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# Safety Culture and Agricultural Cooperatives

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# Introduction

- Agricultural cooperatives critical to U.S. agriculture
  - Nearly 200,000 employees and 2 million members (USDA)
  - Volume of business doubled since 2000 (USDA)
  - Old labor force (45% of my sample is 50+)



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# Introduction

- Agriculture has poor safety record (OSHA)
  - Crop production: 5.4 incidents per 100 employees per year
  - Animal production: 6.2 incidents per 100 employees per year
- Agricultural cooperatives also unsafe
  - Surveyed firms: 8.4 incidents per 100 employees per year
- Improved safety reduces costs (insurance, lost days, fines, etc.)

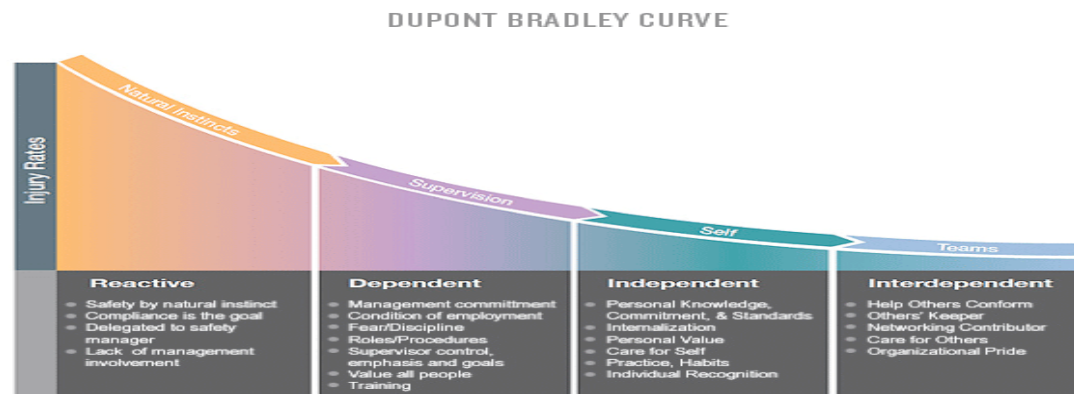


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# Introduction

- **Safety culture** (employee's empowerment to work safely) empirically tied to safety performance (Risch et al., 2014)



- Safety directors boost safety culture through **safety systems** (policies and procedures that promote safety)



# Research Questions

- Which safety systems improve safety culture?
- Does employee background influence safety culture?



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# Conceptual Model

- Cost savings motivate occupational safety
  - $Cost_j = f(Accident\ Rate_j)$
- Safety performance determined by inputs into safety (Oi, 1974)
  - $Accident\ Rate_j = g(Safety\ Culture_j, Safety\ Capital_j)$
- Safety culture created by safety systems and employee background
  - $Safety\ Culture_i = h(Safety\ Systems_j, Background_j)$



# Data

- U of M Occupational Health and Safety Survey administered at 11 firms
- 85% completion rate



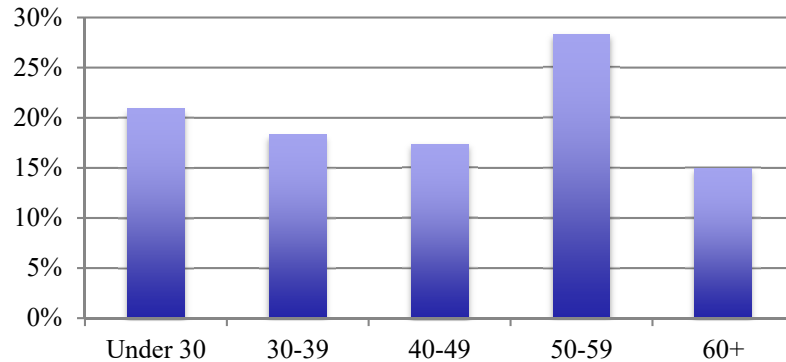
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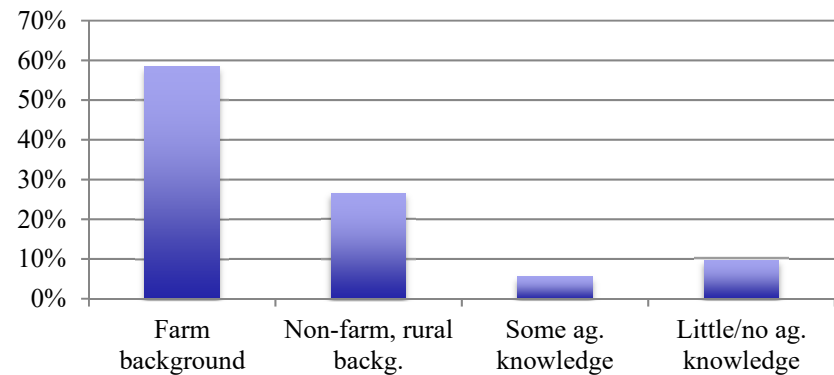


# Data

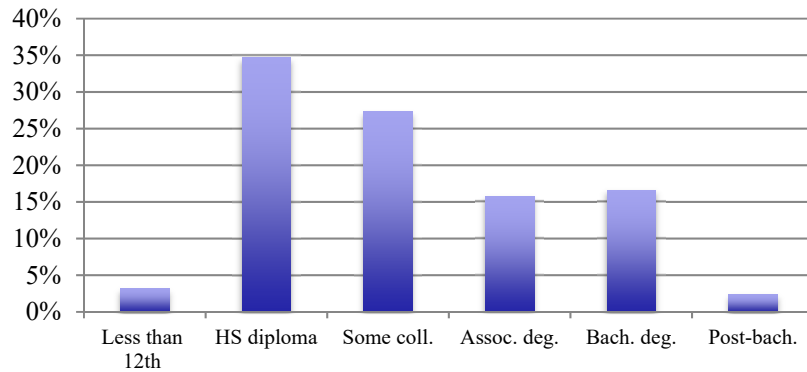
## Age



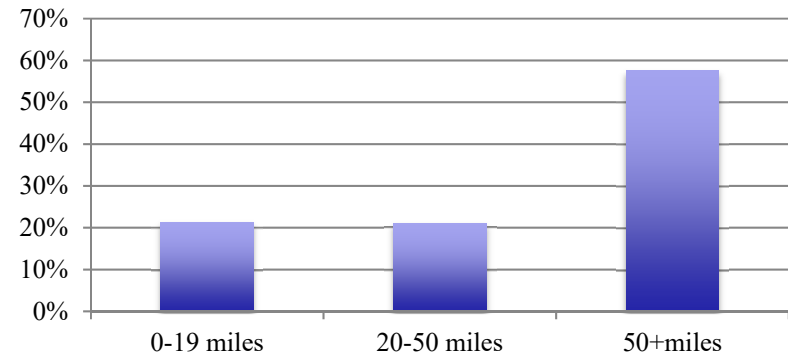
## Agricultural Background



## Education



## Distance to Childhood Home



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# Empirical Model

- $Safety Culture_i = \alpha + \sum_{h=1}^{11} \beta_h SS_{h,i} + \sum_{k=1}^3 \gamma_k B_{k,i} + \varepsilon_i$ 
  - $SS_{h,i}$  is the rating of safety system  $h$  by worker  $i$
  - $B_{k,i}$  is the rating of employee background factor  $k$  by worker  $i$ 
    - Employee education
    - Distance from childhood home
    - Agricultural background
- Managers excluded from sample
- Estimated with OLS and ordered probit



# Description of Variables

Variable	Description
Safety Culture	Empowerment to promote safety of self and others
Training Frequency	Amount of safety training received in past year
Meeting Frequency	Frequency of safety meetings
Meeting Quality	Quality of safety meetings
Discipline Frequency	Extent to which safety incidents are disciplined
Discipline Quality	Consistency with which discipline is applied
Investigation Frequency	Extent to which all workplace accidents are investigated
Investigation Quality	Extent to which investigation findings are implemented
Inspection Frequency	Frequency of safety inspections by managers
Inspection Quality	Relevance and applicability of safety inspections
Mod. Duty Accessibility	Extent to which injured employees have duties modified
Recognition Frequency	Frequency of safety accomplishment recognition
Agricultural Background	Childhood familiarity with agriculture
Distance to Childhood Home	Distance from childhood home to current work site
Educational Background	Maximum educational level attained



# Regression Results

Variable	OLS Coeff. (SE)	Ord. Probit Coeff. (SE)
Training Frequency	-0.011 (0.03)	-0.017 (0.056)
Meeting Frequency	-0.027 (0.035)	-0.055 (0.065)
Meeting Quality	0.014 (0.032)	0.006 (0.058)
Discipline Frequency	-0.014 (0.029)	-0.031 (0.053)
Discipline Quality	0.086*** (0.032)	0.172*** (0.057)
Investigation Frequency	0.116*** (0.032)	0.176*** (0.056)
Investigation Quality	0.136*** (0.032)	0.231*** (0.056)
Inspection Frequency	0.04 (0.037)	0.07 (0.066)
Inspection Quality	0.095** (0.037)	0.180*** (0.066)
Mod. Duty Accessibility	0.040* (0.024)	0.068 (0.043)
Recognition Frequency	0.098*** (0.024)	0.188*** (0.044)
Agricultural Background	-0.050** (0.021)	-0.105*** (0.04)
Distance to Childhood Home	-0.023 (0.026)	-0.044 (0.047)
Educational Background	0.011 (0.018)	0.017 (0.033)
<i>R-Squared</i>	0.231	
<i>Pseudo R-Squared</i>		0.128

Standard errors in parentheses; \*\*\* = p<0.01, \*\* = p<0.05, \* = p<0.10



# Major Results

- Variables significant at 5% level:
  - Safety culture increases as...
    - **Discipline quality** (consistency) improves
    - **Investigation frequency** increases
    - **Investigation quality** (applicability) improves
    - **Inspection quality** (relevance) improves
    - **Recognition frequency** increases
  - Safety culture decreases as...
    - **Agricultural backgrounds** increases
- Results robust to firm effects and employee age



# Discussion of Safety System Results

- Positive relationship between safety systems and safety culture confirms previous research
- Quality responses to safety successes and failures linked closely to safety culture
- Insights for improving safety programs:
  - Safety programming must be well-targeted
  - Compliance-based safety insufficient



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# Discussion of Background Results

- Poor safety culture travels from the farm to the workplace
  - According to sample, may be less problematic in future:
    - Workers under 30: 52.3% grew up on farm
    - Workers 60+: 69.9% grew up on farm
- Education and distance to childhood home don't impact safety culture



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# Summary

- At agricultural cooperatives...
  - Safety culture tied to several safety systems
  - Quality of safety systems paramount
  - Agricultural background associated with low safety culture



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# Moving Forward

- Currently estimating safety cost and accident rate models
- Adding observations, expenditure data, 2015 OSHA data
- Other questions:
  - Most common injuries? Can safety systems prevent?
  - Net benefit of safety investment? How long until positive?



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# Thanks for Listening

- Questions?
- Comments?



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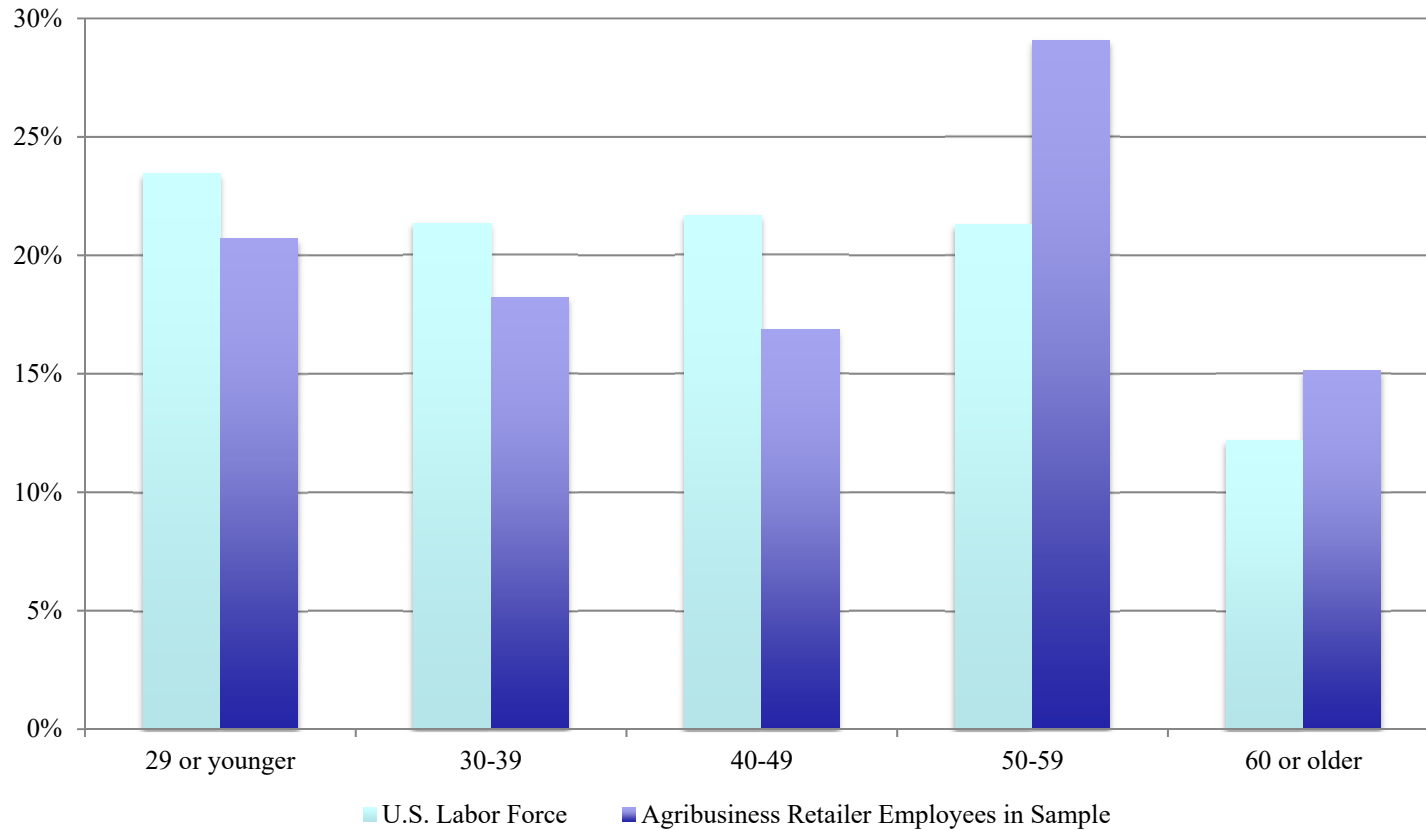
# Appendices



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# Age Distribution of Sampled Employees



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## Regression Results, Managerial Workers

<i>Variable</i>	<i>Ordinary Least Squares</i>	<i>Ordered Probit</i>
Training Frequency	-0.101 (0.104)	-0.211 (0.260)
Meeting Frequency	0.021 (0.123)	0.049 (0.284)
Meeting Quality	0.189 (0.133)	0.474 (0.326)
Discipline Frequency	0.053 (0.099)	0.006 (0.250)
Discipline Quality	0.070 (0.106)	0.271 (0.249)
Investigation Frequency	-0.098 (0.110)	-0.238 (0.241)
Investigation Quality	0.178* (0.098)	0.451** (0.217)
Inspection Frequency	0.017 (0.116)	0.177 (0.266)
Inspection Quality	0.170 (0.135)	0.359 (0.307)
Mod. Duty Accessibility	0.077 (0.084)	0.301 (0.188)
Recognition Frequency	0.104 (0.084)	0.242 (0.197)
Agricultural Background	0.083 (0.083)	0.187 (0.181)
Distance to Childhood Home	0.041 (0.073)	0.099 (0.167)
Educational Background	0.093* (0.052)	0.200* (0.121)
Constant	0.890 (0.644)	
Constant Cut 1		4.053** (1.658)
Constant Cut 2		4.995*** (1.648)
Constant Cut 3		6.507*** (1.703)
Observations	90	90
R-Squared	0.301	
Pseudo R-Squared		0.223

*Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.10*



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## OSHA Incidence Rates

<i>NAICS Code</i>	<i>Subsector Name</i>	<i>Total recordable cases</i>	<i>Cases with days away from work</i>	<i>Cases with job transfer/restriction</i>	<i>Other recordable cases</i>
	<b><i>Private industry</i></b>	<b><i>3.3</i></b>	<b><i>1.0</i></b>	<b><i>0.7</i></b>	<b><i>1.6</i></b>
115	Support activities for agriculture and forestry	6.0	2.3	1.4	2.4
424	Merchant wholesalers, nondurable goods	3.9	1.4	1.2	1.3
454	Nonstore retailers	3.2	1.2	0.8	Not available
493	Warehousing and storage	5.2	1.8	2.0	1.5

*Incidence rates represent the number of injuries and illnesses per 100 full-time workers in 2013. Incidence rates are calculated per 200,000 work hours (100 workers x 40 hours per week x 50 weeks per year).*

Source: U.S. Department of Labor (2014)



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# Survey Questions

## Part 1. Demographic and Background Questions

1. Choose the location where you work most of the time: (Locations Vary)
2. Choose the department where you work most of the time: (Departments Vary)
3. How would you describe your job? (4 Categories)
4. What is your age? (5 Categories)
5. What best describes your background? (4 Categories)
6. How far is your childhood home from where you currently work? (3 Categories)
7. What is the maximum level of education you have attained? (6 Categories)
8. How many years have you worked for this cooperative? (5 Categories)
9. How many years total have you worked for cooperatives or similar agribusinesses (including years at your current cooperative)? (6 Categories)
10. What is your job category? Check the appropriate category below: (4 Categories)
11. How often are safety meetings held in your workplace? (5-Point Scale)
12. Have you attended a safety meeting within the past 12 months? (Yes/No)
13. Do you attend safety meetings regularly? (Yes/No)
14. How do you rate the quality and effectiveness of the safety meetings at your workplace? (5-Point Scale)
15. How much formal training have you received in safety and occupational health during the last 12 months? (5-Point Scale)

## Part 2. Safety Attitude and Practice Questions (All Responses on 4-Point Scale)

1. I know how my organization's safety performance compares to other organizations in our industry.
2. Disciplinary action (which can range from verbal caution to termination) is taken in response to safety violations.
3. My organization investigates workplace injuries, safety incidents, and near-misses caused by safety violations.



# Survey Questions, Continued

4. I obey safety rules when I am working under time pressure.
5. I know my organization's present performance in achieving our safety goals.
6. Workplace disciplinary action (which can range from verbal caution to termination) is more likely to occur if a safety violation is relatively serious in nature.
7. The benefits of improved safety are less than the costs of achieving improved safety. (Possible benefits of safety include reduced injury expenses and lost work time, better morale, improved productivity, etc.)
8. The senior manager in my organization is more concerned with productivity than safety.
9. I expect my co-workers to inform me of safety violations I commit in their presence.
10. Hourly workers in my organization encourage others to practice good safety.
11. Supervisors and managers in my organization are rewarded for good safety and held accountable for safety incidents in their area.
12. My primary motivation for practicing good safety is avoiding negative feedback from my organization's safety director.
13. Off-the-job safety is addressed in our workplace safety program. (Off-the-job safety includes safety at home, safety when driving for non-work purposes, etc.)
14. The overall safety performance of my organization meets my expectations.
15. Recommendations from safety investigations are added to the safety rules and expectations at my workplace.
16. My organization recognizes and publicizes safety violations more than good safety performance.
17. Workplace safety incidents that do not cause injury or property damage are investigated by my organization.
18. The recognition of good safety performances motivates me to maintain and improve my safety habits.
19. I feel empowered to take action to prevent injuries and ensure the safety of others and myself. (Action may include stopping work, shutting down equipment, or making suggestions or taking steps to fix the safety of the job.)
20. My organization recognizes workplace safety achievements.
21. Workplace injuries are avoidable.
22. Our workplace safety rules are clearly publicized.
23. I am satisfied with the overall safety performance of my organization.
24. My organization's physical assets (equipment, facilities, etc.) are designed for safety.
25. Once good safety performance is reached, improving safety costs more than it delivers in benefits. (Possible benefits of safety include reduced injury expenses and lost work time, better morale, improved production, etc.)
26. All safety rules are obeyed in my workplace.
27. If I am injured on the job, my supervisor will let me return to work but modify my responsibilities until I am fully recovered.





## Survey Questions, Continued

A large empty rectangular box intended for survey questions.



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# Literature Review

- Risch et al. (2014) link accident rates at cooperatives to safety culture and safety culture to safety systems
- I add value to previous research:
  - New, cooperative-specific survey
  - Qualitative measures of safety systems
  - Employee background measures



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