



Sex Differences in Acute Occupational Pesticide Poisonings among Farmworkers in the Pacific Northwest



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The Rise of Women Farmworkers

- Globally there has been a marked increase in the percentage of women farmworkers over the past several decades
- As of 2010 the share of women comprising the agricultural workforce in developing regions of Africa and Asia rose to over 40%
- Trend can be seen in the US too
- Study among hops workers in southwestern Idaho estimated that more than 50% of the farmworkers were women



An Increased Risk of Pesticide Poisonings

Analysis of SENSOR-Pesticides program data from 1998-2005 (Calvert et al.)

- Risk of acute pesticide poisoning for female agricultural workers almost **two times higher** than male agricultural workers

“...a finding that was quite unexpected. Before indulging in speculation about possible differences in susceptibility, risk of exposure, or rate of ascertainment, we plan to perform more detailed analyses by geographic region, activity at time of exposure, pesticide, protective equipment, and severity.”

An Increased Risk of Pesticide Poisonings

Analysis of SENSOR-Pesticides program data from 1998-2007 (Kasner et al.)

- IR of acute pesticide poisoning among female agricultural workers was **nearly twice** that of male agricultural workers
- Specific to farmworkers
 - IRR female farmworkers to male farmworkers = 2.2



Photo credit: Cynthia Curl

- Highest risk among female farmworker pesticide non-handlers, more likely to be
 - working on fruit and nut crops (especially small fruits)
 - exposed by drift from the application site
 - exposed to fungicides and fumigants

Research Aims

1. Analyze sex-specific risks of acute pesticide poisonings among agricultural workers using the most recent SENSOR-Pesticides program data for Washington and Oregon
2. Identify factors that may contribute to any observed differences
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Photo Source: drought.gov

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Photo Source: drought.gov

Aim 1: Study Population & Case Definition

- SENSOR-Pesticides program data analyzed in collaboration with the Department of Health in one state in the Pacific Northwest
- Farmworker: Individuals that work on, but do not own, a farm
 - Agricultural workers defined by Census Industry Codes for agricultural production, excluding livestock; agricultural production, including livestock; and agricultural services
 - Farmworkers defined by Census Occupation Codes for supervisors, farm workers; farm workers; and nursery workers
- Case of acute occupational pesticide-related illness and injury:
 - Work related status is yes or probably
 - Case status is definite, probable, or possible
- 2010 to 2017, ages 15 to 64, excluded if sex was unknown

Aim 1: Preliminary Results

Table 1. Characteristics of cases of acute occupational pesticide-related illness and injury among farmworkers in one state in the Pacific Northwest, 2010-2017 (N=566).	
	N(%)
Year of exposure	
2010	86 (15.2)
2011	67 (11.8)
2012	54 (9.5)
2013	78 (13.8)
2014	145 (25.6)
2015	59 (10.5)
2016	39 (6.9)
2017	38 (6.7)
Sex	
Men	368 (65.0)
Women	198 (35.0)
Age	
15-24	102 (18.1)
25-34	180 (31.8)
35-44	167 (29.5)
45-54	80 (14.1)
55-64	37 (6.5)
Unknown	0 (0.0)
Race	
White	134 (23.7)
Black	1 (0.2)
Mixed Race	182 (32.2)
Other	20 (3.5)
Unknown	229 (40.4)
Hispanic Ethnicity	
Yes	516 (91.1)
No	27 (4.8)
Unknown	23 (4.1)

Aim 1: Preliminary Results

Table 2. Acute occupational pesticide-related illness and injury incidence rates among farmworkers in one state in the Pacific Northwest by sex, 2010-2017.

	Total			Women			Men			IRR ^c	IRR 95% CI ^d
	Cases	FTE Estimate ^a	IR ^b	Cases	FTE Estimate ^a	IR ^b	Cases	FTE Estimate ^a	IR ^b		
Agricultural Workers: Farmworkers	566	277,248	204.1	198	53,034	373.3	368	224,214	164.1	2.3	1.9, 2.7

^aFTE = Full-time equivalent. FTEs were calculated from the Current Population Survey using employment counts and hours worked. One FTE = 2,000 hours worked.

^bIR = Incidence rate per 100,000 FTEs.

^cIRR = Incidence rate ratio = IR women/IR men.

^dCI = Confidence interval.

Aim 3: Data Availability in Idaho

- Data collected from calls made to the Nebraska Regional Poison Center
- Select list of available information:
 - Sex
 - Age
 - State
 - Date of poisoning
 - Acuity
 - Reason
 - Substance Generic Category
 - Substance Description
 - Substance Verbatim
 - Route
 - Medical Outcome
 - NOTE: No information on industry or occupation

Aim 3: Case Definition

Case of acute occupational pesticide exposure:

- Acute or Acute-on-Chronic
- Unintentional - Occupational
- Insecticide, Herbicide, Fungicide, Rodenticide, Fumigants, Surfactants
- Pyrethroid, Organophosphate, Glyphosate, Copper Fungicide, etc.
- 2012 to 2020
- 16 to 79 years old



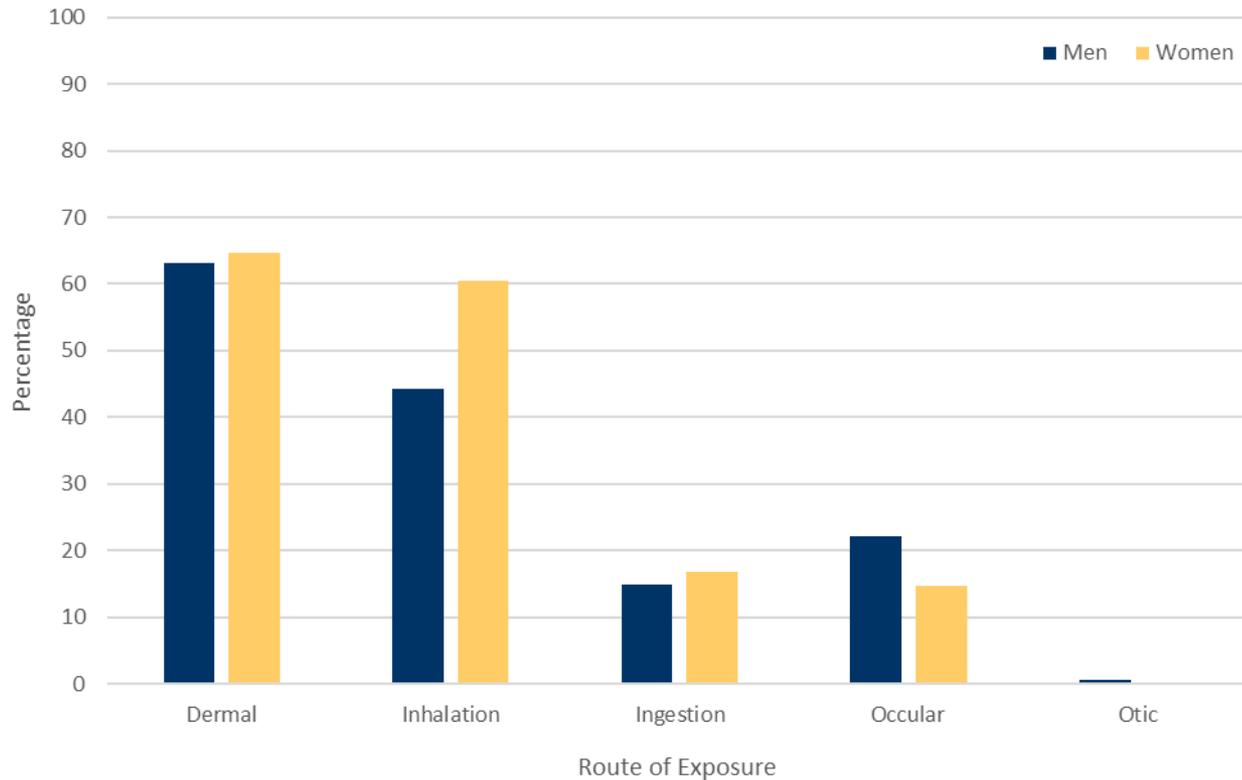
Aim 3: Preliminary Results

Table 1. Characteristics of acute occupational pesticide exposures in Idaho based on calls to the Nebraska Regional Poison Center, * 2012 - 2020 (N = 237 Calls)

	N (%)
Month of event	
January - March	17 (7.1)
April - June	99 (41.8)
July - September	99 (41.8)
October - December	22 (9.3)
Age at time of event	
16-24	37 (15.6)
25-34	56 (23.6)
35-44	27 (11.4)
45-54	32 (13.5)
55-64	19 (8.0)
65+	14 (5.9)
Missing	52 (21.9)
Sex	
Women	48 (20.4)
Men	176 (74.2)
Unknown	13 (5.4)
Exposure substance category[†]	
Insecticides	107 (45.1)
Herbicides	93 (39.2)
Fungicides (non-medicinal)	45 (19.0)
Rodenticides	7 (3.0)
Fumigants	5 (2.1)
Surfactants	1 (0.4)
*Data for calls for acute or acute-on-chronic unintentional exposure to pesticides in the state of Idaho occurring as a direct result of being at work.	
†Calls could be for one case with exposure to multiple substances.	

Aim 3: Preliminary Results

Figure 1. Sex differences in acute occupational pesticide exposures in Idaho based on calls to the Nebraska Regional Poison Center, 2012 - 2020,* by Route of Exposure⁺

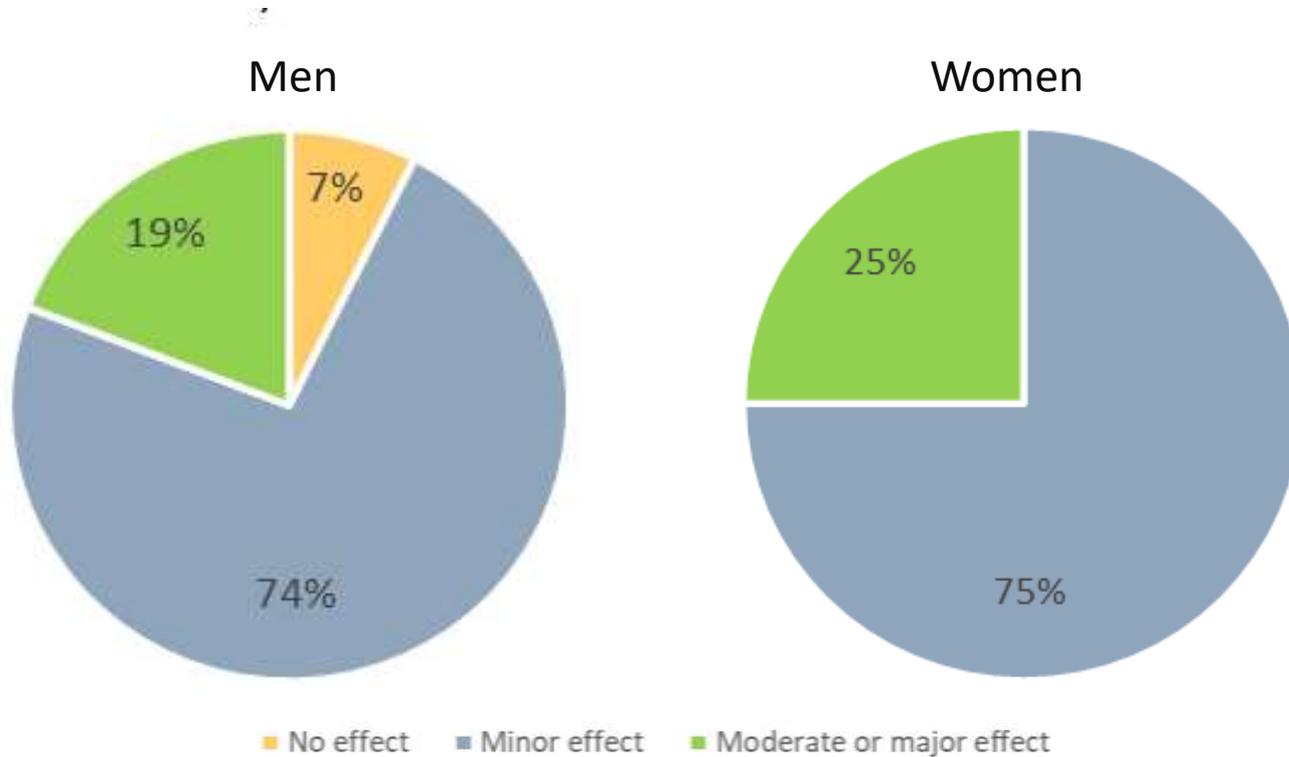


*Data for calls for acute or acute-on-chronic unintentional exposure to pesticides in the state of Idaho occurring as a direct result of being at work.

⁺Calls could be for one case with multiple routes of exposure.

Aim 3: Preliminary Results

Figure 2. Sex differences in medical outcomes⁺ for acute occupational pesticide exposures in Idaho based on calls to the Nebraska Regional Poison Center, 2012 - 2020*



*Data for calls for acute or acute-on-chronic unintentional exposure to pesticides in the state of Idaho occurring as a direct result of being at work.

*Medical outcomes among followed cases.

Conclusions, Limitations & Next Steps

- More up-to-date SENSOR-Pesticides program data from one state in the Pacific Northwest confirms that women farmworkers remain at an increased risk of acute occupational pesticide-related injury and illness compared to men farmworkers
- Continue analysis on SENSOR-Pesticides program data from more states in the Pacific Northwest
- Investigate contributing factors and determine what is actionable
- Data in Idaho does not include specific industry, occupation, or activity at time of exposure, do not know if cases occurred among agricultural workers
- Data in Idaho can only be summarized, cannot calculate FTEs or IRs, is not as informative

Acknowledgments

- PI and mentor: Dr. Cynthia Curl, Boise State University, School of Public and Population Health
- Mentor: Dr. Edward Kasner, University of Washington, Department of Environmental and Occupational Health Sciences
- Dr. Walter Alarcon, Lead Research Epidemiologist, Division of Field Studies & Engineering, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention
- Dr. Daniel Farber, Pesticide Epidemiologist/Environmental Lead System Epidemiologist, Washington State Department of Health
- Joanne Prado, Epidemiologist, Washington State Department of Health
- The SENSOR-Pesticides Program at NIOSH
- Marcia Rasmussen, RN, CSPI, Nebraska Regional Poison Center
- Funded by the Professional Training Opportunities Program, University of Washington, Northwest Center for Occupational Health and Safety

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