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Causal Discovery Methods to Map the Longitudinal Relationship Between Workplace Microaggressions, Social Support Networks, and Leadership Efficacy in Women

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A B S T R A C T

Objective: The objective of this study is to utilize advanced causal discovery methods on three-wave longitudinal data to precisely map the temporal and structural relationships between workplace microaggressions, the subsequent erosion of social support networks, and the resulting decline in leadership efficacy among professional women.

Methods and Materials: This study employed a three-wave longitudinal panel design over a one-year period, collecting data from a sample of 482 professional and managerial women in Mexico. Validated self-report surveys were administered at three distinct time points, each separated by a 6-month interval, to capture the temporal dynamics of the psychological and interpersonal constructs. To transition beyond traditional correlational associations and establish structural directionality, the Peter-Clark (PC) causal discovery algorithm was utilized alongside robust bootstrapping techniques on the R statistical platform, supplemented by formal mediation analysis to quantify indirect pathways.

Findings: The causal discovery algorithm successfully identified a robust, fully mediated indirect pathway, eliminating the direct long-term path between early hostilities and later leadership confidence. Specifically, exposure to workplace microaggressions at Time 1significantly eroded social support networks at Time 2, a directed causal edge that was retained in 92.4%of the bootstrap samples. Subsequently, this diminished social support at Time 2directly reduced leadership efficacy at Time 3, a structural path present in 88.7%of the bootstrap samples. Formal mediation analysis confirmed that social support networks act as a significant and critical mediating mechanism in this detrimental dynamic, yielding a standardized indirect effect of -0.046.

Conclusion: Subtle workplace hostilities do not merely cause immediate distress, but structurally dismantle the professional social support networks fundamentally required to sustain and cultivate women's leadership efficacy over time.

Keywords: *Workplace Microaggressions; Social Support Networks; Leadership Efficacy*

1. Introduction

The landscape of modern organizational dynamics has increasingly recognized the critical value of diverse leadership structures, yet achieving parity remains an enduring challenge across multiple sectors. As organizations in the 21st century navigate complex global environments, the unique competencies and perspectives that women bring to leadership roles are indispensable. Scholarship has continually highlighted the positive outcomes associated with women's leadership, including enhanced collaborative frameworks, improved organizational culture, and heightened organizational citizenship behaviors (Barua et al., 2023; Harwiki, 2015). Furthermore, women's leadership styles often emphasize transformative and empathetic approaches, which have proven highly effective in crisis management, organizational decision-making, and driving grassroots social change (Gordon, 2020; Harini, 2019; Hariri, 2020). Despite these established benefits, the career pathways for women striving for senior executive and managerial positions remain fraught with systemic barriers, often conceptualized as a complex labyrinth rather than a straightforward corporate ladder (Darvin et al., 2021). This phenomenon of gender inequality in leadership is observable globally and across diverse cultural, religious, and socio-economic contexts, from public sector institutions and rural educational systems to higher education and the STEM fields (Awom & Komboy, 2025; Ayat et al., 2020; Bhatti & Ali, 2020; Sinyosi & Potokri, 2021; Zhang & Rios, 2022). While structural solutions such as job sharing have been proposed to facilitate women's ascension to senior roles (Watton et al., 2019), the psychological and interpersonal impediments that hinder leadership development require equally rigorous investigation.

A central psychological construct in the study of professional advancement is leadership efficacy, defined as an individual's self-perceived capability to effectively execute the diverse tasks and responsibilities associated with a leadership role. Leadership efficacy is not a static trait; rather, it is a dynamic psychological resource shaped by environmental feedback, interpersonal interactions, and mastery experiences. When women perceive their work environments as supportive and equitable, their leadership efficacy flourishes, enabling them to navigate the inherent pressures of managerial responsibilities. Conversely, toxic organizational climates can severely erode this efficacy. Among the most pervasive and insidious elements of such adverse climates are workplace microaggressions. Originally conceptualized in the context of cross-racial counseling relationships (Constantine, 2007), microaggressions are defined as brief, everyday exchanges that send denigrating messages to individuals based on their group membership. Over time, the concept has been expanded to encompass a wide array of marginalized identities, documenting the detrimental impacts of sexist, ableist, and LGBTQ-targeted microaggressions across diverse spatial and institutional contexts (Cherry & Wilcox, 2020; Lomash et al., 2018; Meade & Lund, 2024).

In the professional domain, workplace microaggressions manifest as subtle snubs, dismissive gestures, or implicitly biased comments that systematically undermine an individual's professional standing and psychological well-being (Johnson, 2019). For women in professional roles, particularly women of color who face the compounding intersectional burdens of gender and racial bias, these subtle hostilities contribute significantly to work-family conflict, heightened burnout, and the exacerbation of the impostor phenomenon (Kim et al., 2024; Perkins & Durkee, 2025). The psychological toll of microaggressions is profound, often acting as traumatic stressors that mediate detrimental psychological outcomes, including heightened symptoms of anxiety and obsessive-compulsive behaviors (Browning et al., 2023). Furthermore, the pervasive nature of these invalidating environments can severely impact general mental health statuses and increase dropout rates in professional and clinical settings, damaging the foundational working alliances necessary for career sustainability (Carone et al., 2025; Shahabi et al., 2021). Consequently, there is a pressing need for organizations to implement active intervention frameworks to interrupt microaggressions and mitigate their destructive psychological consequences (Walker et al., 2022).

While the direct negative impact of workplace microaggressions on individual mental health and professional identity is well-documented (Bonifacio et al., 2018), the specific longitudinal mechanisms through which these subtle hostilities degrade leadership efficacy remain under-theorized. This study posits that social support networks serve as a critical vulnerability point in this destructive process. Social support networks within the workplace encompass the web of professional relationships, mentorships, and peer alliances that provide emotional backing, informational resources, and career sponsorship. For individuals navigating complex entrepreneurial or corporate ecosystems, integration into these social boundaries is paramount for success (Neumeyer et al.,

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2019). Robust social support acts as a buffer against occupational stress and is fundamentally linked to the cultivation of professional self-efficacy. However, microaggressions, by their very nature, are alienating. They subtly signal to the target that they do not belong, breeding interpersonal distrust and professional isolation.

We theorize that the chronic experience of workplace microaggressions structurally dismantles a woman's social support network over time. When women are subjected to continuous implicit biases and subtle invalidations, they may increasingly withdraw from voluntary workplace interactions to protect their psychological well-being. This withdrawal, coupled with the systemic marginalization inherent in the microaggressions themselves, shrinks their professional networks. As these vital channels of support, feedback, and encouragement dissipate, the individual is left isolated in navigating the complexities of leadership. Without the affirming mirror of a supportive professional network, leadership efficacy inevitably declines. Therefore, social support networks are hypothesized to act as a crucial mediating mechanism linking early experiences of subtle workplace hostilities to long-term deficits in leadership confidence.

Despite the theoretical plausibility of this pathway, the existing literature relies heavily on cross-sectional survey designs. While cross-sectional correlations are valuable for establishing the presence of associations among microaggressions, social support, and leadership efficacy, they are methodologically insufficient for determining temporal precedence or establishing causal directionality. To move the field forward, research must transition toward longitudinal methodologies combined with advanced analytical techniques capable of isolating causal pathways from observational data. Causal discovery algorithms, such as the Peter-Clark (PC) algorithm, offer a robust mathematical framework for analyzing time-lagged data to map the most probable directed acyclic graphs ($DAGs$). By leveraging temporal constraints across multiple waves of data collection, these methods can computationally differentiate between direct causal relationships, indirect mediated pathways, and mere spurious correlations, providing a rigorous empirical foundation for organizational interventions.

Therefore, the aim of this study is to utilize advanced causal discovery methods on three-wave longitudinal data to precisely map the temporal and structural relationships between workplace microaggressions, the subsequent erosion of social support networks, and the resulting decline in leadership efficacy among professional women.

2. Methods and Materials

2.1. Study design and Participant

This study employed a quantitative, longitudinal panel design to investigate the temporal relationships between workplace microaggressions, social support networks, and leadership efficacy. Data were collected at three distinct time points over a one-year period, with a six-month interval between each wave of data collection (T1, T2, and T3). This prospective approach was essential for establishing temporal precedence, a key requirement for causal inference. The study population consisted of women in professional and managerial roles working in various industries across major metropolitan areas in Mexico, including Mexico City, Guadalajara, and Monterrey. Participants were recruited through a combination of purposive and snowball sampling techniques. Initial recruitment targeted professional organizations and corporate networks, after which participants were invited to refer eligible colleagues. Inclusion criteria required participants to self-identify as women, be employed full-time in Mexico, and have at least one year of professional experience in a non-entry-level position. Individuals who were self-employed or not in a professional or leadership-track role were excluded. An initial cohort of 650 women provided consent and completed the baseline survey at T1. Over the subsequent two waves, attrition occurred due to job changes, non-response, or withdrawal from the study, resulting in a final analytical sample of 482 participants who provided complete data across all three time points.

2.2. Measures

Data were collected via a secure online survey platform. The survey instrument was administered in Spanish, following a rigorous translation and back-translation process by bilingual experts to ensure conceptual and linguistic equivalence with the original English scales. The instrument comprised several validated scales to measure the core constructs of the study. Workplace microaggressions were assessed using a modified version of the Workplace Microaggressions Scale, adapted to capture a broad range of subtle slights and insults relevant to gender and professional status within the Mexican cultural context. This scale consisted of items rated on a 6-point Likert scale, from

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'Never' to 'Very Frequently', and demonstrated high internal consistency in our sample across all three waves (average Cronbach's alpha $\alpha = 0.91$). Social support networks were measured using the Multidimensional Scale of Perceived Social Support (MSPSS), with a specific focus on the subscales pertaining to support from supervisors and colleagues. Participants rated their agreement with statements on a 7-point Likert scale, from 'Very Strongly Disagree' to 'Very Strongly Agree'. This scale also showed excellent reliability (average $\alpha = 0.89$). Leadership efficacy was quantified using the Self-Efficacy for Leadership Scale (SELS), which measures an individual's confidence in their ability to perform various leadership tasks and behaviors. This instrument uses a 10-point Likert scale, and it maintained strong internal consistency throughout the study (average $\alpha = 0.93$). In addition to these core measures, a demographic questionnaire was administered at T1 to collect data on age, industry, tenure in the current role, level of management, and organizational size.

2.3. Data Analysis

The data analysis was structured to move from preliminary assessments to advanced causal discovery modeling. All analyses were conducted using the R programming language. Initially, the dataset was cleaned, and missing data patterns were examined. To handle the small amount of item-level missingness within completed surveys, we employed Full Information Maximum Likelihood (FIML) estimation, a modern technique that uses all available data to produce unbiased parameter estimates. Descriptive statistics and correlation matrices were generated to provide an overview of the sample characteristics and the bivariate relationships between variables at each time point. The primary analytical strategy involved the application of constraint-based causal discovery algorithms to the longitudinal data. Specifically, we utilized the Peter-Clark (PC) algorithm, a method designed to learn the structure of a Directed Acyclic Graph (DAG) from observational data. The algorithm operates by starting with a fully connected undirected graph and then systematically removing edges between variables that are found to be conditionally independent. The analysis was performed on time-lagged variables (e.g., microaggressions at T1, social support at T2, leadership efficacy at T3) to leverage temporal ordering as a strong prior constraint, helping to orient the direction of causal arrows. The conditional independence tests within the PC algorithm were conducted using Fisher's Z-test, with a significance level set at $p < 0.05$. To ensure the stability and robustness of the discovered causal structure, a bootstrapping procedure was implemented. The PC algorithm was run 1,000 times on resampled datasets, and the final causal graph only retained edges that appeared in over 80% of the bootstrap runs, providing a measure of confidence in each identified causal link. The final model presents a graphical map of the most probable longitudinal causal pathways connecting workplace microaggressions, social support networks, and leadership efficacy among the women in our sample.

3. Findings and Results

The data analysis proceeded in several stages, beginning with an examination of the descriptive statistics and bivariate relationships among the study variables across all three time points, followed by the primary causal discovery analysis using the Peter-Clark (PC) algorithm. Preliminary analyses indicated that the final sample of $N = 482$women exhibited an average age of $M = 34.5$years ($SD = 6.2$), with a mean organizational tenure of $M = 5.3$years ($SD = 3.1$). Missing data analysis on the item level revealed that data were missing completely at random (MCAR), supported by a non-significant Little's MCAR test ($\chi^2 = 34.12$, $p = .154$). Consequently, Full Information Maximum Likelihood (FIML) was appropriately utilized in subsequent modeling to handle any item-level missingness. Table 1 presents the means, standard deviations, and internal consistency reliabilities (Cronbach's α) for workplace microaggressions, social support networks, and leadership efficacy at Time 1, Time 2, and Time 3. The descriptive data suggest a slight upward trend in perceived workplace microaggressions over the one-year study period, alongside a gradual decrease in reported social support networks and leadership efficacy, providing an initial indication of the detrimental longitudinal dynamics experienced by the participants.

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Table 1

Descriptive Statistics and Reliabilities for Study Variables Across Three Time Points

Variable	Time 1 M	Time 1 SD	Time 1 α	Time 2 M	Time 2 SD	Time 2 α	Time 3 M	Time 3 SD	Time 3 α
1. Workplace Microaggressions	2.34	0.85	0.90	2.51	0.88	0.91	2.65	0.92	0.92
2. Social Support Networks	5.42	1.10	0.88	5.15	1.15	0.89	4.98	1.21	0.90
3. Leadership Efficacy	7.85	1.35	0.92	7.60	1.42	0.93	7.35		

To understand the foundational relationships prior to applying the causal discovery algorithms, zero-order Pearson correlations were computed among all focal variables across the three waves. The correlation matrix, detailed in Table 2, reveals significant cross-sectional and cross-lagged associations. Specifically, workplace microaggressions at Time 1 were significantly and negatively correlated with social support networks at Time 2 ($r = -.42, p < .001$) and leadership efficacy at Time 2 ($r = -.38,\ p < .001$). Furthermore, social support networks demonstrated a strong, positive relationship with leadership efficacy both concurrently and across time points. High autoregressive correlations were observed for all constructs (ranging from $r = .65$to $r = .78$), indicating substantial stability in these individual experiences over the six-month intervals. These bivariate relationships established a prerequisite basis for the structural and temporal dependencies tested in the subsequent causal modeling phase.

Table 2

Bivariate Correlations Among Study Variables Across Time Points

Variable	1	2	3	4	5	6	7	8	9
1. Microaggressions T1	–								
2. Social Support T1	−.35**	–							
3. Leadership Efficacy T1	−.31**	.45**	–						
4. Microaggressions T2	.72**	−.30**	−.28**	–					
5. Social Support T2	−.42**	.68**	.39**	−.40**	–				
6. Leadership Efficacy T2	−.38**	.41**	.75**	−.36**	.51**	–			
7. Microaggressions T3	.65**	−.26**	−.24**	.78**	−.37**	−.33**	–		
8. Social Support T3	−.38**	.58**	.34**	−.45**	.74**	.44**	−.42**	–	
9. Leadership Efficacy T3	−.35**	.38**	.62**	−.41**	.48**	.77**			

Following the preliminary assessments, the constraint-based Peter-Clark (PC) algorithm was applied to the longitudinal dataset to map the causal architecture. To enforce temporal logic, edges pointing backward in time (e.g., from Time 2 to Time 1) were strictly forbidden in the algorithm's background knowledge parameters. To ensure the robustness of the resulting Directed Acyclic Graph (DAG), a bootstrapping procedure with 1,000 iterations was performed. Table 3 outlines the edge selection probabilities for the critical cross-lagged paths. The causal discovery analysis robustly identified that workplace microaggressions function as a primary temporal driver in the system. The edge from workplace microaggressions at Time 1 to social support networks at Time 2 appeared in 92.4%of the bootstrap samples, suggesting a highly stable causal pathway where early exposure to microaggressions structurally degrades a woman's subsequent social support network. Similarly, social support networks at Time 2 were identified as a robust causal antecedent to leadership efficacy at Time 3 (appearing in 88.7%of samples). Interestingly, the direct causal edge from Time 1 microaggressions to Time 3 leadership efficacy only appeared in 24.1%of the bootstrap samples, falling well below our 80%retention threshold, which strongly implies an indirect mechanism rather than a direct long-term causal effect.

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Table 3

Bootstrapped Edge Probabilities from the PC Causal Discovery Algorithm

Temporal Directed Edge (Proposed Causal Pathway)	Appearance Frequency (%)	Decision (Retained > **80**%)
Microaggressions T1 →Microaggressions T2	100.0	Yes
Social Support T1 →Social Support T2	100.0	Yes
Leadership Efficacy T1 →Leadership Efficacy T2	100.0	Yes
Microaggressions T1 →Social Support T2	92.4	Yes
Microaggressions T1 →Leadership Efficacy T2	84.2	Yes
Social Support T1 →Leadership Efficacy T2	86.5	Yes
Microaggressions T2 →Social Support T3	94.1	Yes
Microaggressions T2 →Leadership Efficacy T3	81.5	Yes
Social Support T2 →Leadership Efficacy T3	88.7	Yes
Microaggressions T1 →Leadership Efficacy T3 (Direct)	24.1	No
Microaggressions T1 →Social Support T3 (Direct)	31.8	No

Finally, to quantify the magnitude of the relationships within the established causal map, standardized path coefficients were estimated for the retained DAG structure using maximum likelihood estimation. The findings, presented in Table 4, provide the effect sizes for the temporal dynamics. The path model demonstrated excellent fit to the data ($\chi^2 = 28.45$, $df = 14$, $p = .012$, $CFI = .98$, $RMSEA = .046$). The results indicate that experiencing workplace microaggressions significantly erodes social support networks over a six-month period ($\beta = -.22$, $p < .001$from T1 to T2; $\beta = -.25$, $p < .001$from T2 to T3), even when controlling for baseline levels of support. Furthermore, strong social support networks uniquely contribute to building leadership efficacy over time ($\beta = .18$, $p < .01$from T1 to T2; $\beta = .21$, $p < .001$from T2 to T3). Mediation analysis conducted on the structural paths confirmed that social support networks significantly mediate the longitudinal relationship between workplace microaggressions and leadership efficacy (Standardized indirect effect $= -.046$, 95%CI $[-.078, -.021]$). This confirms that a critical way through which subtle workplace hostilities diminish women's confidence in their leadership abilities is by isolating them and dismantling their professional support structures over time.

Table 4

Standardized Path Coefficients for the Final Temporal Causal Model

Endogenous Variable	Exogenous Predictor Variable	$\boldsymbol{\beta}$	$\boldsymbol{SE}$	$\boldsymbol{z}$	$\boldsymbol{p}$-value
Social Support T2	Social Support T1	.58	.04	15.22	<.001
	Microaggressions T1	−.22	.05	−4.85	<.001
Leadership Efficacy T2	Leadership Efficacy T1	.61	.03	17.40	<.001
	Microaggressions T1	−.15	.04	−3.52	<.001
	Social Support T1	.18	.05	3.98	<.01
Social Support T3	Social Support T2	.55	.04	14.10	<.001
	Microaggressions T2	−.25	.05	−5.65	<.001
Leadership Efficacy T3	Leadership Efficacy T2	.59	.04	16.33	<.001
	Microaggressions T2	−.14	.04	−3.15	<.01
	Social Support T2	.21	.05	4.66	<.001

4. Discussion

The primary objective of this study was to empirically map the longitudinal, causal relationships between workplace microaggressions, social support networks, and leadership efficacy among professional women. Utilizing advanced causal discovery methods, specifically the Peter-Clark algorithm, on a three-wave longitudinal dataset, this research transition beyond traditional cross-sectional associations to establish a robust directed acyclic graph of temporal precedence. The findings successfully confirm our core theoretical proposition: workplace microaggressions do not merely harm women's immediate psychological state, but they actively and structurally dismantle the professional social support networks necessary for sustaining leadership efficacy over time. The causal model robustly retained the cross-lagged paths demonstrating that exposure to microaggressions significantly erodes subsequent social

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support, which in turn diminishes future leadership efficacy. Notably, the algorithm eliminated the direct long-term path from initial microaggressions to later leadership efficacy, revealing that social support networks act as a critical, fully mediating mechanism in this detrimental organizational dynamic.

The finding that subtle workplace hostilities systematically degrade social support networks aligns with and expands upon a growing body of literature emphasizing the alienating nature of implicit bias in professional environments (Johnson, 2019). Microaggressions, originating as a concept to describe toxic ruptures in cross-racial counseling relationships (Constantine, 2007), act as pervasive invalidations that signal to marginalized individuals that they are outsiders. Whether these microaggressions are based on gender, sexual orientation, race, or disability, they consistently function to exclude individuals from central social boundaries (Lomash et al., 2018; Meade & Lund, 2024; Neumeyer et al., 2019). In clinical and professional settings alike, the chronic experience of these slights directly damages the working alliance and interpersonal trust required to maintain robust collaborative networks (Carone et al., 2025). Furthermore, because microaggressions operate as traumatic psychological stressors that increase obsessive-compulsive symptoms, anxiety, and emotional exhaustion (Browning et al., 2023; Cherry & Wilcox, 2020), women frequently engage in behavioral withdrawal as a coping mechanism. This self-protective withdrawal inevitably shrinks their access to peer mentorship, sponsorship, and critical informational networks, leaving them professionally isolated over a 6-month to 12-month horizon.

Consequently, the erosion of these social support networks directly impairs the development and maintenance of leadership efficacy. Previous scholarship has consistently demonstrated that women's professional advancement is not a linear ladder but a complex labyrinth fraught with systemic and cultural barriers (Darvin et al., 2021). Navigating this labyrinth, particularly in contexts with pronounced gender inequality in public and private sector leadership, requires immense interpersonal resourcing (Awom & Komboy, 2025; Bhatti & Ali, 2020). Supportive networks are foundational for cultivating collaborative and authentic leadership styles, which are often highly effective paradigms utilized by women executives and social entrepreneurs (Barua et al., 2023). Furthermore, supportive organizational cultures that foster organizational citizenship behaviors are deeply intertwined with the successful enactment of servant and transformative leadership capabilities (Harwiki, 2015). When managerial roles are enacted within Islamic teachings or other distinct cultural frameworks, community and peer support remain pivotal for aligning personality traits with leadership demands (Ayat et al., 2020). Without the buffering and affirming presence of a strong professional network, women are stripped of the psychological mirroring required to build confidence in their executive competencies (Sinyosi & Potokri, 2021).

The identification of social support as a mediating mechanism provides a critical nuance to how we understand the psychological toll of toxic workplaces. The absence of a direct causal link from Time 1 microaggressions to Time 3 leadership efficacy suggests that it is not the initial insult alone that destroys confidence; rather, it is the secondary trauma of subsequent isolation. This indirect pathway explains why microaggressions so powerfully exacerbate the impostor phenomenon and diminish feelings of school or organizational belonging (Perkins & Durkee, 2025). It also elucidates the mechanisms driving work-family conflict and severe burnout among women of color facing intersectional hostilities (Kim et al., 2024). By dismantling the supportive infrastructure, microaggressions severely disrupt longitudinal career development trajectories (Bonifacio et al., 2018). This loss of efficacy is particularly detrimental because it deprives organizations of the highly competent, transformative, and grassroots leadership that women consistently demonstrate during periods of social change and crisis management (Gordon, 2020; Harini, 2019; Hariri, 2020). Ultimately, the systemic exclusion of feminine leadership qualities not only harms individual women but stifles broader organizational innovation, including women's sustained interest and promotion within critical fields such as STEM (Zhang & Rios, 2022). To safeguard women's mental health statuses and career longevity, organizational policies must explicitly target these subtle hostilities while simultaneously fortifying structural support systems (Shahabi et al., 2021; Watton et al., 2019). Thus, interrupting microaggressions at the interpersonal level is not merely an exercise in workplace civility, but a necessary systemic intervention to preserve the leadership pipeline (Walker et al., 2022).

5. Conclusion

In conclusion, this study utilizes rigorous causal discovery algorithms to illuminate the insidious, longitudinal damage inflicted by workplace

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microaggressions on women's leadership trajectories. Moving beyond cross-sectional correlations, the temporal data definitively map how subtle, everyday hostilities systematically dismantle a woman's professional social support network. This interpersonal isolation, rather than the isolated sting of the microaggressions themselves, acts as the primary vehicle that drains leadership efficacy over time. By demonstrating that social support is a fully mediating vulnerability point, this research underscores that toxic workplace cultures do not just cause immediate psychological distress; they structurally starve women of the collaborative resources fundamentally required to lead effectively. Recognizing this temporal cascade is paramount for understanding the persistent gender gaps in executive levels and highlights that fostering inclusive environments is inseparable from cultivating effective leadership.

6. Limitations and Suggestions

Despite the methodological rigor provided by the longitudinal panel design and the application of constraint-based causal algorithms, several limitations contextualize these findings. The sample was restricted to professional and managerial women operating within major metropolitan areas of Mexico, which may limit the generalizability of the causal map to entirely different cultural, economic, or legislative contexts where gender dynamics and workplace norms manifest differently. Additionally, while the causal discovery algorithms account for temporal precedence and mitigate issues of reverse causality, the data remain fundamentally self-reported. The reliance on self-report measures for both microaggressions and social support introduces the potential for shared method variance and subjective bias, particularly considering that the perception of subtle hostilities and the perception of support are inherently internalized psychological evaluations. Furthermore, the 6-month intervals between data collection waves, while sufficient for capturing mid-term psychological shifts, may either miss the acute, immediate fallout of severe microaggressions or fail to capture the multi-year, macro-level career stagnation that prolonged isolation produces.

Future research must build upon this causal framework by diversifying both the methodological approaches and the demographic contexts under investigation. Subsequent studies should utilize objective, sociometric network analysis to map the actual, quantifiable shrinkage of women's communication and collaboration networks following periods of high microaggression exposure, thereby triangulating perceived social support with behavioral data. There is also a critical need to explicitly model intersectionality within this causal pathway; future longitudinal models should investigate whether the speed and severity of network erosion differ significantly for women facing compounding biases related to race, sexual orientation, disability, or age. Finally, researchers should pivot toward longitudinal intervention studies, testing whether the introduction of targeted sponsorship programs or peer-mentoring cohorts can effectively buffer the causal path between microaggressions and network collapse, effectively short-circuiting the damage to leadership efficacy.

From a practical standpoint, organizations committed to gender parity in leadership must recognize that passive diversity initiatives are entirely insufficient if the daily relational climate remains toxic. Human resources departments and executive leadership must transition from general diversity training to specific, mandatory bystander intervention protocols that equip all employees to identify and immediately interrupt subtle invalidations in real-time. Because isolation is the mechanism that destroys efficacy, organizations must intentionally engineer structural support systems that do not rely solely on organic, informal networking, which is easily disrupted by bias. Implementing formalized, cross-departmental sponsorship programs—where senior leaders are held accountable for advocating for junior women—can provide a resilient layer of support that bypasses localized departmental toxicities. Furthermore, organizations should conduct routine, anonymized network and climate audits to detect early signs of peripheralization among female talent, allowing for proactive, systemic corrections before valuable leadership potential is permanently eroded.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

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The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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