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The association between union membership and perceptions of safety climate among US adult workers

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ABSTRACT

Objectives: An individual's perceptions of their workplace safety climate can influence their health and safety outcomes in the workplace. Even though union membership has been declining in the US, union members still comprise 10% of the working population and have higher-than-industry average non-fatal illness and injury rates. Due to limited research focused in this area, this study examined whether union membership was associated with worker perceptions of safety climate.

Methods: This was a secondary data analysis study utilizing data from the Quality Work Life module from the General Social Survey centered on US workers aged 18 and above. Propensity-score matching was implemented to reduce potential selection bias between unionized and non-unionized workers. Linear regression explored the association between union membership and perceptions of safety climate, controlling for age, sex, education, industry, resource adequacy, supervisor support, co-worker support, and workload.

Results: For perceived safety climate (on a 0–16 scale, the higher the more positive), those in union had a lower mean of perceived safety climate (12.44) compared to those not in a union (13.20). Based on the regression results, those who were in a union reported more negative perceptions of their workplace safety climate in a 12-month period ($\beta = -0.61$, $p < .001$).

Conclusions: By demonstrating a commitment to proactive injury prevention and bolstering the business's overall safety performance indicators, businesses who are open to collaborations with unions may see some long-term benefits (e.g. return on investment, increased job satisfaction) and enhance union workers' perceptions of safety climate.

1. Introduction

Labor unions have a long and deeply rooted history in the United States since their formation in the mid-1800s, stemming from the societal and economic impacts of the Industrial Revolution. Labor unions are organizations that hold a critical role in enhancing their members' workplace safety and public health conditions through empowerment, workplace advocacy (i.e., policies, procedures), and collective bargaining (e.g., better wages and benefits) (Hagedorn et al., 2016; Kimeldorf, 1991; Morris, 1946). Today under US labor laws, many unions in different industrial sectors are still recognized as the primary champion for their members' health and safety.

According to the Bureau of Labor Statistics, as of 2018, 14.7 million wage and salary workers (10.5% of all workers) in the US were part of a union—a 0.2% decrease from 2017 and continued trend of a century-long decline in US union membership (Bureau of Labor Statistics, 2018a; Mishel, 2012). Despite this decline in union membership, in 2017, the top five states with the highest union membership and union density had higher employee-reported non-fatal injury and illness rates that were as much as 35% above the national average of 2.8 per 100 employees (Bureau of Labor Statistics, 2018a, 2018b, 2018c). These statistics are congruent with what is found in the literature, as employees in unions compared to non-unionized employees are more likely to self-report injuries and illnesses in the workplace and follow through with filing workers' compensation claims. This also may be attributed to those in unions working more dangerous and laborious jobs (e.g.,

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construction, steel work), working in larger industries, being educated by their union about their employee rights, and their union's contributions to workplace safety culture where self-reporting injuries is encouraged (Fenn & Ashby, 2004; Freeman & Medoff, 1981; Gillen et al., 2002; Hirsch & Berger, 1984; Goldenhar et al., 2003; Morse et al., 2003; Worrall & Butler, 1983).

Regardless of what the documented reasons were for these non-fatal injuries and illnesses in unions, it is still critical to understand the underlying cause of these elevated rates and determine strategies to mitigate occupational risks. Safety climate has been acknowledged as having the potential to reduce workplace injury rates and bolster injury prevention (Gillen et al., 2002; Huang et al., 2006). Safety climate—a construct that is a sub-facet of organizational climate—reflects shared perceptions and beliefs workers hold regarding their safety in their workplace. There are also factors that influence safety climate, which include but are not limited to safety leadership style, supervisor support, communication, organizational support, resource availability, workload, and job demands (Barrah et al., 2004; DeJoy et al., 2004; Fernández-Muñiz et al., 2012; Flin et al., 2000; Gillen et al., 2002; Neal & Griffin, 2004, 2006; Zohar, 1980; Zohar & Tenne-Gazit, 2008). Perceived safety climate, or self-reported safety climate, has been defined in many ways in the literature and a number of scales have been developed to measure the construct (Cooper & Phillips, 1994; DeJoy et al., 2004; Flin et al., 2000; Neal & Griffin, 2004; Seo et al., 2004; Zohar, 2010). While no consensus has been developed or standardized instrument has been adapted on how to best measure safety climate, it generally quantifies how workers perceive and describe the importance of safety issues within their organization during a particular point in time by measuring a worker's perceptions of workplace policies, practices and procedures (e.g., supportive environment, safety rules and procedures, communication, management commitment).

Exploring the relationship between union membership and perceptions of safety climate may highlight areas of improvement when addressing union workers' health and safety. By measuring safety climate, businesses and organizations can better understand the molar perceptions their unionized employees have about workplace safety and obtain safety performance indicators—that go beyond recordable rate. As a result, concrete, organization-specific solutions to predict and prevent workplace injury can be developed and implemented (Cooper & Phillips, 1994; Guldenmund, 2000; Zohar, 1980, 2010).

Previous studies have sought to analyze the associations between perceptions of safety climate, safety attitudes, and/or safety performance in very specific unionized study samples, such as workers in Italian manufacturing companies, nuclear decommissioning and demolition industries, construction, Australian hospitals, South Korean labor industries, and Midwestern retail (Brondino, Silva, & Pasini, 2012; Findley et al., 2007; Gillen et al., 2002; Iverson, Buttigieg, & Maguire, 2003; Lee et al., 2017; Marin, Cifuentes, & Roelofs, 2015; Sinclair, Martin, & Sears, 2010); however, none looked across industries or used a nationally representative sample. Moreover, when comparing workers who are in a union versus those who are not, it should be noted that individuals in a union might systematically differ from those who are non-unionized. Previous studies have indicated that those in a union may have better safety climate scores and reduced injury severity (Gillen et al., 2002) and better union-management relations (Findley et al., 2007; Iverson et al., 2003; Lee et al., 2017). Therefore, unionized workers may be more inclined to have positive safety climate perceptions; this suggests that workers who are in a union and workers who are not in a union (i.e., the treatment and control groups) may not be comparable in terms of perceived safety climate due to differences in observable characteristics. Thus, this study sought to address a critical research gap and shortcomings of previous studies by using the propensity-score matching (PSM) method to reduce potential selection bias between unionized and non-unionized workers. To our knowledge, this is the first study to utilize a US nationally representative dataset to explore the association between union membership and an individual's safety climate perceptions. Given recent events, such as the unprecedented COVID-19 pandemic, attention is being focused once more on workers' safety, health, conditions, and rights, making it all the more important to understand how unions—an advocate for the worker—influence safety climate perceptions (CDC, 2020; Lancet, OSHA, 2020).

To address this gap in the literature, the objective of this study was to examine the association between union membership and perceptions of workplace safety climate in US adult workers, using data from the General Social Survey (GSS) Quality of Worklife (QWL) Module. This quasi-experimental design with a control group study implemented PSM to reduce potential selection bias between unionized and non-unionized US adult workers. Given the evidence that increased illness and injury reporting is a positive aspect of a positive safety culture (Shannon, Mayr, & Haines, 1997; Vredenburgh, 2002; Wu, Lin, & Shiau, 2010), and aforementioned past findings and that states with higher union density also had higher than national average self-reported non-fatal injury and illness rates, it was hypothesized that US adult workers in a union were more likely to have positive perceptions of their workplace safety climate compared to workers that were not part of a union.

2. Methods

2.1. Data source and study sample

The GSS has gathered data on contemporary American society since 1972 and contains a standard core of questions on demographics, behaviors and attitudes, along with special topics modules that are periodically administered (NORC, 2019). The Quality of Worklife (QWL) Module, which is a subset of data from the GSS developed by the University of Chicago NORC group and administered in partnership with the National Institute for Occupational Safety and Health (NIOSH). The QWL measures how work life and work experiences have changed over time and can be used to assess relationships between job/organizational characteristics and employee safety and health in order to identify targets for preventive interventions. QWL data has been previously utilized to find associations on topics such as workplace harassment and occupational injury, occupation and socioeconomic indicators, and long work hours and psychosocial well-being (Fujishiro, Xu, & Gong, 2010; Grosch et al., 2006; Yu et al., 2018). The QWL is the only public dataset that measures behaviors and attitudes in the American workplace (NIOSH, 2013; Smith, 2016).

Data from the GSS QWL Module and Core Module from 2002, 2006, 2010, 2014, and 2018 were extracted. Each year contains observations for 1,100–1,800 working adults aged 18 and above, depending on the year. Inclusion criteria for this study were adults aged 18 and above who were participants in the 2002, 2006, 2010, 2014, or 2018 GSS QWL module. Data across 16 years were utilized rather than a single year of the GSS QWL module to provide a better view over time, as well as to enhance the sample size and statistical power. Additionally, as this study assessed perceptions of safety climate, which is an organizational-level construct, those who were self-employed at the time of survey administration were excluded from the study as they may be their own supervisor or predominantly work autonomously. Of the original sample from the aforementioned years, 7,289 adults aged 18 to 89 without missing values on major variables were included in the analyses.

2.2. Measures

The GSS provides a codebook, which specifies which questions correspond to certain constructs and/or measures for the QWL module.

2.2.1. Outcome variable: perceived safety climate

The GSS adopted items from the NIOSH Management Commitment to Safety Scale (NIOSH, 2013) for the QWL to measure safety climate, which included the following four items: (1) "The safety and health

conditions where I work are good"; (2) "The safety of workers is a high priority with management where I work"; (3) "There are no significant compromises or shortcuts taken when worker safety is at stake"; (4) "Where I work, employees and management work together to ensure the safest possible working conditions." All four questions' responses were on a four-point ordinal scale from 'Strongly Agree' to 'Strongly Disagree' and were reverse coded so that the higher value indicated stronger agreement (Strongly Agree = 4, Agree = 3, Disagree = 2, Strongly Disagree = 1). The four recoded variables for the discrete questions above were then summed up into a single variable, "safety climate", on a continuous scale that ranged from 0 to 16; a higher scale score is indicative of a more positive perception of safety climate.

2.2.2. Primary predictor: union membership

Union membership was determined by the respondent's answer to, "Does the respondent or spouse belong to a union?" If "respondent belongs" or "respondent and spouse belongs" was selected, those individuals were included in the study sample as the treatment group. This variable was treated as a binary variable.

2.2.3. Covariates

Covariates were selected based on what was supported in the literature as being factors of safety climate and union membership, as well as taking into consideration whether the variable was collected in the QWL. The available literature identifies sex, race, age, education, private vs. public sector, work status, and state of residence being strong indicators of union membership with males, non-whites, those middle-aged, individuals who were high school graduates or had some college education, those who worked in the public sector and government, full-time employees, and individuals from certain states (e.g., Hawaii, New Jersey, New York, Washington), respectively, having greater likelihood of being in a union (Bureau of Labor Statistics, 2018a; Benson & Griffin, 1988; Hirsch & Berger, 1984; Hirsch, Macpherson, & Vroman, 2001; Hundley, 1988; Kokkelenberg & Sockell, 1985; Mishel, 2012; Schur & Kruse, 1992; Silverblatt & Amann, 1991;). Following the literature, individual demographics included in the analysis were: age (18–29, 30–39, 40–49, 50–64, 65 and above), sex (male or female), educational level (less than a high school diploma, high school graduate, some college/associate's degree, bachelor's degree, or beyond bachelor's degree), work status (part- or full-time), race/ethnicity (non-Hispanic white, non-Hispanic black, and other/unclassified), region of residence (northeast, Midwest, south, west), and respondent annual income ($1-$9,999, $10,000-$14,999, $15,000-$19,999, $20,000-$24,999, or $25,000 and greater). Whether the individual worked in the private or public sector was included, as well as industry—determined by the North American Industry Classification System 2007. Six industry categories were generated based on a fusion of the Medical Expenditure Panel Survey's (MEPS) Fiscal Year 2010 condensing rules for industries and occupations (AHRQ, n.d.a,b). These variables were recoded from the dataset as dummy variables into the categories listed in Appendix A.

Factors of safety climate that were both documented in the literature and were captured in the QWL were also included as covariates. These variables were resource adequacy, supervisor support, co-worker support, and workload (Brondino et al., 2012; DeJoy et al., 2004; Fernández-Muñiz et al., 2012; Gillen et al., 2002; Neal & Griffin, 2004; Zohar, 2010; Zohar & Tenne-Gazit, 2008). Resource adequacy was determined by summing the respondent's answer to "I receive enough help and equipment to get the job done" and "I have enough information to get the job done" with responses reverse coded so that 'Strongly Agree' indicated a value of 4, 'Agree' a value of 3, 'Disagree' a value of 2, and 'Strongly Disagree' a value of 1; values were then totaled into a single, continuous variable that ranged on scale of 0–8, with 8 indicating the highest self-reported resource adequacy. Supervisor support was derived from responses to, "My supervisor is concerned about the welfare of those under him or her" and "My supervisor is helpful to me in getting the job done" and was reverse coded in the same manner as resource adequacy into a single, continuous variable on a scale of 0–8, with 8 indicating the highest self-reported supervisor support. Co-worker support was determined from responses to, "The people I work with take a personal interest in me" and "The people I work with can be relied on when I need help" reverse coded into a single, continuous variable on a scale of 0–8, with 8 indicating the highest self-reported co-worker support. Lastly, workload was determined by the respondent's answers to: "My job requires that I work very fast", "I have too much work to do everything well", and "I have enough time to get the job done." The first two statements were reverse coded so that 'Strongly Agree' indicated a value of 4, 'Agree' a value of 3, 'Disagree' a value of 2, and 'Strongly Disagree' a value of 1; the last statement was not reverse coded because the lower value already indicated a decreased workload. After being recoded these three variables were summed into a single continuous scale of 0–12, with 12 indicating the highest self-reported workload.

2.3. Statistical analysis

2.3.1. Creating a matched sample

To minimize selection bias between the two study groups (adult workers in a union and adult workers not in a union), a matched sample using PSM with nearest-neighbor matching was constructed (Rosenbaum & Rubin, 1985). Matching allows an individual from the control group (non-unionized) to be selected as the matched partner for a treated individual (unionized) that is closest in propensity to be treated (Caliendo & Kopeinig, 2008; Coca-Perraillon, 2007; Parsons, 2004). The estimate of the likelihood of one subject being in the treatment group, based on a set of characteristics, was the first step conducted in the PSM.

The study matched participants based on demographic factors (age, sex, education, race/ethnicity, region) and likelihood of being in a union (work status, respondent income, private vs. public sector, industry) as stated above (Bureau of Labor Statistics, 2018a; Benson & Griffin, 1988; Hirsch & Berger, 1984; Hirsch et al., 2001; Hundley, 1988; Kokkelenberg & Sockell, 1985; Mishel, 2012; Schur & Kruse, 1992; Silverblatt & Amann, 1991). The study utilized 1:3 nearest-neighbor matching so that each treated unit could be matched to more than one control since the unmatched treatment and control group had a notable difference in numbers (n = 634 and n = 6,655); nearest-neighbor 1:3 matching was used because the matched units reached saturation beyond one-to-three matching. The suggested caliper (i.e., propensity range) for the PSM was 0.2 of the logit of the standard deviation of the predicted propensity scores was used (Austin, 2011; Coca-Perraillon, 2007; Parsons, 2004). After PSM, a matched sample of adults in a union and not in a union was created (n = 530 in treatment group and n = 997 in control group). Stata 15.1 was used for all data analyses, including conducting the imbalance test to corroborate successful matching by reducing the imbalance between the treatment (unionized) and control group (non-unionized) based on the aforementioned covariates (StataCorp. 2017. *Stata Statistical Software: Release 15*, College Station, TX: StataCorp LLC). Multicollinearity among covariates in the final model was also assessed; multicollinearity was not present with the variables selected for the models.

2.3.2. Descriptive statistics

The descriptive statistics were calculated for both the matched and unmatched samples included weighted and unweighted frequencies or means, as well as percentages or standard errors for all variables used in the statistical models. Chi-square tests were conducted to determine group differences between respondents who were part of a union and those who were not for categorical variables and *t*-test were used for continuous variables.

2.3.3. Linear regression

A linear regression model was conducted to examine the associations between union membership and perceived safety climate, controlling for the covariates pertaining to perceived safety climate (resource

adequacy, supervisor support, co-worker support, workload) and sociodemographic factors (age, sex, education, industry). To account for disparate selection probabilities, non-response, and post-stratification adjustments, the regression was weighted using the GSS survey weight to provide nationally representative estimates. Due to the public availability and de-identified nature of the dataset, this study was deemed as a non-human subject study by the Institutional Review Board at the authors' institution.

3. Results

3.1. Descriptive statistics

The imbalance test showed that the matched sample was balanced ($\chi^2 = 2.18$, df = 8, $p = 0.988$), indicating enhanced comparability and a reduction in selection bias between US adult workers who were part of a union and those who were not, based on the covariates identified (Table 1). Table 2 shows descriptive statistics of the study sample (weighted matched n = 1,552, unweighted matched n = 1,527; weighted unmatched $n = 6{,}967$, unweighted unmatched $n = 6{,}820$). The majority of unionized respondents were middle aged (58.26% aged 40–64), there were slightly more males than females (54.26%), most had graduated high school or obtained some college education (55.36%), a large majority worked full time (88.81%), most were non-Hispanic white (70.38%), the largest percentage of respondents came from the western region (27.66%), most made over $25,000 per year for individual annual income (71.22%), slightly fewer union workers were in the public sector compared to those who were not (49.41%), and those in public services (i.e. education, health and social services; public administration; military) were the largest industry category (50.59%).

For perceived safety climate, those in a union had a mean of 12.44 (SE = 0.11) compared to 13.23 (SE = 0.08) for those not in a union. Respondents who were in a union also had smaller means for resource adequacy, supervisor support, and co-worker support, and a higher mean for workload relative to their non-union counterparts. The mean for resource adequacy for those in a union was 6.50 (SE = 0.07) compared to 6.73 ($SE = 0.05$); supervisor support was 6.41 ($SE = 0.07$) vs. 6.58 (SE = 0.06), and co-worker support was 6.43 (SE = 0.06) vs. 6.60 (SE = 0.05). Those in a union had a higher mean for workload at 7.12 (SE = 0.08) vs. 7.02 (SE = 0.06) for those not in a union.

3.2. Associations between union membership and perceptions of safety climate

Table 3 displays the results from the linear regression that examined whether union membership was associated with perceptions of safety climate in the matched sample. Those who were in a union reported more negative perceptions of their workplace safety climate in the when surveyed (β = -0.61, SE = 0.126, $p < .001$). On average, workers who were part of a union had 0.61 units lower safety climate perception, compared to workers who were not part of a union.

The regression results also showed that resource adequacy ($\beta = 0.43$, SE = 0.065, $p < .001$), supervisor support ($\beta = 0.37$, $SE = 0.054$, $p < .001$), and co-worker support ($\beta = 0.17$, $SE = 0.056$, $p < .001$) were significant (Table 3). On average, workers who were in a union had 0.43 units, 0.37 units, and 0.17 units higher safety climate perception for resource adequacy, supervisor support, and co-worker support, respectively, compared to non-unionized workers.

Within age groups on average, for those age 65 and above, when compared to those aged 18–29 had 0.61 units higher safety climate perception ($\beta = 0.61$, $SE = 0.287$, $p = .033$). Lastly, union workers in the Construction, Extraction, and Maintenance Operations industry on average, had 1.46 units higher safety climate perception, compared to people who worked in Public Services ($\beta = 0.56$, $SE = 0.239$, $p = .019$).

4. Discussion

This study examined the association between union membership and perceptions of safety climate in US adult workers. A secondary data analysis was conducted using the General Social Survey Quality of Worklife module to address the gap on the limited amount of research conducted in this area using a nationally representative sample to explore the relationship between union membership and perceptions of safety climate. Moreover, this study utilized a propensity-score matching methodology to reduce potential selection bias in observed characteristics between the treatment (union) and control (non-union) groups.

It was hypothesized that those in a union would have more positive perceptions of their workplace safety climate. Regression results from the study did not support the hypothesis and showed that unionized workers were more likely to have decreased positive perceptions of safety climate relative to their non-union counterparts. Historically, unions and employers have frequently had adversarial relationship due

Table 1
Results of imbalance test of propensity-score matching.

Variable	Sample	Mean		t-test		% bias reduction
		Union	Non-Union	t	$p > \lvert t \rvert$	
Age	Unmatched	2.92	2.74	3.33	0.001	97.6
	Matched	2.92	2.93	−0.07	0.946	
Sex	Unmatched	1.47	1.52	−2.53	0.011	83.6
	Matched	1.47	1.46	0.31	0.758	
Education	Unmatched	3.27	3.03	4.33	0.000	90.5
	Matched	3.27	3.29	−0.30	0.765	
Work status (part- or full-time)	Unmatched	1.11	1.16	−2.81	0.005	63.4
	Matched	1.11	1.10	0.90	0.367	
Race/ethnicity	Unmatched	1.43	1.46	−0.86	0.388	−34.6
	Matched	1.43	1.39	0.91	0.362	
Region	Unmatched	2.47	2.66	−4.01	0.000	93.4
	Matched	2.47	2.46	0.17	0.865	
Respondent Income	Unmatched	4.51	4.01	7.46	0.000	95.4
	Matched	4.51	4.53	−0.32	0.748	
Private vs. public sector	Unmatched	1.50	1.84	−19.31	0.000	94.0
	Matched	1.50	1.48	0.65	0.513	
Industry	Unmatched	2.71	3.84	−10.96	0.000	98.7
	Matched	2.71	2.70	0.12	0.906	
	Sample	LR χ^2	$p < \chi^2$	Mean Bias	Rubin's B*	Rubin's R*
Overall	Unmatched	372.98	0.000	27.5	89.9	1.36
	Matched	2.18	0.988	2.5	9.1	1.15

*Rubin (2001) recommends that B be less than 25 and that R be between 0.5 and 2 for the samples to be considered sufficiently balanced.

Table 2
Descriptive statistics of matched and unmatched study samples.

	Matched Sample[3]				Unmatched Sample			
	Weighted n[1] (%) or weighted mean (SE)				Weighted n[1] (%) or weighted mean (SE)			
	Union	Non-Union	Overall	*p*-value[2]	Union	Non-Union	Overall	*p*-value[2]
	537 (34.58%)	1015 (65.42%)	1552 (100%)		617 (8.86%)	6350 (91.14%)	6967 (100%)	
Variable								
1. Outcome								
Safety Climate	12.44 (0.11)	13.23 (0.08)	12.96 (0.07)	<0.001	12.49 (0.11)	13.26 (0.03)	13.19 (0.03)	<0.001
2. Covariates								
Resource adequacy	6.50 (0.07)	6.73 (0.05)	6.65 (0.04)	<0.01	6.50 (0.07)	6.83 (0.02)	6.80 (0.02)	<0.001
Supervisor support	6.41 (0.07)	6.58 (0.06)	6.52 (0.05)	0.079	6.37 (0.07)	6.60 (0.02)	6.58 (0.02)	0.001
Co-worker support	6.43 (0.06)	6.60 (0.05)	6.54 (0.04)	<0.05	6.41 (0.06)	6.67 (0.02)	6.65 (0.02)	<0.001
Workload	7.12 (0.08)	7.02 (0.06)	7.05 (0.05)	0.289	7.10 (0.8)	6.90 (0.2)	6.92 (0.02)	<0.05
Age:				0.610				<0.001
18–29	69 (12.92%)	156 (15.38%)	225 (14.53%)		86 (14.03%)	1433 (22.56%)	1519 (21.81%)	
30–39	134 (24.97%)	266 (26.21%)	400 (25.78%)		151 (24.51%)	1473 (23.20%)	1624 (23.31%)	
40–49	156 (29.02%)	265 (26.12%)	421 (27.12%)		169 (27.44%)	1479 (23.30%)	1649 (23.66%)	
50–64	157 (29.24%)	296 (29.15%)	453 (29.18%)		187 (30.34%)	1647 (25.93%)	1834 (26.32%)	
65 and above	21 (3.85%)	32 (3.14%)	53 (3.39%)		23 (3.68%)	319 (5.02%)	342 (4.90%)	
Sex:				0.748				<0.05
Male	291 (54.26%)	561 (55.23%)	852 (54.89%)		330 (53.51%)	3088 (48.64%)	3418 (39.08%)	
Female	245 (45.74%)	455 (44.77%)	700 (45.11%)		287 (46.49%)	3262 (51.37%)	3549 50.93%)	
Education:				0.056				<0.001
Less than high school	32 (6.05%)	71 (7.01%)	103 (6.67%)		39 (6.39%)	670 (10.55%)	709 (10.18%)	
High school graduate	137 (25.45%)	306 (30.15%)	443 (28.52%)		152 (24.67%)	1678 (26.43%)	1830 (26.28%)	
Some college/associate's	161 (29.91%)	320 (31.54%)	481 (30.97%)		186 (30.11%)	1943 (30.60%)	2129 (30.55%)	
Bachelor's degree	87 (16.19%)	157 (15.48%)	244 (15.73%)		99 (16.12%)	1159 (18.26%)	1259 (18.07%)	
Beyond bachelor's	120 (22.40%)	161 (15.83%)	281 (18.10%)		138 (22.34%)	892 (14.05%)	1030 (14.78%)	
Industry:				<0.01				<0.001
Public Services	271 (50.59%)	400 (39.39%)	671 (43.26%)		314 (50.90%)	1729 (27.23%)	2043 (29.33%)	
Construction, Extraction, and Maintenance Operations	39 (7.23%)	85 (8.40%)	124 (8.00%		43 (7.03%)	517 (8.14%)	560 (8.04%)	
Manufacturing	54 (10.14%)	117 (11.57%)	172 (11.08%)		59 (9.53%)	706 (11.12%)	765 (10.98%)	
Transportation	108 (20.13%)	224 (22.08%)	332 (21.40%)		124 (20.03%)	1204 (18.96%)	1328 (19.05%)	
Professional Services	33 (6.12%)	104 (10.20%)	136 (8.79%)		39 (6.35%)	1233 (19.41%)	1272 (18.25%)	
Miscellaneous	31 (5.79%)	85 (8.37%)	116 (7.48%)		38 (6.17%)	932 (14.68%)	970 (13.93%)	
3. Year				0.298				<0.05
2002	155 (28.90%)	324 (31.92%)	479 (30.88%)		171 (27.75%)	1513 (23.83%)	1684 (24.18%)	
2006	129 (23.96%)	295 (23.13%)	363 (23.42%)		151 (24.46%)	1454 (22.90%)	1605 (23.04%)	
2010	58 (10.79%)	137 (13.47%)	195 (12.54%)		66 (10.62%)	1035 (16.29%)	1101 (15.79%)	
2014	92 (17.15%)	168 (16.53%)	260 (16.74%)		101 (16.38%)	1090 (17.17%)	1191 (17.10%)	
2018	103 (19.20%)	152 (14.96%)	255 (16.42%)		128 (20.79%)	1258 (19.81%)	1386 (19.90%)	

Data Source: General Social Survey, Quality of Worklife Module 2002–2018.
1. All *n*'s are unweighted; all percentages are weighted.
2. *p*-values are based on χ^2 tests (for categorical variables) and t-tests (for continuous variables) for group differences between respondents in a union and not in a union.
3. Matched sample was matched on age, sex, education, work status, race/ethnicity, region, respondent income, private vs. public sector, industry.

to conflicting interests and ideologies in the workplace (Hagedorn et al., 2016; Kimeldorf, 1991; Morris, 1946), and unionized employees tend to be more advocacy- and change-driven. Findings from previous studies might explain the negative association between union membership and safety climate. For example, it has been suggested that unionized workers are provided greater education and awareness than non-union workers on potential workplace risks and hazards as well as their union organization establishing minimum safety standards; in fact, the presence of elevated risk and hazards might have been the impetus to unionize in the first place, which thereby could result in negative safety

Table 3
Linear regression estimates of union membership and perceptions of safety climate.

	Perceptions of safety climate	
	β	SE
1. Outcome:	-0.609***	0.126
Union: Yes		
2. Covariates:		
Resource adequacy	0.429***	0.065
Supervisor support	0.370***	0.054
Co-worker support	0.167***	0.056
Workload	-0.014	0.043
Age:		
18–29	–	
30–39	0.251	0.187
40–49	0.192	0.192
50–64	0.069	0.189
65 and above	0.614*	0.287
Sex: female	0.104	0.132
Education:		
Less than high school	–	
High school graduate	0.086	0.306
Some college/associate's	0.427	0.302
Bachelor's degree	0.210	0.328
Beyond bachelor's	0.466	0.334
Industry[a]:		
Public Services	–	
Construction, Extraction, and Maintenance Operations	0.563*	0.239
Manufacturing	0.137	0.199
Transportation, Trade, and Utilities	0.147	0.157
Professional Services	0.053	0.206
Miscellaneous	0.025	0.248
3. Year:		
2002	–	
2006	0.167	0.164
2010	0.120	0.189
2014	0.052	0.168
2018	-0.178	0.155

Note: weighted n = 1,552; unweighted n = 1,527.
Data Source: General Social Survey, Quality of Worklife Module 2002–2018
* $p < .05$; **p < .01; *** $p < .001$
[a] Industry classification detailed in Appendix A.

climate perceptions (Barling, Kelloway, & Bremermann, 1991; Baugher & Roberts, 1999; Fenn & Ashby, 2004; Kelloway, 2004; Mishel, 2012; Sinclair et al., 2010; Spigener & Hodson, 1997).

Moreover, it has been suggested companies that want to avoid unionization—for various economic and organizational reasons—may make a more concerted effort to keep their employees satisfied and bolster human resource practices so that employees do not feel compelled to form a union (Borjas, 1979; Guest, 2002). In turn, unionized employees who are less satisfied than non-union members exercise a different "exit-voice" model and are less likely to leave their jobs even though dissatisfied (Freeman, 1976; Hirschman, 1980; Premack & Hunter, 1988). This can have a negative impact on union workers' job satisfaction (Bender & Sloane, 1998; Bryson, Cappellari, & Lucifora, 2004; Feldman & Scheffler, 1982; Meng, 1990) and in turn could result in non-unionized employees' positive perceptions of safety climate. Recent research has explored how civility norms—the existence of norms for respectful treatment—may also influence an individual's perceptions of safety climate; greater civility and less contention between workers and management can lead to more positive safety climates (McGonagle et al., 2016, 2014; Yang et al., 2014)

Organizational change considerations could be derived based on these findings. When job satisfaction is enhanced, it has been found to be protective against the occurrences and direct and indirect costs of non-fatal injury and illnesses in the workplace, as well as decreasing the costs associated with employee turnover (Carsten & Spector, 1987; Gillen et al., 2002; Huang et al., 2003, 2006; Huang, Shaw, & Chen, 2004; Li, Wolf, & Evanoff, 2004; Mobley, 1977; Smith et al., 2006; Zohar, 2002). Additionally, a more inclusive and civil leadership style (i.e., authentic, transformational), as well as employers and unions working together to agree on what issues should be addressed (i.e., drafting an action plan to be implemented) has also been shown to improve psychosocial and physical safety outcomes (Barling, Loughlin, & Kelloway, 2002; Hasle, Hansen, & Møller, 2004; Kelloway, Mullen, & Francis, 2006; Laschinger & Read, 2016; Mullen & Kelloway, 2009; Zohar & Tenne-Gazit, 2008). While there is no simple singular solution for enhancing unionized employees' satisfaction, businesses who choose to collaborate and have open negotiations with unions to better address union workers' asks might see some long-term benefits (e.g., return on investment, increased job satisfaction) of enhancing these workers' perceptions of safety and demonstrating a commitment to proactive injury prevention and bolstering the business's overall safety performance indicators.

The majority of survey respondents for the study sample were non-Hispanic whites, worked full-time and made more than $25,000 per year in annual individual income. Resource adequacy, supervisor support, and co-worker had a significantly positive association between union membership and perceived safety climate; no sociodemographic factors from the regression demonstrated significance between union membership and perceived safety climate. While there has been ongoing discourse on the challenges in obtaining consensus and demonstrating high reliability around appropriate scales to measure safety climate, these findings are congruent with what is found in the literature on indicators of individual perceptions on safety climate—generally sociodemographic factors (e.g., sex, race/ethnicity, educational attainment) do not have a demonstrated strong influence on safety climate as contextual factors such as safety commitment and communication, resources and demands, training, supportive environment, leadership, etc. (Brondino et al., 2012; Cooper & Phillips, 1994; DeJoy et al., 2004; Fernández-Muñiz et al., 2012; Flin et al., 2000; Fogarty & Shaw, 2010; Neal & Griffin, 2004; Seo et al., 2004; Zohar, 1980, 2010).

In the regression results, being age 65 and above, and being in the Construction, Extraction, and Maintenance Operations industry also resulted in a positive association between union membership and perceptions of safety climate. Previously, it was thought that age and perceptions of the workplace had a linear relationship—as one aged, a person becomes less critical about their job. However, some studies have found the relationship between job satisfaction and age may actually be U-shaped (Clark, Oswald, & Warr, 1996; Dobrow Riza, Ganzach, & Liu, 2015; Kacmar & Ferris, 1989). Those age 65 and above had positive perceptions with safety climate for this age group relative to those aged 18–29. This could be due to the protective factors work has on cognitive aging, and the continued sense of purpose and community employment provides for the elderly. Additionally, those who are older and are still in the workforce may compare their current experiences relative to those earlier in life, before the Occupational Safety and Health (OSH) Act of 1970 was passed; this resulted in the creation of the Occupational Safety and Health Administration (OSHA) creating federal regulations for the workplace thereby driving improved workplace conditions that were non-existent several decades earlier (Dobrow Riza et al., 2015; Occupational Safety and Health Administration OSHA, n.d.; Scott et al., 2015; Thielgen, Krumm, Rauschenbach, & Hertel, 2015).

Those in Construction, Extraction, and Maintenance Operations (CEMO), which includes mining (i.e., quarrying, oil and gas extraction), and natural resources (i.e., agriculture, forestry, fishing, hunting), had more positive perceptions of safety climate compared to those in Public Services, which is the industry with the greatest union membership in this study sample. CEMO traditionally has a high union denisty in the U. S. relative to other industries. It has been found that greater union density can be positively associated to workers' self-reported quality of work conditions and thereby safety climate (Booth, Budd, & Munday, 2010; Dollard & Neser, 2013; Gillen et al., 2002; Mayer, 2004). Therefore, having a greater number of employees in unions could prove to be beneficial to the employer over time given the long-term benefits of their employees participating in a union (e.g., championing for better

working conditions, identifying safety shortcomings). By having a symbiotic relationship with unions and unionized employees rather than adversarial ones, businesses may reap the long-term benefits of an improved safety climate, such as fewer non-fatal injuries and accidents and lost work days (Clarke, 2006; Christian et al., 2009).

There were several limitations to this study that should be acknowledged. First, because of the NIOSH QWL is cross-sectional data, causal or temporal relationships could not be tested. Second, the QWL relies on self-reported data, which could lead to acquiescence bias due to the length of the questionnaire and recall biases since respondents were asked to reflect experiences and attitudes over the past 12 months. In the same vein, perceived safety climate, rather than using data from an objective measure, may introduce some response bias. Additionally, perceptions of safety climate could have been influenced by other factors that were not captured by the QWL. Also, the publicly available QWL datasets do not provide state identifiers—which in the data and literature, union membership and states have a strong relationship (Bureau of Labor Statistics, 2018a; Hirsch et al., 2001; Mayer, 2004)—therefore making matching union membership and perceptions in safety climate with state-level information not possible. Finally, while using PSM does reduce selection bias, it does not remove it completely; unobservable differences between the treatment and control groups may exist but cannot be eliminated. Despite these limitations, the QWL does provide data spanning nearly two decades, as well as a nationally representative and generalizable sample on US adults' work conditions, work behaviors, and attitudes.

5. Conclusions

To our knowledge, this is the first study examining the association between union membership and perceptions of safety climate using a national representative sample of US adult workers. This study found that those in a union generally had decreased perceptions of safety climate in their workplace relative to US adult workers not in a union. Moreover, by implementing propensity-score matching, selection bias was reduced so the significance of the findings are enhanced. The study may provide a piece of evidence to support the associations between union membership and perceptions of safety climate, focusing more on unions as a population or industry. It has been suggested that stronger union connectivity provides feelings of empowerment, fosters a culture of safety, and provides potentially protective health factors (Hogler, Hunt, & Weiler, 2015; Malinowski, Minkler, & Stock, 2015; Mishel, 2012). Although union membership nationwide is declining, it is important to recognize they still comprise approximately 10% of the American workforce—which is larger than certain industrial sectors (e.g., mining, transportation) where safety climate research has been previously focused (Bureau of Labor Statistics, 2018a,b,c).

Future studies could utilize longitudinal data to examine perceptions of safety climate or a national cross-sectional study with a larger sample size than what was extracted from the datasets utilized, specifically focused on union members. These studies could , assess attitudes and behaviors for individual- and organizational-level safety behavior factors, such as safety climate, with more questions per construct in the scale than what was available through the QWL to determine if more significant associations can be gleaned in this overlooked but important worker population. For employers or organizations who would like to enhance employee perceptions of safety climate, focusing on unionized employees who may have a tendency towards more negative perceptions of safety climate through bolstering leadership commitment, enhancing collaboration with the union, and addressing other upstream organizational factors could behoove employers and generally improve the organization's workplace health and safety (Barling et al., 2002; Hammer, Bayazit, & Wazeter, 2009; Kelloway et al., 2006; Mullen & Kelloway, 2009; Spigener & Hodson, 1997; Zohar, 2002; Zohar & Tenne-Gazit, 2008).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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A. Le conceptualized the study, conducted and performed the analyses, and drafted the full manuscript. S. Wong provided critical edits to the code and assisted with data analysis. H. Lin assisted with refining the statistical models and provided critical edits to the manuscript. T. Smith provided subject matter expertise on safety climate and provided critical edits to the manuscript.

Appendix A. Condensed industry categories from GSS data 2002–2018

Description	Condensed Industry Category	Census Industry Code Range
Public Services	1	7860–8470, 9370–9590, 9670–9880
Construction, Extraction, and Maintenance Operations	2	0170–0290, 0370–0490, 0770
Manufacturing	3	1070–3990
Transportation, Trade, and Utilities	4	0570–0690, 4070–5790, 6070–6390
Professional Services	5	6470–6780, 6870–7190, 7270–7790
Miscellaneous	6	8560–8690, 8770–9290, 9990

*These industries were condensed based on The Medical Expenditure Panel Survey (MEPS) Industry Condensing Rules Beginning with FY2010 and the MEPS Occupation Codes Condensing Rules Beginning with FY2010 (AHRQ, n.d.a,b).

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