Self-Reported Psychological Stress and Prevalence of Methicillin-Resistant Staphylococcus Aureus Nasal Carriage among Beef Meatpacking Workers in Nebraska

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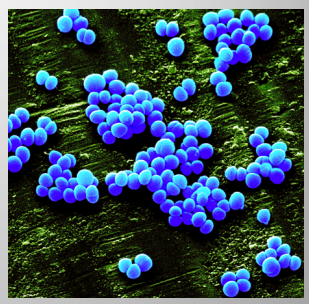
MRSA

- Pathogenic bacteria resistant to beta-lactam antimicrobials
- 1.5% prevalence of MRSA colonization
- Public health impact (CDC, 2010)
  - 82,042 infections
  - 11,478 deaths
- MRSA types
  - HA-MRSA (1960s)
  - CA-MRSA (1990s)
  - **Livestock-associated** MRSA (2000s)



LA-MRSA, Occupational Risk and Stress

- Prevalent in various food producing animals
- Occupational groups at risk:
  - Farmers (pig/veal calf/cattle)
  - Veterinarians
  - Slaughterhouse personnel
- Risk factors for transmission
  - Contact w/animals and animal byproducts
  - Workplace environmental contamination
  - Presence of skin-breaking wounds and infections
  - Stress???

- Biological stress response linked with immune suppression
- Stress factors associated with increased:
  - Infection susceptibility
  - Symptom severity
  - Illness duration
  - Pathogen carriage

- Psychological stressors in the slaughterhouse
  - Animal slaughter
  - Long work hours
  - Discrimination
  - Line speed
  - High workload
  - Low task variety

Study Aims and Hypotheses

Primary aim:

To examine association between self-reported psychological stress and MRSA colonization and infection risk among beef meatpackers in NE

Hypothesis:

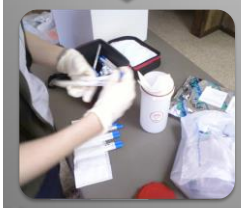
Higher self-reported psychological stress will be associated with increased risk of MRSA carriage and infection

Secondary aim:

To examine the association between occupational factors (job category and hours worked per week) and self-reported psychological stress among beef meatpackers in NE

Hypothesis:

Kill floor work and working >40 hrs/wk will be associated with higher self-reported psychological stress



Methods

- Study design: cross-sectional survey (GWU IRB approval)
- Study population: 2000 member unionized workforce at NE beef meatpacking plant
- Subject recruitment:
  - convenience sample of 137 workers
  - Four-day enrollment at union Local office
  - Inclusion criteria: current plant employee, ≥18 y/o
  - Exclusion criterion: past 3 month travel outside U.S.
- Data collection: nasal swabs and questionnaires
  - Sociodemographic variables
  - Potential confounders
  - Occupational factors
  - Kessler 6-Item Psychological Distress Scale (K6)

Methods: K6 and Psychological Assessment

- Reliable, validated screen for significant psychological distress (SPD)

Stress symptoms	**Past month prevalence**
Nervous	"……of the time"
Hopeless	(0) None
Restless or fidgety	(1) A little
So sad that nothing could cheer you up	(2) Some
That everything was an effort	(3) Most
Worthless	(4) All

- Prevalence scores summed across symptoms (0-24)
- Total K6 score >12 = SPD

Methods: Statistical Analysis

- Descriptive statistics
- Shapiro-Wilk test for normality *(age, work hrs/wk, K6 score)*
- Mann-Whitney U-test for median K6 score differences
- Relative risk comparisons to test associations between all other main outcome and effects *(95% CIs, exact p-values)*

Main outcome variables	**Main effect variables**
S. aureus carriage (Y/N)	Kill floor worker (Y/N)
MRSA carriage (Y/N)	Work hrs/week (≤40 vs >40)
SPD [K6 score > 12] (Y/N)	SPD [K6 score > 12], (Y/N)
Total K6 score (0-24)	Total K6 score (0-24)

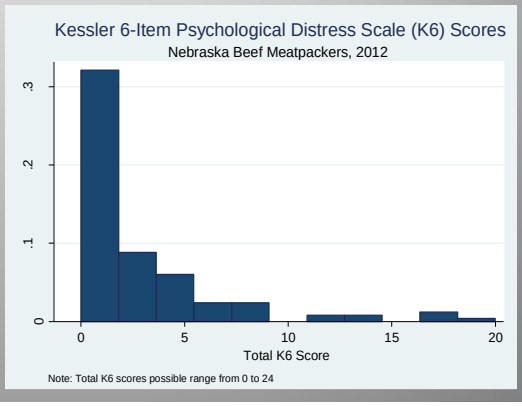
Results: Descriptive Statistics

Characteristic	Total (n=137) No. (%)
Age§, y, mean ±SD	44.1 ±11.0
≤ 44	71 (52.2)
> 44	65 (47.8)
Sex	
Male	76 (55.5)
Female	61 (44.5)
Race	
White	10 (7.3)
Non-White‡	127 (92.7)
Work hrs/week, median (min-max)	40 (33.5-65)
≤ 40	86 (62.8)
> 40	51 (37.2)
Job Category	
Pen floor	1 (0.7)
Kill floor	40 (29.2)
Cut floor	71 (51.8)
Box room	8 (5.8)
Shipping	5 (3.7)
Maintenance	2 (1.5)
Other	10 (7.3)

§ Age and smoking data missing for 1 subject
‡Among non-white subjects, 126 identified as Hispanic and 1 identified as Asian

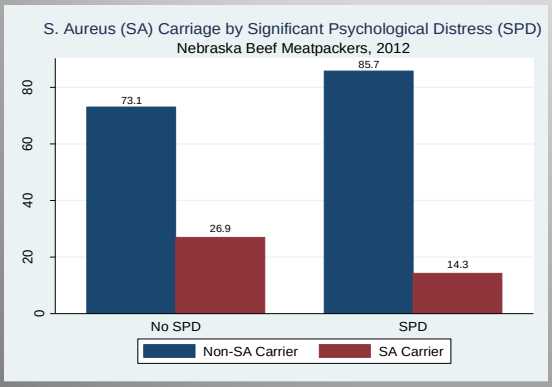
Overall prevalence:
- *S.aureus*: 26.3%
- MRSA: 4.4%
- SPD: 5.1%

K6 scores:
- Median: 1
- Range: 0-20



Results: *S.aureus* and Stress

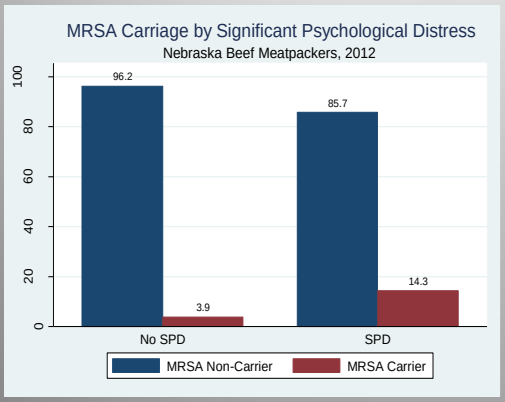
- SPD and K6 score were not associated with *S.aureus* carrier status



	SPD	No SPD
S. aureus Carrier	1	35
Non-*S.aureus* Carrier	6	95
Relative Risk = 0.53 (0.08, 3.33), p=0.68		

Results: MRSA and SPD

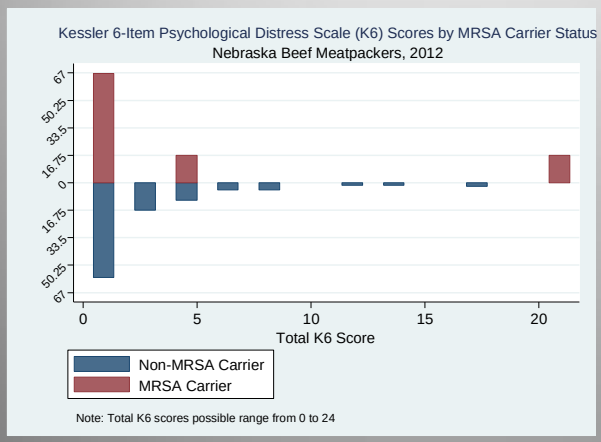
- SPD was not associated with MRSA carrier status



	SPD	No SPD
MRSA Carrier	1	5
Non-MRSA Carrier	6	125
Relative Risk = 3.71 (0.50, 27.66), p=0.27		

Results: MRSA and K6 Score

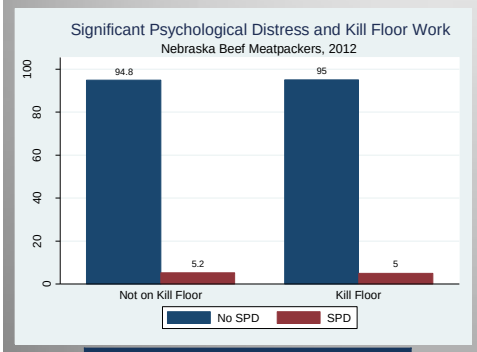
- K6 scores did not differ significantly by MRSA carrier status (p=0.71)



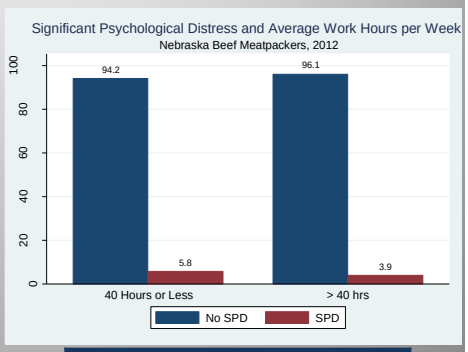
	K6 Score Median (min-max)
MRSA Carrier	0 (0-20)
MRSA Non-Carrier	1 (0-18)
Mann-Whitney U-test, p=0.71	

Results: Stress and Occupational Factors

- No significant associations with either SPD or K6 score
- Non-significant findings between work hours and SPD suggest a negative relationship



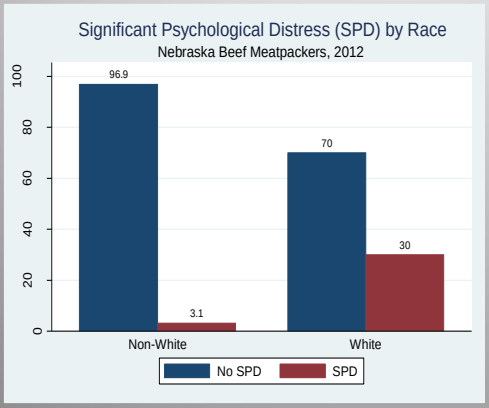
	Kill Floor	Non Kill Floor
SPD	2	5
No SPD	38	92
Relative Risk = 0.97 (0.20, 4.79), p=1.00		



	> 40 hrs/week	≤ 40 hrs/week
SPD	2	5
No SPD	49	81
Relative Risk = 0.67 (0.14, 3.35), p=1.00		

Results: SPD and Race

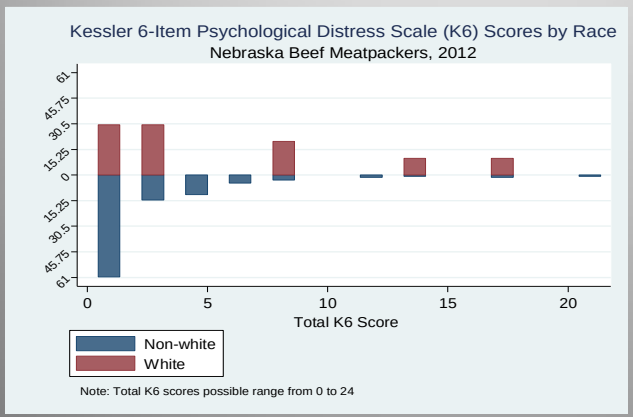
- Whites were more likely than non-whites to have SPD



	Whites	Non-Whites
SPD	3	7
No SPD	4	123
Relative Risk = 9.53 (2.47, 36.80), p=0.01		

Results: K6 Scores and Race

- White workers had statistically significant higher K6 scores than non-white workers



	K6 Score Median (min-max)
White	2 (0-18)
Non-White	1 (0-20)
Mann-Whitney U-test, p=0.05	

Discussion of Key Findings

- Beef meatpackers have elevated risk of MRSA nasal carriage and SPD compared to general population
- Higher psychological distress reported by whites
- No relationship between psychological distress and nasal colonization
- Kill floor work and work hours not related to psychological distress

Discussion of Limitations

- Small sample size
- Lack of control for confounders
- Selection bias – “healthy worker effect”
- Reporting bias – underreport of stress symptoms
- Misclassification of stress or carrier status
- Generalizability limited to unionized workforces in beef slaughter industry

Discussion: Strengths

- Novel investigation
- Source for hypothesis-generation
- Individual-level data
- Laboratory confirmation
- Union collaboration and support

Discussion: Recommendations

- Further investigation of the relationship between stress and colonization susceptibility
- Larger studies to characterize potential occupational stressors within the slaughterhouse working environment
- Better understanding of cultural bias for developing cross-culturally valid psychological assessment methods

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