

Prevalence of serious psychological distress among slaughterhouse workers at a United States beef packing plant

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Abstract.

BACKGROUND: Workers in the animal slaughter and processing industry in the United States experience high rates of occupational injury as well as stressful work conditions, yet mental health in this workforce remains largely unstudied.

OBJECTIVE: To assess prevalence of serious psychological distress (SPD) in a sample of industrial US slaughterhouse workers.

PARTICIPANTS: Workers at an industrial beef packing plant in Nebraska, United States ($n = 137$).

METHODS: We interviewed workers using the Kessler-6, a well-validated measure of non-specific anxiety disorders, to assess SPD. We compared SPD prevalence with national estimates from 2009 CDC's Behavioral Risk Factor Surveillance Study.

RESULTS: Prevalence of SPD among workers was 4.4%, compared to United States population-wide prevalence of 3.6%. Prevalence of mild and moderate psychological distress among these workers (14.6%) was also higher than national estimates. Recent occupational injury, work area and job activities were not associated with elevated prevalence of SPD. Non-Hispanic white workers experienced elevated prevalence of SPD compared to Hispanic or Latino workers (prevalence odds ratio: 6.4; CI: 1.3, 30.5; $p = 0.012$).

CONCLUSION: Workers at a US industrial slaughterhouse experienced higher prevalence of SPD compared to United States population-wide estimates, but occupational risk factors for this outcome were not identified.

Keywords: Abattoir, stress, agricultural workers, occupational health psychology, occupational injury

1. Introduction

A growing body of literature documents the association between occupational injury and poor mental health [1–4]. Although animal slaughter and meatpacking workers in the United States experience among the highest rates of occupational injury of

all industries, there have been few studies of mental health in this workforce [5]. Industrial meatpacking work may involve direct contact with slaughter and butchering of large animals, which may cause distress for some individuals [6–9]. Keeping pace with a quickly moving production line, which has been identified in United States beef packing plants as upwards of 360 head per hour, has also been identified as a cause of anxiety in this workforce [7, 10].

We report here on an analysis of prevalence of serious psychological distress (SPD) in a sample of beef packing workers in Nebraska, United States.

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We sought to compare prevalence of SPD in this population to general population estimates derived from published analyses of the Centers for Disease and Control and Prevention's national Behavioral Risk Factor Surveillance System (BFRSS) [11, 12]. In a prior report on risk factors for occupational injury in this population, we did not find an association between SPD and recent injury [13], however we intended in this short report to assess both prevalence of SPD as well as demographic risk factors for psychological distress among this workforce. The intention of this analysis is to inform the need for additional mental health services for industrial beef packing workers.

2. Methods

2.1. Study design

We recruited and enrolled beef packing workers in a cross-sectional occupational health study in June 2012 using a convenience sampling design during a four-day recruitment period. The primary aim of this research was to evaluate occupational pathogen exposures among meatpacking workers [14], and secondary aims were to assess occupational injury and psychological distress in this population. Participants were full-time employees at a large-scale, unionized beef slaughter and processing facility in Nebraska. The plant employed approximately 2,000 workers and was operated by an international agricultural corporation. Workers were recruited by union leaders primarily in two departments, kill and cut, to represent work areas of the majority of employees, and workers volunteered to participate. Workers were eligible if they spoke English or Spanish, were over the age of 18, and had not traveled outside the country in the last three months. After providing informed consent, participants underwent a 30-minute interview with a trained examiner at a local union hall. Interviews were focused on job tasks, occupational behaviors, demographics, self-reported occupational injury, self-reported psychological distress and medical histories pertaining to infection. All aspects of study design and subject participation were approved by the Institutional Review Board at the George Washington University.

2.2. Measurement

The Kessler-6 (K6) scale was included in the questionnaire tool as a metric of psychological distress.

The Kessler-6 is a short tool used to measure non-specific psychological distress in the previous month, and has been extensively validated [12, 15–17]. The K6 is strongly predictive of non-specific anxiety disorders, severe personality disorders and minor and major depressive disorders, and may recognize individuals with sub-clinical psychological illness, but is not in itself a measure of any specific disorder. The K6 consists of the following questions that examine a subject's feelings of distress during the past 30 days: "How often during the past 30 days did you feel: 1) nervous? 2) hopeless? 3) restless or fidgety? 4) so depressed that nothing could cheer you up? 5) that everything was an effort? 6) worthless?" Subjects answer in regard to the frequency of their experience of these feelings: "All of the time," "Most of the time," "Some of the time," "A little of the time," or "None of the time."

2.3. Data analysis

Kessler-6 responses were coded 0–4 with 0 = "None of the time" and 4 = "All of the time" and summed per subject to represent a continuous psychological distress score ranging from 0–24. Scores were evaluated primarily as a binary variable, with a cutoff of ≥ 13 reflective of serious psychological distress (SPD). Additionally, we evaluated the variable categorically, using the approach of Pearson and colleagues who designated the following categories: 0–7: no psychological distress; 8–12: mild or moderate psychological distress; ≥ 13 high psychological distress [11, 15].

Prevalence and prevalence ratios of SPD was assessed in the study population and across demographic (ethnicity, sex, age, education, household characteristics) and occupational (job type, duration of employment, hours worked per week, recent occupational injury) subgroups. Risk factors for psychological distress using the binary SPD outcome variable (K6 scores $>$ or $<$ 13) were evaluated with exact logistic regression due to small cell counts. Multivariate logistic regression models adjusting for age in brackets consistent the Centers for Disease and Control and Prevention's national Behavioral Risk Factor Surveillance System (BFRSS) data (18–24; 25–34; 35–44; 45–64; >65 years) and sex were evaluated. Prevalence outcomes were compared to the BRFSS data on SPD from 2009, the most recent year the K6 was used [18]. All calculations were performed in Stata/SE 13.1.

3. Results

At our recruitment events, 137 workers met inclusion criteria and were enrolled in this study. More than 90% of study participants identified as Hispanic (92%; $n = 126$), with the remaining participants largely non-Hispanic white (7.3%; $n = 10$). Of participants, 55.5% were men ($n = 76$) and 44.5% were women ($n = 61$). Mean age was 44 years (SD: 11 years). More than 50% of participants had worked in the plant for five years or more (55%; $n = 74$). Additional details on the study population can be found in Leibler et al. 2106 [14].

Prevalence of SPD in the 30 days prior to the study was 4.4% ($n = 6$) (Table 1). Twenty subjects (14.6%) were identified as experiencing mild or moderate psychological distress in the last 30 days and 81.0% of workers reported no psychological distress using the categorical designations. Occupational injury in the last three months was not associated with elevated SPD prevalence ($p = 0.16$), as reported in our study on this topic [13]. No associations were observed between SPD and identified occupational activities or behaviors, including duration of work in meatpacking, hours worked per week, or between SPD and demographic factors.

In univariate models, self-reported ethnicity was a significant predictor of SPD and mild/moderate psychological distress. The prevalence of SPD in non-Hispanic white workers was 6.4 times higher

compared to workers who identified as Hispanic or Latino (prevalence ratio (PR): 6.4; CI: 1.3, 30.5; $p = 0.012$). The prevalence of any psychological distress (moderate or significant scores on the K6) among non-Hispanic white workers was 3.0 times higher compared to Hispanic/Latino workers (PR: 3.0; CI: 1.5, 6.3; $p = 0.009$). In models adjusted for age and sex, the association between ethnicity and SPD was diminished ($p = 0.11$). We observed no other significant associations between SPD and occupational or demographic risk factors in the adjusted models.

4. Discussion

Analyses of K6 responses from the 2009 Behavior Risk Factor Surveillance System (BRFSS) indicate a US general population SPD prevalence of 3.6% (95% CI: 3.2, 4.0). This national survey of 432,607 adults found that 11.6% (95% CI: 10.9, 12.4) of the population identified as having mild or moderate psychological distress [19]. Our findings indicate that workers at this US meatpacking plant may experience higher prevalence of serious psychological distress and moderate and mild psychological distress compared to general US population estimates. Our findings indicate that beef packing workers are an occupational population that should be targeted for mental health services, and that intervention efforts

Table 1

Prevalence (%) of serious psychological distress among a sample of US meatpacking workers ($n = 137$)			
Worker characteristic (n)	Serious psychological distress ^a	Mild or moderate psychological distress ^b	No psychological distress ^c
All workers ($n = 137$)	4.4	14.6	81.0
Sex			
Men ($n = 76$)	2.6	17.1	80.1
Women ($n = 61$)	6.6	11.5	81.2
Ethnicity			
Non-Hispanic white ($n = 10$)	20.0 ^d	30.0	50.0
Hispanic ($n = 126$)	3.2	13.5	83.3
Age			
18–24 years ($n = 4$)	0	25.0	75.0
25–34 years ($n = 23$)	4.4	21.7	73.9
35–44 years ($n = 44$)	9.1	15.9	75.0
45–64 years ($n = 58$)	0	12.1	87.9
>65 years ($n = 8$)	12.5	0	87.5
Department/work area			
Kill floor ($n = 40$)	5.0	15.0	80.0
Cut floor ($n = 71$)	1.4	14.1	84.5

^aSerious psychological distress defined as K6 scores ≥ 13 . ^bMild or moderate psychological distress K6 scores ≥ 8 and ≤ 12 . ^cNo psychological distress defined as K6 scores ≤ 7 . ^dStatistically significant univariate association between SPD and ethnicity (Prevalence ratio: 6.4; CI: 1.3, 30.5; $p = 0.012$) and between all psychological distress (serious, moderate and mild) and ethnicity (Prevalence ratio: 3.0; CI: 1.5, 6.3; $p = 0.009$) using exact logistic regression.

to reduce job-related mental health stressors would improve the health of this workforce.

We were unable to identify occupational factors that were significantly associated with SPD in our study, including recent occupational injury and work area. This observation is discordant with findings from studies of other occupational populations that observe a significant association between occupational injury and poor mental health [1, 3, 11, 20, 21]. However, our findings are consistent with a recent study by Lander and colleagues of a similar workforce in the US [22]. Lander et al. found the prevalence of depression to be higher among US pork processing workers than general population estimates, although no associations between depression and occupational laceration injury risk were observed. It is possible that occupational injury causes less distress among workers in industries with high rates of injury, who may be more accustomed to experiencing frequent injury on the job, reflecting a healthy worker bias. It is also possible that workers who experienced major occupational injury and/or major distress from work stressors were less likely to participate in this study. This latter hypothesis would suggest that the SPD prevalence observed here is an underestimate of the true prevalence in this plant.

In our study, non-Hispanic white workers experienced greater prevalence of psychological distress compared to other workers, who were predominantly Hispanic. The plant workforce was comprised primarily of Spanish-speaking immigrants from Central America, and it is possible that the distress experienced by white non-Hispanic workers was a reflection of their minority experience in the workplace. Being a minority at work has been documented as a cause of stress in prior research [23]. It is also possible that our research reflected national trends in reduced self-reported overall health and heightened distress among non-Hispanic white Americans, particularly those with limited education [24].

4.1. *Limitations*

Our study is limited by small sample size, recruitment of workers from a single plant in one geographic area of the United States, convenience sampling design, covariates focused on infectious disease risk and not chronic conditions, as well as by the use of a single metric of mental health status. As such, it provides an indication of poor mental health outcomes experienced by workers at one facility, and conclusions regarding the workforce as a whole should be

made with caution. Workers were blinded to the intention of the study during recruitment in an effort to minimize selection bias, and our sample did parallel overall demographics of the plant workforce by age and work area. However, it is possible that the volunteer nature of our participants resulted in a sample that was not representative of the overall plant workforce in regard to our outcome measure, which may have biased our results. The questionnaire tool was developed in conjunction with union partners so as to include an accurate description of occupational activities and jobs to reduce misclassification, but it is possible that our findings are affected by unidentified bias in a small study. The discordant timeframe between our occupational injury questions (prior three months) and the K6 tool (prior 30 days) may have resulted in our inability to observe significant associations between occupational injury and psychological distress, and this is a limitation that future studies on this topic can improve upon. Additionally, it is possible that workers who experienced most severe psychological distress did not volunteer to participate in the study, which would have biased our prevalence findings towards the null.

5. **Conclusion**

Results of a study from one plant indicate that workers in the animal slaughter and processing industry may experience elevated prevalence of psychological distress compared to general population estimates, although specific occupational risk factors for these findings were unclear. It is possible that the small size of this study contributed to null findings in regard to occupational risk factors, and larger studies are advised to further evaluate the relationship between work factors and psychological distress in this workforce. Our study evidenced significant differences in experience of psychological distress by ethnicity, suggesting that workers in the ethnic minority within a given work environment may experience elevated prevalence of distress compared to workers of the ethnicity that is a majority in that facility, but these findings as well should be validated with a larger sample. Future research should use more refined psychological assessment tools, include biomarkers of stress, and evaluate workers at multiple plants and in different geographic areas to fully assess these issues. Meatpacking workers are a difficult occupational population to study, due to language barriers and recruitment challenges, and research on

the occupational experience among this population is scant. Mental health is an important area of future study of this disadvantaged and high-risk workforce to inform workplace and community interventions.

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Conflict of interest

None to report.

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