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Accident under-reporting among employees: Testing the moderating influence of psychological safety climate and supervisor enforcement of safety practices

Tahira M. Probst*, Armando X. Estrada

Department of Psychology, Washington State University, 14204 NE Salmon Creek Avenue, Vancouver, WA 98686-9600, USA

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ABSTRACT

We examined accident under-reporting with data from 425 employees employed in 5 industries with above average risk for employee injuries. We expected that rates for unreported accidents would be higher than rates for reported accidents; and that organizational safety climate and perceptions of supervisor enforcement of safety policies would moderate the relationship between unreported accidents and reported accidents. Results showed that the number of unreported accidents was significantly higher than the number of reported accidents. There was an average of 2.48 unreported accidents for every accident reported to the organization. Further, under-reporting was higher in working environments with poorer organizational safety climate or where supervisor safety enforcement was inconsistent. We discuss the implications of these findings for improving accident under-reporting and occupational safety in the workplace.

Each year approximately 4.1 million work-related injuries and illnesses are reported in the United States (Bureau of Labor Statistics, 2007). This figure represents a rate of about 4.4 cases for every 100 full-time equivalent workers. Recent research suggests that these figures may actually underestimate the true number of non-fatal occupational injuries (e.g., Leigh et al., 2004; Rosenman et al., 2006). Such underestimation occurs when organizations fail to record employee injuries and illnesses in the OSHA Log of Work-Related Injuries and Illnesses (*organizational-level under-reporting*) or when employees fail to report injuries and illnesses occurring at work (*individual-level under-reporting*).

Organizational-level under-reporting has been linked to multiple factors including organizational size (Leigh et al., 2004; Oleinick et al., 1995), industry sector (Daniels and Marlow, 2005), perceived lack of management responsiveness (Clarke, 1998) and organizational safety climate (Probst et al., 2008; Zohar, 2003), while individual-level under-reporting has been linked with variables such as fear of reprisals or loss of benefits (Webb et al., 1989; Pransky et al., 1999; Sinclair and Tetrick, 2004); and with a general acceptance that injuries are a fact of life in certain lines of work (Pransky et al., 1999).

This research has advanced our understanding of the factors that influence individual and organizational under-reporting behaviors. However, it is important to note that little research has investigated the effect of organizational safety climate on the accuracy of employee reports of experienced workplace injuries. And, there is limited research examining how supervisory enforcement of safety practices influence employee reporting behaviors. This study begins to address these limitations by examining accident under-reporting among workers employed in above average risk industries. Specifically, we describe the extent of under-reporting of accidents and illnesses; examine how organizational safety climate influence both the number of experienced accidents and the under-reporting of these accidents; and, we examine how perceptions of supervisor enforcement of safety policies affect under-reporting. Before presenting and discussing our main findings, we provide a review of relevant literature to contextualize the present study.

1. Accident under-reporting & organizational safety climate

In the current study, we define under-reporting as a function of both (1) the number of accidents reported by the employee to the organization and (2) the number of accidents experienced by the employee but not reported to the organization. As the discrepancy between the number of unreported and reported accidents increases, under-reporting can be said to increase. Thus, we argue that under-reporting is not adequately captured simply by the number of unreported accidents. Rather, to understand the depth of the problem, one needs to ascertain both the number of unreported accidents as well as the number of reported accidents.[1]

* Corresponding author.
E-mail address: probst@vancouver.wsu.edu (T.M. Probst).

[1] Alternatively, one might argue for conceptualizing under-reporting as simply a function of unreported accidents and total experienced accidents. However, this

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To illustrate this point, consider two employees who have both failed to report 3 accidents, but Employee One reported 4 other accidents, whereas Employee Two reported 0 other accidents. Although they both engage in under-reporting of their accident rates, Employee Two demonstrates less accurate reporting behavior (i.e., failed to report 100% of accidents). On the other hand, whereas Employee One is more accurate about reporting (i.e., reported 57% of all accidents), he has also experienced more accidents overall. In an ideal situation, of course, all accidents would be reported and there would be zero unreported accidents.

Although the exact extent of the phenomenon varies, accident under-reporting has been well documented in the empirical literature (Glazner et al., 1998; Leigh et al., 2004; Pransky et al., 1999; Rosenman et al., 2006). For example, Rosenman et al. (2006) suggest that up to 68% of all workplace accidents and injuries are not captured in national injury surveillance systems set up by the Occupational Safety and Health Administration (OSHA) and the Bureau of Labor Statistics (BLS). Similarly, Probst et al. (2008) report that nearly 78% of all experienced accidents went unreported. Finally, Probst (2006) found that employees failed to report over half of all experienced accidents to their supervisors. While these estimates may vary across studies, the accumulated evidence suggests that under-reporting is a prevalent phenomenon. Accordingly, we expected that:

Hypothesis 1 (replication). The number of accidents reported by employees to their organization will be fewer than the number of accidents experienced but not reported (i.e., under-reporting will occur).

Research examining why employees fail to report on-the-job injuries to their employers suggests that under-reporting may be influenced by a number of characteristics. Specifically, fear of reprisals or loss of workplace perks and pay incentives (Webb et al., 1989; Pransky et al., 1999; Sinclair and Tetrick, 2004); fear of job loss (Probst, 2006); and individual beliefs regarding accident and injuries as an occupational hazard (Pransky et al., 1999) have all been shown to predict accident under-reporting.

Other research has alluded to the importance of organizational safety climate in predicting accident and illness reporting (Bridges, 2000; Clarke, 1998; Glendon, 1991). Zohar (1980) first defined organizational safety climate as "a unified set of cognitions [held by workers] regarding the safety aspects of their organization" (p. 101). While safety climate has traditionally been conceptualized as an organizational-level variable, more recent work suggests that studying climate at the workgroup or individual levels may also be informative and predictive of outcomes (Neal and Griffin, 2004; Zohar, 2003; Zohar and Luria, 2005). Neal and Griffin (2004) specifically argue that safety climate should be defined purely at the individual level reflecting individual perceptions of the value of safety within their organization. This conceptualization of safety climate has been referred to as "psychological climate" (i.e., non-aggregated individual perceptions; Clarke, 2009).

Regardless of the level at which climate is conceptualized or measured, subsequent research has shown that there are a number of dimensions that are important to consider when conceptualizing and measuring organizational safety climate. These include *management values* (i.e., the extent to which management places a high priority on safety), *safety communication* (i.e., the extent to which there is an open exchange of information regarding safety), *safety training* (i.e., the extent to which training is accessible, relevant, and comprehensive), and *safety systems* (i.e., the extent to which safety policies and procedures are perceived to be effective in preventing accidents; Neal et al., 2000).

A significant body of research has shown that these factors are predictive of safety-related outcomes at work such as accidents and injuries, safety compliance, safety motivation, and safety knowledge (Brown and Holmes, 1986; Dedobbeleer and Beland, 1991; Hofmann and Stetzer, 1996; Neal et al., 2000; Probst, 2004). Accordingly, we expect to replicate prior research by finding that:

Hypothesis 2 (replication). Safety climate will be related to the number of experienced employee accidents, such that a more positive climate will be related to fewer accidents.

However, we note that due to sample size restrictions that preclude the meaningful analysis of data at the organizational or workgroup levels, our predictions were made with regard to the effects of psychological safety climate on employee under-reporting. Our conceptualization of safety climate, as an individual difference variable, contributes to the extant literature by proposing that safety climate may also be predictive of individual-level under-reporting of workplace injuries and accidents. Thus, not only does climate predict overall experiences of accidents, but we hypothesize it will predict the extent to which accidents are reported (or not reported) by employees. There are several reasons that support this proposition. First, if employees lack safety training or if safety communication is poor, then they may not know what constitutes an accident or how to report it to the organization. Further, if management is perceived as devaluing safety, employees may (correctly or not) assume that their company does not want to hear or know about injuries when they occur. Additionally, punitive safety systems may serve to discourage reporting by making rewards/punishments contingent upon safety outcomes rather than safety behaviors (i.e., reporting safety concerns).

Preliminary research suggests that safety climate may influence individual-level under-reporting. Clarke (1998) found that the largest predictor of under-reporting by train drivers was perceived managerial reactions to such reports. Drivers who thought that managers would be unresponsive or unconcerned about safety incidents were less likely to report accidents when these occurred. Bridges (2000) found that near misses are under-reported when employees perceive low levels of management commitment to safety. Thus, if no incident investigation or corrective actions can be expected to occur as a result of a reported accident, employees may feel it is pointless to report the incident. Glendon (1991) suggests that onerous reporting procedures may have a dampening effect on reporting because employees may decide that it is not worth the effort to report an incident. Furthermore, Glendon (1991) suggests that organizations or industries with a so-called macho work environment may also be more likely to experience employee under-reporting of injuries and illnesses because accidents are seen as part and parcel of the job. Collectively, this research suggests that safety climate may play a role in explaining why individuals choose not to report incidents to their supervisors. Accordingly, we expected that:

Hypothesis 3. Employees who perceive their organizational safety climate to be poor will engage in more accident under-reporting compared to employees who perceive a more positive organizational safety climate.

In addition to using perceptions regarding the organizational safety climate to predict under-reporting, research also points to the importance of supervisor safety-specific behaviors in predicting employee safety outcomes (Hofmann and Morgeson, 2004). In keeping with this notion, Zohar (2003) distinguished between *formal* organizational safety policies and *enacted* organizational safety policies. *Formal* organizational safety policies include, for example, the strategic policy making and development of organiza-

becomes problematic statistically speaking since the latter number is dependent on the former, whereas reported and unreported accidents are independently distributed.

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tional safety procedures by upper management. On the other hand, *enacted* policy refers to the actual implementation and execution of safety procedures and practices among supervisors and employees. Zohar (2003) argues that enacted policies carry greater weight than their formalized counterparts (particularly if there is inconsistency between the two) because they more accurately inform expected behavior-outcome contingencies. In other words, actions speak louder than words when determining safety's true prominence within an organization.

In keeping with this idea, Probst and Brubaker (2001) proposed that *extrinsic safety motivation* would be related to employee accidents and injuries at work. Extrinsic safety motivation involves the perceptions of supervisor enforcement of safety policies (i.e., enacted safety policy), including the extent to which supervisors provide praise for safety compliance and punish for non-compliance. They found that employees who had low extrinsic safety motivation (i.e., supervisors who failed to enforce safety policies) had lower levels of safety compliance and were more likely to experience injuries and accidents at work. Thus, this aspect of enacted safety policy was shown to influence safety outcomes. Unfortunately, the Probst and Brubaker (2001) study did not distinguish between reported, unreported, and near miss accidents.

However, given Zohar's (2003) assertion that enacted safety policies inform expected behavior-outcome contingencies, it can be theorized that employees who have supervisors who are lax in enforcing safety policies (i.e., do not reward compliance or punish non-compliance) would perceive little incentive to report accidents when they occur. Typically, organizations have formal policies that instruct employees to report all safety incidents. However, if supervisors do not directly reward such reporting (or punish failure to report), it is expected that this will inform employees' expected behavior-outcome contingencies such that reporting will not be expected to result in reward, nor will failure to report result in punishment. Therefore, our final prediction was that:

Hypothesis 4. Employees who perceive low supervisor enforcement of safety policies will engage in greater under-reporting than employees who perceive stronger supervisor enforcement of safety policies.

2. Methods

2.1. Participants and procedures

Data were drawn from a multi-organization study of 425 employees working in a light manufacturing firm ($N = 136$); a small heating and cooling company ($N = 22$); 7 dental clinics of a regional dental care organization ($N = 77$); a pulp and paper mill ($N = 128$); and multiple restaurants in the hospitality industry ($N = 62$). We selected these industries and organizations because they represent a wide array of industry sectors with at-or-above average risk of employee injuries (ranging from 2.4 injuries per 100 full-time employees for the dental industry to 6.9 for the heating and cooling sector; Bureau of Labor Statistics, 2007).

Employees within each site were informed about the purpose of the study ahead of time during regularly scheduled meetings and through the use of invitation letters sent by the researchers. Employees were also told that their participation was encouraged by upper management; support was also secured from union officials in the mill, the only unionized site. Surveys containing the measures of interest were distributed by the researchers to groups of employees during data collection sessions that were held during employees' regularly scheduled work shifts. The surveys included a cover letter describing the general purpose of the study and safeguards taken to preserve the anonymity of respondents. We attempted to reach all employees within the organizations by holding survey sessions during all possible work shifts. Additionally, employees were given time off during working hours to complete the survey. While participation was high (estimated response rates of 80–90%), exact rates cannot be determined because the number of employees invited to participate could vary greatly from the number of employees on site on the days the surveys were administered. This was particularly true in the restaurant settings and dental clinics.

Examination of the demographic characteristics of the sample showed that the majority of the participants were male Caucasians (65%) with an average 8.60 years (SD = 9.47 years) on the job. The majority of employees (54%) had a high school education or less, with an additional 33% reporting some college education. The median (and modal) age category of respondents was 35–39 years. Inspection of sample demographics within each organization suggests that the survey respondents were similar to the overall workforce of each organization. More importantly, based on U.S. Census data regarding the gender and racial composition of broadly defined industry categories (US Census Bureau, 2009), our industry samples appear to be fairly representative with respect to those demographic characteristics (see Table 1 for detailed comparisons). Our restaurant sample, however, had greater proportions of males and Caucasians than would be expected given the industry population parameters.

2.2. Measures

2.2.1. Accidents

Workplace accidents were assessed with 2 items developed by Smecko and Hayes (1999) to assess experienced and reported accidents and experienced and not reported accidents. Instructions asked employees to indicate how many safety accidents they *experienced and reported* and how many they *experienced but did not report* to their supervisor over the past 12 months. Reported accidents ranged from 0 (the modal response) to a high of 13, whereas unreported accidents ranged from 0 (the modal response) to a high of 37.[2]

2.2.2. Organizational safety climate

We assessed safety climate with 16 items taken from Neal et al. (2000) designed to assess four dimensions of organizational safety climate including *management values* (e.g., "Management places a strong emphasis on workplace health and safety"), *safety communication* (e.g., There is open communication about safety issues within this workplace), *safety training* (e.g., Safety issues are given a high priority in training programs), and *safety systems* (e.g., There are systematic procedures in place for preventing breakdowns in workplace safety). Items were presented in Likert-type format with a scale ranging from *strongly disagree* (1) to *strongly agree* (7). A principal-components factor analysis extracted one primary factor accounting for 55% of the variance with loadings ranging from .60 to .81. A total climate score was computed based on these results by taking the mean across all items with higher scores reflecting a more positive safety climate (Neal et al., 2000). The Cronbach's alpha coefficient for the composite was .94.[3]

[2] It is important to note that although the nature of accidents might vary from industry to industry (i.e., needle prick in health care vs. pinch in paper mill), employees generally receive training regarding what constitutes a reportable accident in their industry. Additionally, OSHA has specific standards that define a "recordable" accident (i.e., one which must be reported to the organization and recorded in the OSHA Log of Injuries and Illnesses) and these standards do not differ across industries. Often, these standards are used to assess whether the injury resulted in the need for medical treatment beyond first aid.

[3] Although safety climate was measured at the individual-level, and our sample was too small to conduct meaningful analyses at the organizational-level, we

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Table 1
Sample demographics and U.S. 2000 census statistics for comparable NAICS industries.

Sample	Comparable NAICS industry (Code)	Sample % male	NAICS industry % male	Sample % Caucasian	NAICS industry % Caucasian
Light manufacturing	Machinery manufacturing (333)	77.9	77.5	72.8*	82.5
Heating and cooling	Utilities (22)	75.0	77.3	81.8	80.1
Dental clinics	Ambulatory health services (621)	9.1*	23.7	77.9	76.4
Pulp and paper mill	Paper manufacturing (322)	81.2	81.7	81.2	78.1
Restaurants/hospitality	Food services/drinking places (722)	67.7*	47.2	87.1*	65.7

Notes: NAICS = North American Industry Classification System.
* Significant ($p < .05$) departure from population parameter using $\chi_{crit}^2(1) = 3.84$.

Table 2
Descriptive statistics and inter-correlations of study variables.

Variable	*N*	*M*	SD	1	2	3	4
1. Organizational safety climate	398	5.17	1.05				
2. Supervisor enforcement	411	4.49	1.11	.59			
3. Reported accidents	393	.42	1.34	−.11	−.18		
4. Unreported accidents	382	1.02	3.45	−.19	−.28	.35	
5. Total experienced accidents	381	1.43	4.12	−.19	−.29	.62	.95

Note: All correlations are statistically significant at $p < .05$.

2.2.3. Supervisor enforcement

Supervisor enforcement of safety policies was assessed with 3 items from the extrinsic safety motivation scale developed by Probst and Brubaker (2001). Items were presented in Likert-type format with a scale ranging from *strongly agree* (1) to *strongly disagree* (7). A composite score was computed by taking the mean across all items with higher scores reflecting greater levels of supervisory enforcement of safety rules and policies. The Cronbach's alpha coefficient for the scale was .62. Scale items include "My supervisor strictly enforces safety rules and regulations"; "My manager praises me when he or she sees that I am following proper safety procedures"; "When I ignore safety rules, my supervisor punishes me".

3. Results

Table 2 presents the means, standard deviations, and inter-correlations of the variables measured in the study. As can be seen, a positive organizational safety climate was related to fewer reported and unreported accidents. Additionally, as predicted by Hypothesis 2, a positive safety climate was related to fewer total experienced accidents.[4] As would be expected, the organizational safety climate and supervisor enforcement levels were positively correlated ($r = .59$, $p < .01$), suggesting a moderately strong, but not perfect, relationship between the formal and enacted aspects of climate. Interestingly, supervisor enforcement was more strongly negatively related to both reported and unreported accidents than was safety climate, which may provide support for Zohar's contention that enacted safety policies may carry greater weight than the formal organizational safety climate.

3.1. Accident reporting, organizational safety climate and supervisor enforcement

We performed one-way repeated measures ANCOVA, using mean scores for reported vs. unreported accidents as the within-subject factor and organizational safety climate and supervisor enforcement as between-subject factors, to test the remaining hypothesis.[5] As predicted in Hypothesis 1, we found a significant main effect for under-reporting, such that for every one accident reported in an organization ($M = .41$), more than two went unreported ($M = 1.02$), $F(1, 380) = 13.38$, $p < .001$, $\eta^2 = .03$. Significant main effects were also observed for organizational safety climate, $F(1, 361) = 13.57$, $p < .001$, $\eta^2 = .04$; and supervisor enforcement, $F(1, 377) = 35.28$, $p < .001$, $\eta^2 = .09$. Specifically, as the safety climate was perceived to be more positive and supervisors enforced safety to a greater extent, the number of accidents declined.

3.2. Organizational safety climate and supervisor enforcement as moderators of reporting

More importantly, the two central moderation hypotheses of the study were also supported. As predicted by Hypothesis 3, organizational safety climate was a significant moderator of the relationship between reported and unreported accidents, $F(1, 361) = 8.94$, $p < .005$, $\eta^2 = .02$. We used Aiken and West's (1991) method for plotting interactions with continuous data to illustrate the differences between individuals who perceived a negative safety climate (−1 SD) and those with positive safety climate perceptions (+1 SD; see Fig. 1). As can be seen in Fig. 1, when the organizational safety climate was perceived to be positive, there was relatively little discrepancy between the number of reported and unreported accidents. However, when the climate was perceived to be poor, the ratio of accident under-reporting significantly increased to more than 3 unreported accidents for every 1 reported.

As predicted by Hypothesis 4, supervisor enforcement was a significant moderator of the relationship between reported and

did ascertain whether there were in fact shared perceptions regarding the safety climate within each organization (i.e., within-group agreement) and whether these perceptions differed across the organizations (between-sites variability). A one-way ANOVA found significantly different levels of perceived safety climate across the sites, $F(4, 393) = 12.50$, $p < .001$, with climate means ranging from 4.45 to 5.94. Additionally, the r_{wg} (an indicator of within-group agreement) was .73, .48, .85, .73, and .84 for the 5 organizations, respectively. As can be seen, with the exception of the smallest organization (where $n = 22$), agreement levels were sufficiently high (>.70) to conclude that there were indeed shared perceptions regarding the organization's safety climate.

[4] Jointly, Hypotheses 1 and 2 imply that the relationship between safety climate and experienced accidents ($r = -.19$) should be stronger than the relationship between safety climate and reported accidents ($r = -.11$). Because this could have implications for arguments about the practical value of promoting a positive safety climate, we did compute a Hotelling-Williams *t*-test to test for differences in the strength of the two correlations. Although the strength of the correlations were in the expected direction, the test did not reach statistical significance, $t(360) = 1.77$, *ns*.

[5] A more complex analysis was also conducted which included age and tenure as covariates, and gender and organizational site as blocking variables. However, none of these variables demonstrated significant main or interactive effects related to underreporting. Therefore, we report the more parsimonious analysis.

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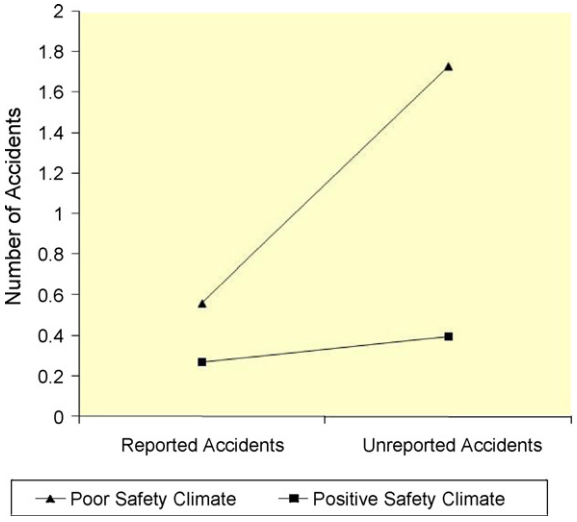

Fig. 1. Accident under-reporting as a function of organizational safety climate.

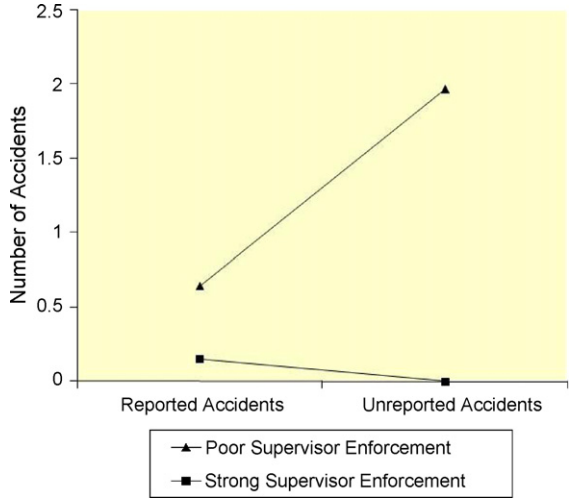

Fig. 2. Accident under-reporting as a function of supervisor enforcement.

unreported accidents, $F(1, 377) = 19.95$, $p < .001$, $\eta^2 = .05$. Again, we used Aiken and West's (1991) method for plotting interactions with continuous data to illustrate the differences between employees experiencing low supervisor enforcement (−1 SD) and those with high supervisor enforcement (+1 SD; see Fig. 2). As can be seen in Fig. 2, when employees perceived low levels of supervisor enforcement of safety policies, they were more likely to engage in greater accident under-reporting than when supervisor enforcement was higher.

3.3. Ancillary analyses

Two additional items designed to examine employees reasoning for under-reporting accidents and employees perceptions of the consequences for reporting accidents were included in the questionnaire for the pulp and paper mill sample. The items were used to delve further into the self-reported reasons for accident under-reporting and provide additional information regarding the causes of under-reporting for this sub-sample.[6]

[6] We added these items to the original survey because of qualitative information gathered during focus group sessions conducted in the pulp and paper mill. Specifically, employees independently raised a number of reasons (specifically, 19 reasons) why they chose not to report an accident, as well as numerous negative outcomes (in total, 14 distinct outcomes) that accrued as a result of reporting. Based on a content analysis of the focus group data, questions were added to the mill's survey that asked employees to indicate whether they endorsed the aforementioned reasons for not reporting accidents and if they had experienced any of the listed consequences of reporting an accident. The wording for each item was as follows: (1) "Sometimes people may have problems at work after reporting a safety-related incident or concern. Did any of the following things happen to you as a result of your report of the incident? Mark Yes or No for each item." (2) "If you experienced but did not report a safety incident within the past year, what were the reasons for not reporting? Check all that apply."

Table 3
Top reasons for under-reporting and perceived consequence for reporting accidents.

Item	Endorsement rate
Reasons for under-reporting	
I took care of the problem myself	73.8%
I did not want to go through the follow-up interviews and questions	69.0%
I did not think anything would be done to fix the problem	51.2%
I did not think it was that important	47.5%
I thought it would make work unpleasant	41.5%
I did not want to be the one to break the company's accident-free record	37.5%
I thought it would affect my crew's safety scorecard	37.2%
Consequences of reporting	
Your group lost scorecard points	37.3%
You were blamed for the incident	23.9%
You were blamed for ending the company's accident-free record	21.7%
People gossiped about you in an unkind or negative way	19.7%
You were unfairly disciplined	18.6%
You were mistreated in some other way	11.6%
You were given an unfair performance evaluation	11.4%
You were given less favorable duties	10%

Note: Numbers could add to greater than 100% since multiple responses could be checked.

3.3.1. Reasoning for under-reporting

Fifty-four percent of employees indicated that they had experienced and failed to report an accident in the previous year. Table 3 lists the most frequently endorsed reasons for not reporting the accident. These top reasons all seem to point to a poor safety climate as potential reasons for failing to report the accident. The most frequently endorsed item indicated the employee took care of the problem his- or herself, suggesting that safety communication is poor in that employees do not see the benefit of an open exchange of information regarding safety. Similarly, thinking nothing would be done to fix the problem perhaps reflects a perception that management does not value safety. Finally, failing to report the accident in order to avoid follow-up interviews, a loss of scorecard safety points, or breaking the company's "accident-free record" points to misguided safety incentive systems that reward for safety outcomes rather than safety behavior.

3.3.2. Consequences of reporting

Fifteen percent of respondents in the pulp and paper mill reported an accident within the past year. Table 3 lists the most frequently endorsed consequences of reporting the incident. Sixty-four percent of all respondents indicated they had experienced at least one negative consequence. These consequences ranged from poor interpersonal treatment (being blamed for the incident or gossiped about) to adverse job performance outcomes (e.g., loss of scorecard points, disciplinary action; poor performance review) and re-assignment to less favorable tasks.

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4. Discussion

The purpose of the present study was to replicate earlier research documenting employee under-reporting of accidents and extend such research by testing whether organizational safety climate and supervisor enforcement of safety would predict such under-reporting. The results from our 5 industry samples consistently indicated that under-reporting does in fact occur. Earlier studies estimated that up to 68% of all workplace accidents and injuries are not captured in the OSHA and BLS national injury surveillance systems (Rosenman et al., 2006). Our data found that 71% of experienced accidents went unreported (i.e., a ratio of unreported to reported accidents = 2.43:1), thus replicating the findings of these earlier studies.

Moreover, we found that the extent of such under-reporting can be predicted both by perceptions of the organizational safety climate and the degree to which supervisors enforce safety policies. When employees perceive their organizational safety climate to be positive, they engage in far less under-reporting (ratio of unreported to reported accidents = 1.46:1). Even more dramatically, when employees report having supervisors who enforce safety policies, they not only experienced far fewer accidents, but they also fully reported all of those accidents. On the other hand, among employees who perceived a poor safety climate and/or lax enforcement, the ratio of unreported to reported accidents was greater than 3:1. These findings illustrate the importance of independently assessing both unreported and reported accidents. Most studies conceptualize under-reported accidents as a function of unreported accidents and total of experienced accidents. This approach ignores the fact that reported and unreported accident may have independent distributions. This distinction is important since it enabled us to examine whether the extent of under-reporting is influenced by common variables, like safety climate and supervisory enforcement of safety policies and practices.

In order to further explore these results, supplemental data were gathered from the mill employees to provide additional information regarding self-reported reasons for not reporting accidents and perceived consequences of any prior reporting of accidents. These data allowed us to evaluate whether self-reported reasons would comport with the climate and enforcement analyses. The responses from the mill employees appeared to be consistent with the safety climate analyses in that explanations for failing to report accidents appeared to relate to previously identified important dimensions of safety climate (e.g., management value of safety, safety communication, and safety systems). Further, nearly 2/3 of employees who did report an accident reported experiencing negative consequences as a result of doing so.

Based on these sets of analyses, it is clear that: (1) under-reporting does occur; and (2) perceptions of organizational safety climate and supervisor enforcement of safety are important variables in the prediction of such accident under-reporting. In the following section, we discuss some of the implications of this finding.

4.1. Implications

Most organizations would claim that the occupational health and safety of employees are of paramount concern. Yet, despite this assertion, accidents and the under-reporting of accidents remain all-too-prevalent occurrences. While the extant literature has provided increasing evidence that a positive organizational safety climate can reduce workplace accidents, this is the first study to demonstrate that safety climate is significantly related to accident under-reporting as well.

Thus, it is important for organizations to recognize that they can benefit from creating a more positive safety climate and a more accurate reporting climate. Organizations are ultimately concerned with the bottom-line costs associated with worker injuries. Poor safety climate organizations with high levels of accident under-reporting do not have fewer accidents; they just have fewer reports of accidents. Thus, while the appearance of fewer accidents may have short-term benefits (e.g., a lower workers' compensation loss rate), these organizations are likely to pay a heavy price when it comes to the long-term health and safety of their employees and the costs associated with the failure to rectify the root causes of the injuries or accidents. Based on the results of this study, fostering a positive safety climate appears not only to be related to fewer workplace accidents, but also appears to improve the likelihood that employees will accurately report accidents when they occur.

In their book on building successful teams at work, Ancona and Bresman (2007) discuss the problem of "quiet fixing." They note:

"At Toyota, for example, when a new car comes off the assembly line with a defective door handle, the person responsible for that part does not fix the problem quietly without the assembly team leader noticing. Instead, the team comes together to identify the root cause of the problem to ensure that it does not happen again. This process often gets noisy, and it requires psychological safety. Without it, quiet fixers would rule the day – leaving the source of the problem and its consequences to crop up again and again (p. 93)."

Although their example relates to quality control issues, it is equally applicable to safety and the hidden problem of accident under-reporting. The results of our research show that safety climate and supervisor safety leadership behaviors (i.e., enforcement behaviors) are potentially critical to determining whether safety problems receive a "noisy fix" or a "quiet fix", whether employees are comfortable with bringing safety concerns and incidents to the attention of their coworkers and supervisor in order to address the root causes of the problem, or whether employees will fail to report incidents, "leaving the source of the problem and its consequences to crop up again and again."

4.2. Limitations and directions for future research

Although the findings of this study were consistent for psychological safety climate as well as supervisor safety enforcement, there are some limitations that should be acknowledged. Of primary concern is the study's reliance on self-report safety data. There are two issues related to self-report data that may raise concerns. First, self-report data can be inaccurate simply due to an inability to correctly recall safety incidents. For example, the literature suggests that many minor accidents might be forgotten due to extended recall periods. Specifically, research suggests that the accurate recall of workplace accidents may only extend back four weeks (Landen and Hendricks, 1995). In the current study, we asked employees to consider events over the prior 12 months. One method of dealing with the issue of accurate recall in the future would be to utilize new technologies allowing mobile data collection via the use of handheld devices such as a Palm Pilot, whereby longitudinal data on safety incidents and reporting behavior would be collected at set intervals (e.g., once a week) for the duration of the timeframe of interest.

In addition to the problem of inaccurate recall, self-report measures could also be misleading due to impression management goals of the employee. Thus, there might be some incentive for employees to respond to survey questions about reporting in a specific way. However, it is important to note that previous studies do indicate that self-report measures of accidents and unsafe behaviors are related to independent observations of these variables (Lusk et al., 1995). Further, if anything, social desirability responding would act to suppress the variance on these measures as people would probably tend to underestimate rather than overestimate

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these variables (Hofmann and Stetzer, 1996). Thus, even if impression management were operating in the current study, it would be presumably be operating in the opposite direction from that predicted by the study's hypotheses. Finally, the data collected in the study were completely anonymous and employees knew individual data would not be shared with supervisors or management. Notably, in the current study, we found that on average employees admitted to not reporting 2 accidents for every 1 that was reported.

Nonetheless, gathering archival data on accidents in conjunction with self-report measures is recommended for future data collections. Unfortunately, the only way to gather information regarding unreported accidents is to ask employees how many accidents they have experienced but failed to report. By definition, there would be no independent archival evidence of under-reporting by employees since these accidents are never reported to the organization. However, organizations are required by law to keep track of OSHA recordables. Therefore, an independent measure of "reported accidents" could at least be obtained from the OSHA archival records to complement survey data regarding the number of reported accidents.

In the current study, OSHA archival data was not sought because it would have eliminated the anonymity of our data collection. Thus, to link self-reports with archival data, we would have had to ask employees for identifying information. We made the judgment call that it was more important to preserve anonymity (and therefore, reduce potential impression management threats) than it was to gather an independent source of reported accident data (which would have countered the inaccurate recall threat).

Despite these limitations, this remains a fruitful area for future research. In particular, there are several questions that should be addressed in future studies. For example, what types of injuries are being under-reported in poor safety climate organizations? Is it the case that major accidents are generally reported, but so-called "minors" go unreported? Future research should include a much more exhaustive assessment of reported and unreported accidents using detailed industry and OSHA reports that describe the nature of on-the-job injuries prevalent in the industry, as well as the precipitating event, and whether first aid, lost time, and/or property damage accrued as a result of the incident.

Additionally, are there certain aspects of safety climate that contribute most heavily to under-reporting (e.g., lack of training vs. fear of punishment, etc.)? While the exploratory data gathered in the mill sample provide some insight, it would have been preferable if this data had been collected in all of the organizational samples, so that the generalizability of these results to other organizations and industry sectors could be evaluated. Finally, once the relationship between safety climate and under-reporting is firmly established, the next major step forward would be to design intervention studies to improve an organization's safety climate and subsequently assess the extent to which this change reduces under-reporting.

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