HHS Public Access

Author manuscript

J Agromedicine. Author manuscript; available in PMC 2019 April 22.

Published in final edited form as:

J Agromedicine. 2019 April ; 24(2): 186–196. doi:10.1080/1059924X.2019.1567421.

System Failure: Work Organization and Injury Outcomes among Latino Forest Workers

Carl Wilmsen[a], **A. Butch de Castro**[b], **Diane Bush**[c], and **Marcy J. Harrington**[d]

[a]Northwest Forest Worker Center, Albany, CA, USA

[b]Department of Psychosocial & Community Health, Occupational Health Nursing Program, University of Washington School of Nursing, Seattle, WA, USA

[c]Labor Occupational Health Program, University of California, Berkeley, CA, USA

[d]Pacific Northwest Agricultural Safety And Health (PNASH) Center, Department of Environmental and Occupational Health Sciences, University of Washington, Seattle, WA, USA

Abstract

Objectives: Forestry services is a hazardous industry with high job-related injury, illness, and fatality rates. The Northwest workforce is largely Spanish-speaking, Latino, and immigrant, working in poor conditions with insufficient attention paid to safety and health. Institutional racism fundamentally shapes the structural vulnerability of Latino immigrant workers. Given this context, we sought to understand how workplace organizational factors and safety climate affect job-related injuries in this industry.

Methods: We developed 23 case studies from personal interviews after selecting from an initial participant survey pool of 99 Latino forest workers in southern Oregon who had been injured at work in the previous 2 years. Workers were recruited through snowball sampling and door-to-door canvassing. Questions spanned work conditions, tasks, employer safety practices, injury experience, medical treatment, and workers' compensation benefits.

Results: Workers reported broken bones, chainsaw lacerations, back pain, heat and pesticide illnesses, and other occupational injuries. One-third of the cases fell into a *Systems Functional* category in which they reported their injuries to their supervisors and received medical treatment and workers' compensation benefits. The remaining two-thirds experienced *System Failures* with difficulties in receiving medical treatment and/or workers' compensation benefits, employer direction to not report, being fired, or seeking alternative home remedies.

Conclusion: Workers employed by companies with more indicators of safety climate were more likely to obtain adequate treatment for their injuries and fully recover. Workers for whom interpretation at medical exams was provided by someone unaffiliated with their employers also reported better treatment and recovery outcomes.

CONTACT Carl Wilmsen carl@nwforestworkers.org Northwest Forest Worker Center, P.O. Box 6722, Albany, CA 94706, USA.

Disclosure statement

No potential conflict of interest was reported by the authors.

Keywords

Work organization; occupational safety and health; safety climate; institutional racism; forest workers; Latino immigrants

Introduction

Conceptual models of causal mechanisms that produce disparities in occupational injury and illness suggest that workplace organization,[1] socioeconomic position,[2] institutional racism,[3] and other factors[4] play significant roles. Through 23 case studies of work-related injuries and illnesses and injury outcomes of workers in the forestry services industry in Oregon, we concluded that safety climate may be positively associated with injury outcomes, and that who interprets during the medical exam may also have an influence.

Forestry services work is designed to support timber production, reduce wildfire risk, and/or restore forest conditions. It involves tree planting to reforest logged or burned sites, thinning to decrease tree density and other understory plants, and other tasks to improve forest health. Job tasks and working conditions commonly include felling trees with chainsaws, which entails the risk of being struck by falling trees, branches, or the chainsaw itself; carrying and lifting heavy loads; repetitive motions; navigating rough terrain; riding in inadequately maintained vehicles; extreme temperatures and inclement weather; exposure to contact dermatitis inducing plants (e.g., poison oak, ivy, and sumac), water-borne pathogens, and pesticides; and constant pressures to work harder and faster.[5,6] The industry comprises many small firms that contract with federal land agencies (US Forest Service and Bureau of Land Management), state forestry departments, and private timber companies to achieve forest management objectives.[6]

In Oregon, workers in this industry are largely Latino immigrants. These workers, like other immigrant workers of color, are socially positioned in ways that shape access to employment, education, medical care, housing, and other necessities of life. That social positioning and the relations of power that bear on it entails elevated vulnerability to economic, social, physical, and psychological harm.[7] The institutional racism that underlies this structural vulnerability may have profound implications for health disparities.[3,4] It is a root cause, underlying proximate causes such as immigration status, limited English ability, and exploitive kinship networks,[3,6] of the channeling of Latino immigrants into low-status occupations that perpetuate power imbalances with employers and supervisors.

Forestry services has long been an industry with low pay and dangerous working conditions employing people of color and working-class whites. Accordingly, this workforce is hidden and ignored relative to higher profile loggers (who are mostly white), and has been the subject of derision.[6,8] As such, it is an industry in which immigrant Latinos can find employment compared to limited opportunities to enter other types of work. Moreover, US immigration laws severely limit opportunities for Latino immigrants by criminalizing workers who overstay their visas or cross the border without authorization. At the same time, the “guest worker” visa system, which many forestry services workers use, allows recruitment of workers for low-status jobs, but requires them to return to their countries of

origin upon completion of their contracts. This is an illustrative example of institutionalized racism.[9] This program serves to institutionalize the exploitation of foreign temporary workers of color without allowing them to become permanent residents in US communities. This has been a pattern in US immigration policy for over 100 years.[10] Immigration laws also create an imbalance of power between employers and undocumented workers as well as those on "guest worker" visas.[11,12] These workers are less likely to defend their workplace rights, including safe working conditions, out of fear of deportation or not being re-hired compared to their counterparts with citizenship or permanent residency.[7,12]

Occupational segregation by race is a typical occurrence in the forestry services industry. Labor-intensive, more dangerous work tends to be done by Latino workers, while more specialized, technical, higher paying tasks are performed by white workers.[13] Work is seasonal, from February through November, with no guarantee of work or rehire each season. Workers experience high-pressure work environments where bullying by supervisors is common.[14] Most workers receive little safety training, and health and safety are typically given inadequate attention from management.[5,6] The workforce is not unionized. Collectively, such work organization factors and their attendant power relations place workers in this industry at high risk for job-related injury, illness, and fatality.[15,16]

Given this context, we sought to understand how workplace organizational factors, safety climate, in particular, affect injury outcomes of job-related injuries suffered by workers in the forestry services industry. By "injury outcomes" we mean worker self-reported medical treatment of and recovery from a work-related injury.

Methods

Twenty-three case studies were used to develop rich information that revealed underlying meanings and lessons learned[17] from forest workers who had experienced an injury. We applied principles of participatory action research to this project.[18] University investigators, and a local worker center (WC) partnered to conduct the project. To guide the research, we convened an Expert Working Group (EWG) consisting of forest workers, the WC's community health workers, or promotoras (from the local community), other WC staff, and members from the university research team. The forest workers on the EWG identified core safety issues and informed participant recruitment strategies and foci for a survey. The promotoras were engaged in all aspects of the research including survey development and interpretation of results. Engaging forest workers and the promotoras assured that the research was sensitive to the daily realities of forest work thereby enriching the analysis, and that the research process and products promoted mutual learning as well as sharing of knowledge and power.[18]

Participants were purposively sampled using combined snowball and canvas-style sampling. Eligibility criteria included being 18 years of age or older, currently working for a forestry services contractor, and having been injured on the job in the previous 2 years. Initially, we contacted workers in community social networks known to the WC, and at the conclusion of each interview asked the interviewee for names and contact information of others fitting the eligibility criteria. We also recruited participants by canvassing door-to-door at motels,

trailer parks, and apartment complexes throughout the local area and surrounding towns where forest workers are known to live. Ninety-nine forest workers were enrolled and completed “pre-selection” interviews and were offered $20 gift cards for their participation.

Interviews consisted of open-ended and closed questions to gather information about being injured on the job. Questions asked for details about injury type, how the injury occurred, and about experience getting medical treatment and workers’ compensation benefits. Interviews also included questions about safety training, whether the employer conducts safety meetings and inspects work sites for hazards, whether workers are given rest breaks, and about the pace of work. Interviews further asked questions about the interviewee’s experience in the forestry services industry (how he got started, how long he had been doing it, what types of forest work he had done (tree planting, thinning, etc.) and demographics. All interviews were conducted in Spanish.

From 99 pre-selection interviews, 23 interviewees were selected to complete more in-depth case-study interviews. To be selected, the interviewee’s injury experience had to include at least one of the priority workplace hazards or work organization factors the EWG previously identified. These included slips, trips and falls, heat stress, chainsaws, transportation hazards, pesticides, musculoskeletal disorders, lack of safety training, inadequate personal protective equipment (PPE), bullying, and pace of work. Those completing a case study interview were offered an additional $50 gift card.

Case study interviews were conducted by the same interviewers who conducted the pre-selection interviews using an interview guide consisting of mostly open-ended questions. Interviewees were asked to provide more detail about the injury they reported in the pre-selection interviews. This included information on the environmental conditions at the time of injury (weather, slope, time of day, presence or absence of downed trees and other slash), the manner in which the crew was working that day (pace of work and how the supervisor was managing the crew), how the injury happened, and what the worker, his coworkers, and supervisor did immediately after. Interviewees were also asked to elaborate on their experiences seeking medical treatment and workers’ compensation benefits, what happened when they returned to work, and the current status of their injury. (Interview guides presented in Appendices A and B.)

A professional interpreter translated the interviews into English. We conducted analysis of the interviews using the English translations with frequent references to the original Spanish.

Three bi-lingual research team members coded the case study interview transcripts and corresponding pre-selections interviews. Text associated with codes from each case-study interview were entered into Atlas-ti, and code reports were generated. We read through the code reports and wrote memos to record emerging patterns and points of agreement and disagreement.[19] Quantitative data were entered into an Excel spreadsheet. We calculated averages and generated frequency tables of these data and cross-tabulated data to evaluate relationships between select variables.

Our analysis focused on relationships between injury outcomes and work organization factors, especially safety climate. Safety climate is generally defined as employees’

perception of the value placed on safety within an organization. Indicators of safety climate include the existence of safety policies, practices, resources, and training, as well as perceived management commitment to safety.[20] The indicators we considered included safety training, holding safety meetings, provision of rest breaks, and inspecting the worksite for hazards. Safety training included a subset of variables that described the type of training workers said they received (i.e., training in use of equipment, how to work safely, and others; see Table 2). This was important to consider since training the workers receive is not consistent between workers or between employers.

As analyses progressed, we discerned a pattern in which some workers were given immediate, or almost immediate, medical attention after being injured and were entered into the workers' compensation system for payment of medical treatment and receipt of any compensation for time away from work to which they might have been entitled. Other workers had experiences that departed from such standard procedures. We, therefore, created two broad categories of injury outcome: "system functional" and "system failures." Criteria for inclusion in the *System Functional* category included (1) being taken to a hospital or clinic for treatment of the injury, (2) initiating a workers' compensation claim by filling out form 801 (the form used by the Oregon Department of Business and Consumer Services for this purpose), (3) receiving review by and/or benefits from the workers' compensation division without difficulty, and (4) being allowed to follow the physician's advice by one's employer (for example, light duty or time away from work). Categorization for the *System Failures* category was based on (1) not being taken by one's employer to a health-care professional for treatment of the injury, (2) being told to lie at the health-care facility about work-relatedness of the injury, (3) not filling out form 801 and not receiving workers' compensation benefits, (4) not being allowed to follow the physician's orders with regard to light duty or recovery time away from work, and (5) being fired or not rehired after being injured.

Because interpersonal relationships between employers, supervisors, and workers, whether based on kinship or otherwise, influence the treatment of workers,[6] we also examined relationships between injury outcomes and the workers' self-reported relationships with their supervisors and coworkers. We also considered the influence of perceived injury severity.

Results

The 23 case study interviewees were all men from Mexico with an average age of 30. The sample was split fairly evenly between workers with H-2B visas (11 workers) and workers with unknown immigration status (12). At least 15 different employers (34% of the 44 registered contractors in the Medford area) were represented in the sample; three workers declined to name their employers. The interviewees had been in the US for 8.5 years on average and had worked for their current employer for an average of 3 years.

Table 1 presents the results of the case study interviews organized by injury outcome category. The *System Functional* category included about one-third (7) of the case studies. In these, workers described injury outcomes in which the healthcare system functioned, more or less, as intended. These cases generally unfolded in the following way: The worker,

or a co-worker, promptly reported the injury to the foreman. The injured worker was evacuated, taken to a nearby hospital or clinic, and treated for the injury. The health-care provider was informed that the injury was work-related, and the case was entered into the workers' compensation system.

The remaining two-thirds of the case studies fell into the *System Failures* category. Failure of the system was initiated by the employers opting to not participate in it. In four cases, workers did not receive workers' compensation benefits despite missing from 14 to 45 work days due to injury, instead receiving compensation directly from their employers for time away from work. In three of those cases, workers were instructed to lie at the hospital about their injuries being work-related. Several other workers in this category described having to wait hours and days for treatment, during which they endured much pain and suffering. Workers who were not taken to the hospital treated their injuries with home remedies, sought the care of traditional healers, or sought treatment at the hospital or by chiropractors on their own. Seven workers were ultimately fired and one, we subsequently learned, committed suicide.

While workers in the *System Functional* category were more likely to report worksites with safety climate indicators (5 of 7 reported at least one indicator vs 5 of 16 in the *System Failures* group), two workers in this group did not report any indicators. The only two workers who reported their worksites reflected all four safety climate indicators (training, safety meetings, rest breaks, site inspections) were, in fact, in the *System Functional* group. The five workers in the *System Functional* group who reported training also reported a much broader range of training than workers in the *System Failures* group (Table 2).

A higher proportion of the workers in the *Systems Functional* category (60%) said they had fully recovered from their injuries than workers in the *System Failures* category (31%). Two case studies were not included in this calculation because it was too early to know what injury outcomes they experienced because we had interviewed them 16 days or fewer after their injury (Table 1).

A similar pattern held for responses to questions about the interviewee's relationship with his supervisor and his coworkers. Greater proportions of workers in the *Systems Functional* group described these relationships in positive terms than workers in the *Systems Failure* group (Table 3).

Discussion

Two things are striking about the case studies: (1) workers who worked for companies with at least one indicator of a safety climate (six different companies in the *System Functional* category) were more likely to have had their injuries handled according to standard procedures and were more likely to have fully recovered from their injuries; and (2) workers whose communication with medical personnel was not mediated by an interpreter who was affiliated with their employer were also more likely to have fully recovered as well as to have received workers' compensation benefits. Other factors that appeared to be related to

differing treatment and outcomes included the worker's relationship with his supervisor and the nature and perceived severity of the injury.

These results provide evidence that attention to safety climate may have led to better outcomes for the injured workers in our study. This complements other studies reporting that safety climate can improve worker safety behavior,[21] may reduce injuries,[22] and may mitigate the negative health effects of other work organizational factors such as job insecurity.[23] These findings have implications for workers in low socio-economic positions, including immigrants and workers of color, who are especially vulnerable to work organization conditions associated with health disparities, such as absence of a safety climate, temporary work, job insecurity, and others.[1,23,24] Such workers are disproportionately represented in work-places with limited training and protection for workers,[25] and this held true for our case studies. That very few of the contractors whose employees we interviewed have established or promoted a safety climate is consistent with prior studies of occupational safety and health in the forestry services industry.[5,6]

A second factor that affected injury outcomes in the case studies was language interpretation at the medical exam. Workers who could communicate directly with health-care staff or who had an interpreter who was unaffiliated with their employer fared better in getting treatment and workers' compensation benefits, suggesting that the interface with the healthcare system is an important factor in shaping injury outcomes. Holmes[26] demonstrated the crucial role communication between doctor and patient plays in injury outcomes of injured workers. In his study, Triqui-speaking workers faced a medical system that was ill-equipped to handle non-Spanish speaking Latin Americans. Language barriers, conscious and unconscious bias, and lack of understanding by health-care personnel of the living conditions and workplace stressors farmworkers face, led to poor injury outcomes for many of these workers and their family members. In our case studies, in which all workers were Spanish speakers (a language for which interpretation is relatively easy to supply), the fact that three employers instructed workers to lie at the hospital about their injuries being work-related indicates that employers may have deliberately taken advantage of language barriers to steer the economic outcomes of medical treatment to favor them. That workers for whom a company employee served as interpreter fared poorly even when there was no evidence of such workers' compensation fraud shows that there was some communication barrier when a company employee acted as interpreter. Perhaps the employee/interpreter was not medically knowledgeable or had an interest in protecting the company or both.

Current workers' compensation law in Oregon grants workers the right to choose an interpreter at medical exams. The assumption underlying this law is that all workers will feel equally privileged in advocating for themselves. The fact that the law elides the fear of being fired, being deported or not being issued a work visa the next year that many forest workers (and other immigrant workers) feel is part of the structural racism Latino and other workers of color routinely face.[9] This finding suggests current models attempting to explain the relationships between structural discrimination and health disparities,[2,4] as well as between work organization and health disparities,[1] need to incorporate the role played by the interface between work and the health-care system.

The four cases in which the employers themselves directly paid the injured workers' expenses reveal that the relationship is complex. In each case this was observed, the worker's injury was treated, and he received compensation for missed work time – seemingly receiving the same benefits he would have if the case had been handled through the workers' compensation system. When the legally prescribed process is not followed, however, other factors may come into play more strongly. Only one of these four workers said he had fully recovered and was no longer experiencing symptoms at the time of his interview. He was also the only one of these four who described his relationship with the foreman as very good, saying that they had worked together for a long time. That more workers in the *Systems Functional* category described their relationship with their foreman as good than the workers in the *System Failures* category (Table 3) indicates that having a good relationship with one's supervisor may have been related to positive injury outcomes. This effect may have been more pronounced when employers handled injuries through extralegal procedures. Workers who were part of the boss's or foreman's in-group, through long association or friendship, sharing familial ties, or being from the same town in their country of origin, may have benefited from such patron-client relations. Workers who were not part of the in-group may, on the other hand, have suffered discrimination and unfairness.

The nature and perceived severity of the injury may have also accounted for some of the differences in injury outcomes. We were not able to assess injury severity through independent medical evaluations or examination of medical records. Nevertheless, it is interesting to note that all the injuries in the *System Functional* category were either broken bones or chainsaw cuts. While these types of injury were also represented in the *System Failures* category, all of the injuries that do not always exhibit clear external signs of injury or illness on the body (ankle sprains, back pain, heat illness, and acute pesticide poisoning) were in this category. It may be that company personnel were less likely to perceive a serious condition in these instances and, therefore, did not take the workers' complaints seriously.

Support from coworkers was not strongly associated with positive or negative injury outcomes. It may be reasonable to assume that where there is a stronger safety climate, workers would be more likely to support an injured coworker,[27] and proportionally more workers in the *System Functional* group said they felt supported by their coworkers (Table 3). Nevertheless, the evidence from our case studies suggests that mutual support among coworkers was contingent on the power relations in the workplace. The workers' explanations are instructive. One stated that coworkers *cannot* do anything, suggesting that they feel powerless or apathetic out of fear of reprisals or distrust of the boss. Another described coworker support in in-group/out-group terms explaining that workers who do not know the boss or foreman well may not be motivated to support their coworkers. Still other workers described coworker support in more utilitarian terms, suggesting that their coworkers are not supportive of one another because they want to curry favor with the boss. Altogether these differing perspectives describe a work environment where workers feel powerless but will support one another quietly or surreptitiously when they can, and can also be unsupportive if they think doing so is more favorable to their own interests.

Limitations of the study

Using a non-probability sample, as well as it is small in size, limits our conclusions only to the set of workers interviewed. While snowball sampling was appropriate for our study, because forest workers in Oregon are a "hidden population,"[28] with no comprehensive list of them to use as a sampling frame, the method risks over-representing people with similar characteristics, such as disgruntled employees, in the sample.[29] It is also possible that workers who suffered poor injury outcomes were more likely to describe work organization and safety climate in their workplaces as somehow lacking. We sought to reduce these risks by also recruiting study participants through canvassing door-to-door and providing incentives to any interviewee whose referrals led to an interview.[28] Accordingly, the results of the study are not generalizable to the broader population of forest workers in Oregon or elsewhere.

The assessments of work organization in our interviews, as well as the narratives of experiences with job-related injuries, healthcare treatment, and recovery were all self-reports. Reporting bias may affect the information collected, although evidence indicates that self-reports are valid for assessing work history.[30] Memory lapse may also affect the accuracy of the injury narratives.

Conclusion

Institutional racism creates power imbalances between employers and employees in the forestry services industry. These power imbalances usher the potential for abuse of workers through the organization of work in ways that promote production at the expense of employee well-being. Within this context, however, the evidence gathered in our case studies suggests that employers who created more of a safety climate followed through with better medical care for their employees when injured. This comports with research done on workers in other industries[23] and suggests that promoting a safety climate holds promise for improving the occupational safety and health of immigrants and workers of color. While many studies show that Latino workers and other workers of color experience occupational health disparities, and that this is driven in part by institutional racism, studies of the injury outcomes of workers of other races and ethnicities in other parts of the forestry sector are needed to assess any such disparities in the sector. The evidence gathered in our case studies also reveals that the interface between work and the health-care system – that is, communication between medical personnel and the injured worker – may play an important role in determining injury outcomes. We argue that models attempting to explain occupational health disparities need to include the interface with the health-care system.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding

This research was funded by the National Institute for Occupational Safety and Health Cooperative Agreement number 5U01OH010814.

References

1. Landsbergis PA, Grzywacz JG, LaMontagne AD. Work organization, job insecurity, and occupational health disparities. Am J Ind Med 2014;57:495–515. doi:10.1002/ajim.22126. [PubMed: 23074099]
2. Krieger N, Chen JT, Waterman PD, et al. The inverse hazard law: blood pressure, sexual harassment, racial discrimination, workplace abuse and occupational exposures in U.S. low-income black, white and Latino workers. Soc Sci Med 2008;67(12):1970–1981. doi:10.1016/j.socscimed.2008.09.039. [PubMed: 18950922]
3. Gee GC, Ford CL. Structural racism and health inequities. Du Bois Rev 2011;8(1):115–132. doi: 10.1017/S1742058X11000130. [PubMed: 25632292]
4. Okechukwu CA, Souza K, Davis KD, de Castro AB. Discrimination, harassment, abuse, and bullying in the workplace: contribution of workplace injustice to occupational health disparities. Am J Ind Med 2014;57:573–586. doi:10.1002/ajim.22221. [PubMed: 23813664]
5. Wilmsen C, Bush D, Barton-Antonio D. Working in the shadows: safety and health in forestry services in southern Oregon. J For 2015;113(3):315–324. doi:10.5849/jof.13-076. [PubMed: 29643572]
6. Sarathy B Pineros: Latino Labour and the Changing Face of Forestry in the Pacific Northwest Vancouver, British Columbia: University of British Columbia Press; 2012.
7. Quesada J, Hart LK, Bourgois P. Structural vulnerability and health: latino migrant laborers in the United States. Med Anthropol 2011;30(4):339–362. doi:10.1080/01459740.2011.576725. [PubMed: 21777121]
8. Hartzell HJ. Birth of a Cooperative: Hoedads, Inc., A Worker Owned Forest Labor Co-Op Eugene, OR: Hulogos'i; 1987.
9. Feagin J, Bennefield Z. Systemic racism and U.S. health care. Soc Sci Med 2013;103:7–14. doi: 10.1016/j.socscimed.2013.09.006.
10. Mitchell D Labor's geography: capital, violence, guest workers and the post-World War II landscape. Antipode 2011;43(2):563–595. doi:10.1111/j.1467-8330.2010.00855.x.
11. Griffith KL. U.S. migrant worker law: the interstices of immigration law and labor and employment law. Comp Labor Law J 2009;31:125–162.
12. Casanova V, McDaniel J. 'No sobra y no falta': recruitment networks and guest workers in southeastern U.S. forest industries. Urban Anthropol Stud Cult Sys World Econ Dev 2005;34:45–84.
13. Moseley C Ethnic differences in job quality among contract forest workers on six national forests. Policy Sci 2006;39:113–133. doi:10.1007/s11077-006-9005-8.
14. Wilmsen C, de Castro AB, Bush D, Harrington M. Fear and loathing in the forest: power and control of cheap labor in forest work in press.
15. Byler CG. Hispanic/Latino Fatal Occupational Injury Rates Washington, DC: Bureau of Labor Statistics; 2013.
16. Vawter E Oregon Forest Industry: A Comparison of Occupational Safety and Health Measures, 2016 Salem, OR: Oregon Department of Consumer and Business Services; 2017.
17. Stake RE. The Art of Case Study Research Thousand Oaks, CA: Sage Publications; 1995.
18. Minkler M, Wallerstein N, eds. Community-Based Participatory Research for Health San Francisco: Jossey-Bass; 2003.
19. Miles MB, Huberman AM, Saldaña J. Qualitative Data Analysis: A Methods Sourcebook 3rd. Thousand Oaks, CA: Sage Publications; 2013.
20. Schwatka NV, Hecker S, Goldenhar LM. Defining and measuring safety climate: A review of the construction industry literature. Ann Occup Hyg 2016;60 (5):537–550. doi:10.1093/annhyg/mew020. [PubMed: 27094180]
21. Schwarz U, Hasson H, Tafvelin S. Leadership training as an occupational health intervention: improved safety and sustained productivity. Saf Clim 2016;81:35–45.

22. Jiang L, Probst TM, Benson W, Byrd J. Voices carry: effects of verbal and physical aggression on injuries and accident reporting. Accid Anal Prev 2018. doi:10.1016/j.aap.2018.02.017.

23. Probst TM. Safety and insecutiry: exploring the moderating effect of organizational safety climate. J Occup Health Psychol 2004;9(1):3–10. doi:10.1037/1076-8998.9.1.3. [PubMed: 14700454]

24. Grzywacz JG, Arcury TA, Marín A, et al. The Organization of work: implications for injury and illness among immigrant latino poultry-processing workers. Arch Environ Occup Health 2007;62 (1):19–26. doi:10.3200/AEOH.62.1.19-26. [PubMed: 18171643]

25. Moyce SC, Schenker M. Migrant workers and their occupational health and safety. Annu Rev Public Health 2018;39:13.11–13.15. doi:10.1146/annurev-publhealth-040617-013714.

26. Holmes SM. Fresh Fruit, Broken Bodies: Migrant Farmworkers in the United States Berkeley: University of California Press; 2013.

27. Gillen M, Baltz D, Gassel M, Kirsch L, Vaccaro D. Perceived safety climate, job demands, and coworker support among union and nonunion injured construction workers. J Safety Res 2002;33:33–51. [PubMed: 11979636]

28. Heckathorn DD. Respondent-driven sampling II: deriving valid population estimates from chain-referral samples of hidden populations. Soc Prob 2002;49:11–34. doi:10.1525/sp.2002.49.1.11.

29. Shaghaghi A, Bhopal RS, Sheikh A. Approaches to recruiting ‘hard-to-reach’ populations into research: A review of the literature. Health Promot Perspect 2011;1(2):86–94. doi:10.5681/hpp. 2011.009. [PubMed: 24688904]

30. Landsbergis PA, Schnall PL, Pickering TG, Schwartz JE. Validity and reliability of a work history questionnaire derived from the Job Content Questionnaire. J Occup Environ Med 2002;44:1037–1047. [PubMed: 12448355]

Table 1.

Work organization factors, medical treatment, and injury outcomes.

Case #	Receive training?	Hold safety meetings?	Inspect work site?	Rest breaks?	Pace of work	Nature of injury	Taken to hospital?	Who interpreted at medical exam?	Filled out form 801?[1]	Received workers' comp benefits?	Told to lie at hospital?	# Work days missed	Fired or not recruited again	Current status of injury[2]
System functional														
W88	Y	N	N	N	Very fast	Fractured vertebrae & rib	Y	hospital personnel	Y	N[3]		?		Still recovering
W87	Y	Y	Y	Y	Normal	Chainsaw cut	Y	worker bilingual	not sure[4]	N3		?		Still recovering
W82	Y	Y	N	N	Very fast	Cut toe with saw	Y	wife	Y	Y		4		Fully recovered
W73	N	N	N	N	Very fast	Chainsaw cut	Y	Hospital personnel	Y	N		6		Fully recovered
W71	Y	N	N	N	Very fast	Broken foot	Y	Hospital personnel & boss's son	Y	Y		365		Not fully recovered
W59	Y	Y	Y	Y	Fast	Chainsaw cut	Y	worker bilingual	Y	Y		9		Fully recovered
W36	N	N	N	N	Fast	Broken foot	Y	Company foreman	Y	Y		487		Not fully recovered
System failures														
W97	N	N	N	N	Regular	Chainsaw cut	Y	Company foreman	N	N[5]		14		Fully recovered
W95	N	N	N	N	Very fast	Back injury	N	N/A	dk	N		2	Y	Not fully recovered
W85	N	N	N	N	Normal	Concussion	N	Hospital personnel[6]	Y	Y		60	Y	Fully recovered
W80		N	N	N	Fast	Twisted foot	N	N/A	dk	N		5		Recovered w/ symptoms
W75	N	N	N	N	Very fast	Fractured vertebrae	Y	Hospital personnel	Y	N[7]		3		Not fully recovered
W67	N	Y	N	N	Very fast	Broke left thumb	Y	Company foreman	dk	Y		210[8]		Not fully recovered
W63	N	N	N	N	Very fast	Heat illness	N	N/A	dk	N		0		Recovered w/ symptoms
W62	N	N	N	N	Very fast	Back & foot injuries	N	N/A	dk	N		5	Y	Not fully recovered
W38	N	N	N	N	Very fast	Puncture wound	N	girlfriend[6]	Y	N		0	Y	Fully recovered
W35	Y	Y	N	N	Calm	Chainsaw cut	Y	Company manager	dk	N[5]	Y	40		Recovered w/ symptoms
W29	Y	N	N	N	Fast	Contusion of	Y	boss's brother	Y	Y		225	Y	Committed
W24	N	N	N	N	Very fast	Pesticide illness	N	N/A	dk	N		3	Y	Fully recovered
W23	N	Y	N	N	Fast	Fractured vertebrae; gash on head	Y	Company manager	N	N[5]	Y	45		Recovered w/ symptoms

Case #	Receive training?	Hold safety meetings?	Inspect work site?	Rest breaks?	Pace of work	Nature of injury	Taken to hospital?	Who interpreted at medical exam?	Filled out form 801?[1]	Received workers' comp benefits?	Told to lie at hospital?	# Work days missed	Fired or not recruited again	Current status of injury[2]
W22	Y	N	N	N	Very fast	Twisted tendons in his neck	Y	Company manager	dk	N[5]	Y	15		Recoveredw/ symptoms
W5	N	N	N	N	Very fast	Broken arm	Y	foreman	Y	Y		240	Y	Not fully recovered
W1	Y					Twisted ankle	N[9]	N/A	dk	N		0.125		Fully recovered

[1] 801 is the form the Oregon Department of Business and Consumer Services uses to initiate a workers' compensation claim

[2] Recovered w/symptoms = able to work at full capacity but still experiencing symptoms from time to time; Not fully recovered = still not able to work at full capacity

[3] Worker interviewed 16 days or less after accident

[4] Thinks his employer filled out form 801 but isn't sure

[5] Company paid worker while he was not working

[6] Worker was not taken to hospital by company personnel. Went on his own later.

[7] Worker returned to work after 3 days, but eventually quit. Now he does not work, and got WC benefits with the assistance of a lawyer.

[8] Worker was kept working for 20 days after being injured despite doctor's orders.

[9] Worker's injury was probably minor, but worker not given days off or light duty to facilitate recovery.

Table 2.

Safety training interviewees received.

Case# saw	How to use chainsaw	How to plant trees	How to work safely	How to report injuries and illnesses	EmerGency procedures	How to use PPE	Work safely with pesticides	How to lift Heavy objects	What to do in case of violence/ harassment	First aid	Equip ment maintenance
System functional											
W88	Y	Y			Y	Y	Y	Y		Y	Y
W87	Y	Y	Y			Y				Y	Y
W82	Y	Y	Y			Y				Y	
W73										Y	
W71		Y		Y						Y	
W59	Y		Y							Y	
W36										Y	
System failures											
W97											
W95										Y	
W85											
W80											
W75										Y	
W67											
W63											
W62										Y	
W38											
W35	Y									Y	
W29	Y	Y								Y	
W24											
W23			Y							Y	
W22	Y		Y								
W5											
W1						Y					

Table 3.

Knowledge of rights and relationships with supervisor and coworkers.

Case #	Relationship with supervisor	Support of coworkers
System functional		
W88		
W87		
W82	Foreman to worker, that's all	Said coworkers did not support him
W73	Okay	
W71	Like a friend	Coworkers urged foreman nof to take him to the hospital
W59	Good	Felt supported by coworkers
W36	Good	Felt supported by coworkers
System failures		
W97	Good. We've known each other for a long time.	Coworkers told foreman of injury. Describes support as situational.
W95	Foreman talked bad about him after he was injured	Foreman kept his coworkers working
W85		
W80	Not good	
W75	So-so	Coworkers not supportive
W67	Not good	Called coworkers "brownnosers"
W63	So-so	A coworker gave him water, but all kept working
W62		
W38		
W35		
W29	So-so	Said coworkers only wanted to look good for the boss
W24	Feels the foreman doesn't care about him	Coworkers teased him about illness
W23		
W22	Foreman telling them they weren't worth a s*** on day of accident	Coworkers not supportive
W5	Foreman got mad at him when he was injured	Coworkers got mad at the worker who threw the tree because they worked fewer days
W1	Got along well	Coworkers teased him about injury; also massaged his ankle