

Children's Behaviors and High-Risk Agricultural Work Exposures: *An Opportunity for Intervention?*



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BACKGROUND



- Children's involvement on their family's agricultural operation is a time-honored **cultural tradition** and is important for **healthy development** (Conger and Elder, 2000)

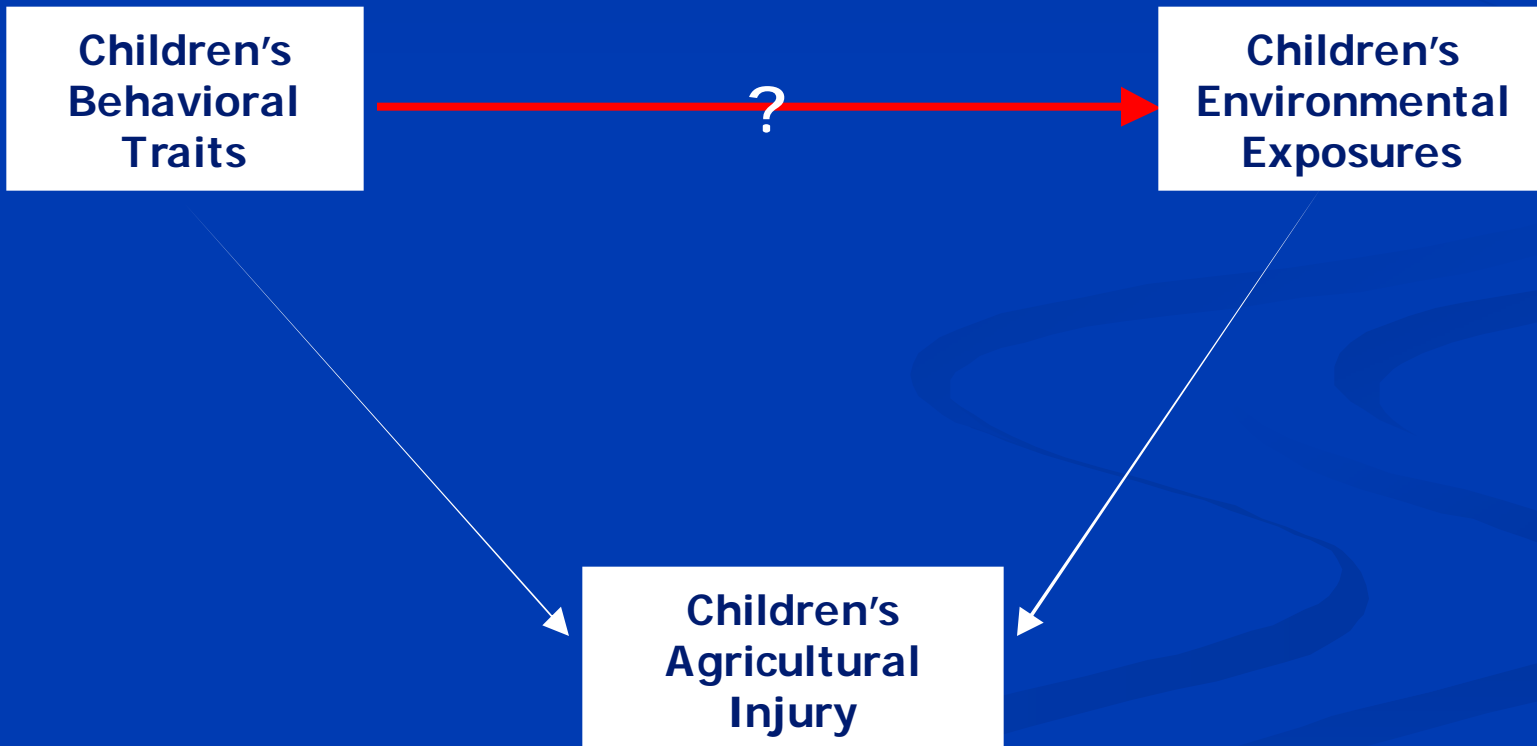
Children's Agricultural Injury

- Rates of fatal occupational injury for the agricultural sector are more than **nine times greater** than for all other occupations combined (National Safety Council, 2007)
- Children who work or are reared on agricultural operations have a **high risk of fatal and nonfatal injury** (Rivara, 1997; Pickett et al., 2001)
- **High-risk environmental exposures** include machinery, tractors, and animals
- **Behavioral traits**, such as depression, aggression, and self-regulation, have also been shown to be risk factors (Carlson et al., 2006)



AIM

To identify associations between children's behaviors and their exposures to high-risk agricultural work environments



METHODS

- Based on combined data from Phase 1 (1999) and Phase 2 (2001) of the **Regional Rural Injury Study – II (RRIS-II)**
- Population-based prospective cohort studies
 - Incidence and outcomes of all injuries among agricultural operation family members
- Nested case-control studies
 - Risk factors for agricultural injuries among children <20 years of age
- USDA National Agricultural Statistics Service master sampling frame
 - 3,200 agricultural operations sampled from each of 5 states (MN, ND, SD, NE, WI)
 - Total n = 16,000 each year



Contact Procedures

- Introductory mailings in January, 1999 and 2001
- Participation interviews using computer-assisted telephone interview (CATI) instrument
 - Agricultural operation had to have an associated household
 - Household had to include children <20 as of January 1
 - Operation had to have produced at least \$1,000 in agricultural goods the year prior to the study
 - Had to be actively farming or ranching as of January 1 of the study period, or be involved in a CRP
- Mailing of comprehensive study materials
- Full-length interviews in July and following January
 - Obtained information on each member of the household (**Demographics, Injury incidence, Injury consequences**)
 - Enrolled Cases and Controls (**Behaviors and Exposures of interest**)

Nested Case-Control Study

■ Case Events

- Agricultural injury incurred by a household member <20, that occurred on their own operation
 - Restriction of activity ≥ 4 hours
 - Loss of consciousness/awareness, or amnesia, for any length of time
 - Treatment by a professional health care provider
- Cases questioned about various exposures of interest during month prior to injury event

■ Controls

- Up to six controls were selected per case
- Randomly assigned a one-month exposure period to proportionately represent number of expected cases during each month for each six-month study period

Study Population

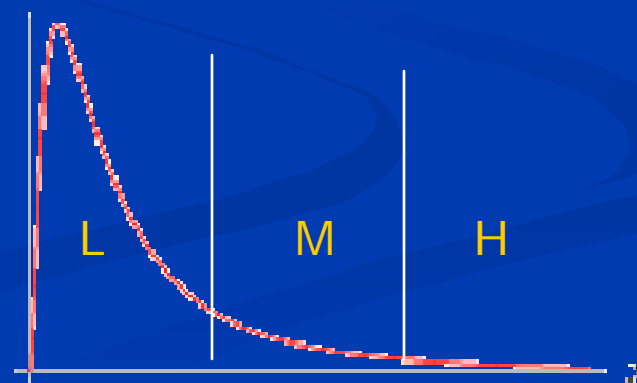
- Aggregate Phase 1 and Phase 2 Data:
 - 7,420 households (84% of eligible)
 - 32,602 family members
 - 410 cases and 1,866 controls (95% and 97% of eligible)
 - 4.6 controls per case
- Behavioral traits assessed for those >5 years of age
 - 379 cases and 1,562 controls
 - Surveys adapted from commonly used inventories
 - Parent Observation of Child Adaptation (POCA)
(Kellam et al., 1975; Ialongo et al., 1999)
 - Child Behavior Checklist (CBCL)
(Achenbach and Edelbroch, 1991)
- Total n for analysis = 1,941

Behavioral Items and Scales

- “Would you say that <child’s name> almost never, sometimes, often, or almost always...?”
 - Acted without thinking?
 - Was impulsive?
 - Was cautious?
 - Was easily distracted?
 - Followed rules?
 - Completed his/her work and chores?
 - Got into fights?
- **Factor analysis** used to develop scales using 18 behavioral items
 - Maximum likelihood analyses with Promax oblique rotation
- Item responses were reversed, where appropriate
- Internal consistency measured using Cronbach’s alphas (Cronbach, 1951)
- **Five factors identified**

Behavioral Scales

- “Depressive Symptoms”
 - Looked sad or down, had low energy, was irritable
 - $\alpha = 0.58$
- “Aggression”
 - Broke rules, got into fights, was aggressive
 - $\alpha = 0.51$
- “Self-Regulation”
 - Was easily distracted, paid attention, worked hard, had good concentration
 - $\alpha = 0.78$
- “Careful/Cautious Behavior”
 - Was careful, was cautious
 - $\alpha = 0.58$
- “Responsible Conduct”
 - Completed work, followed rules
 - $\alpha = 0.60$



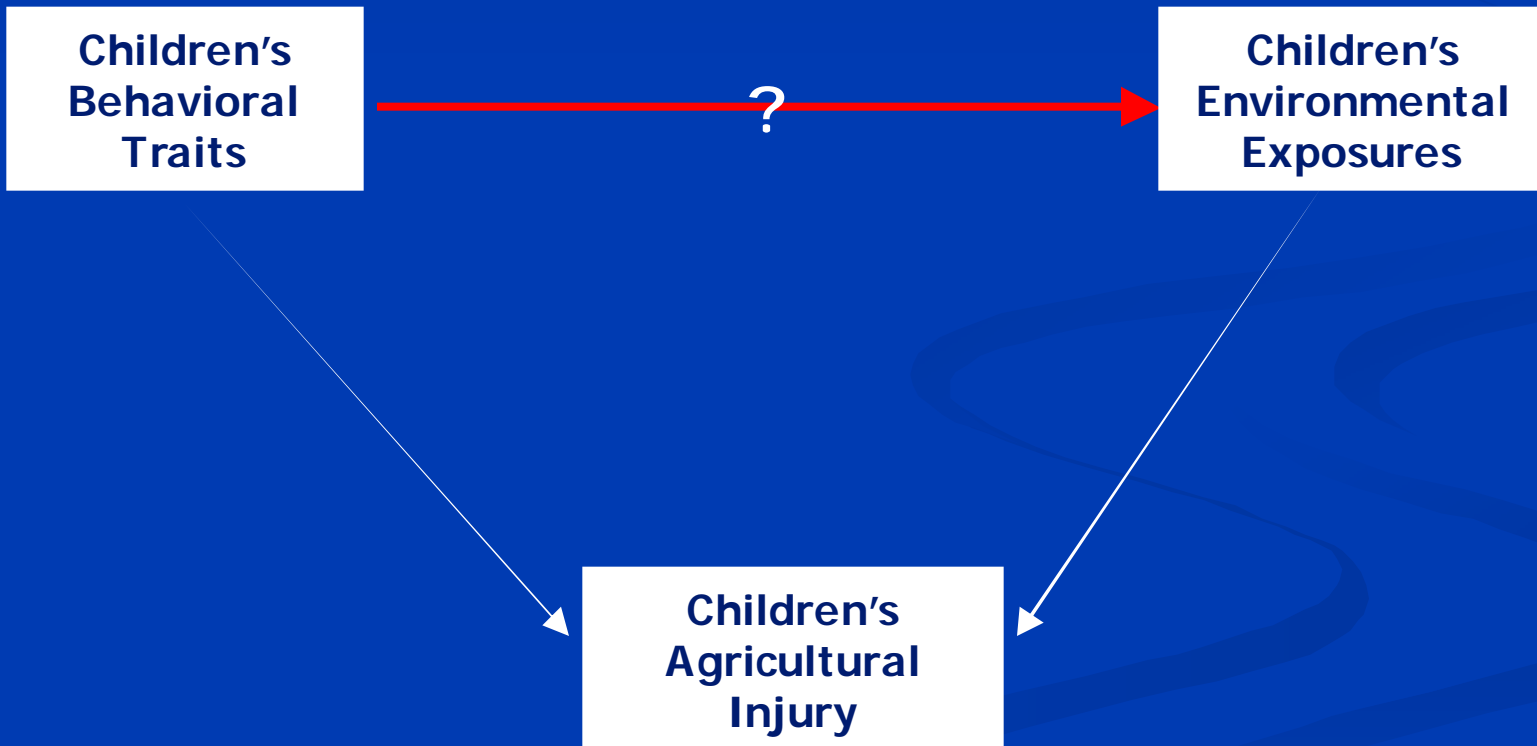
High-Risk Agricultural Work Exposures

- Most questions posed in nominal (yes/no) format
- Responses for the bystanding item categorized as “frequently,” versus “sometimes/never.”
 - Operate Motor Vehicles (OR=1.9; CI=1.3-2.7)
 - Operate Tractors (OR=1.7; CI=1.2-2.4)
 - Ride on Tractors (OR=1.4; CI=1.0-1.8)
 - Operate Large Equipment (OR=1.5; CI=1.1-2.1)
 - Work with Horses? (OR=1.7; CI=1.2-2.3)
 - Work with Beef Cattle? (OR=2.3; CI=1.7-3.1)
 - Work with Dairy Cattle? (OR=1.4; CI=0.8-2.3)
 - Bystanding in Fields or Barnyards (OR=1.2; CI=0.8-1.8)

Multivariable Analyses

- **Multiple logistic regression** used to investigate the relation between specific behaviors and children's risk of exposure to high risk agricultural work
- Adjustments made for **within-household correlation** and **non-response** (Liang & Zeger, 1986; Horvitz & Thompson, 1952; Mongin, 2001)
- **Directed acyclic graphs (DAGs)** used to select groups of potential confounders to include in the models with each behavior of interest (Greenland et al., 1999)
 - **Models included** gender, age, BMI, hours worked, parents' age, parents' education, # children in household, operation state, operation type, operation income, and 17 alternative behavioral items or 4 behavioral scales

RESULTS



Select Results – Behavioral Scales

Behavioral Scale	Operated Tractors	Rode on Tractors	Operated Equipment	Worked with Beef	Worked with Dairy
Depression					
High	1.3 (0.7-2.5)	1.3 (0.8-2.1)	1.1 (0.6-2.0)	0.9 (0.5-1.7)	2.5 (1.3-4.7)
Medium/Low	Referent	Referent	Referent	Referent	Referent
Aggression					
High	1.3 (0.7-2.4)	1.8 (1.1-2.9)	1.7 (0.9-3.2)	0.7 (0.4-1.3)	0.7 (0.3-1.7)
Medium/Low	Referent	Referent	Referent	Referent	Referent
Self-Regulation					
Low	0.6 (0.4-1.0)	1.1 (0.8-1.6)	1.1 (0.7-1.7)	1.1 (0.7-1.6)	1.6 (0.8-3.3)
Medium/High	Referent	Referent	Referent	Referent	Referent
Responsible Conduct					
Low	0.7 (0.4-1.1)	0.8 (0.5-1.1)	0.8 (0.5-1.3)	0.7 (0.4-1.0)	0.6 (0.3-1.5)
Medium/High	Referent	Referent	Referent	Referent	Referent

Select Results – Behavioral Scales

- Children with low levels of **careful/cautious behavior** were more likely to be frequent (vs. sometimes/never) bystanders in fields or barnyards (OR=2.1; 95% CI=1.2-3.8)

DISCUSSION

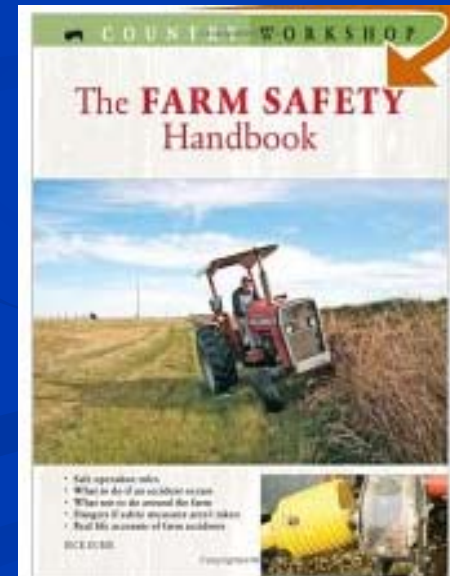
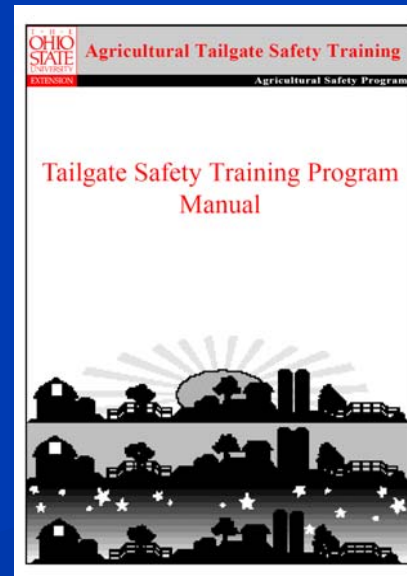
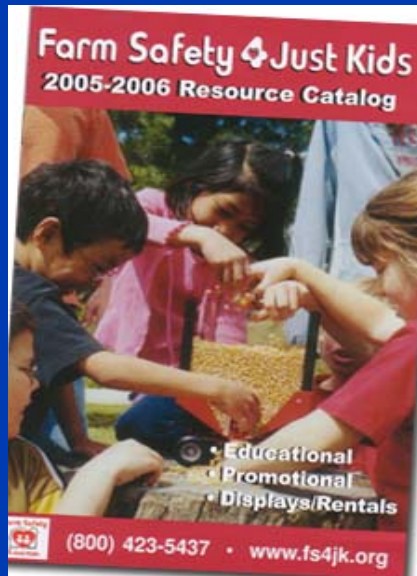
- Children with:
 - High levels of **depressive symptoms** more likely to work with dairy cattle
 - High levels of **aggression** more likely to ride on tractors and operate large equipment
 - Low levels of **self-regulation** less likely to operate tractors
 - Low levels of **responsible conduct** less likely to work with tractors and animals
 - Low levels of **careful/cautious** behavior more likely to bystand in fields or barnyards

LIMITATIONS

- Additional confounding
 - Parental supervision?
- Recall bias
- Behavioral items limited in scope and number

IMPLICATIONS

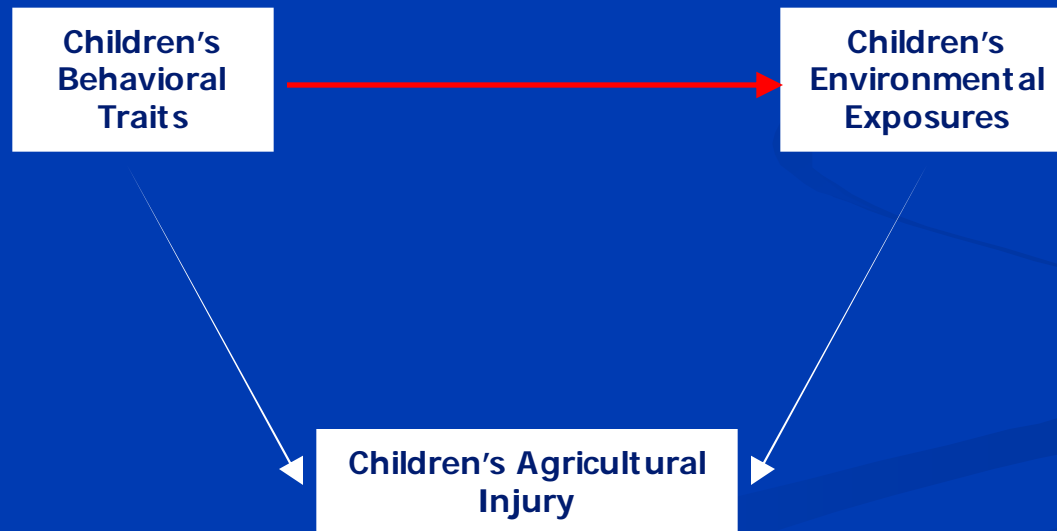
- Children in agricultural households experience behavior-based differential assignment of chores
- Agricultural operations present a unique context in which parent perceptions of individual child behavior, and the nature of work available to children, interact in complex ways
- Safety interventions for this population rely heavily on educational initiatives



Sources: www.fs4jk.org; www.nagcat.org; www.ohioline.osu.edu

IMPLICATIONS

- Educational interventions might include behavioral component
 - Parents' perceptions of children's behavioral traits and their readiness to perform certain chores



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