

Is it always this cold? Chilly interpersonal climates as a barrier to the well-being of early-career women faculty in STEM

Kathi N. Miner, Samantha C. January, Kelly K. Dray and
Adrienne R. Carter-Sowell

*Department of Psychological and Brain Sciences, Texas A&M University,
College Station, Texas, USA*

Abstract

Purpose – The purpose of this project was to examine the extent to which early-career women faculty in science, technology, engineering and math (STEM) experience working in a chilly interpersonal climate (as indicated by experiences of ostracism and incivility) and how those experiences relate to work and non-work well-being outcomes.

Design/methodology/approach – Data came from a sample of 96 early-career STEM faculty (Study 1) and a sample of 68 early-career women STEM faculty (Study 2). Both samples completed online surveys assessing their experiences of working in a chilly interpersonal climate and well-being.

Findings – In Study 1, early-career women STEM faculty reported greater experiences of ostracism and incivility and more negative occupational well-being outcomes associated with these experiences compared to early-career men STEM faculty. In Study 2, early-career women STEM faculty reported more ostracism and incivility from their male colleagues than from their female colleagues. Experiences of ostracism (and, to a lesser extent, incivility) from male colleagues also related to negative occupational and psychological well-being outcomes.

Originality/value – This paper documents that exposure to a chilly interpersonal climate in the form of ostracism and incivility is a potential explanation for the lack and withdrawal of junior women faculty in STEM academic fields.

Keywords Well-being, Ostracism, STEM, Incivility, Chilly climate

Paper type Research paper

Decades of research document that women are less likely to enter and more likely to exit science, technology, engineering and math (STEM) fields compared to men (Hill *et al.*, 2010; Xie and Shauman, 2003), including academic faculty (Bilimoria and Liang, 2012; Demos *et al.*, 2014; Rosser, 2004; West and Curtis, 2006). For example, according to the National Science Board (2016), women earn only 40 percent of STEM PhDs and account for only 46 percent of assistant professors, 38 percent of associate professors and 25 percent of full professors in STEM. Although researchers have been unable to identify a specific time point in which women leave STEM academic fields, the greatest losses appear to occur early with women becoming more and more underrepresented over time (Lichtenstein *et al.*, 2014). One explanation for the underrepresentation and departure of women from STEM academia is that it has a “chilly” climate for women.

Chilly climate refers to the differential maltreatment that women experience in academic settings. The term was introduced by Hall and Sandler (1982), who described it as the tendency for faculty, whether intended or not, to interact with women and men students differently in the classroom. More recent theoretical work has conceptualized chilly climates for women as encompassing not just inequitable interpersonal interactions in

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organizations, but also organizational structures and cultures including, for example, those related to work-life balance and the allocation of resources and rewards (Britton, 2017; Stewart *et al.*, 2007). However, we focus solely on the interpersonal aspect of chilly climates in the present research. Indeed, gender equity rests in part on micro-level relational processes making quality interpersonal interactions critical for women in STEM (Bilimoria *et al.*, 2006; Callister, 2006; Etzkowitz *et al.*, 2000; Latimer *et al.*, 2014; Morimoto and Zajicek, 2014; Roos and Gatta, 2009; Xu and Martin, 2011).

Research on the interpersonal aspect of chilly climates has documented the subtle mistreatment undergraduate women students experience in academic environments (e.g. Hall and Sandler, 1982; Morris and Daniel, 2008; Pyke and Janz, 2000). Research has also demonstrated the preponderance of chilly interpersonal climates for women academics (Blakemore *et al.*, 1997; Gersick *et al.*, 2000; Maranto and Griffin, 2011; Riger *et al.*, 1997), including in STEM fields (Carapinha *et al.*, 2017; Greene *et al.*, 2010; Settles *et al.*, 2006; Settles *et al.*, 2007; Wright *et al.*, 2003; Xie and Shauman, 2003; Xu, 2008). Findings have also documented that chilly climates relate to a host of negative occupational well-being outcomes for women faculty in STEM including lower job satisfaction and higher turnover intentions (e.g. Callister, 2006; Carapinha *et al.*, 2017; Riffle *et al.*, 2013; Settles *et al.*, 2006, 2007; Xu, 2008).

Although research has linked chilly interpersonal climates for women faculty in STEM to negative outcomes, a number of gaps in the literature remain. For example, little research has isolated the effects of working in a chilly interpersonal climate for STEM women academics early in their career, a time when they may be particularly vulnerable to leaving (Lichtenstein *et al.*, 2014). Further, it remains unclear the extent to which such experiences and their effects may differ from their early-career male STEM faculty counterparts. There is also a paucity of research examining how working in a chilly interpersonal climate affects non-work outcomes for women STEM faculty. Research has also not examined the extent to which the negative effects of chilly interpersonal climates differ depending on the gender of the instigator; that is, it remains unclear the extent to which women faculty in STEM are differentially harmed by chilly behavior from male and female colleagues.

The purpose of the present paper is to advance the literature on the underrepresentation of women faculty in STEM by examining the extent to which junior women in STEM experience working in a chilly interpersonal climate and how those experiences affect work and non-work well-being outcomes for these women. We do so in two studies by utilizing data from early-career faculty in STEM academia. In the first study, we assess gender differences in experiences of two indicators of an chilly interpersonal climate (ostracism and incivility) and the extent to which such experiences relate to two occupational well-being outcomes (turnover intentions and affective organizational commitment) in a sample of male and female junior academics in STEM at one university. We then extend these findings in the second study using data from a sample of junior women faculty in STEM from various universities by investigating the extent to which experiences of ostracism and incivility relate to two additional occupational well-being outcomes (academic self-efficacy and future career perceptions), as well as outcomes in two non-work domains: physical well-being (physical health ailments) and psychological well-being (psychological distress). In Study 2, we also examine the extent to which junior women STEM faculty differentially experience ostracism and incivility from their male and female colleagues and if those experiences differentially relate to outcomes.

Texas A&M University (TAMU) ADVANCE-IT

The data for the present studies originated from a National Science Foundation ADVANCE-IT grant awarded to TAMU in 2010. In 2006, findings from a faculty campus climate study showed that STEM women faculty perceived the workplace climate as much more negative

and discriminatory than did their men counterparts (TAMU ADVANCE Center, 2013). To help address this issue, the university submitted a proposal to the NSF ADVANCE program with the goal of transforming the workplace climate through numerous targeted initiatives aimed at improving recruitment, reducing attrition and promoting success of women faculty at all levels at TAMU. TAMU adapted and implemented the American Psychological Association's (APA) Psychologically Healthy Workplace (PHW; Grawitch and Ballard, 2016) framework as the foundation for the ADVANCE-IT to benefit women faculty at TAMU.

A PHW is characterized by "intentional, systematic, and collaborative efforts to maximize employee well-being and productivity by providing a supportive social-organizational environment, and accessible opportunities for career and work-life enhancement" (Wilson *et al.*, 2004). Empirical research has demonstrated that PHWs contain five areas with clear benefits for employees and the organizations within which they work. For example, people who work in PHWs have lower turnover rates, less stress, and higher satisfaction than the national average (Grawitch *et al.*, 2006; Grawitch *et al.*, 2007, 2009). PHWs are also better able to attract and retain top people (Grawitch *et al.*, 2007).

The present research focuses on one of the five areas of PHW: health and well-being. This component of PHW includes the health and well-being effects of workplace stressors for employees, such as those related to working in a chilly interpersonal climate. As part of the TAMU ADVANCE-IT social science research component, we developed surveys to assess the health and well-being effects of working in a chilly interpersonal climate for faculty in STEM to contribute to the literature on potential explanations for the underrepresentation of women faculty in STEM. We focus here on the data from STEM faculty early in their career trajectory that was collected as part of that effort.

Indicators of a chilly interpersonal climate: ostracism and incivility

We examine two indicators of a chilly interpersonal climate: ostracism and incivility. Ostracism is defined as being ignored and excluded by others (Williams, 2001). Examples include language exclusion, such as being ignored among people in a shared conversation (Hitlan *et al.*, 2006), information exclusion, or being "out-of-the-loop" (Jones *et al.*, 2009), and group exclusion, or marginalizing people from group activities (Williams and Carter-Sowell, 2009). Such behavior could result in junior women faculty receiving less information about resources, expectations for tenure and promotion, opportunities for career advancement, and developments in the field (Rose, 1985). Incivility, in contrast, is defined as rude and discourteous behavior that displays a lack of regard for others (Andersson and Pearson, 1999). Examples include condescension, being addressed inappropriately, and disparaging comments. Such behavior could lead junior women faculty to be taken less seriously and seen as less of an expert in her field. Both ostracism and incivility, because they entail exclusion and dismissal, may be particularly harmful to the well-being and career trajectories of early-career women STEM faculty as they attempt to build their reputation, develop their expertise, and increase their visibility.

Both ostracism and incivility have been conceptualized as chronic stressors (Cortina *et al.*, 2001; Williams, 2007). Chronic stressors differ from acute stressors in that they occur over extended periods and have ambiguous onsets and offsets (Hepburn *et al.*, 1997). Lazarus and Folkman (1984) referred to such persistent stressors as "daily hassles." These daily stressors, while seemingly inconsequential in the short term, accumulate leading to well-being detriments for those who experience them. Research suggests they can be even more damaging to well-being than more dramatic life events because chronic stressors produce an additive "wear and tear" effect through repeated exposure (DeLongis *et al.*, 1982; Kanner *et al.*, 1981). Minority stress theory (Meyer, 1995) proposes that individuals in subordinate social groups (e.g. women) are especially likely to experience well-being detriments because of the persistent exposure to environments where they are a minority.

Empirical research on the effects of ostracism and incivility follow from theory. Experiences of ostracism have been linked with lowered organizational commitment (Hitlan *et al.*, 2006) and higher turnover intentions (Smith and Calasanti, 2005; Yin and Liu, 2013). In a sample of academic faculty, He *et al.* (under review) found that faculty experiences of ostracism related to lower job satisfaction, higher turnover intentions, and more job burnout. Pedersen and Minnotte (2017) reported that STEM faculty, particularly women, reported higher job burnout the more they experienced information exclusion. Research also shows that female faculty, compared to male faculty, reported greater incidences of ostracism and are commonly excluded from male networks and isolated from male colleagues (August and Waltman, 2004; Gersick *et al.*, 2000; Zimmerman *et al.*, 2016).

One of the most documented outcomes of incivility is decreased well-being (Schilpzand *et al.*, 2014). People who experience incivility at work also tend to be less motivated and committed, which eventually leads to withdrawal from work, higher turnover intentions, and organizational exit (Pearson and Porath, 2009). O'Brien *et al.* (2016) found that experiences of incivility related to stress which in turn predicted declines in physical health and objective performance for STEM academicians. Research also shows that women are especially likely to experience uncivil treatment at work (Cortina *et al.*, 2013; Settles and O'Connor, 2014; Zurbrügg and Miner, 2016) and report more work withdrawal (Loi *et al.*, 2015) and less job satisfaction (Zurbrügg and Miner, 2016) compared to men when they work in contexts tolerant of incivility.

Consistent with this research and theory, we propose that early-career women STEM faculty are more likely to experience ostracism and incivility at work compared to their male counterparts. We also posit that although both women and men report declines in occupational well-being with greater experiences of ostracism and incivility, such effects are especially pronounced for women:

- H1. Early-career women STEM faculty report more experiences of ostracism and incivility than do early-career men STEM faculty.
- H2. Greater experiences of ostracism and incivility are associated with greater negative occupational well-being outcomes (higher turnover intentions and lower affective organizational commitment) for early-career women and men STEM faculty.
- H3. Although greater experiences of ostracism and incivility are associated with greater negative occupational well-being outcomes for both early-career women and men STEM faculty, the effects are stronger for women faculty.

Does sex of the instigator matter?

We also propose that men are more likely than women to instigate ostracism and incivility toward women academics in STEM and that the negative effects of ostracism and incivility are worse when men compared to women instigate such behavior. Theories of social power and dominance help explain gender differences in the instigation and impact of workplace mistreatment on outcomes. At the core of social power and dominance theories (Brauer and Bourhis, 2006; Fiske and Berdahl, 2007; Magee and Galinsky, 2008) is inequity between groups, which allows the more dominant social group to exert their control and influence over the subordinate group. To do so, the dominant group often engages in acts of aggression and mistreatment toward the subordinate group to maintain and promulgate their power in that context. Because power is often distributed based on ascribed status characteristics such as gender, men have historically been afforded more social power as the dominant social group, leaving women as the disadvantaged subordinate group. Such power differences extend to the workplace making women vulnerable to male-instigated maltreatment, especially in contexts where men numerically dominate (Acker, 1990, 2006).

Indeed, meta-analytic research suggests that men are more likely to engage in interpersonal workplace mistreatment than are women (Hershcovis *et al.*, 2007). Britton's (2017) findings support this notion specifically for women in STEM. She found that women faculty were especially likely to experience chilly "sexist or clueless" (pg. 22) interactions with male colleagues compared to female colleagues. As such, we propose that men (the dominant group) are more likely than women (the subordinate group) to engage in ostracizing and uncivil treatment toward junior women in STEM. Consistent with minority stress theory (Meyer, 1995), we further propose that ostracism and incivility instigated by male colleagues is more harmful for early-career women STEM faculty than when instigated by female colleagues because such experiences act as signals to early-career women of their minority status in STEM. We therefore predict the following:

- H4. Male colleagues are more likely to instigate ostracism and incivility toward junior women faculty in STEM than are female colleagues.
- H5. Greater experiences of ostracism and incivility (from both male and female colleagues) are associated with negative well-being outcomes (lower levels of academic self-efficacy and positive future career perceptions and greater physical health ailments and psychological distress).
- H6. Although greater experiences of ostracism and incivility from both male and female colleagues are associated with negative well-being outcomes, the effects are stronger when instigated by male colleagues than when instigated by female colleagues.

Study 1

Method

Participants and procedure. Study 1 included data from 96 early-career STEM faculty at TAMU. The majority of participants were male ($n = 54$, 56 percent) and white ($n = 79$, 82 percent) with other ethnicities reported as Latinx or Hispanic ($n = 10$, 10 percent), Asian American/Asian ($n = 9$, 9 percent), Native American ($n = 3$, 3 percent) and black/African/African American ($n = 3$, 3 percent). Roughly 10 percent of the sample was composed of women of color ($n = 10$). Participants' ages ranged from 27 to 52 with an average age of 36.35, and they had been employed at the university an average of 3.64 years. In total, 69 percent ($n = 66$) of participants reported they were US citizens.

Potential participants were invited via e-mail by the Dean of Faculties to participate in an Institutional Review Board (IRB) approved "Faculty Campus Climate and Satisfaction" online survey in 2009–2010. The e-mail consisted of a description of the study, information about research participants' rights, and a link to the survey. Participants were told that their responses would be confidential and that completion of the survey served as their consent to participate. After the first e-mail invitation, three reminder e-mails were sent out roughly two weeks apart to encourage participation.

Measures. The survey assessed faculty perceptions of their department, attitudes about the university, and well-being. Demographic and work information were also collected. Survey construction focused on minimizing response bias and utilizing valid and reliable measures. For example, occupational well-being measures appeared prior to questions about ostracism and incivility to allow for an impartial assessment of well-being. All scale scores were computed by taking the mean of items, after reverse coding any necessary items. Thus, for final scale scores, higher values reflect higher levels of the underlying construct.

Ostracism. Ostracism was measured with three items in the survey deemed to tap into the workplace ostracism construct (i.e. being ignored or excluded). Two items came from the Workplace Incivility Scale (WIS; Cortina *et al.*, 2001, 2013) and the third item came from

the Uncivil Workplace Behavior Questionnaire (Martin and Hine, 2005). Respondents were asked if they had experienced any of the behaviors from someone in their department in the past year using a response scale from 1 (never) to 5 (very often). The items included “ignored or excluded you from professional camaraderie,” “ignored you or failed to speak to you (e.g. gave you ‘the silent treatment’)” and “failed to inform you of a meeting you should have been informed about.” Cronbach’s α for our measure of ostracism was 0.80.

Incivility. Incivility was measured using nine items from the WIS (Cortina *et al.*, 2001, 2013) which assessed the degree to which participants had been the target of rude or disrespectful behavior at work. Respondents were asked if they had experienced any of the behaviors from someone in their department in the past year using a response scale from 1 (never) to 5 (very often). Example items include “put you down or was condescending to you” and “made jokes at your expense.” Cronbach’s α for this measure was 0.87.

Occupational well-being. Occupational well-being was assessed with measures of turnover intentions and affective organizational commitment. Turnover intentions were measured using Porter *et al.*’s (1976) three-item measure. The items included “I often think about quitting this job,” “I am actively looking for another job,” and “I will probably look for a new job during the next year,” to which participants responded using a response scale from 1 (strongly disagree) to 5 (strongly agree). Affective organizational commitment was measured with Allen and Meyer’s (1990) eight-item affective commitment scale. Respondents indicated how strongly they agreed with each item using a response scale from 1 (strongly disagree) to 5 (strongly agree). Example items include “[This university] has a great deal of personal meaning for me” and “I do not feel ‘emotionally attached’ to [this university]” (reverse-coded). Cronbach’s α for these measures were 0.86 and 0.88, respectively.

Results

Means, standard deviations, and intercorrelations for all Study 1 variables are presented separately for women and men in Table I. Ostracism and incivility, as well as ostracism and turnover intentions and turnover intentions and affective organizational commitment, were correlated for both women and men. Incivility was correlated with turnover intentions and affective organizational commitment for women but not for men.

H1 predicted that early-career women STEM faculty would report more experiences of ostracism and incivility than early-career men STEM faculty. We conducted independent samples t-tests to examine this hypothesis. Results for ostracism showed a marginally significant difference in the frequency of ostracism experienced by women ($M = 1.85$, $SD = 0.88$) compared to men ($M = 1.54$, $SD = 0.74$), such that early-career women in STEM reported more ostracism than did early-career men in STEM, $t(78) = -1.82$, $p = 0.07$, Cohen’s $d = 0.39$. Results for incivility showed that there was a significant difference in the frequency of experienced incivility by women ($M = 1.75$, $SD = 0.54$) compared to men ($M = 1.51$, $SD = 0.61$), such that early-career women in STEM reported significantly

Variable	<i>M</i>	<i>SD</i>	1	2	3	4
1. Ostracism	1.85 (1.54)	0.88 (0.74)	–	0.83***	0.36*	–0.34*
2. Incivility	1.75 (1.51)	0.54 (0.61)	0.83***	–	0.43**	–0.32*
3. Turnover intentions	2.69 (2.56)	1.06 (1.05)	0.28*	0.26	–	–0.33*
4. Org. commitment	2.69 (2.95)	0.83 (0.73)	–0.16	–0.08	–0.51***	–

Notes: $n = 42$ for women and $n = 56$ for men. Means and standard deviations for men are in parentheses. Intercorrelations for men are shown below the diagonal and intercorrelations for women are shown above the diagonal. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table I.
Means, standard
deviations, and
intercorrelations for
all study 1 variables

more incivility than early-career men in STEM, $t(91) = -2.05, p = 0.04$, Cohen's $d = 0.42$. Taken together, these results provide support for *H1*, showing that junior women faculty in STEM report more frequent experiences of ostracism and incivility compared to their male counterparts.

H2 predicted that greater experiences of ostracism and incivility would be associated with greater negative well-being outcomes (higher turnover intentions and lower affective organizational commitment) for both early-career women and for early-career men STEM faculty. We further predicted in *H3* that the effects would be stronger for women than for men. Because ostracism and incivility were highly correlated suggesting the possibility of multicollinearity, we conducted separate multiple regression analyses for the predictors separately for women and men to test *H2* and *H3*; Table II displays the results for these analyses. Results revealed that experiences of both ostracism and incivility predicted higher turnover intentions and lower affective organizational commitment for early-career women in STEM. There was only one significant effect for early-career men in STEM: experiences of ostracism predicted higher turnover intentions. As such, *H2* was partially supported, and *H3* was fully supported.

Because research shows that declines in affective organizational commitment precede turnover intentions (Holtom *et al.*, 2008; Meyer *et al.*, 2002), we conducted additional analyses examining affective organizational commitment as a mediator of chilly climate experiences and turnover intentions for women and men faculty. We analyzed the data using the PROCESS macro for SPSS (Hayes, 2017) with 5,000 bootstrapped samples. Results showed that affective organizational commitment mediated the relationship between ostracism and turnover intentions for women faculty ($\beta = 0.14, SE = 0.08, 95\% CI [0.01, 0.31]$) but not for men faculty ($\beta = 0.08, SE = 0.08, 95\% CI [-0.09, 0.23]$). However, affective organizational commitment did not mediate the relationship between incivility and turnover intentions for women faculty ($\beta = 0.22, SE = 0.11, 95\% CI [-0.01, 0.45]$) or for men faculty ($\beta = 0.05, SE = 0.09, 95\% CI [-0.10, 0.25]$).

Discussion

Findings for Study 1 revealed that junior women faculty in STEM reported experiencing more ostracism and incivility and were more harmed by those experiences compared to their male counterparts. Results also showed that lowered affective organizational commitment undergirded the relationship between experiences of ostracism and turnover intentions for junior women. In Study 2, we extend these findings in a separate sample of early-career women faculty in STEM by investigating the extent to which experiences of ostracism and incivility relate to two additional occupational well-being outcomes (academic self-efficacy and positive future career perceptions), as well as outcomes in two non-work domains: physical well-being (physical health ailments) and psychological

Table II.
Study 1 multiple regression results for female and male target experiences of ostracism and incivility

	Ostracism		Incivility	
	Turnover intentions	Organizational commitment	Turnover intentions	Organizational commitment
Female targets	0.36*	-0.34*	0.43**	-0.32*
R^2	0.13	0.12	0.18	0.10
F	5.94*	5.15*	8.62**	4.40*
Male targets	0.28*	-0.16	0.26	-0.08
R^2	0.08	0.03	0.17	0.01
F	4.12*	1.28	3.66	0.32

Notes: β s are standardized. * $p < 0.05$; ** $p < 0.01$

well-being (psychological distress). We also examine the extent to which junior women STEM faculty differentially experience ostracism and incivility from their male and female colleagues and if those experiences dissimilarly relate to outcomes.

Study 2

Method

Participants and procedure. The data utilized for Study 2 came from 68 early-career women in STEM academic positions who participated in an online survey study assessing “junior academics’ career success.” The majority of the respondents ($n = 53$, 78 percent) were participants in one of five ADVANCE-IT-funded workshops that were conducted from 2012 to 2016 aimed at increasing the success of junior faculty women in STEM; the remaining participants had been nominated by workshop participants to complete in survey. The most common ethnicity reported by the respondents was white ($n = 39$, 57 percent), followed by Asian American/Asian ($n = 6$, 9 percent), black/African/African American ($n = 4$, 6 percent), Latina or Hispanic ($n = 4$, 6 percent), and Native American ($n = 1$, 2 percent). The rest of the sample did not provide a response ($n = 12$, 18 percent). Participants’ ages ranged from 24 to 40 with an average age of 32.43. Most of the sample consisted of assistant professors ($n = 62$, 91 percent) and the remainder were visiting professors. The majority of the participants ($n = 41$, 62 percent) were employed at the university conducting the workshops and accompanying survey study.

All potential participants ($N = 126$, for a 54 percent overall response rate) were contacted via e-mail by an ADVANCE-IT co-investigator and member of the social science research team and invited to participate in the three-wave longitudinal IRB-approved study. Before completing each survey, participants read consent information including the purpose of the study and research participant rights. To incentivize the participation of non-workshop participants, we offered nominees \$20 for their participation at each wave. Consent was considered given if participants completed the survey. Because of high attrition numbers, only data from each participant’s first survey were included in the present study. Thus, all participants completed the same survey but potentially in different years. In addition, if participants completed more than one survey (which was rare) over the three years for their cohort, we only included data from their first survey.

Measures. The survey contained scales assessing experiences of ostracism and incivility from male and female coworkers, attitudes, and health and well-being. Demographic and work information was also collected. Survey construction focused on minimizing response bias and utilizing valid and reliable measures such that outcome measures appeared prior to questions about ostracism and incivility to allow for an unbiased assessment of well-being. All scale scores were computed by taking the mean of items, after reverse coding any necessary items. Thus, for final scale scores, higher values reflect higher levels of the underlying construct. As mentioned above, data were collected in different waves, from 2012 to 2016, and individuals were asked to respond to three survey time points (the initial survey, and two subsequent years later). Thus, in order to compute scale scores, data from the first time an individual responded were used, which could have been in any year from 2012 to 2016. Thus, we have included the mean reliability over the five-year time period to give an estimate of the scale reliability.

Ostracism from male and female colleagues. Ostracism was measured using a modified version of Ferris *et al.*’s (2008) workplace ostracism scale. Respondents were presented with a series of six statements and asked if they experienced any of the behaviors from each of two sources (male colleagues and female colleagues) in their present job using a five-point response scale from 1 (never) to 5 (very often). Example statements include “Treat you as if you are invisible” and “Keep you out-of-the-loop on information that

is important.” The mean reliability for the ostracism from male colleagues scale across years was 0.93, and the mean reliability for the ostracism from female colleagues scale across years was 0.94.

Incivility from male and female colleagues. Incivility was measured using the seven-item version of the WIS (Cortina *et al.*, 2001). Respondents were asked to report the extent to which they had experienced any of the behaviors from each of two sources (male colleagues and female colleagues) in their present job using a five-point response scale from 1 (never) and 5 (very often). The mean reliability for the incivility from male colleagues scale across years was 0.91, and the mean reliability for the incivility from female colleagues across years was 0.90.

Well-being outcomes. Well-being was assessed with measures of academic self-efficacy and future career perceptions (occupational well-being), physical health ailments (physical well-being) and psychological distress (psychological well-being).

Academic self-efficacy was measured using a series of nine statements created for the present study. Respondents were asked to rate their confidence in their ability to perform routine academic duties related to research, teaching, and mentoring using a response scale from 1 (not confident at all) to 5 (very confident). Example items include “present your research ideas orally or in written form to your colleagues,” “effectively prepare a teaching lesson/lecture,” and “mentor undergraduate students.” The mean reliability of academic self-efficacy scale across years was 0.81.

Future career perceptions were measured using a series of 20 statements from Lyness and Thompson’s (2000) Perceived Barriers and Facilitators to Advancement Scale. Respondents were asked to rate the perceived likelihood of 6 “barriers” and 14 “facilitators” of a future career in their discipline for someone of their gender using a response scale from 1 (extremely unlikely) to 5 (extremely likely). Example items include “Getting access to opportunities,” “Receiving enough meaningful feedback about your strengths and weaknesses,” and “Feeling like you are held to a higher standard than others” (reverse-coded). The mean reliability for this measure across years was 0.91.

Physical health ailments were measured with seven items from the Physical Symptom Inventory (Spector and Jex, 1998) which assesses physical, somatic health symptoms. Respondents were asked to indicate the extent to which they experienced the ailments (e.g. “headache,” “an upset stomach or nausea,” “trouble sleeping”) in the previous year using a 1 (never) to 5 (once a week or more) response scale. The mean reliability for this measure across years was 0.74.

Psychological distress was assessed with nine items from the Brief Symptoms Inventory (Derogatis and Spencer, 1983) which includes three subscales (anxiety, hostility, and depression). Respondents were asked how much in the past week, symptoms such as “nervousness or shakiness inside,” “feeling easily annoyed or irritated,” and “feeling blue” had bothered them using a response scale that ranged from 1 (not at all) to 5 (extremely). The mean reliability for psychological distress scale across years was 0.85.

Results

Means, standard deviations and intercorrelations for all Study 2 variables are presented in Table III. Ostracism and incivility from male colleagues were correlated with all of the well-being outcome measures with one exception: incivility from males was not related to physical health ailments. Ostracism and incivility from female colleagues were both correlated with psychological distress; ostracism from females was also related to lower academic self-efficacy and less positive future career perceptions. The well-being outcomes were all significantly correlated.

H4 predicted that male colleagues would be more likely to instigate ostracism and incivility toward junior women faculty in STEM than female colleagues. To test this hypothesis, paired samples *t*-tests were run comparing experiences of ostracism and incivility from male and female colleagues. Results for ostracism showed that there was a significant difference in the frequency of ostracism experienced from male ($M=1.97$, $SD=0.99$) and female ($M=1.61$, $SD=0.79$) colleagues, such that respondents reported significantly more ostracism from male colleagues than from female colleagues, $t(62)=3.11$, $p=0.003$, Cohen's $d=0.39$. Results for incivility showed that there was also a significant difference in the frequency of experienced incivility from male ($M=1.93$, $SD=1.01$) and female ($M=1.63$, $SD=0.67$) colleagues such that respondents reported significantly more incivility from male colleagues than from female colleagues, $t(62)=2.21$, $p=0.03$, Cohen's $d=0.28$. These results provide support for *H4*, showing that junior women faculty in STEM report more frequent experiences of ostracism and incivility from their male colleagues than their female colleagues.

H5 predicted that greater experiences of ostracism and incivility (from both male and female colleagues) would be associated with negative well-being outcomes (lower levels of academic self-efficacy and positive future career perceptions and greater physical health ailments and psychological distress). We conducted a series of multiple regression analyses to test *H5* with all mistreatment variables being entered simultaneously; Table IV displays the findings. Results revealed that ostracism from male colleagues predicted lower academic self-efficacy, less positive future career perceptions, and heightened psychological distress. Ostracism from male colleagues was not related to physical health ailments. Incivility from male colleagues was also related to lower academic self-efficacy and less positive future career perceptions. In contrast, ostracism and incivility from female colleagues did not predict any of the outcome variables. Thus, *H5* was only partially supported as subtle interpersonal mistreatment from female colleagues did not predict negative well-being.

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7
1. Ostracism from males	1.90	0.98							
2. Incivility from males	1.93	1.35	0.57***						
3. Ostracism from females	1.60	0.74	0.49***	0.56***					
4. Incivility from females	1.65	0.73	0.28*	0.22	0.54***				
5. Academic self-efficacy	3.78	1.11	-0.59**	-0.57***	-0.27*	-0.14			
6. Future career perceptions	3.18	0.83	-0.70***	-0.58***	-0.26*	-0.19	0.83***		
7. Physical health ailments	3.15	0.83	0.29*	0.16	0.16	0.12	-0.36**	-0.34**	
8. Psychological distress	2.09	0.94	0.55***	0.42**	0.39**	0.29*	-0.69***	-0.64***	-0.48***

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table III. Means, standard deviations, and intercorrelations for all study 2 variables

	Academic self-efficacy	Future career expectations	Physical health ailments	Psychological distress
Ostracism from males	-0.45**	-0.61***	0.28	0.42**
Incivility from males	-0.41**	-0.36**	-0.03	0.11
Ostracism from females	-0.09	0.24***	-0.06	0.14
Incivility from females	0.18	-0.01	-0.04	-0.03
Total <i>R</i> ²	0.69	0.76	0.29	0.57
Total <i>R</i> ²	0.47	0.57	0.08	0.32
<i>F</i>	12.48***	18.83***	1.29	6.59***

Notes: β s are standardized. ** $p < 0.01$; *** $p < 0.001$

Table IV. Study 2 multiple regression results for ostracism and incivility from male and female instigators

Finally, *H6* predicted that the negative effects of ostracism and incivility would be stronger when instigated by male colleagues than when instigated by female colleagues. As shown in Table IV and described above, there were no significant effects of ostracism or incivility from female colleagues on well-being. As such, *H6* was fully supported.

Based on the literature on academic self-efficacy and STEM career attainment for women (Buse *et al.*, 2013; Jaeger *et al.*, 2017), we also conducted several follow-up analyses examining academic self-efficacy as a mediator of the relationship between working in a chilly interpersonal climate and well-being outcomes. We analyzed the data using the PROCESS macro for SPSS (Hayes, 2017) with 5,000 bootstrapped samples. Results showed that academic self-efficacy mediated the relationship between ostracism from male colleagues and lowered positive future career perceptions ($\beta = -0.35$, $SE = 0.08$, 95% CI [-0.50, -0.17]) and ostracism from male colleagues and psychological distress ($\beta = 0.31$, $SE = 0.12$, 95% CI [0.09, 0.55]). Academic self-efficacy also mediated the relationship between incivility from male colleagues and future career perceptions ($\beta = 0.35$, $SE = 0.10$, 95% CI [0.12, 0.51]).

Discussion

Findings for Study 2 revealed that junior women faculty in STEM reported experiencing significantly more ostracism and incivility instigated by their male colleagues than by their female colleagues. Findings also showed that ostracism instigated by male (but not female) colleagues (and to a lesser extent incivility instigated by male but not female colleagues) was the best predictor of negative well-being outcomes (lowered academic self-efficacy and positive future career perceptions and heightened psychological distress) for junior women faculty in STEM. Academic self-efficacy also mediated several of the relationships between chilly interpersonal experiences with male colleagues and well-being.

General discussion

Research shows that women are less likely to enter and more likely to exit academic STEM positions compared to men (Bilimoria and Liang, 2012; Demos *et al.*, 2014; Rosser, 2004; West and Curtis, 2006) and that the greatest losses occur early in the career trajectory (Lichtenstein *et al.*, 2014). The purpose of the present research was to investigate chilly interpersonal climates as a possible explanation for this discrepancy. In Study 1, we examined gender differences in experiences of working in chilly climate – as indicated by experiences of ostracism and incivility – for junior women and men faculty in STEM; we also examined how those experiences related to two occupational well-being outcomes. In Study 2, we built on these findings by investigating the extent to which junior women faculty in STEM differentially experience ostracism and incivility from their male and female colleagues and how those experiences affected not only occupational well-being outcomes but physical and psychological well-being as well. Both studies utilized data collected as part of the social science research component of TAMU's ADVANCE-IT grant.

We tested three hypotheses in Study 1: early-career women STEM faculty report more experiences of ostracism and incivility than early-career men STEM faculty; greater experiences of ostracism and incivility are associated with greater negative occupational well-being outcomes (higher turnover intentions and lower affective organizational commitment); and the effects of ostracism and incivility on outcomes are stronger for junior women faculty than for junior men faculty. Largely consistent with our hypotheses, junior women faculty in STEM reported more frequent experiences of ostracism and incivility compared to their male counterparts. Moreover, whereas men reported greater turnover intentions with higher levels of ostracism, both ostracism and incivility predicted both greater turnover intentions and lowered affective organizational commitment for women.

Thus, early-career women in STEM not only experienced their workplace as interpersonally chillier than early-career men in STEM, but they were also more harmed by it.

We extended these findings in Study 2 by testing three additional hypotheses: junior women faculty in STEM report more ostracism and incivility instigated by their male colleagues compared to their female colleagues; greater experiences of ostracism and incivility are associated with negative well-being outcomes (lowered academic self-efficacy and positive future career perceptions and greater physical health ailments and psychological distress); and the effects of ostracism and incivility on outcomes are stronger when instigated by male colleagues compared to female colleagues. These hypotheses were also largely supported; participants reported experiencing an interpersonally chiller climate from their male colleagues than from their female colleagues and were more negatively affected by it when they did. Specifically, participants reported more ostracism and incivility from their male colleagues than from their female colleagues. They also reported lower academic self-efficacy and positive future career perceptions the more they experienced ostracism and incivility instigated by their male colleagues; greater experiences of ostracism instigated by male colleagues was also associated with more psychological distress. Experiencing mistreatment from male colleagues was not related to physical health ailments. Finally, none of the well-being outcomes were related to experiences of ostracism or incivility instigated by female colleagues.

Advancing past research on chilly climates for women in STEM, our findings suggest that junior women faculty in STEM experience an interpersonally chillier climate compared to junior men faculty in STEM and that working in a such a climate has important implications for junior women's occupational and psychological well-being, especially when they have chilly interpersonal experiences with male colleagues. These findings offer a potential explanation for the underrepresentation of women academics in STEM and why women STEM faculty may leave at an earlier and more consistent rate than men. These findings are also wholly consistent with theories of chronic stressors (Lazarus and Folkman, 1984), minority stress (Meyer, 1995), and social power and dominance (Brauer and Bourhis, 2006; Fiske and Berdahl, 2007; Magee and Galinsky, 2008). For example, the findings that women faculty experienced more ostracism and incivility than men faculty and reported more ostracism and incivility instigated by male compared to female colleagues lends support to the theoretical proposition that women, because of their subordinate status in society, are particularly likely to experience maltreatment, especially from men who hold dominant status in society (Brauer and Bourhis, 2006; Fiske and Berdahl, 2007; Magee and Galinsky, 2008). That women faculty were also more negatively affected than men faculty when they were targets of such behavior and more harmed when they were targeted by male colleagues than female colleagues suggests that women's minority status in society makes them vulnerable to the chronic wear and tear associated with mistreatment, particularly in contexts where they are underrepresented (Lazarus and Folkman, 1984; Meyer, 1995). Finally, our findings also contribute to research on APA's PHW (Grawitch and Ballard, 2016), the framework used as the foundation for the ADVANCE-IT awarded to TAMU where the research was conducted, by documenting the important role interpersonal workplace relationships have on the health and well-being of employees.

Practical implications

Results from the present research showed that chilly interpersonal experiences with colleagues (particularly male colleagues) were associated with negative occupational and psychological well-being outcomes for junior women in STEM. Like other ADVANCE-related efforts, the present research documents that subtle gender biases in interactions are critical to the recruitment, promotion, and retention of women faculty in STEM academia.

The ADVANCE community of scholars has investigated and identified a number of potential interventions that may be helpful for addressing and lessening the chilly interpersonal treatment experienced by early-career women in STEM. Indeed, research shows that efforts aimed at making interpersonal interactions less gendered is one of the most common interventions ADVANCE institutions have instituted to address gender equity in STEM (e.g. Morimoto *et al.*, 2013). We review several of these interventions here. First, universities might institute workshops that specifically address subtle negative interpersonal behavior and how such interactions are often gendered. Bird (2011) reported findings from an ADVANCE-related intervention strategy to raise awareness among faculty and administrators about subtle interpersonal gender barriers to women's advancement in academe. The intervention used a case-study approach where participants discussed situations (e.g. a junior female faculty member being excluded from male colleagues' information networks about tenure and promotion) involving STEM academicians that had unanticipated gender effects favoring men and problem solved how to rectify them. She reported that most men in the workshop initially did not perceive the situations as gendered but through discussion became committed to understanding and learning more about the issues and the larger transformation effort. Moreover, the participants engaged in practices after the workshop demonstrating this commitment. A case-study workshop approach could also be used to address other aspects of chilly interpersonal climates for women faculty in STEM (e.g. being disparaged) and how they affect junior women's well-being.

Second, universities might provide opportunities for junior women faculty in STEM to build their interpersonal relationships with colleagues. Such opportunities could be explicit or part of a larger initiative. For example, Smith *et al.* (2017) described a grant-writing "bootcamp" that focused in part on building meaningful connections with others that was created as part of their university's ADVANCE. The bootcamp was specifically developed to engage and fulfill three critical psychological needs – autonomy, competence and relatedness – as proposed by self-determination theory (Deci and Ryan, 2000). Most relevant here, relatedness refers to the experience of connection, caring, and involvement with other people (Deci and Ryan, 2012). They addressed the relatedness component by creating small groups of faculty to work together on a common-interest grant proposal; group members included both junior faculty and faculty who had an established and successful record of securing funding. Not only did the bootcamp participants receive more grant funding compared to a sample of matched faculty, but they also reported that the bootcamp supported and fostered feelings of relatedness. Universities could implement similar common-goal interventions to build interpersonal connections and relationships among STEM faculty members.

ADVANCE institutions have also implemented relationship-building interventions such as workshops to promote collegiality through a departmental Dialogues process (Holmes *et al.*, 2016; Latimer *et al.*, 2014), develop networks to challenge existing policies and practices that limit women (Rankin *et al.*, 2007), increase the number of professional connections untenured women have with distinguished scholars outside the institution (Dyer and Montelone, 2007) and develop interconnections across multiple levels of the university (Realf *et al.*, 2007). Laursen and Austin (2014) summarize numerous other interventions aimed at developing faculty interpersonal connections and creating climates that are more hospitable for women in STEM. Together, these efforts have proved helpful in addressing the negative differential interpersonal treatment women faculty experience in STEM contexts.

Limitations and future directions

The present research has a number of limitations that offer directions for future research. For example, the cross-sectional nature of the data renders causal inferences about the relationships among variables tentative until they can be replicated using longitudinal or experimental designs. That is, we cannot say definitively that working in chilly climate

causes declines in occupational and psychological well-being for early-career STEM women faculty. It may be, for example, that having greater turnover intentions causes women to perceive their workplace climate as particularly chilly. Note, however, that we based our hypotheses on theoretical work (Grawitch and Ballard, 2016; Lazarus and Folkman, 1984; Meyer, 1995) suggesting the proposed causal order of the variables. Even so, it would be fruitful for future research to track chilly climate experiences and related outcomes for tenure-track STEM faculty over time or to experimentally manipulate chilly workplace interactions to make more definitive conclusions about how cold interpersonal environments affect early-career women in STEM.

The data were also single-source and self-reported, and are therefore susceptible to perceptual biases. Thus, we cannot know conclusively if junior women in STEM actually experienced a chillier workplace climate compared to junior men in STEM or that junior women in STEM actually had chillier workplace interactions with male colleagues compared to female colleagues. Nevertheless, we maintain that perceptions are necessary to understanding individual outcomes, because it is individuals' perceptions of their environment that determine how they are affected by and respond to it. Perceptions also need not agree with others' perceptions in the same environment to be meaningful because each individual's environment may be distinct and not necessarily shared with others. It would be fruitful, however, for future research to examine bystander (e.g. colleagues) reports of ostracism and incivility toward junior women STEM faculty to help address some of the problems inherent in single-source self-report assessments.

Our findings were also primarily based on the experiences of faculty at a predominantly White research-intensive public university in the southern USA. Thus, concerns may arise about the generalizability of results to other academic STEM contexts. Moreover, our samples included faculty who were currently employed at the university and does not represent the experiences of those who may have left for industry or other academic positions, perhaps because of their chilly interpersonal climate experiences. Indeed, faculty who may have encountered the most ostracism and incivility may have left the university, or academia altogether, before the data were collected. Future research should investigate experiences of working in chilly interpersonal climates for early-career STEM faculty in other academic settings such as those that are teaching intensive, private, in other regions of the USA, and more diverse. It would also be worthwhile to sample faculty who had left the university for other opportunities perhaps through exit interviews or online surveys about the extent to which working in a chilly climate was a factor in their departure.

Finally, because of our small sample sizes, we were unable to examine the intersection of gender with other identities such as race, ethnicity, or nationality. Given that women of color are particularly underrepresented in STEM faculty positions a focus on intersectionality is critical for understanding how STEM women faculty of color may be differentially targeted and affected by working in chilly interpersonal climates (Smith and Calasanti, 2005). As such, we encourage future research to investigate the interpersonal experiences of women of color in STEM academic contexts. Examinations of how gender intersects with sexual orientation, ability, social class, parenting status, and other dimensions of inequality to affect chilly climate experiences for STEM women faculty would also be beneficial (Acker, 2006; Armstrong and Jovanovic, 2015; Hunt *et al.*, 2012; Morimoto and Zajicek, 2014).

Conclusion

The present research was conducted as part of the social science research component of an NSF ADVANCE-IT grant awarded to TAMU in 2010. The purpose of this specific project was to examine the extent to which early-career women STEM faculty experience working

in an interpersonally chilly climate (as indicated by experiences of ostracism and incivility) and how those chilly experiences relate to a host of work and non-work well-being outcomes. In the first study, we found that junior women STEM faculty reported greater experiences of ostracism and incivility compared to junior men STEM faculty and that these experiences related to more negative occupational well-being outcomes (heightened turnover intentions and lowered affective organizational commitment) for women. In the second study, we found that early-career women in STEM experienced more ostracism and incivility from their male colleagues than from their female colleagues. Results also revealed that experiences of ostracism (and to a lesser extent, incivility) from male colleagues related to more negative occupational (lowered academic self-efficacy and positive future career perceptions) and psychological (greater psychological distress) well-being outcomes. Together, our findings suggest that junior women faculty in STEM experience an interpersonally chillier climate compared to junior men faculty in STEM and that working in such a climate has consequences for junior women's well-being especially when they have chilly interpersonal experiences with male colleagues. These findings suggest that exposure to a chilly climate and its effects may be an important explanation for the lack and withdrawal of women in STEM academic fields. They also point to the importance of organizational interventions focused on developing STEM faculty interpersonal relationships and connections as a means to address such interactions.

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Corresponding author

Kathi N. Miner can be contacted at: kminer@tamu.edu

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