible disability

Visible and/or Invisible Disability		Average	N	Average (Disability)	Average (No Disability)	std	df (IV-1)	p-value
	Q16.10	2.08	705	2.53	2.00	1.29	1	**<0.01**
	Q16.11	2.15	705	2.38	2.06	1.42	1	0.12
	Q16.13	2.23	705	2.49	2.17	1.45	1	0.15

Table 14: Externally imposed sources of constraint and Religious Signifier

Religious Signifier		Average	N	Average (Religious Sig.)	Average (No Religious Sig.)	std	df (IV-1)	p-value
	Q16.10	2.08	712	2.45	2.05	1.29	1	0.45
	Q16.11	2.15	712	2.58	2.12	1.42	1	0.32
	Q16.13	2.23	712	2.67	2.20	1.45	1	0.35

Table 15: Externally imposed sources of constraint and Race and Ethnicity

Race and Ethnicity		Average	N	Average (Arab)	Average (Asian)	Average (Black)	Average (Indigenous)	Average (Latin American)	Average (Multiple ethnicities)	Average (White)	std	df (IV-1)	p-value
	Q16.10	2.08	693	1.73	2.66	1.91	IS	2.33	2.20	1.99	1.29	6	**<0.01**
	Q16.11	2.15	693	1.44	2.78	2.36	IS	2.63	2.40	2.02	1.42	6	**<0.01**
	Q16.13	2.23	693	1.33	2.71	2.09	IS	2.40	2.60	2.13	1.45	6	**<0.01**

Table 16: Externally imposed sources of constraint and Perceived Race

Perceived Race		Average	N	Average (Arab)	Average (Asian)	Average (Black)	Average (Indigenous)	Average (Latin American)	Average (Multiple ethnicities)	Average (White)	std	df (IV-1)	p-value
	Q16.10	2.08	691	1.60	2.54	2.15	IS	2.31	2.35	1.99	1.29	6	**0.04**
	Q16.11	2.15	691	1.56	2.79	2.38	IS	2.67	2.19	2.02	1.42	6	**<0.01**
	Q16.13	2.23	691	1.44	2.71	2.23	IS	2.36	2.40	2.13	1.45	6	**0.01**

Table 17: Externally imposed sources of constraint and Racial Minorities

Race and Ethnicity		Average	N	Average (Racial Minorities)	Average (White)	std	df (IV-1)	p-value
	Q16.10	2.08	693	2.36	1.99	1.29	1	**0.01**
	Q16.11	2.15	693	2.53	2.02	1.42	1	**<0.01**
	Q16.13	2.23	693	2.52	2.13	1.45	1	**<0.01**

Table 18: Externally imposed sources of constraint and Visible Minority

Perceived Race		Average	N	Average (Visible Minorities)	Average (White)	std	df (IV-1)	p-value
	Q16.10	2.08	691	2.31	1.99	1.29	1	**0.02**
	Q16.11	2.15	691	2.50	2.02	1.42	1	**<0.01**
	Q16.13	2.23	691	2.50	2.13	1.45	1	**<0.01**

Workplace colleagues/peer pressure/workplace culture (Q16.10), was an externally imposed source of interference that was found to be statistically significant among Gender (p-values = 0.02), respondents that identified have a Visible and/or Invisible Disability (p-value = <0.01), Race and Ethnicity (p-value = <0.01), Perceived Race (p-value = 0.04), White and Racial Minority (p-value = 0.01), and White and Visible Minority (p-value = 0.0). Workplace policy (Q16.11), was an externally imposed source of interference that was found to be statistically significant among Race and Ethnicity (p-value = <0.01), Perceived Race (p-value = <0.01), White and Racial Minority (p-value = <0.01), and White and Visible Minority (p-value = <0.01). Finally, Senior management (Q16.13), was an externally imposed source of interference that was found to be statistically significant among Race and Ethnicity (p-value = <0.01), Perceived Race (p-value = 0.01), White and Racial Minority (p-value = <0.01), and White and Visible Minority (p-value = <0.01). See Appendix D for all graphs.
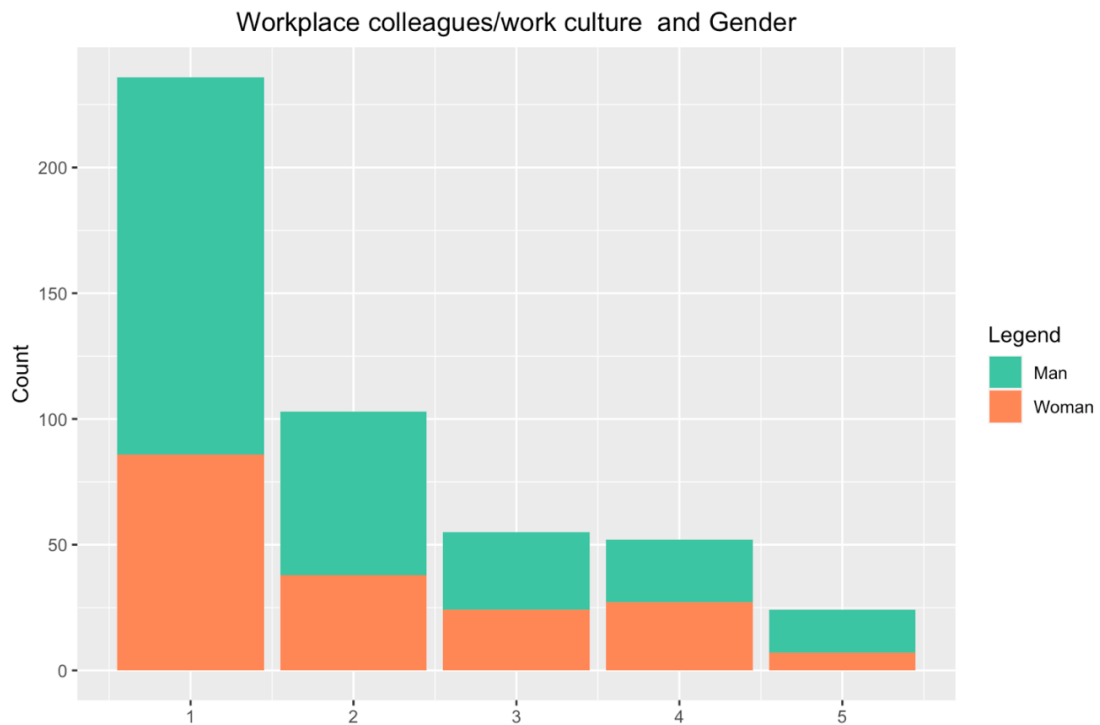
Figure 5: Responses to (Q16.10) Workplace colleagues/peer pressure/workplace culture by Gender
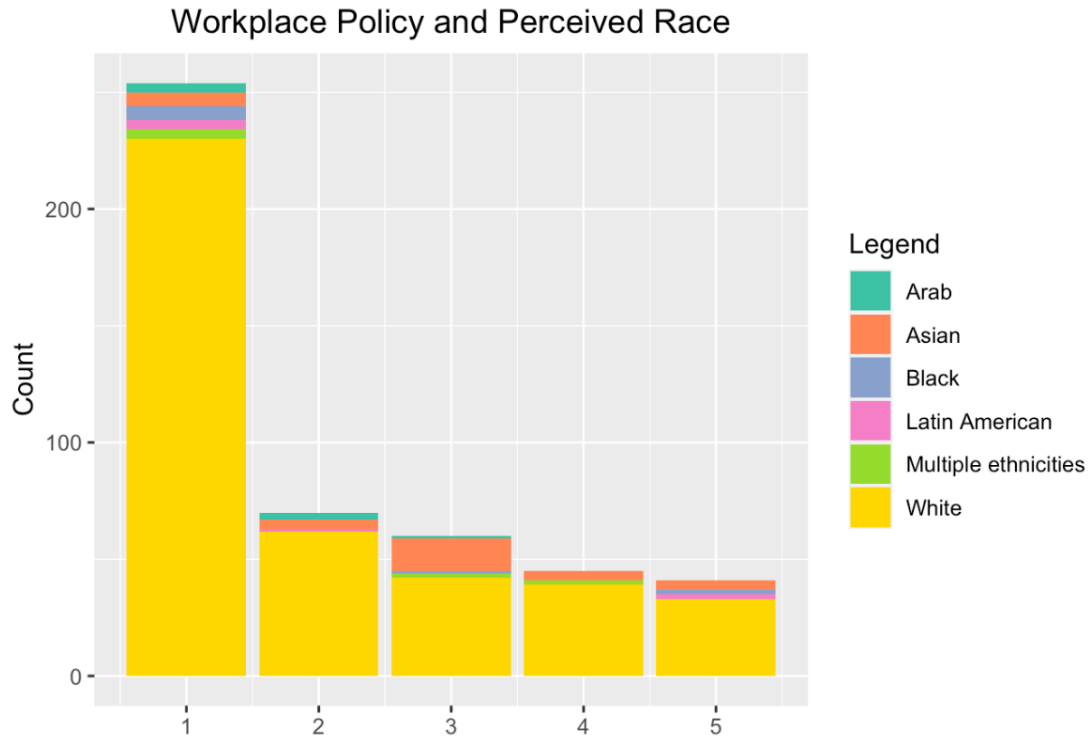
Figure 6: Responses to (Q16.11) Workplace policy by Perceived Race

4.5 Consequences of Interference

Nine percent of respondents reported that they had experienced undue modification to work by their organization that substantively changed the text or story to downplay, mask, or mislead information about environmental impact (Q10) (hereafter 'undue modification') (6% reported 'unsure' and 85% reported 'no'). Nineteen percent reported experiencing that their job satisfaction had been affected by restraints on public commentary and peer communication (Q17) (hereafter 'job satisfaction') (9% reported 'unsure' and 72% reported 'no'). Twenty-three percent of respondents indicated that they believed that their identity influenced whether they had experienced interference (Q28) (16% reported 'unsure' and 61% reported 'no'.

Table 19: Consequences of Interference and Gender

Gender		Average	N	Average (man)	Average (Non-binary)	Average (Women)	std	df (IV-1)	p-value
	Q10	1.24	707	1.19	IS*	1.28	0.61	2	0.07
	Q17	1.47	707	1.42	IS	1.50	0.80	2	0.26
	Q28	1.62	707	1.50	IS	1.76	0.84	2	**<0.01**

*Insufficient sample size (N<10)

Table 20: Consequences of Interference and LGBTQ+

LGBTQ+		Average	N	Average (LGBTQ+)	Average (Non-LGBTQ+)	std	df (IV-1)	p-value
	Q10	1.24	704	1.34	1.23	0.61	1	0.31
	Q17	1.47	704	1.53	1.45	0.80	1	0.43
	Q28	1.62	704	1.75	1.60	0.84	1	0.16

Table 21: Consequences of Interference and Visible and/or Invisible Disability

Visible and/or Invisible Disability		Average	N	Average (Disability)	Average (No Disability)	std	df (IV-1)	p-value
	Q10	1.24	705	1.58	1.19	0.61	1	**<0.01**
	Q17	1.47	705	1.90	1.40	0.80	1	**<0.01**
	Q28	1.62	705	1.77	1.60	0.84	1	0.17

Table 22: Consequences of Interference and religious Signifier

Religious Signifier		Average	N	Average (Religious Sig.)	Average (No Religious Sig.)	std	df (IV-1)	p-value
	Q10	1.24	712	1.38	1.23	0.61	1	0.38
	Q17	1.47	712	1.62	1.46	0.80	1	0.41
	Q28	1.62	712	1.62	1.62	0.84	1	0.99

Table 23: Consequences of Interference and Race and Ethnicity

Race and Ethnicity		Average	N	Average (Arab)	Average (Asian)	Average (Black)	Average (Indigenous)	Average (Latin American)	Average (Multiple ethnicities)	Average (White)	std	df (IV-1)	p-value
	Q10	1.24	693	1.18	1.23	1.23	IS	1.30	1.52	1.22	0.61	6	0.19
	Q17	1.47	693	1.18	1.57	1.15	IS	1.40	1.76	1.45	0.80	6	0.11
	Q28	1.62	693	1.64	1.67	1.69	IS	1.70	2.00	1.60	0.84	6	0.47

Table 24: Consequences of Interference and Perceived Race

Perceived Race		Average	N	Average (Arab)	Average (Asian)	Average (Black)	Average (Indigenous)	Average (Latin American)	Average (Multiple ethnicities)	Average (White)	std	df (IV-1)	p-value
	Q10	1.24	691	1.20	1.21	1.33	IS	1.21	1.29	1.23	0.61	6	0.95
	Q17	1.47	691	1.40	1.54	1.20	IS	1.43	1.65	1.45	0.80	6	0.44
	Q28	1.62	691	1.30	1.65	1.67	IS	1.57	1.65	1.62	0.84	6	0.73

Table 25: Consequences of Interference and Racial Minorities

Race and Ethnicity		Average	N	Average (Racial Minorities)	Average (White)	std	df (IV-1)	p-value
	Q10	1.24	693	1.29	1.22	0.61	1	0.09
	Q17	1.47	693	1.50	1.45	0.80	1	0.28
	Q28	1.62	693	1.75	1.60	0.84	1	0.20

Table 26: Consequences of Interference and Visible Minorities

Perceived Race		Average	N	Average (Visible Minorities)	Average (White)	std	df (IV-1)	p-value
	Q10	1.24	691	1.23	1.23	0.61	1	0.42
	Q17	1.47	691	1.47	1.45	0.80	1	0.36
	Q28	1.62	691	1.64	1.62	0.84	1	0.72

Undue modification (Q10) was a consequence of interference that was found to be statistically significant among respondents that identified have a Visible and/or Invisible Disability (p-value = <0.01). Job Satisfaction (Q17) was a consequence of interference that was also found to be statistically significant among respondents that identified have a Visible and/or Invisible Disability (p-value = <0.01). Finally, whether a respondents identity influenced whether they experienced interference or not (Q28) was a consequence of interference that was found to be statistically significant among Gender (p-value = <0.01). See Appendix D for all graphs.
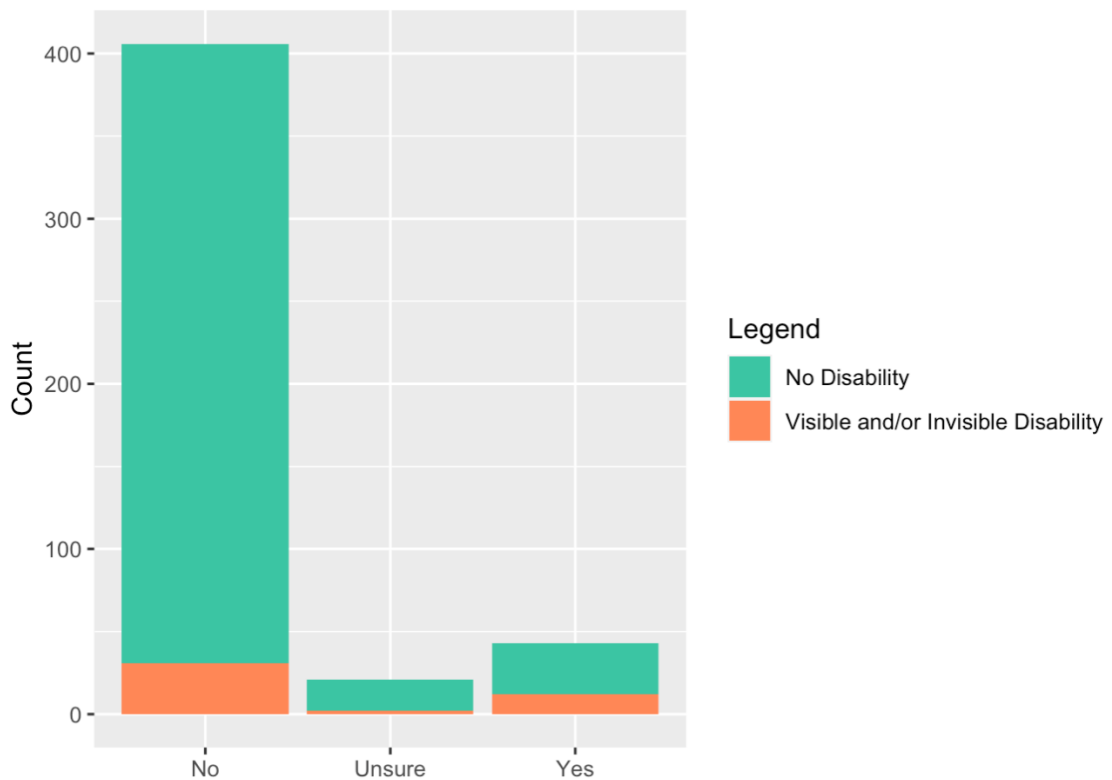

Figure 7: Responses to (Q10) Undue Modification by respondents who identified having a Visible and/or Invisible Disability
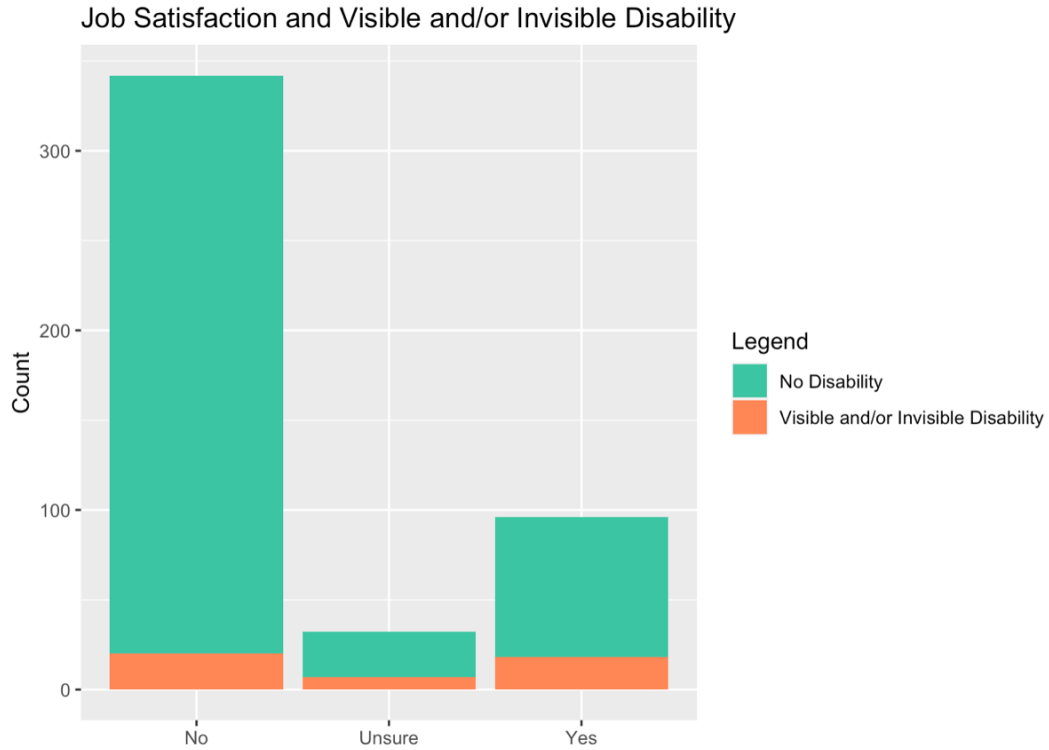
Figure 8: Responses to (Q17) Job satisfaction by respondents who identified having a Visible and/or Invisible Disability
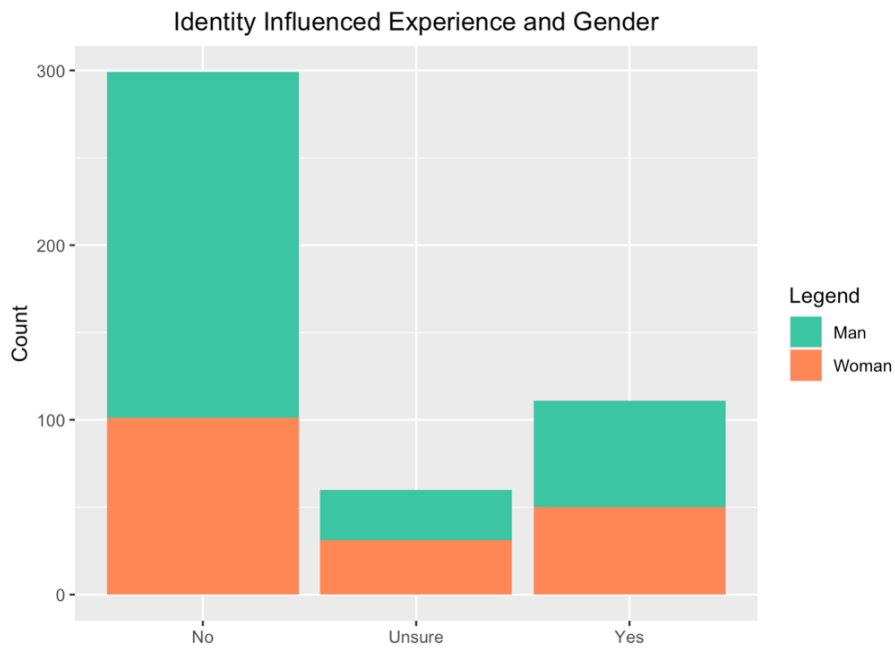

Figure 9: Responses to (Q28) Whether they believe their identity influenced whether they experienced interference By Gender

Table 27: Examples of open-text responses to Q29

Category	ID number	Quotes
Gender	587	*Misogyny is still very much alive and well.*
	644	*I am a woman in science, specifically in fisheries. I often have to force my way in a conversation with funding agencies about my research and my opinions are not often considered in a conversation with said agencies. I am not one to take that as is, but I do feel that my research ideas are dismissed before they even leave my mouth.*
	3	*As a white man in science, I have had almost entirely positive experiences as far as being seen as trustworthy and capable and have also felt largely secure in my positions. To that end, I feel I am less likely to have experienced interference than marginalized people.*
	552	*Sexism in the workplace has negatively impacted by experiences and interfered in my research (e.g. limiting what I can do in the field, respect in the workplace etc).*
	597	*As an established white male scientist, I believe I have benefitted from innumerable biases in my favor throughout my education and career.*
Visible and/or invisible disability	528	*I have a disability, which contributed to the harassment and bullying from my peers and administration.... I think that the need to suppress strong evidence of action and science is within academia, and people will use whatever power dynamic is available.*
LGBTQ+	84	*Homophobic comments and remarks from senior coworkers that were unaware of my sexuality created a power balance when I was earlier in my career... I felt threatened during fieldwork and this created a power imbalance that continued beyond fieldwork. It became very difficult to communicate with coworkers and impacted my ability to properly defend analysis or interpretation of analysis...*
	129	*Existing as both queer and a woman in STEM has led to peers and superiors questioning my credentials and/or abilities, and being asked to complete tasks outside of my job description that would historically be considered "women's work" in the office place.*

| Race and Ethnicity/ Perceived Race | 405 | *I receive more vetting and questioning because I am black. The first impression is that very little can come from my race* |
| | 508 | *As someone whose name, skin colour, and related economic status create limitations or constraints on my career options, I have fewer financial resources to fall back on than some others, and hence need to be strategic and careful about how and when I "push back" against constraints or pressures. In short - I didn't always have the money to do whatever I wanted, and had to figure out how to "play the game" as a researcher. Different people face different *cumulative* barriers to their ability to conduct research and speak out.* |

Chapter 5.0 Discussion

This study provides insight into the extent to which identity factors play a role in the interference experienced by researchers in environmental studies and sciences in Canada. I conclude that identity factors did play a significant role in interference experienced by respondents and, depending on the identity factor, marginalized groups reported experiencing higher rates of interference. This matters as, based on the literature, diverse perspectives are positively correlated with the quality, quantity, and impact of the research; representation and equity help to create just workplaces; and a researchers' identity can heavily influence a researchers' area of study, making them potentially more likely to research marginalized groups which is important because marginalized communities are more likely to be negatively impacted by climate change, environmental harms, and other ecological losses and changes (Hong et al., 2004; Fine et al., 2020; Parker, 2020; Holmes, 2020; Massey et al., 2021; Islam & Winkle, 2017; Taylor, 2018; Masuda et al., 2008; Freeman & Huang, 2014). This section will explain major trends revealed by the researchers surveyed in the study and highlight major trends and their implications.

5.1 Study Demographics Representation and Canadian Demographics

This study is the first known attempt to document the identity demographics of environmental researchers in Canada. I found that the survey demographic is inconsistent with Canadian Census Data and depict many of the marginalized groups as underrepresented in the study (Statistics Canada, 2017). This subsection compares the study demographics, 2016 Canadian Census data and other government sourced demographic data and gives reasoning as to why certain demographics may have been over or underrepresented.

5.1.1 Gender

Men are significantly overrepresented in my sample compared to the 2016 Census. It worth noting that these are not a direct comparison as the 2016 Canadian Census reported on sex and this survey reported on gender (Statistics Canada, 2017). This corroborates with previous research that found that women were underrepresented in top-publishing ecology papers (Maas et al., 2021).

Table 28: Survey respondents' gender demographics and Canadian Demographics

Respondents' demographics		Canadian Demographics (2016)	
Gender		Sex	
Man	61%	Male	49%
Women	38%	Female	51%

5.1.2 Perceived Race and Race and Ethnicity

Visible marginalized groups including Asian, Indigenous, and, to a smaller degree, Black identifying researchers were underrepresented compared to the 2016 Census, whereas researchers who identified as White and, to a smaller degree, respondents who identified as Multiple Ethnicities were overrepresented (Statistics Canada, 2017).

Table 29: Survey respondents' perceived race demographics and Canadian Demographics

Respondents' demographics (Perceived Race)		Canadian Demographics (2016)	
Arab	1.5%	Arab	1.5%
Asian	8.3%	Asian	14.9%
Black	1.8%	Black	3.4%
Indigenous	IS*	Indigenous	6.2%
Latin American	2.0%	Latin American	1.3%
Multiple Ethnicities	2.6%	Multiple Ethnicities	0.7%
White	83.8%	White	71.5%

*Insufficient sample size (N<10)

The number of racial and perceived Indigenous identifying respondents was insufficient and therefore could not be reported on uniquely. Several respondents who identified as Ingenious, however, also identified with other ethnicities, and therefor was categorized in the Multiple Ethnicities group. Total respondents that identified as Indigenous, when including those who also identified as another ethnicity(s), is 14 (2%).

There are several reasons why Asian, Black, and Indigenous identifying researchers in particular may be underrepresented. A United States study suggests that visible minorities were underrepresented in environmental science degrees, as a result of high tuition costs, lack of mentorship; and narrow curricula that failed to incorporate experience, expertise, and idea from people of colour (Taylor, 2018). This study went further to suggests that people of colour are also

more likely to leave the environmental studies and sciences sector because of lack of mentoring, discrimination, racial insensitivity, and the feeling that they do not fit in (Taylor, 2018).

5.1.3 LGBTQ+

Respondents who identified as LGBTQ+ were overrepresented compared to the Canadian population (Statistics Canada, 2021). Based on the known literature there are two reasons as to why respondents who identified as LGBTQ+ in the study demographics may have been overrepresented compared to Canadian demographics. Firstly, people who identify as LGBTQ+ are overrepresented in academia because they are more likely to go into an occupation that "provide a high degree of task independence or require a high level of social perceptiveness, or both" (Tilcsik, Anteby & Knight, 2015). Secondly, people who identify as LGBTQ+ may be underrepresented in census data, this may be due to either to poor data collection or less likely to self-identify (Velte, 2020; HRC foundation, 2009; Duc et al., 2020).

Table 30: Survey respondents' sexual orientation demographics and Canadian Demographics

Respondents' demographics		Canadian Demographics	
LGBTQ+	8%	LGBTQ+	4%
Non-LGBTQ+	92%	Non-LGBTQ+	96%

5.1.4 Visible and/or Invisible Disability

The survey found that respondents with a visible and/or invisible disability are underrepresented, compared to Canadian demographics (Morris et al., 2018). These results are in tangent with other studies that have found that people with visible and/or invisible disabilities have lower employment rates and are underrepresented in the workforce (Turcotte, 2014; Government of Canada, 2022). Looking specifically at environmental science, in a study by Aadita Chaudhury and Sheila Colla, they suggested that people with disabilities would also be less likely to be in environmental sciences because field research, which is difficult for people with disabilities to access, is often required to secure graduate and professional positions (2020).

Table 31: Survey respondents' disability status demographics and Canadian Demographics

Respondents' demographics		Canadian Demographics	
Disability	12%	Disability	22%
No Disability	88%	No Disability	78%

5.1.5 Visible Religious Signifier

There was no census data available to quantify the percentage of the population that wear visible religious signifiers. This survey found that 13 respondents (2%), had a visible religious signifier.

5.2 Gender Inequality in Environmental Studies and Sciences

According to our findings, women reported significantly higher rates of interference from both internalized and the externally imposed factor workplace colleagues/peer pressure/work culture.

Researchers frequently indicated gender as a key factor that influenced whether they experienced interference or not (Q29). Open-text responses allowed respondents to expand upon many of the ways that identity has both positively or negatively influenced their experience of interference in conducting or communicating scientific research. Seventy-three researchers explained they had been negatively affected by sexist comments, racist comments, homophobic comments, unfair vetting due to race or gender, citing unfair questioning of their credentials, being "brushed aside", and other discriminatory actions. Seventy researchers explained that their identity may have put them in more advantageous positions and resulting in minimal to no experience with interference (Table 32)

Table 32: Coded responses to Q29. Only respondents who had indicated "yes" in Q28 and made a comment in Q29 were coded.

Q29: Based on your response in Q28, please explain why or why not.	Man		Woman	
	Count	%	Count	%
Negative influence	16	27	57	56
Neutral/NA	6	10	9	9
Positive influence	34	58	36	35
Total Comments	59		102	

Of the 59 respondents that identified as a man to Q29 and had responded 'yes' to Q28, 29% indicated that their gender had a negative influence on their experience with interference. Fifty-eight percent indicated that their identity positively influenced their experience. In comparison, of the 102 respondents that identified as woman to Q29 and had responded 'yes' to Q28), 56% indicated it was a negative influence and 35% indicated that it was a positive influence.

These results show that a higher percentage of men-identifying respondents (58%) reported that that their identity has more positively influenced whether they experience interference, compared to women. Ninety-one percent of those positive comments by men-identifying respondents cited gender (man) and/or Race and Ethnicity (white) as the reason for positive influence (see table 27).

These results are consistent with previous research which shows that women are less likely to speak up due to fears of backlash and more likely to be at the receiving end of discriminatory behaviours and action in the workplace (Brescoll, 2011; Funk & Parker, 2018). These internalised sources of constraint lead to interference in the form of self-censorship (Driscoll, 2021; Robertson et al., in press).

5.3 Systemic Racism

Aa stated in the Methods section, since white people are and have historically in colonial Canadian history been the dominant racial group, for the analysis of Race and Ethnicity and Perceived Race they were further categorized into Racial Minority and Visible Minority (Banting & Thompson, 2021). I found that racial minorities and visible minorities reported higher rates of externally imposed sources of interference, including workplace colleagues/peer pressure/ work culture, workplace policy, and senior management; and the internalized sources of interference including fear of risking workplace advancement or future funding opportunities.

It is possible that racial and visible minorities reported higher rates of interference from externally imposed factors, including senior management and workplace policy, because these factors often perpetuate systemic racism and discrimination that may amplify the perception of interference. Systemic discrimination is defined by the Ontario Human Right Commission (OHRC) as "patterns of behaviour, policies or practices that are part of the structures of an organization, and which create or perpetuate disadvantage for racialized persons" (OHRC, n.d). These results echo current literature that demonstrates that systemic racism/discrimination is present even in the face of "race neutral" policies and pro-diversity statements, as racism is typically caused by learned unconscious biases (Barber et al., 2020; Mezu-Ndubuisi, 2021; Livingston, 2020). Policies that might disadvantage racial and visible minorities, interferes with their ability to conduct and disseminate their work, practice public commentary, and impact social well-being (Miller & Garran, 2007).

5.4 Workplace Discrimination

Interference from colleagues/peer pressure/work culture was reported to be experienced at higher rates by racial and visible minorities, women, and respondents with a visible and/or invisible disability. Interference from colleagues can come in blatant for forms, such as physical or verbal assault/harassment (Ramlakhan, 2022). Two open-text responses from Q29 commented on experiences of harassment in their research careers. However, interference from colleagues usually comes in the form of microaggressions (Ramlakhan, 2022; Weinberg & Fine 2022; Skinner-Dorkenoo et al., 2021; Santuzzi & Waltz, 2016; Gartner, 2020). Microaggressions are "subtle, often-unintentional indignities and insults", examples of microaggression include covert sexist jokes (Ramlakhan, 2022; Sue, 2012 as cited by Ramlakhan, 2022). Open-text responses from Q29 support this, for example "[t]here is gender bias by colleagues who are dismissive of my opinion..." and "[w]omen in science are still restrained (sexist comments, lack of role model, not able to express ourselves, we don't have same opportunities as men colleagues, etc)...". These results concur with current literature that finds that microaggressions are one of the most pervasive and common forms of discrimination and racism in the workplace (Ramlakhan, 2022; Weinberg & Fine 2022; Skinner-Dorkenoo et al., 2021; Santuzzi & Waltz, 2016; Gartner, 2020). Microaggressions are also shown to uphold systemic inequalities because they "provide cover and support for established systems of oppression" (Skinner-Dorkenoo et al., 2021).

5.5 Internal Workplace Constraints

Internalized sources of workplace constraint refer to (Q16.7) fear to funding opportunities and (Q16.9) fear to workplace advancement. These constraints were grouped together because they refer to internalized sources of workplace concerns that constraint public commentary. Marginalized groups that reported higher amounts of these internal workplace constraints were racial minorities, visible minorities, respondents who had a visible religious signifier, and respondents that identified as LGBTQ+. This suggests these respondents may be engaging in some degree of self-censoring behaviours that has constrained their public commentary in in areas that they are scientifically knowledgeable out of fear. These results echo current literature that argue that marginalized groups are less likely to speak up due to fear of backlash or other consequences (Ramsoomair, 2019; Brescoll, 2011; Funk & Parker, 2018)

5.6 Consequences of Interference

Respondents who identified as living with a visible and/or invisible disability reported experiencing statistically significant higher rates of interference in the form of undue modification

to work and reported higher rates of job satisfaction being affected. This may be due to the unique challenges that people with disabilities face. These unique challenges also differ whether someone has disclosed their disability in the workplace or not (Santuzzi & Waltz, 2016). For example, people who disclose their disabilities in the workplace are often held to a lower expectation of performance standards because of preconceived notions that people with disabilities are less competent (Santuzzi & Waltz, 2016). In a CBC news story regarding the challenges that people living with a disability face in finding jobs, Matthew Santos, a lawyer living with a disability, said people "see the disability first, and their abilities second" ("Many Canadians with disabilities struggling to find jobs", 2015).

Respondents living with a visible and/or invisible disability reported higher rate of job satisfaction being affected. Possible causes for this can depend on whether someone has disclosed or not disclosed their disability in the workplace. People who have disclosed their disability in the workplace report lower rates of job satisfaction when they perceive that they are being unfairly treated (Santuzzi & Waltz, 2016). Whereas people who have not disclosed their disability in the workplace can experience lower job satisfaction because they have not disclosed their disability which leads to "unfavorable psychological outcomes, including anxiety, depression and lower self-esteem" (Santuzzi & Waltz, 2016).

5.7 Limitations

Due to the survey title and description (Appendix A), it is likely that self-selection bias was a limitation, meaning, researchers who have experienced interference are more likely to complete the survey (Driscoll, 2021; Bethlehem, (2010). As well women, white people, and younger people are also shown to be more likely to complete surveys (Smith, 2008). Women being more likely to complete a survey is also notable considering they were underrepresented in the survey demographics. As well, as the data was not based on a probability sample, these results cannot be used to make inferences about the greater environmental studies and sciences population (Driscoll, 2021; Bethlehem, 2010).

Due to limited capacity on behalf of the research team, the survey was not made available in French or any other language. Therefore, it was inaccessible to non-English speaking/reading Canadians. Consequently, a couple of scientific societies also declined to participate in its dissemination as it would not meet their standards for communications (Robertson et al., in press).

Some of the data that was collected, was insufficient to analyze or report on according to standards set by Public Services and Procurement Canada (2020). In efforts to incorporate all

the data, groups with less than ten, when possible, were categorized with other groups. Thus, compromising our intent to be able to understand the experiences of some of the unique groups we sought response from.

5.8 How to Move Forward

In the light of increasing education, EDI initiatives, and new diverse policies, there has been great strides in increasing the awareness of the importance of diversity and creating more equitable workplaces and society (Lyle, 2021; Employment and social development, 2019; National Research Council of Canada, 2018; Taylor, 2018). Despite these efforts, systemic issues still exist, as was highlighted in this research (Taylor, 2018; Skinner-Dorkenoo et al., 2021). We therefore suggest several recommendations and recommended areas for future study.

Based on the results from this research, researchers from marginalized groups experience higher levels of interference than the typically predominant groups in environmental studies and sciences. More needs to done within organizations to ensure equitable and fair practices. Policies such as the federal Scientific Integrity Policy is a good example of a policy intended to protect scientists from interference can improve rates of interference (PIPSC, 2017). Specific actions regarding discrimination should also be taken, following suggestions by Melanie Duc Bo Massey and colleagues, these include increasing anti-discrimination and anti-racism education and increasing accountability (2021). They suggest education begin with EDI workshops and seminars by skilled trainers to avoid ineffective "check-off-the-box" approaches. Massey and colleagues state that these are important as they "move beyond diversity statements and commit to active anti-racism work" (2021).

For future research, we recommend a more thorough report of demographics of environmental researchers in Canada that includes additional variables for consideration such as income distribution and immigration status. This is based on open-text responses in which respondents pointed to these variables as important consideration and current literature that finds that immigration status and income can be determinants for discrimination in the workplace (Di Napoli et al., 2021; Halanych et al., 2011; Krieger et al., 2006).

Chapter 6: Conclusion

This research was the first known report of the role that identity factors play in the experience of interference from the perspective of environmental researchers in Canada. Interference is still occurring, and marginalized groups surveyed reported higher rates of experience of interference than the typically predominant group. The respondents' demographics were not representative of Canadian demographics. Major trends from the data that I found show that of the researchers surveyed, women experience higher levels of internalized sources of interference that constrain their public commentary in areas where they are scientifically knowledgeable. Self-censorship, due to internalized sources of constraint, was apparent across all marginalized groups to varying degrees. Racial and visible minorities experience higher levels of externally imposed constraints and internalized constraints regarding fear to funding and workplace advancement. The consequences of interference such as negative impact on job satisfaction, were reported to be statistically significant by respondents who identified as individuals living with a visible and/or invisible disability. These trends matter in environmental studies and sciences because diverse perspectives are important for creating quality and impactful research; creating just workplaces; and researchers form marginalized groups may be more likely to research marginalized groups which is important because marginalized communities who are more likely to be negatively impacted by climate change, environmental harms, and other ecological losses and changes (Hong et al., 2004; Fine et al., 2020; Parker, 2020; Holmes, 2020; Massey et al., 2021; Islam & Winkle, 2017; Taylor, 2018; Masuda et al., 2008; Freeman & Huang, 2014). To conclude, understanding and preventing interference based on identity factors is important in helping environmental studies and sciences to become more inclusive, barrier and discrimination free, and more protective of environmental researchers who are working to address the global complex challenges of climate change and furthering environmental changes and losses.

Positionality Statement

The research team was comprised of women identifying researchers with perspectives from multiple academic disciplines, different career stages, and who have lived and worked in several Canadian Provinces in academia and in the public sector. Though different backgrounds, all researchers were born and raised in Canada. This research was carried out in alignment with the values stated on the Westwood Lab website (Westwood Lab, n.d).

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Appendix A

DALHOUSIE UNIVERSITY

CONSENT FORM

INTERFERENCE IN CANADIAN SCIENCE: DOCUMENTING SCIENTISTS' PERCEPTIONS OF THEIR ABILITY TO CONDUCT AND COMMUNICATE ENVIRONMENTAL RESEARCH

[Versioning: After receiving ethics approval, add the date of approval and the consent form version number. The first approved version is v1.0. If subsequent amendments to the consent form are requested and approved, the date of approval and version number (e.g. v2.0) must be updated.]

Who is conducting this study? This research study is being conducted by Manjulika E. Robertson (MES Candidate) and Dr. Alana Westwood (Assistant Professor) at the School of Resource and Environment Studies at Dalhousie University. The research is primarily funded by Dalhousie University through the Dean's Collaborative Research Grant.

What is the study about? The purpose of this study is to document the ability of researchers in environmental studies and sciences to conduct and communicate their scientific research. The study is funded by Dalhousie University.

What do I have to do? If you choose to participate, you will be asked to anonymously answer questions to inform the research team about your perspectives on interference with research on environmental sciences or studies. We will also ask for your demographic information.
All responses are anonymous.

Is my participation voluntary? Your participation in this research is entirely your choice. There are no right or wrong answers, our aim is to understand your perspective on the issue of interference. Excerpts from responses to long-form survey questions may be used in the report, only if the information could not possibly reveal the identity of the response author. You may choose 'prefer not to answer' where applicable and may stop the survey at any time by closing the browser window. Recorded responses cannot be deleted after submitting the survey as they are anonymous. If you do not submit your responses by clicking 'Submit' at the end of the survey, your responses will be deleted from the data set.

The survey should take approximately 25 - 30 minutes to complete.

What will happen to my responses? The findings of the research will be shared anonymously and in aggregate via theses, peer-reviewed papers, summary graphics for social media, news releases, and presentations. Your demographic data may also be shared with the scientific societies that you indicate membership to, if they disseminated the survey to you and requested the data in exchange. Aggregate findings for particular identity groups will only be shared if there are a minimum of 10 respondents in that category. All data will be kept indefinitely in secure storage (locked hard drives) for the possibility be re-analyzed in future as part of longitudinal research.

Are there any risks? The risks associated with this study include potential emotional distress in recalling and recounting experiences with interference to your scientific work that may have been negative or traumatizing. If you experience this, we recommend reaching out to your organization's Employee Assistance Program if applicable or using the following services to seek counselling and support.

> Canadian Mental Health Association (613)– 549-7027
> Crises Help Line (CAN) 1-800-233-4357

What are the benefits? There will be no direct benefit to you for participating in this research. The research, however, might contribute to new knowledge on the prevalence and impacts of interference in science in Canada. Participating in the research study ensures that your perspective is included in the case that the research is successfully mobilized to impact the training, programs, and policy of science advocacy groups and governments. If you interested in receiving direct communication about the results of the research or be involved in future research, you will have the option to confidentially provide your email address to the research team via an external form which will be in no way connected to your survey responses.

What about compensation? To thank you for your time, you may choose to enter a draw for a chance to win one of three $50 gift cards to an online store of your choice or donate to the organization/charity of your choice upon completing and submitting the survey. Your contact information for the draw will not be linked in any way to your survey responses.

Where can I direct my questions? You should discuss any questions you have about this study with Dr. Alana Westwood and Manjulika E. Robertson. Please ask as many questions as you like before or after participating by contacting woodlab@dal.ca. If you have any ethical concerns about your participation in this research, you may contact Research Ethics, Dalhousie University at (902) 494-3423, or email ethics@dal.ca (and reference REB file # 20XX-XXXX)."

If you consent to participate, please click "I consent" below.

CONSENT TO PARTICIPATE:

- o   I consent. (continue to initial survey)
- o   I do not consent. (exit study)

Appendix B

1. Do you identify as a researcher in the environmental studies or sciences?
    - o   Yes
    - o   No

2. Are you currently working/employed in the field of environmental studies or sciences?
    - o   Yes
    - o   No

3. In what Canadian Province or Territory do you predominantly conduct your work?
    - o   British Columbia
    - o   Alberta
    - o   Saskatchewan
    - o   Manitoba
    - o   Ontario
    - o   Quebec
    - o   New Brunswick
    - o   Nova Scotia
    - o   Prince Edward Island
    - o   Newfoundland and Labrador s
    - o   Northwest Territories
    - o   Nunavut
    - o   Yukon

4. Please indicate your primary areas of research or your discipline(s).
    You may select up to three of the following.
    - Civil, Industrial and Systems Engineering
    - Chemical, Biomedical and Materials Science Engineering
    - Mechanical Engineering
    - Electrical Engineering
    - Computing Sciences
    - Mathematical Sciences
    - Physics and Astronomy
    - Chemistry
    - Geosciences
    - Evolution and Ecology

Cellular and Molecular Biology
Plant and Animal Biology
Psychology

5. Please indicate the full names of all the scientific societies where you hold membership. If there is more than one, separate the names using semi-colons.
   Open Text Response

6. What career stage are you in?
   o Early Career Researcher: first employed as a researcher (inclusive of postdocs) after 2015
   o Established Researcher: first employed as a researcher before 2015
   o Retired

Please indicate your agreement with the following statements on a scale of 1 -5 (1: Strongly disagree, 2: Somewhat disagree, 3: Neither agree nor disagree, 4: Somewhat agree, 5: Strongly agree, 6: Not Applicable).

7. I am aware of cases where the health and safety of Canadians (or environmental sustainability) has been compromised because of political interference with scientific work at my organization.

8. I am aware of cases where my organization has suppressed or declined to release information, and where this led to incomplete, inaccurate, or misleading impressions by the public, regulated industry, the media and/or government officials.

9. I am aware of cases where the exchange or transfer of knowledge based on scientific evidence for the purpose of developing policy, law, and/or programs at my organization has been compromised by political interference.

10. Have you ever experienced 'undue modification' to your work by your organization, such as substantive changes to a text or story that downplays, masks, or includes misleading information about environmental impacts?
    o Yes
    o No
    o Unsure

11. If yes, who asked you to make the modifications and for what reason?
    Open Text Response

Please indicate your agreement with the following statements on a scale of 1 -5 (1: Strongly disagree, 2: Somewhat disagree, 3: Neither agree nor disagree, 4: Somewhat agree, 5: Strongly agree, 6: Not Applicable).

12. I am allowed by my organization to speak freely and without constraints to the media about my research in the environmental studies or sciences.

13. I have received a question from the public or media that I have the expertise to answer but have been prevented from doing so by my organization.

14. Please indicate which topic areas you have experienced constraints on communication, in mainstream or social media, from your organization/present workplace. (check only those options that are applicable).
"Constraints on communication" refers to any pressure applied to deter public or political engagement, or provision of information or commentary in areas that you are scientifically knowledgeable.

    1 = Biosecurity
    2 = Climate change
    3 = Native species that some consider pests
    4 = Extinctions
    5 = Feral animals
    6 = Invasive / exotic plants
    7 = Firewood collection
    8 = Fishing, commercial
    9 = Fishing, recreational
    10 = Hunting
    11 = Impacts of agriculture
    12 = Impacts of mining
    13 = Impacts of urban development
    14 = Indigenous land management
    15 = Land use planning
    16 = Logging
    17 = Native vegetation clearing
    18 = Pets
    19 = Pollution
    20 = Sustainable use of native species
    21 = Threatened species
    22 = Changes to legislation or policy
    23 = Other (please list)
    24 = I have not experienced any constraints

15. Please explain the nature of these constraints (optional).
    Open Text Response

16. Please indicate your agreement with the following statements on a scale of 1 -5 (1: Strongly disagree, 2: Somewhat disagree, 3: Neither agree nor disagree, 4: Somewhat agree, 5: Strongly agree, 6: Not Applicable).

    My public commentary in areas where I am scientifically knowledgeable is constrained by;

    "Public commentary" refers to any information contributed in interviews with media and media statements or editorials, including social media. By "knowledgeable" we mean having enough knowledge to be able to make a professionally informed contribution to public debate.

    1 = My belief that scientists have no role in making public commentary beyond information provision

    2 = My concern about how I may be represented by the media

    3 = My fear of being drawn to comment beyond the boundaries of my expertise

    4 = My uncertainty about the boundaries of my expertise

    5 = My belief that my primary obligation is to my organization, rather than to the public

    6 = My stress around discussing contentious issues

    7 = My fear of risking funding opportunities

    8 = My fear of being made redundant

    9 = My fear of reducing opportunities for advancement

    10 = My workplace colleagues / peer pressure / work culture

    11 = My workplace policy

    12 = My middle management

13 = My senior management

14 = The Minister's office

17. Has your job satisfaction ever been affected by restraints on public commentary and peer communication?
    o Yes
    o No
    o Unsure

18. If yes, please briefly explain how your job satisfaction was affected.
    Open Text Response

19. How would you define the term 'interference in science'?
    Open Text Response

20. Are you aware of the Scientific Integrity Policies implemented in Canadian federal government departments by in 2019?
    o Yes
    o No

21. If yes, do you feel that the implementation of these policies has had an impact on the ability of researchers in the environmental sciences and studies in Canada to conduct and communicate research? Please explain.
    Open Text Response

22. How do you identify your gender?
    o Woman
    o Man
    o Non-binary
    o Prefer not to say
    o *Text Fill*

23. Would you describe yourself as transgender?
    o Yes
    o No
    o Prefer not to say

24. Do you identify as a member of any marginalized group in terms of sexual orientation? (LGBQ2S+)
    o Yes
    o No

o   Prefer not to say

25. How do you identify in terms of racial and ethnic identity (select all that apply)?

Black, African-Canadian, person of African descent

Indigenous (First Nations, Inuit, Metis)

East Asian (including Chinese, Japanese, Korean, etc.)

South Asian (including East Indian, Indian from India, Pakistani, Sri Lankan, Bangladesh, East Indian from Guyana, East Africa, Trinidad, etc.)

South East Asian (including Burmese, Cambodian, Filipino, Laotian, Thai, Vietnamese, etc.)

Non-White West Asian

North African or Arab (including Afghan, Armenian, Algerian, Egyptian, Iranian, Israeli, Lebanese, Libyan, Palestinian, Syrian, etc.)

Non-White Latin American (including indigenous persons from Central and South America, etc.)

Pacific Islander

White Canadian or of White European descent

Prefer not to disclose

26. How are you typically perceived in terms of racial and ethnic identity (select all that apply)?

Black, African-Canadian, person of African descent

Indigenous (First Nations, Inuit, Metis)

East Asian (including Chinese, Japanese, Korean, etc.)

South Asian (including East Indian, Indian from India, Pakistani, Sri Lankan, Bangladesh, East Indian from Guyana, East Africa, Trinidad, etc.)

South East Asian (including Burmese, Cambodian, Filipino, Laotian, Thai, Vietnamese, etc.)

Non-White West Asian

North African or Arab (including Afghan, Armenian, Algerian, Egyptian, Iranian, Israeli, Lebanese, Libyan, Palestinian, Syrian, etc.)

Non-White Latin American (including indigenous persons from Central and South America, etc.)

Pacific Islander

White Canadian or of White European descent

Prefer not to disclose

27. Do you identify as an individual living with a disability (select all that apply)?

Yes, visible

Yes, invisible

No

Prefer not to say

28. In your workplace do you wear a visible signifier of a religious affiliation (e.g., hijab, cross, kippah)?

o   Yes

    ○   No

    ○   Prefer not to answer

29. Do you believe that your identity and/or demographics have influenced your experiences with interference in your research?
    ○   Yes
    ○   No
    ○   Unsure

30. Please explain why or why not (optional).
Open Text Response

31. Is there anything not covered in the survey questions that you would like us to know?
Open Text Response

Submit

Appendix C

Gender	Count	Total disclosed	Man	Women	Non-binary
Gender	741	707	429	271	IS

LGBTQ+	Count	Total disclosed	LGBTQ+	Non-LGBTQ+
LGBTQ+	741	704	53	651

Race and Ethnicity	Count	Total disclosed	Arab	Asian	Black	Indigenous	Latin American	Multiple ethnicities	White
Race and Ethnicity	741	693	11	60	13	IS	10	26	567

Perceived race	Count	Total disclosed	Arab	Asian	Black	Indigenous	Latin American	Multiple ethnicities	White
Perceived race	741	691	10	57	15	IS	14	18	574

Visible and/or Disability	Count	Total disclosed	Visible and/or Disability	No Disability
Visible and/or Disability	741	705	83	622

Religious Signifier	Count	Total disclosed	Religious Signifier	No Religious Signifier
Religious Signifier	741	712	13	699

Appendix D

Q10 Experienced 'undue modification' to work by the organization that substantively changes a text or story that downplays, masks, or includes misleading information about environmental impact and Gender, LGBTQ+, Race and Ethnicity, Perceived Race, Visible and/or Invisible Disability, and Religious Signifier.

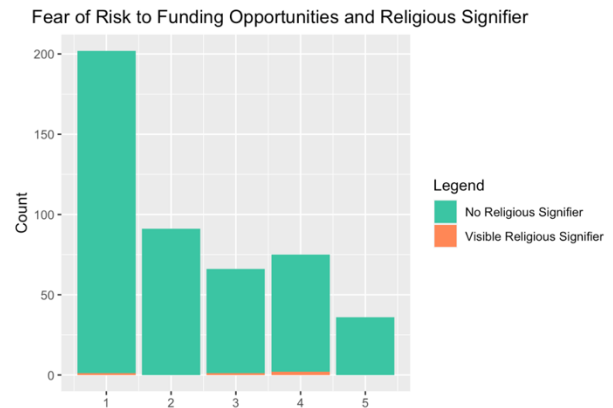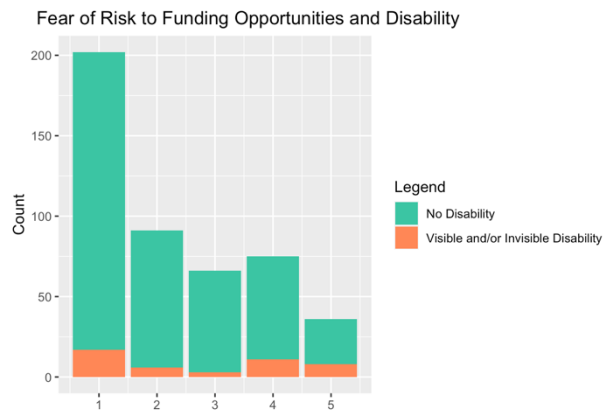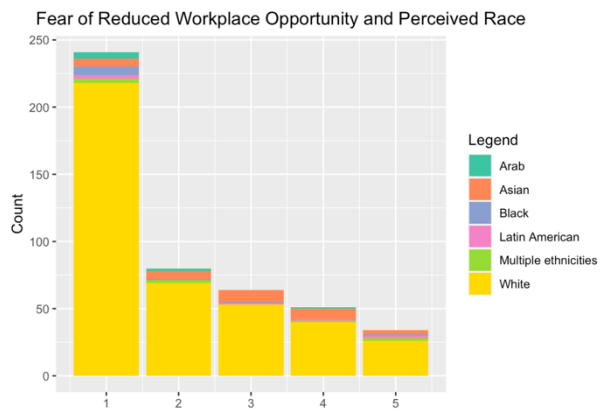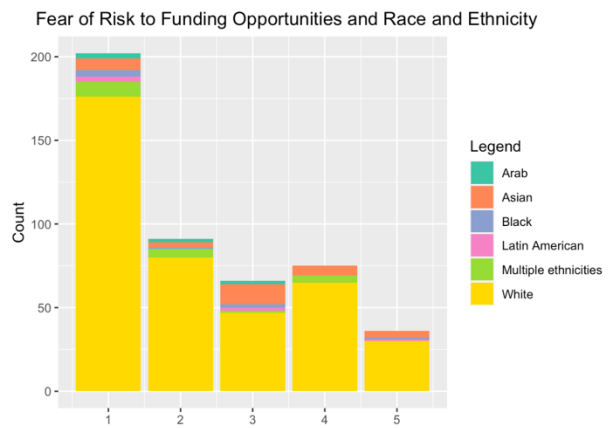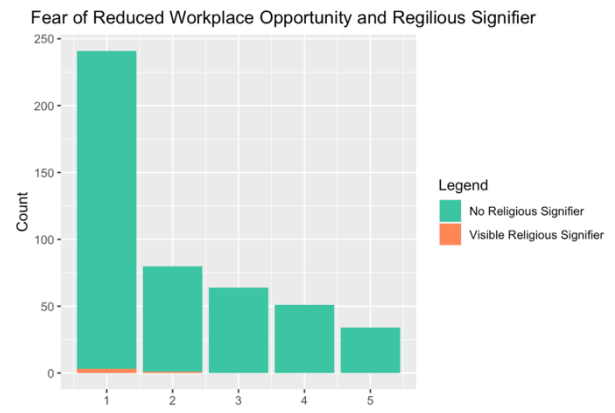Experienced Undue Modification and Gender

Experienced Undue Modification and LGBTQ+

Experienced Undue Modification and Race and Ethnicity

Experienced Undue Modification and Perceived Race

Experienced Undue Modification and Disability

Experienced Undue Modification and Religious Signifier
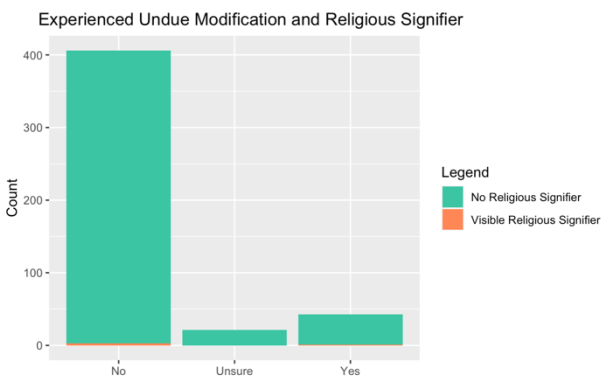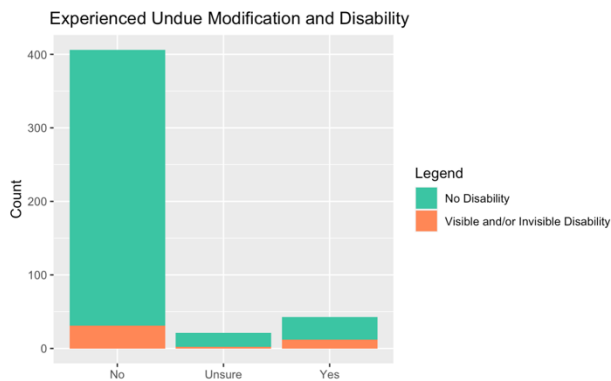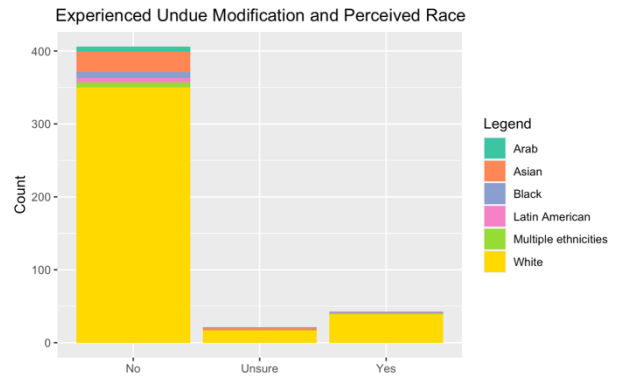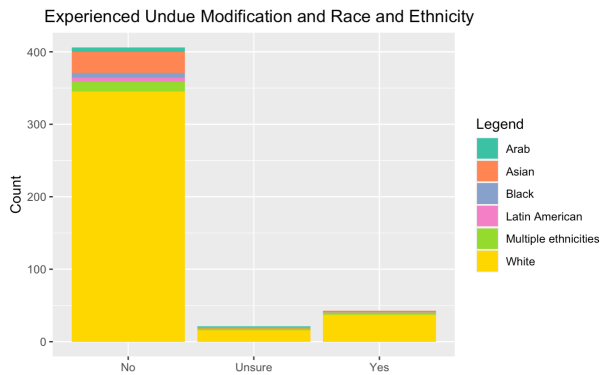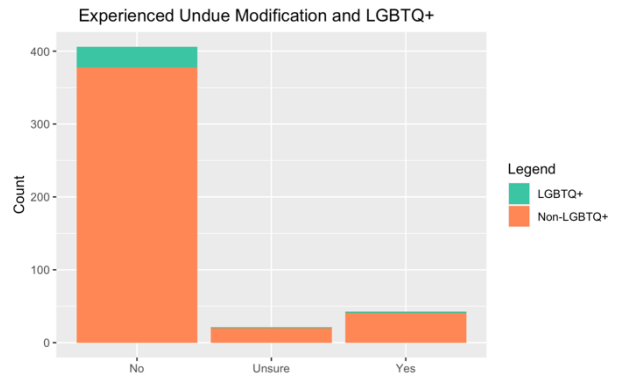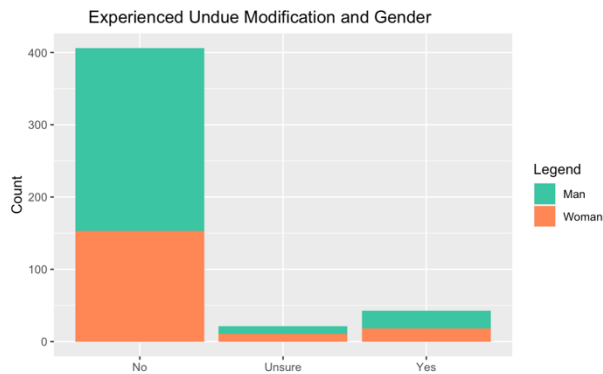
Q16.2 Concerns of how I may be represented by media and Gender, LGBTQ+, Race and Ethnicity, Perceived Race, Visible and/or Invisible Disability, and Religious Signifier.

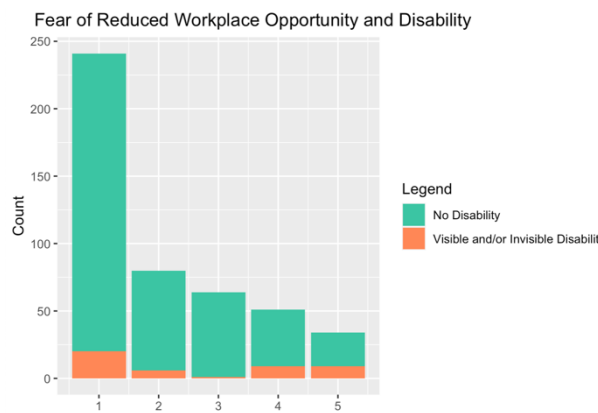Conern regarding Represention by the Media and Gender

Conern regarding Represention by the Media and LGBTQ+

Concern regarding Represention by the Media and Race and Ethnicity

Conern regarding Represention by the Media and Perceived Race

Conern regarding Represention by the Media and Disability

Conern regarding Represention by the Media and Religious Signifier

Q16.3 Fear of being drawn to comment beyond boundaries of expertise and Gender, LGBTQ+, Race and Ethnicity, Perceived Race, Visible and/or Invisible Disability, and Religious Signifier.
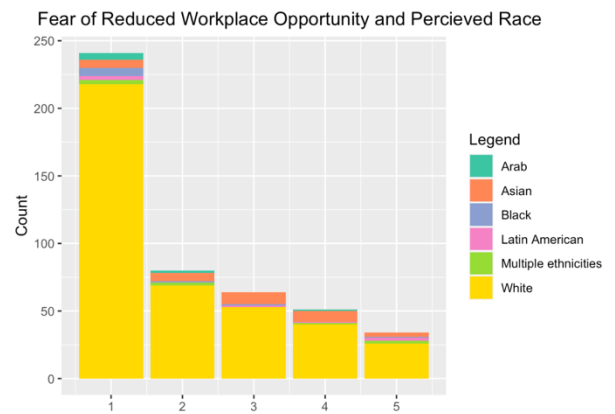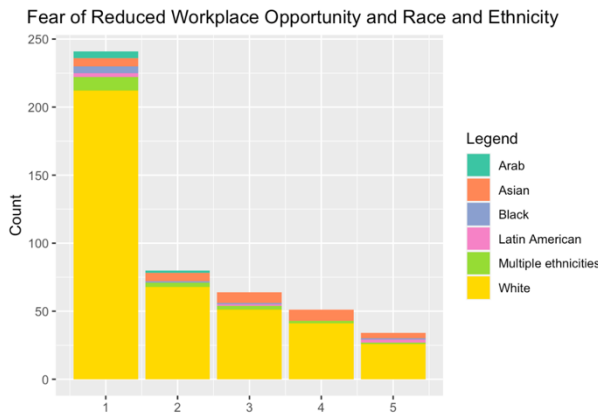

Fear of Being Drawn to Comment Beyond Expertise and Gender

Fear of Being Drawn to Comment Beyond Expertise and LGBTQ+

Fear of Being Drawn to Comment Beyond Expertise and Race and Ethnicity

Fear of Being Drawn to Comment Beyond Expertise and Perceived Race

Fear of Being Drawn to Comment Beyond Expertise and Disability

Fear of Being Drawn to Comment Beyond Expertisee and Religious Signifier
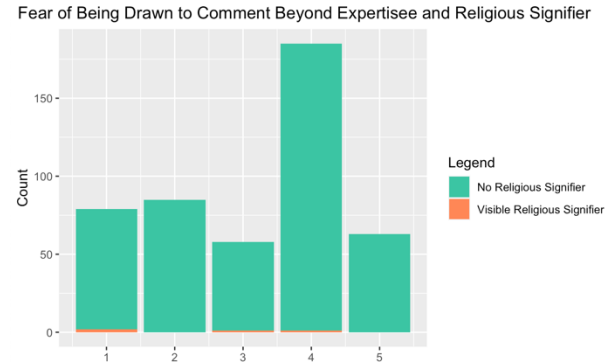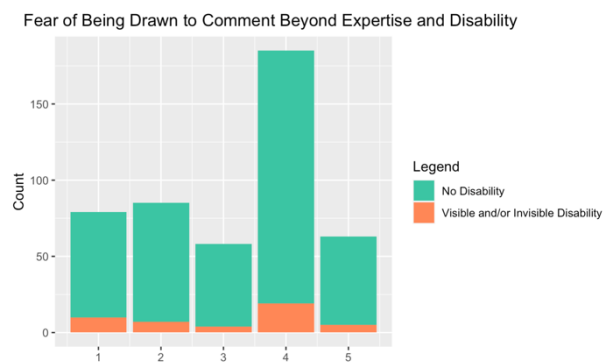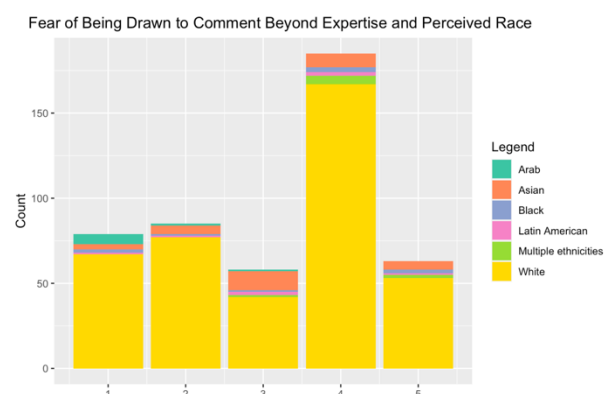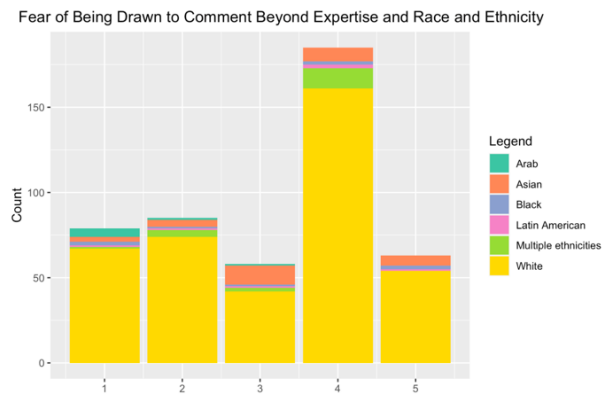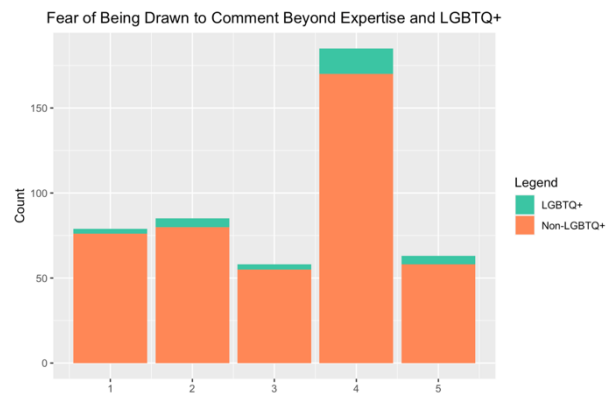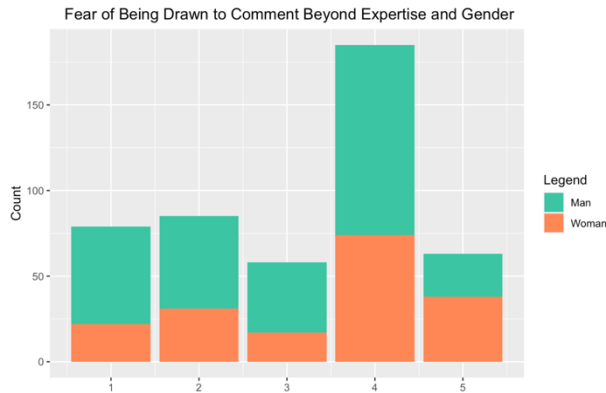
Q16.4 Uncertainty of boundaries of expertise and Gender, LGBTQ+, Race and Ethnicity, Perceived Race, Visible and/or Invisible Disability, and Religious Signifier.

Uncertainty Regarding Boundaries of Expertise and Gender

Uncertainty Regarding Boundaries of Expertise and LGBTQ+

Uncertainty Regarding Boundaries of Expertise and Race and Ethnicity

Uncertainty Regarding Boundaries of Expertise and Perceived Race

Uncertainty Regarding Boundaries of Expertise and Disbility

Uncertainty Regarding Boundaries of Expertise and Religious Signifier
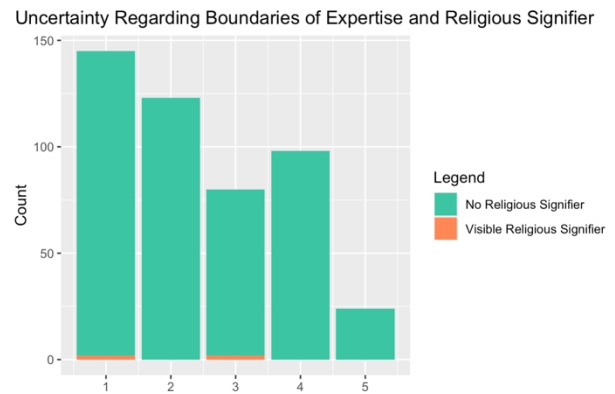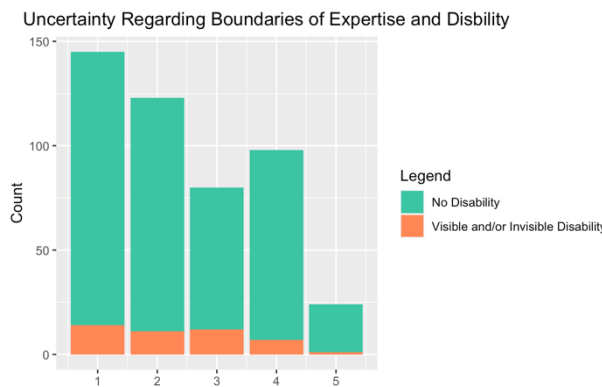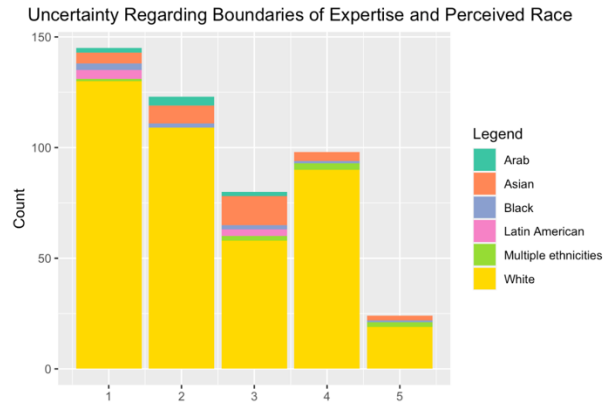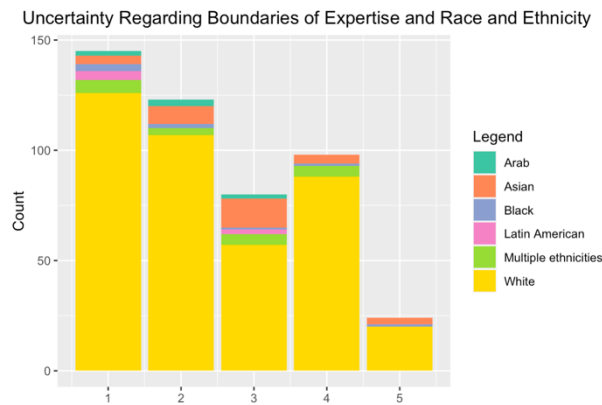
Q16.6 Stressful to talk about contentious issues and Gender, LGBTQ+, Race and Ethnicity, Perceived Race, Visible and/or Invisible Disability, and Religious Signifier.

Stressful to talk about Contentious Issues and Gender

Stressful to talk about Contentious Issues and LGBTQ+

Stressful to talk about Contentious Issues and Race and Ethnicity

Stressful to talk about Contentious Issues and Perceived Raced

Stressful to talk about Contentious Issues and Disability

Stressful to talk about Contentious Issues and Religious Signifier
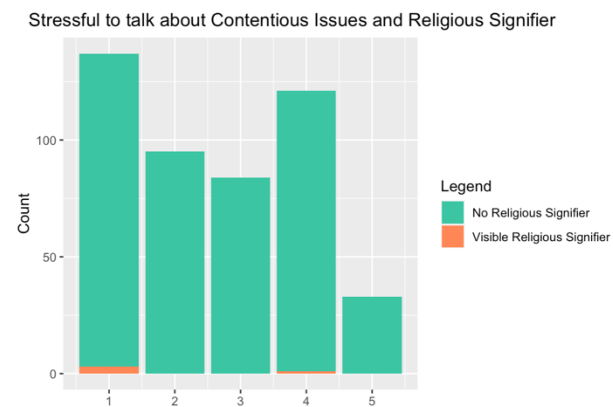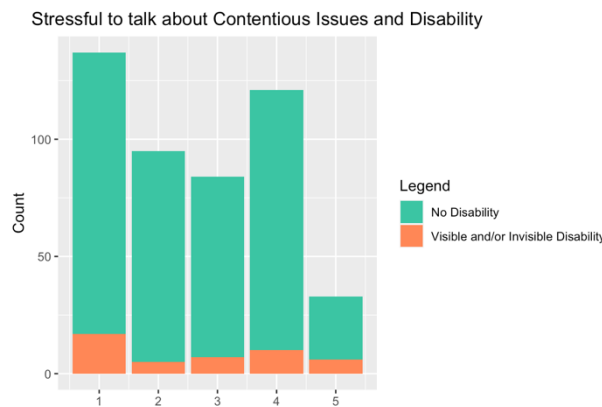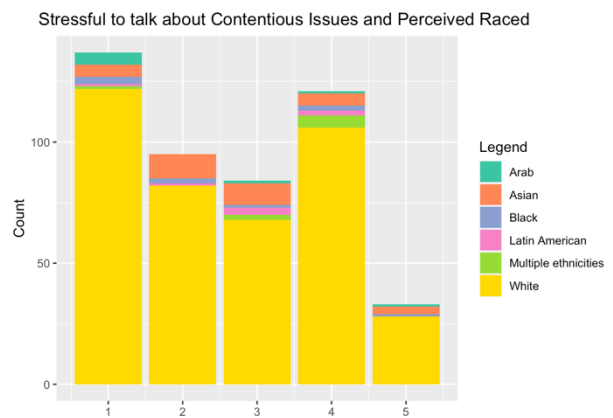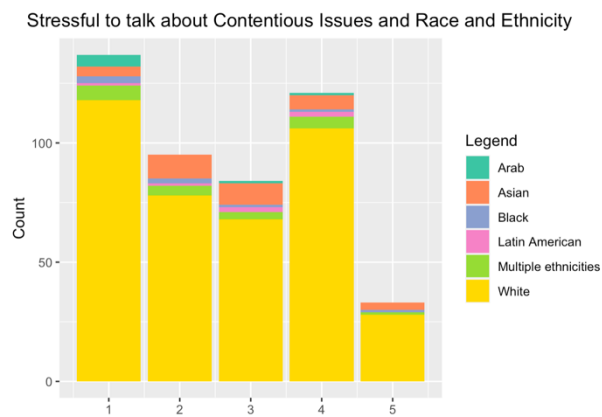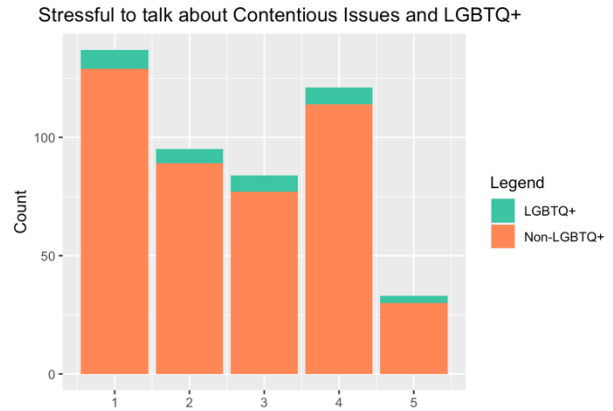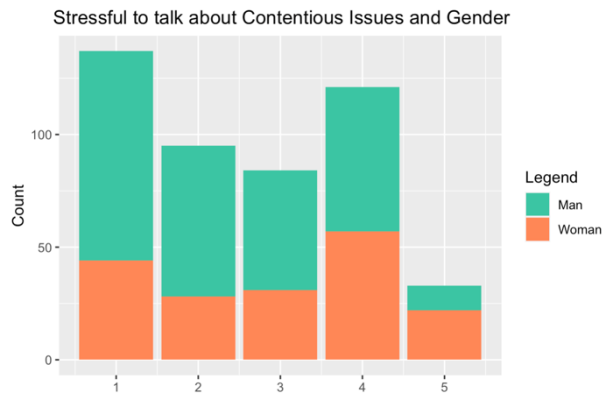
Q16.7 Fear to risking funding opportunities and Gender, LGBTQ+, Race and Ethnicity, Perceived Race, Visible and/or Invisible Disability, and Religious Signifier.

Fear of Risk to Funding Opportunities and Gender

Fear of Risk to Funding Opportunities and LGBTQ+

Fear of Risk to Funding Opportunities and Race and Ethnicity

Fear of Reduced Workplace Opportunity and Perceived Race

Fear of Risk to Funding Opportunities and Disability

Fear of Risk to Funding Opportunities and Religious Signifier
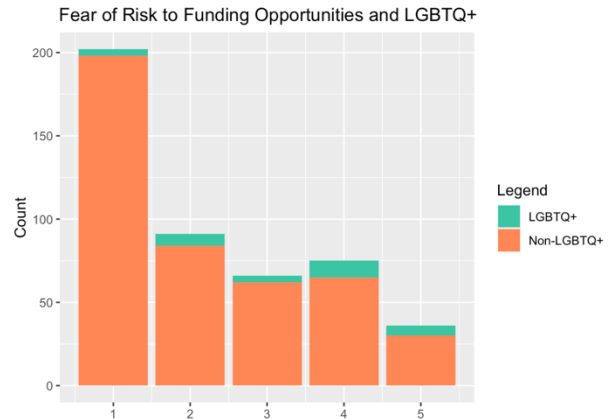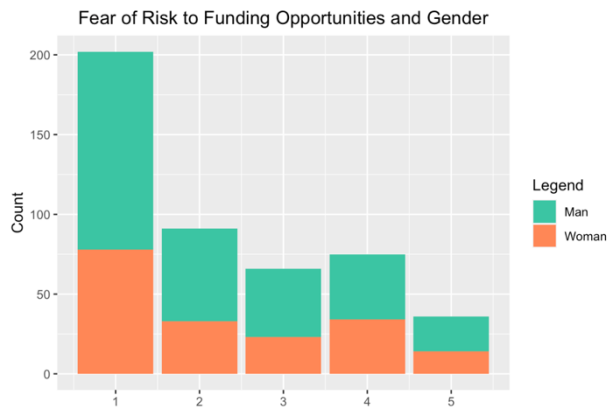
Q16.9 Fear to risking workplace advancement opportunities and Gender, LGBTQ+, Race and Ethnicity, Perceived Race, Visible and/or Invisible Disability, and Religious Signifier.

Fear of Reduced Workplace Opportunity and Gender

Fear of Reduced Workplace Opportunity and LGBTQ+

Fear of Reduced Workplace Opportunity and Race and Ethnicity

Fear of Reduced Workplace Opportunity and Percieved Race

Fear of Reduced Workplace Opportunity and Disability

Fear of Reduced Workplace Opportunity and Regilious Signifier

Q16.10 Workplace colleagues/ peer pressure/ work culture and Gender, LGBTQ+, Race and Ethnicity, Perceived Race, Visible and/or Invisible Disability, and Religious Signifier.


Workplace colleagues/peer pressure/work culture and Gender
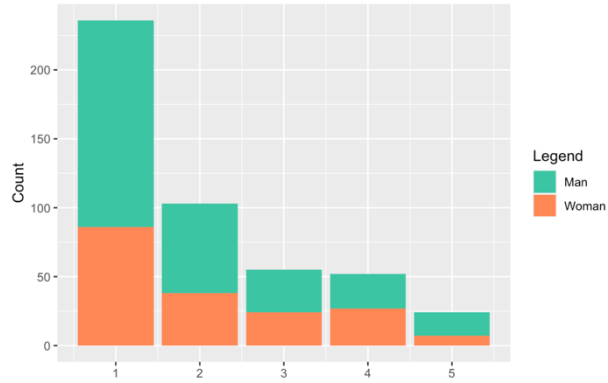

Workplace colleagues/peer pressure/work culture and LGBTQ+
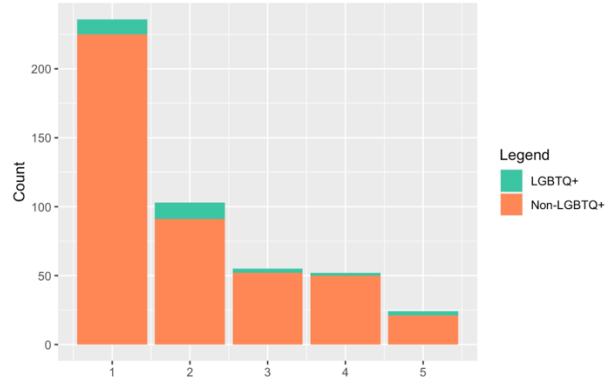
Workplace colleagues/peer pressure/work culture and Race and Ethnicity
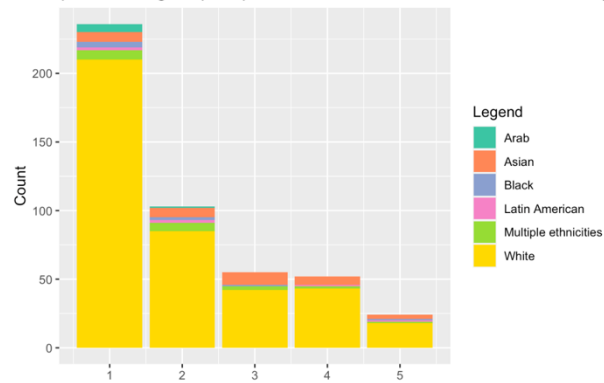
Workplace colleagues/peer pressure/work culture and Perceived Race
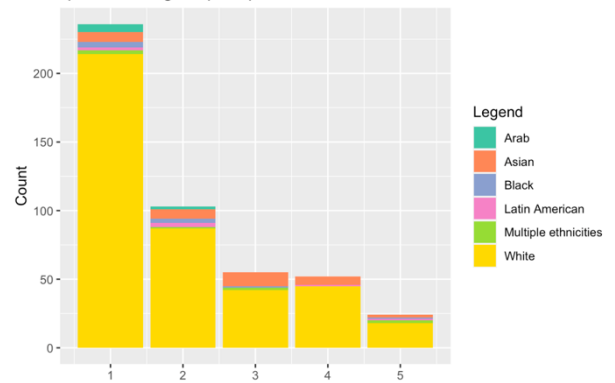
Workplace colleagues/peer pressure/work culture and Disability
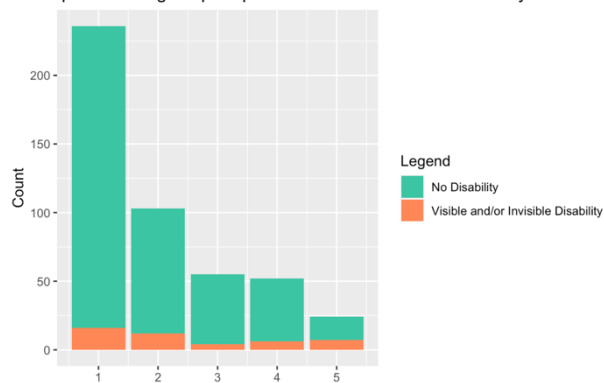
Workplace colleagues/peer pressure/work culture and Religious Signifier
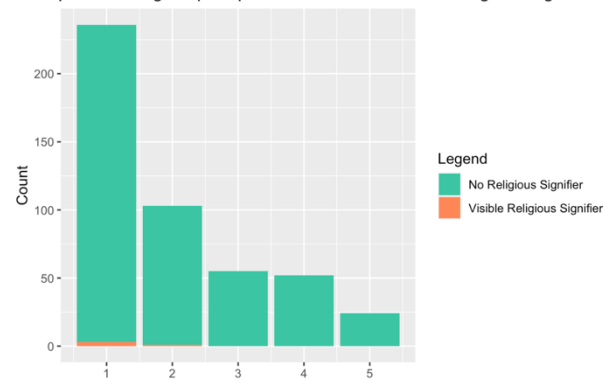
Q16.11 Workplace Policy and Gender, LGBTQ+, Race and Ethnicity, Perceived Race, Visible and/or Invisible Disability, and Religious Signifier.
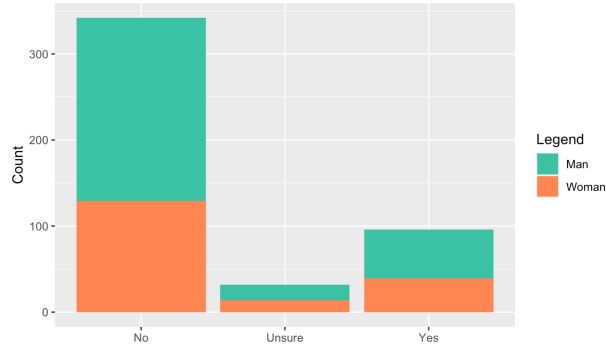
Q16.13 Senior Management and Gender, LGBTQ+, Race and Ethnicity, Perceived Race, Visible and/or Invisible Disability, and Religious Signifier.

Senior Management and Gender

Senior Management and LGBTQ+
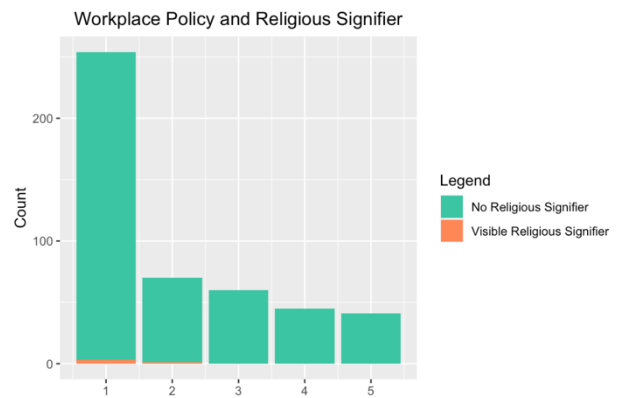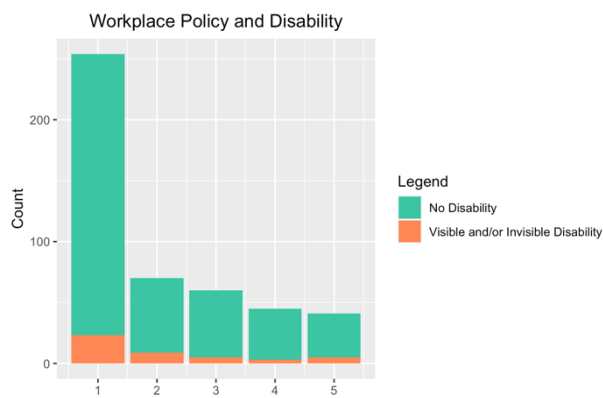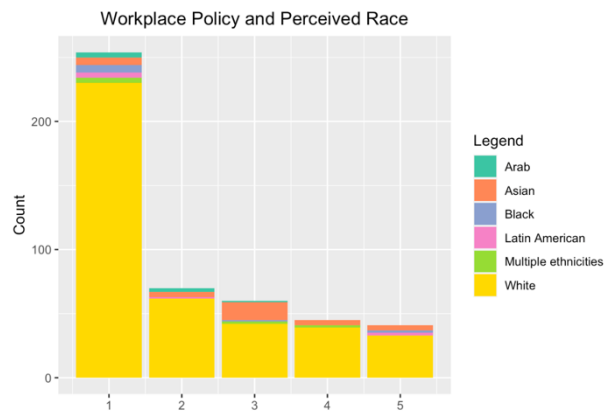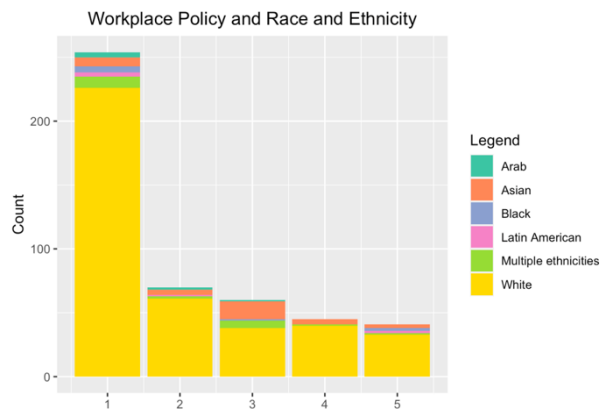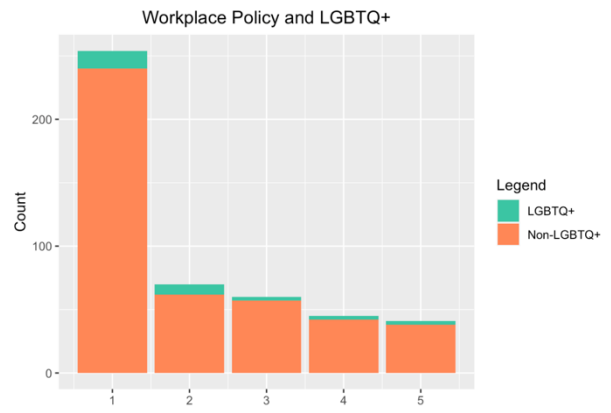
Senior Management and Race

Senior Management and Perceived Race

Senior Management and Disability

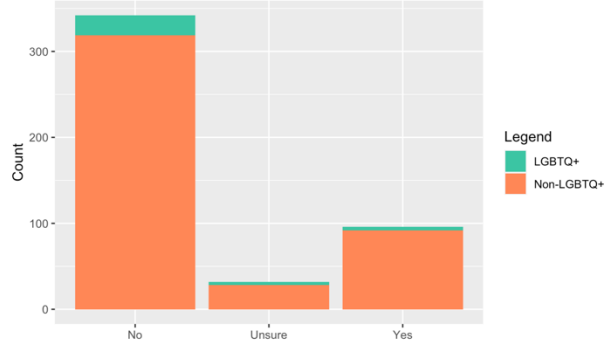Senior Management and Religious Signifier
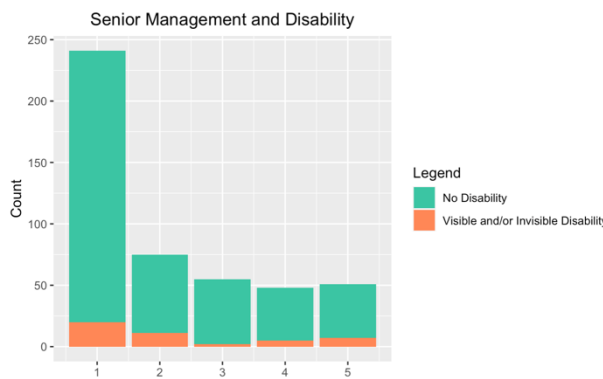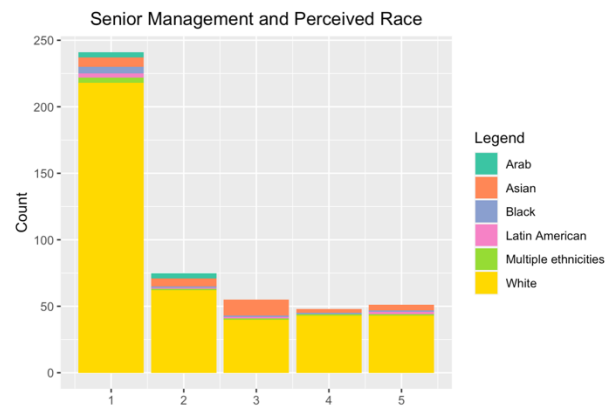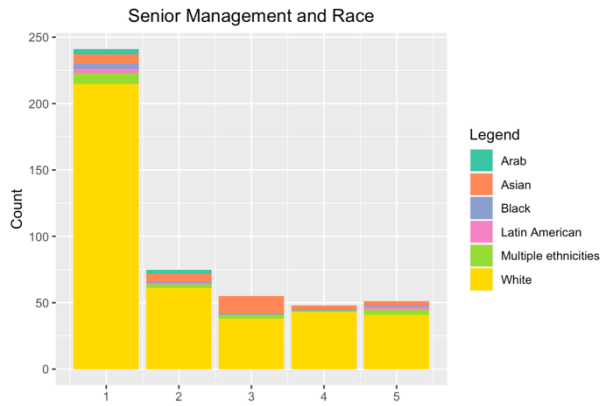
Q17 Job satisfaction been affected by restraints on public commentary and peer communication and Gender, LGBTQ+, Race and Ethnicity, Perceived Race, Visible and/or Invisible Disability, and Religious Signifier.
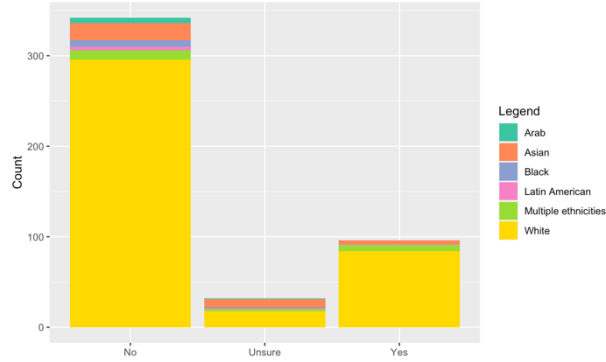
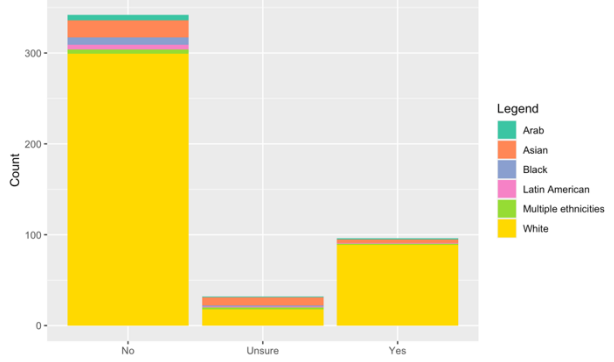Job Satisfaction affected by Restraints on Communication and Gender

Job Satisfaction affected by Restraints on Communication and LGBTQ+
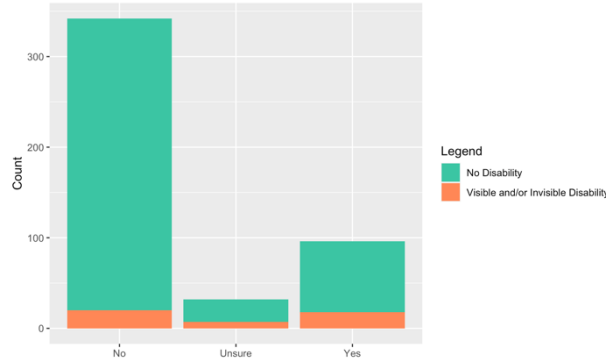
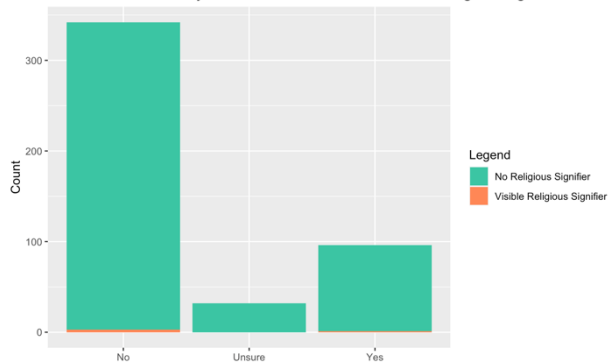Job Satisfaction affected by Restraints on Communication and Race and Ethnicity

Job Satisfaction affected by Restraints on Communication and Perceived Race

Job Satisfaction affected by Restraints on Communication and Disability

Job Satisfaction affected by Restraints on Communication and Religious Signifier

Q28 Belief that identify and/or demographic influenced experienced interference and Gender, LGBTQ+, Race and Ethnicity, Perceived Race, Visible and/or Invisible Disability, and Religious Signifier.

Identity Influenced Experienced Interference and Gender

Identity Influenced Experienced Interference and LGBTQ+

Identity Influenced Experienced Interference and Race and Ethnicity

Identity Influenced Experienced Interference and Perceived Race

Identity Influenced Experienced Interference and Disability

Identity Influenced Experienced Interference and Religious Signifier