PESTICIDE APPLICATORS IN KENTUCKY: THE USE OF PERSONAL PROTECTIVE EQUIPMENT AND FACTORS THAT INFLUENCE ILLNESS

CAPSTONE PROJECT PAPER

A capstone project submitted in partial fulfillment of the requirements for the degree of Master of Public Health in the College of Public Health at the University of Kentucky

Kasandra Lambert
Clearfield, Kentucky

Lexington, Kentucky
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Wayne Sanderson, PhD, Committee Chair

Lee Townsend, PhD

Scott Prince, MD

David Mannino, MD

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Abstract

Objective

The purpose of this study is to investigate factors associated with feeling ill while applying pesticides and the most commonly used pesticides in Kentucky. This study also examines factors that contribute to the use of gloves and other PPE

Methods

Data was collected from pesticide training participants using a survey at eight locations across the state of Kentucky. There was a total of 322 respondents who were over 18 and in good health. We evaluated most common pesticides used, usage of gloves and other PPE, and whether or not participants had ever felt ill while applying pesticides. Demographic information as well as factors associated with feeling ill was determined using bivariate and multivariate analysis.

Results

Our study found that most participants report always using gloves and PPE when applying pesticides. Further, we found that the most commonly reported pesticide applicants used were Roundup, 2,4-D, and Atrazine. Potential factors associated with feeling ill while applying pesticides include working outdoors, fewer certification years, and younger age.

Conclusions

The perception that applying pesticides is low risk is the most common factor that contributes to the decision to not wear PPE. To determine factors significantly associated with feeling ill, more surveys should be collected with more detailed information. The low number of respondents that reported ever feeling ill while applying pesticides was the greatest issue with this study.

Introduction

Many pesticides can have negative health effects on individuals who are exposed through inhalation, ingestion, or skin absorption.[1] Past research has focused on these negative health outcomes and routes of exposure in farm workers.[2–4] Acute pesticide exposure can lead to headaches, nausea, dizziness, and difficulty breathing.[5] Furthermore, long-term pesticide exposure can result in an increased chance of developing various cancers including bladder, liver, breast, and colorectal.[6–11] While the various pesticides present different hazards, all can have impacts on human health.

Protection from these chemicals can be provided by the use of proper personal protective equipment (PPE). Past research has focused on what personal protective gear is necessary for application and use of various pesticides.[12,13] For example, Moretto (2010) provided guidance on what personal protective gear is necessary and why.[14] In general, according to the pesticide labels which are the method by which the Environmental Protection Agency (EPA) regulates pesticides, applicators should wear long sleeves, long pants, boots, an apron, safety glasses, gloves and at times, a respirator.[15]

Work places may or may not provide adequate PPE and usage by workers likely varies.[16] Workers who are not provided PPE or pesticide safety training on the job are less likely to be compliant with safety and labeling protocols.[2] PPE is an expense to the company and if workers do not understand the risk involved with the chemicals they use, they are unlikely to wear adequate protection.[2] Different pesticides require various levels of PPE[17] and if this information and proper PPE are not readily available, compliance is likely to be poor.[3,18–20] Further, if the PPE is restrictive or hinders the completion of a task, workers are unlikely to use the appropriate gear.[18]

Previous research has focused on negative health outcomes[5,6,9–11] as well as what personal protective gear is necessary for application of various pesticides.[17] Therefore, it is known that pesticides present a health risk and also that workers are at times non-compliant with safety guidelines. However, past research heavily focused on pesticide exposure and safety training among farmers and did not look at other occupational groups that may also have a high or higher exposure risk. Many occupational groups use industrial pesticides; safety practices, training, and compliance with PPE regulations should be examined for these at-risk populations as well.

Literature Review

Acute health symptoms[5] and chronic diseases[6–8,10,11]can develop as a result of exposure to pesticides. Proper PPE is known to limit exposure to pesticides[1] and PPE is an important factor in reducing pesticide exposure.[19] Studies have examined what PPE is worn by farmers and what behaviors influence the decision to wear appropriate protective gear.[12,18,19]

Palis et al. (2006) found that requiring workers to purchase their own personal protective equipment was correlated to a decrease in usage. Farmers surveyed reported wearing long pants, long shirts, and cloth or a mask over the face but most did wear gloves.[2] The study also found that most of the workers did not perceive pesticides as being potentially harmful. Overall the study concluded that adequate protection was not provided or used for pesticide application.[2]

Strong et al. (2008) also found that provision of PPE is the most important factor in determining whether workers used proper PPE; continuing education and training was also associated with increased pesticide safety activities and use of PPE. Levesque et al. also found a correlation between safety training and compliant usage of personal protective equipment. Other studies agree and demonstrate that use of PPE is directly linked to what is provided on the farms or work site.[18,21–23] Factors influencing safety are often out of the control of the worker and are more related to the job site.[18]

Other factors that increase the likelihood of PPE usage include the perceived risk of injury[16] and pre-existing health conditions.[24] Nicol et al. (2008) completed a cross sectional telephone survey and found that the most frequently worn PPE include gloves, spray suits, and breathing protection.[24] Personality and risk behavior is also a factor in the usage of PPE.[19] DellaValle et al. (2012) describes the type of personality associated with risk behavior and pesticide usage. Those individuals identified as risk-accepting were less likely to believe that farming was dangerous, accept the risk of accidents and exposure as part of the job, and that for profit to be made that risks must be taken.[19] They found that individuals who did not perceive pesticides as being hazardous to their health were less likely to wear PPE.[20] Safety practices involving pesticides were somewhat influenced by risk-accepting personality traits.[19,20]

Objectives

The aim of this study was to determine demographic information about certified pesticide applicators and what safety practices are common across the state of Kentucky. Our focus was on PPE in general, but also with a specific emphasis on gloves. We also wanted to identify the most commonly used pesticides across the state. The last objective of this study was to determine factors associated with having health symptoms or becoming ill while applying pesticides and factors that are associated with wearing PPE. We hypothesized that age, years certified as a pesticide applicator, and job category influenced this outcome.

Materials and Methods

Survey Design

Our survey also aimed to identify how often gloves were changed, with options of after each application, after an exposure of spill, after a shift or other. Factors contributing to why participants did not wear gloves, if applicable, were gathered and options included inconvenience, cost, unattractiveness, hindrance to tasks, comfortableness, forgetting, no availability, low risk task, or not provided by employer as options. Similar questions about why other PPE was not worn were asks with the same options. Participants were asked to identify what PPE they regularly wear with options of facemask, respirator, apron, boots, long pants, long sleeve shirt, coveralls, goggles/safety glasses, and other as options. Lastly, participants were asked if their employer provided on-going training with the options of yes, no, and unsure. Participants were then asked to rank themselves in knowledge regarding health and safety with pesticides with options of not satisfied, moderately satisfied, and highly satisfied. NOTE: it is fine to give this level of description, but you should include a copy of your survey questionnaire in an appendix of our Capstone.

We developed a survey to assess the PPE available in the participants work environment as well as demographic information and pesticides used. The requested information included certification category (commercial applicator, non-commercial applicator, private applicator), years certified, job title, age, a description of their interaction with pesticides (handle concentrates, mix, both, neither), years of education (some high school, high school/GED, some college, Bachelor's degree or above), days a year they work with pesticides, and most common (up to five) pesticides used. Job titles were consolidated into 9 job categories including manager, groundskeeper, technician, applicator, laborer, arborist, sales, farmer, and academic. The survey also asked participants to describe the PPE available in their work environment. Options included splash apron, cleaning of work clothes, work clothes, facemask, respirator, boots or footwear, gloves, and goggles or safety glasses. Information about type of gloves available including rubber, latex, nitrile, unlined flexible plastic, leather, and cloth was also gathered.

Data Collection

A survey questionnaire was developed as the tool to gather information about PPE usage/availability and pesticide exposure in commercial, non-commercial, and private pesticide applicators Participants were asked about health symptoms or illnesses believed to be caused by pesticides. They were also asked about the types of pesticides they used.

Study participants were recruited from among individuals who participated in a pesticide-training program offered by the UK College of Agriculture Extension Office. All participants were trained applicators working in various industrial settings. These individuals use pesticides that are considered sufficiently toxic by the EPA to require licensing. Before applicators can purchase or apply these regulated pesticides, they are required to take this training and pass an examination. Participants were adults over the age of 20 and in good health. The surveys were provided to willing participants at nine training sites across the state of Kentucky. The counties included were Boone, Wayne, Rowan, McCracken, Logan, Oldham, Spencer, Daviess, and Taylor. Participants were recruited from the nine sampling sites. Only individuals in the pesticide-training program were given the option to complete the survey. Participants were given the survey at the beginning of each training session and asked to complete it if they were willing. Surveys were then collected at the end of the training. This was a convenient sample, as participants were not randomly selected. IRB approval was obtained with protocol number 14-0820-X2B.

Statistical Analysis

Statistical analysis was completed using the Statistical Analysis System (SAS Institute, Cary, NC) software package 9.3. Descriptive, univariate statistics were determined by finding frequencies and percentages for categorical variables and means and standard deviations for continuous various. Bivariate analysis was conducted for the categorical variables of education, job category, certification category, whether safety training was provided at work, training location, knowledge about health and safety, and perceived value of safety training were evaluated using a chi-square analysis ($p < 0.05$). For the continuous variables of age, years certified, and day applied a two-sample t-test ($p < 0.05$) was used to compare the independent variable (feeling ill while applying pesticides) to these dependent variables. Multivariate logistic regression (95% CI) was conducted to evaluate the association between categorical/bivariate factors to the outcome of feeling ill. Adjusted and unadjusted odds ratios were compared to determine factors that increased the likelihood of feeling ill while applying pesticides. The model used for the logistic regression accounted for age, years certified, and job category, all viewed as categorical variables. For the logistic regression, age groups were divided into two categories: 18-44 and 45-75; years certified was divided into 5 categories: 0-5, 6-10 11-5, 16-20, and 21-25+; and job category was divided into 2 categories: indoor and outdoor.

Results

Demographics and Univariate Analysis

A total of 322 individuals from nine training locations completed the survey. The average age of participants was 45.3 years (+/-11.8) (Table 1). Of the 322 respondents, 277 (93.0%) were males, 21 (7.0%) were females, and 24 did not report sex. The average number of days pesticides were applied (among the 244 participants who reported this information) was 70.6 (+/-77.4) with a minimum of 0 days and a maximum of 360 days. Years certified was captured on a continuous scale with an average of 9.4 years (+/-7.7). (Table 1.)

Of the 313 participants who provided education information, 9 (2.9%) reported completing some high school, 117 (37.4%) completed high school or had a GED, 90 (28.8%) had some college education, and 97 (31.0%) obtained a Bachelor's degree or above. Respondents (n=299, 23 missing) were asked to provide a job title on the survey and from that were categorized into 9 subsets: manager 113 (37.8%), applicator 44 (14.7%), groundskeeper 42 (14.0%), laborer 42 (14.0%), technician 23 (7.7%), arborist

16 (5.4%), academic 8 (2.7%), sales 7 (2.3%), and farmer 4 (1.3%). Participants also provided their certification class (n=270, missing 52) with 143 (44.4%) commercial applicators, 116 (36.0%) non-commercial applicators, and 12 (3.7%) private applicators. 35 respondents (n=302, missing 20) reported ever feeling ill while applying pesticides. This was the main outcome of concern. (Table 1.)

The survey also aimed to characterize demographics regarding safety of the pesticide applicators; 212 (70.4%) of the 301 participants that answered reported they were very satisfied with their health and safety knowledge, 84 (27.9%) felt moderately satisfied, and 5 (1.7%) were not satisfied. Safety training was reported to be provided at the work establishment of 222 (88.5%) of the 251 respondents, 23 (9.2%) said that safety training was not provided and 6 (2.4%) were unsure. Finally, participants were asked if they thought pesticide training increased safety. Of the 296 who answered the question, 260 (87.9%) said yes, 27 (9.1) responded no, and 9 (3.0) were unsure. (Table 2.)

Respondents reported an average of 8.7 (+/- 2.3) times out of 10 that gloves (n=236) were worn and a number of 9.0 (+/- 2.2) times that some sort of PPE (n=166) is worn. The majority of respondents reported always wearing gloves (n=157) and always wearing PPE (n=121). (Figure 1. and Figure 2.) The frequencies of various PPE usages were gathered: 71 (22.1%) reported wearing a facemask; 55 (17.1%) using a respirator; 285 (88.5%) wearing an apron; 202 (63.7%) wearing boots; 202 (63.7%) wearing long pants; 157 (48.8%) wearing long sleeve shirt; 42 (13.0%) wearing coveralls; and 202 (62.7%) using goggles/safety glasses. (Table 3.)

Respondents were asked to report the five most frequently used pesticides. From the 322 participants, 234 provided at least one pesticide that was routinely used. 647 total pesticides were reported with 107 unique pesticides represented. The most commonly reported pesticide was Roundup (n=174), followed by 2,4-D (n=79) and atrazine (n=27). (Table 4.)

Bivariate Analysis

We analyzed the 35 individuals who reported ever feeling ill during pesticide application. We evaluated the unadjusted relationships between the outcome (feeling ill) and potential factors. Of these variables, age (p=0.0024), job category (p=0.0383), certification category (p=0.0229), and training location (p=0.0229) were found to be significant. We found that participants who reported feeling ill tended to be younger, have fewer years of certification, were more likely to be a commercial applicator, and to work outdoors. For the bivariate analysis, the variable of job category was collapsed into a dichotomous variable of indoor and outdoor. “Indoor” included the job categories of manager, technician, arborist, academic, and sales. “Outdoor” included the job categories of applicator, groundskeeper, laborer, and farmer. (Table 5.)

Factors associated with neglecting to wear gloves and other PPE was analyzed as well. The most common reasons participants reported not wearing gloves were cost concerns (n=85), gloves were not readily available at the site (n=57), and the task was perceived as low risk (n=56). As for PPE, the most common reasons reported for not wearing PPE items were cost concerns (n=97), task was perceived as low risk (n=60), and PPE was not readily available at the site (n=45). Of the 35 individuals who reported ever feeling sick, the most common reason selected for not wearing gloves or PPE was the perception that applying pesticide was low risk (n=14, 40%; n=17, 48.6%). (Table 6.)

Multivariate Analysis

Logistic regression determined that age, years certified, and job categories were not predicative factors of reporting feeling ill while applying pesticides. Before adjustment, fewer than 16 years of certification (OR=5.1, 95% CI= 1.182 – 21.822) and working outdoors (OR=2.2 , 95% CI= 1.029 – 4.809) were found to significantly correlate with a greater likelihood of feeling ill while applying pesticides. After adjustment, participants certified for less than 15 years and who work outdoors were still more likely to feel ill; however, the results were not significant. While older age seemed to be protective for both the unadjusted (OR=0.49, 95% CI= 0.236 – 1.013) and adjusted (OR=0.64, 95% CI= 0.284 – 1.418) odds ratios, neither results were significant. (Table 7.)

Discussion and Conclusion

This study was able to identify general demographics about trained pesticide applicators in Kentucky. Our sample suggested that training is provided on the job and most pesticide applicators are provided personal protective equipment and do not experience adverse effects from pesticide application. We were also able to identify the potential factors that contribute to an applicator's decision to not wear PPE. We identified perception of pesticide application as a low risk activity as the main reason. This agreed with previous findings.[2,18]

While this was a convenient sample with only a little over three hundred participants, we were able to identify the most commonly used pesticides in our sample, which can be extrapolated to the state of Kentucky. A database of this type previously did not exist for Kentucky and could be a useful resource for interested entities.

Bivariate analysis suggested that age, job category, certification category, and location contributed to the potential for feeling ill while applying pesticides but a predictive multivariate analysis found no significant with adjusted odds ratios. Through the bivariate analysis, participants who reported feeling ill tended to be younger, have fewer years of certification, were more likely to be commercial applicators, and to work outdoors. The multivariate analysis, while not significant, suggested that risk factors for feeling ill while applying pesticides include younger age (under 45 years old), having less than 16 years of certification, and working outdoors. As the confidence intervals for the adjusted ratios were not found to be significant, these findings suggest that sample numbers are the greatest hindrance.

Moving forward, more surveys should be collected to increase the sample size with the goal of identifying the truly significant factors for feeling ill while applying pesticides. This exploratory survey provides a basis and starting point for a larger sample. Future goals also include identifying specific symptoms of those feeling ill, whether that is nausea, vomiting, headaches, or other symptoms. A larger sample with more detailed information could also identify which pesticides are associated with an increased likelihood of feeling ill during application. PPE suggestions and guidelines could then be changed to reduce exposure.

Limitations

The study utilized convenient sampling to obtain data. The survey was provided at select locations pesticide training, not all and was entirely voluntary. As a result, the demographics of the sample population of pesticide applicators may not be truly representative of the population of pesticide applicators in Kentucky. Further, answers to the survey questions were subject to recall bias. Applicators who have used pesticides for numerous years may be less likely to recall a past exposure and feeling ill as a result if it happened long ago.

The greatest limitation of this study was the low number of respondents that reported ever feeling ill while applying pesticides. This reduced the statistical significance of the findings and led to low cell counts in many circumstances. Non-response bias was also likely a factor. Individuals who experienced a negative experience with pesticides may have been less likely to provide information, even though the survey was anonymous.

Acknowledgments

I would like to thank Dr. Lee Townsend for his willingness to help me with this project and create a collaborative effort between the College of Public Health and the College of Agriculture, Food, and Environment. I appreciate Dr. Townsend's efforts in developing and distributing the survey. I would also like to thank Dr. Wayne Sanderson for his guidance, patience, and support during my project. A thank you to Dr. Scott David Mannino and Dr. Scott Prince is extended for their assistance. Lastly, I would like to give my appreciation to Susan Westneat for aid in survey design, Dr. Corrine Williams for help with data entry protocols and IRB approval, and Caroline Holsinger for her patience and willingness to provide guidance with SAS.

Table 1. Demographic Characteristics of Pesticide Training Participants

Characteristic	
Total	322
	Mean (Standard Deviation)
Age	45.3 (11.8)
Missing	15
Years Certified	9.4 (7.7)
Missing	23
Days Pesticides Are Applied	70.6 (77.5)
Missing	
	N (%)
Sex	
Male	277 (93.0)
Female	21 (7.0)
Missing	24
Education	
Some High School	9 (2.9)
High School or GED	117 (37.4)
Some College	90 (28.8)
Bachelor's Degree or Above	97 (31)
Missing	9
Job Category	
Manager	113 (37.8)
Applicator	44 (14.7)
Groundskeeper	42 (14.0)
Laborer	42 (14.0)
Technician	23 (7.7)
Arborist	16 (5.4)
Academic	8 (2.7)
Sales	7 (2.3)
Farmer	4 (1.3)
Missing	23
Certification Category	
Commercial Applicator	143 (44.4)
Non-Commercial Applicator	116 (36.0)
Private Applicator	12 (3.7)
Missing	52
Ever Felt Ill While Applying Pesticides	
Yes	35 (11.6)
No	267 (88.4)
Missing	20
Training Location by County	
Boone	72 (22.4)
Wayne	13 (4.0)
Rowan	52 (16.2)
McCracken	36 (11.2)
Logan	75 (23.3)
Oldham	7 (2.2)
Spencer	6 (1.7)
Daviess	39 (12.1)
Taylor	22 (6.8)

Table 2. Demographics Safety Characteristics of Pesticide Training Participants

Characteristic	**N (%)**
Knowledge Health and Safety	
Not Satisfied	5 (1.7)
Moderately Satisfied	84 (27.9)
Very Satisfied	212 (70.4)
Missing	21
Safety Training Provided at Work	
Yes	222 (88.5)
No	23 (9.2)
Unsure	6 (2.4)
Missing	71
Believe Pesticide Training Increases Safety	
Yes	260 (87.9)
No	27 (9.1)
Unsure	9 (3.0)
Missing	26

Table 3. Frequencies of PPE Worn and Reported PPE Worn

Out of 10 Times How Often	**Mean (Standard Deviation)**
Gloves Are Worn	8.7 (2.3)
Missing	86
PPE is Worn	9.0 (2.2)
Missing	156
PPE Type	**N (%)**
Face Mask	71 (22.1)
Respirator	55 (17.1)
Apron	285 (88.5)
Boots	202 (62.7)
Long Pants	205 (63.7)
Long Sleeve Shirt	157 (48.8)
Coveralls	42 (13.0)
Goggles/Safety Glass	202 (62.7)

Figure 1. Histogram of Frequency of Glove Usage

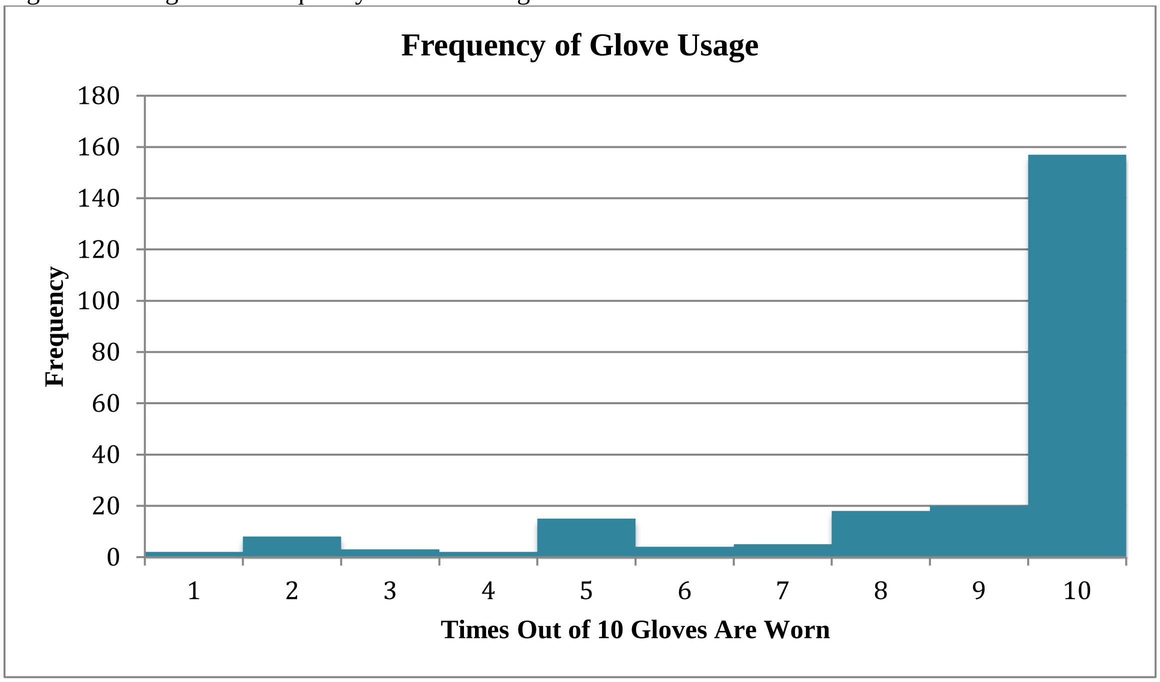

Figure 2. Histogram of Frequency of PPE Usage

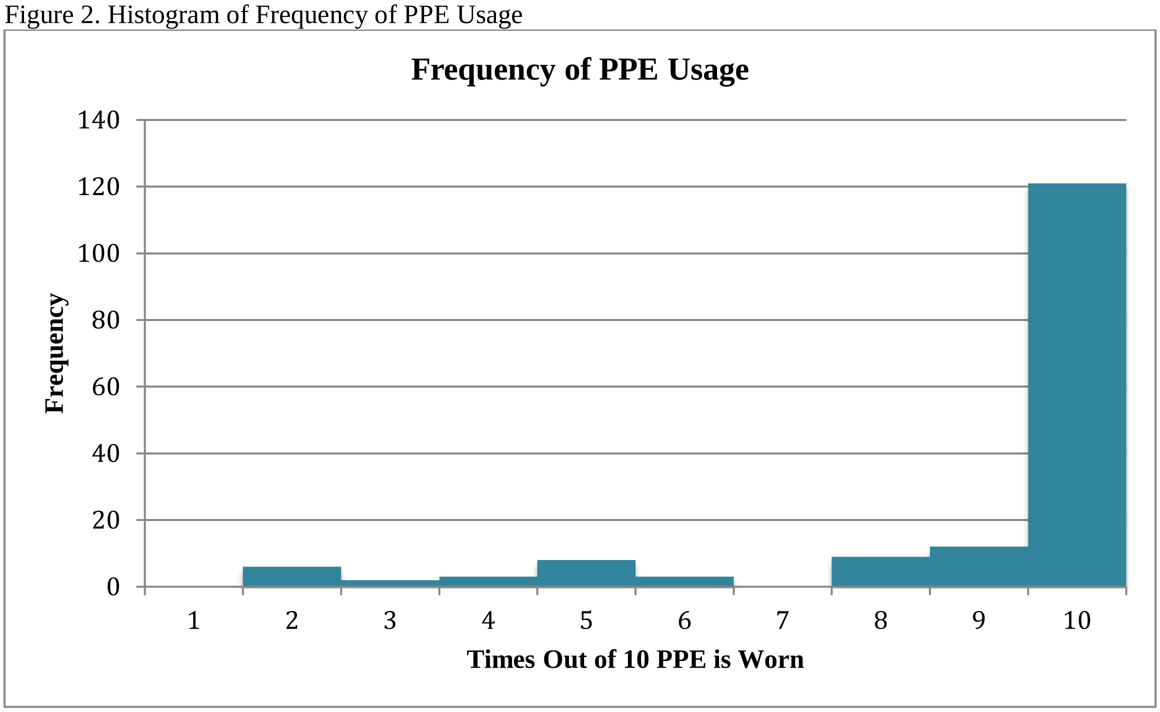

Table 4. Top 15 Reported Pesticides Used on the Job

Pesticide	**N (%)**
Roundup	174 (26.9)
2,4-D	79 (12.2)
Atrazine	27 (4.2)
Bifenthrin	24 (3.7)
Dicamba	17 (2.6)
Merit	17 (2.6)
Tree Age	16 (2.5)
Dimension	14 (2.2)
Treflan	14 (2.2)
Tempo	13 (2.0)
Cyzmic	12 (1.9)
Permethrin	12 (1.9)
Sevin	12 (1.9)
Metolachlor	9 (1.4)
Prowl	9 (1.4)

Table 5. Bivariate Associate Feel Ill

	Feel Ill		
Characteristic	**Yes**	**No**	**p-value**
	Mean (Standard Deviation)	**Mean (Standard Deviation)**	
Age	39.4 (11.7)	45.8 (11.6)	0.0024
Missing	0	33	
Years Certified	7.6 (5.6)	9.7 (7.9)	0.1367
Missing			
Days Pesticides Are Applied	94.8 (83.6)	67.4 (76.2)	0.1069
Missing	12	93	
	N (%)	**N (%)**	
Education			0.77
Some High School	0 (0.0)	9 (3.4)	
High School or GED	12 (38.7)	95 (36.1)	
Some College	9 (29.0)	76 (28.9)	
Bachelor's Degree or Above	10 (32.3)	83 (31.6)	
Missing	4	24	
Job Category			0.0383
Indoor	11 (34.4)	134 (53.8)	
Outdoor	21 (65.6)	115 (46.18)	
Missing	3	38	
Certification Category			0.0229
Commercial Applicator	16 (45.7)	121 (45.3)	
Non-Commercial Applicator	7 (2.3)	103 (34.1)	
Private Applicator	1 (2.9)	10 (3.8)	
Missing	11	53	
Safety Training Provided at Work			0.5757
Yes	22 (91.67)	200 (88.1)	
No	1 (4.2)	22 (9.7)	
Unsure	1 (4.2)	5 (2.2)	
Missing	11	60	
Training Location by County			0.0212
Boone	4 (11.4)	64 (24.0)	
Wayne	4 (11.4)	8 (3.0)	
Rowan	2 (5.7)	49 (18.4)	
McCracken	5 (1.7)	27 (10.1)	
Logan	8 (6.7)	62 (20.5)	
Oldham	1 (2.9)	6 (2.3)	
Spencer	2 (5.7)	4 (1.5)	
Daviess	4 (11.4)	33 (12.4)	
Taylor	5 (14.3)	14 (5.2)	
Missing	0	20	
Knowledge Health and Safety			0.1751
Not Satisfied	1 (2.9)	4 (1.5)	
Moderately Satisfied	14 (40.0)	69 (26.1)	
Very Satisfied	20 (57.1)	191 (72.4)	
Missing	0	264	
Safety Training Provided at Work			0.5757
Yes	22 (91.7)	200 (88.1)	
No	1 (4.2)	22 (9.7)	
Unsure	1 (4.2)	5 (2.2)	
Missing	11	60	
Believe Pesticide Training Increases Safety			0.2666
Yes	27 (79.4)	233 (88.9)	
No	5 (1.7)	22 (8.4)	
Unsure	2 (5.9)	7 (2.7)	
Missing	1	25	

Table 6. Factors that Determine Glove and PPE Usage

	Feel Ill		
Factors	**Yes**	**No**	**p-value**
PPE	**N (%)**	**N (%)**	
Perceived as Low Risk	17 (48.6)	43 (16.1)	0.0001
Inconvenient	2 (5.7)	0 (0.0)	0.0001
Forget	0 (0.0)	0 (0.0)	---
Hinders Tasks	6 (2.0)	29 (10.9)	0.2750
Uncomfortable	6 (2.0)	28 (10.5)	0.2414
Not at Site	7 (20.0)	38 (14.2)	0.3676
Not Provided	8 (22.9)	22 (8.24)	0.0066
Cost Concerns	10 (28.6)	87 (32.6)	0.6326
Unattractive	3 (8.6)	6 (2.3)	0.0386
Gloves	**N (%)**	**N (%)**	
Perceived as Low Risk	14 (40.0)	42 (15.7)	0.0005
Inconvenient	2 (5.7)	0 (0.0)	0.001
Forget	0 (0.0)	1 (3.7)	0.7169
Hinders Tasks	6 (17.4)	30 (11.2)	0.3106
Uncomfortable	5 (14.3)	19 (7.1)	0.1403
Not at Site	9 (25.7)	48 (18.0)	0.2714
Not Provided	6 (17.1)	13 (4.9)	0.0049
Cost Concerns	9 (25.7)	76 (28.5)	0.7337
Unattractive	5 (14.3)	2 (0.8)	0.0001

Table 7. Multivariate Association (Logistic Regression Analysis of Factors Associated with Feeling Ill)

	Feel Ill	
Independent Variable	**Unadjusted OR (95% CI)**	**Adjusted OR (95% CI)**
Age		
18-44	Reference	Reference
45-75	0.49 (0.236 - 1.013)	0.64 (0.284 - 1.418)
Years Certified		
0-15	5.1 (1.182 - 21.822)	3.6 (0.802 – 16.150)
16-25+	Reference	Reference
Job Category		
Indoor	Reference	Reference
Outdoor	2.2 (1.029, 4.809)	1.7 (0.745 – 3.679)

Appendix

Training Participant:

The following survey asks questions about personal protective equipment (PPE) that is available at your work as well as your personal practices using PPE. Further, questions about experiences with pesticides are asked.

Although you will not get personal benefit from taking part in this research study, your responses may help us understand more about what PPE is worn and what pesticides are used in Kentucky.

We hope to receive completed questionnaires from about 600 people, so your answers are important to us. Of course, you have a choice about whether or not to complete the survey/questionnaire, but if you do participate, you are free to skip any questions or discontinue at any time.

The survey/questionnaire will take about 10 minutes to complete.

There are no known risks to participating in this study.

Your response to the survey is anonymous which means no names will appear or be used on research documents, or be used in presentations or publications. The research team will not know that any information you provided came from you, nor even whether you participated in the study.

If you have questions about the study, please feel free to ask; my contact information is given below. If you have complaints, suggestions, or questions about your rights as a research volunteer, contact the staff in the University of Kentucky Office of Research Integrity at 859-257-9428 or toll-free at 1-866-400-9428.

Thank you in advance for your assistance with this important project.

Please place completed survey is the locked box at the back of the room.

Sincerely,

Kasandra Lambert
College of Public Health, Department of Environmental and Occupational Health
University of Kentucky
PHONE: 606-776-3314
E-MAIL: Kasandra.lambert@uky.edu

Pesticide Use Survey 2014-2015

Certification Category (Please circle)

Commercial applicator

Non-commercial applicator

Certified private applicator

If you are a commercial or non-commercial applicator, what category or categories of certification? (Please circle)

1 Agriculture	2 Forest
3 Turf and Ornamental	4 Seed Treatment
5 Aquatic Weeds	6 Right of way
7/8 PCO, Public Health	10 Demonstration and Research
12 Pesticide Retail Sales	18 Golf Course
20 Athletic Turf	Other (Please list)

Male or Female (Circle one)

Years Certified

Job Title

Age

Are you an applicator, operator, or both?

Which of the follow best describes your interaction with pesticides?

a. I handle concentrated pesticides and load and mix them in spray tanks	b. I only apply pesticides (no mixing)
c. Both a. and b.	d. Neither a. nor b.

Approximately how many days out of a year do you work with pesticides?

Years of Education (Circle One)

Some High School	High School or GED	Some College	Bachelor's Degree or Above

Does your employer provide (Please circle)

Splash Apron	Yes or No
Cleaning of work clothes	Yes or No
Work clothes	Yes or No
Face mask	Yes or No
Respirator	Yes or No
Boots or footwear	Yes or No
Gloves	Yes or No
Goggles or safety glasses	Yes or No

If gloves are provided, what type? (Please all that apply circle)

Rubber	Unlined flexible plastic
Latex	Leather
Nitrile	Cloth

How often do you change your gloves? (Please all that apply circle)

After each application	After an exposure or spill	After a shift	Other

If "other" was circled, please describe when gloves are changed

Out of every 10 times you work with pesticides, how many times do you wear protective gloves?

If there are times that you do not wear *gloves* what are the main factors? (Circle all that apply)

Inconvenient	Cost concerns	Unattractive looking
Hinders tasks	Uncomfortable	Forget
Not readily available on site	Perceived as low risk activity	Not provided at work

If there are times that you do not wear a piece of *personal protective clothing* (face mask, respirator, apron, boots, long pants, long sleeve shirt, coveralls, goggles/safety glasses etc.) what are the main factors? (Please circle all that apply)

Inconvenient	Cost concerns	Unattractive looking
Hinders tasks	Uncomfortable	Forget
Not readily available on site	Perceived as low risk activity	Not provided at work

When you do wear protective clothing, what do you wear? (Please circle all that apply)

Face mask	Respirator	Apron	Boots	Long pants
Long sleeve shirt	Coveralls	Goggles/safety glasses	Other	

If "other" was circled, please list what additional personal protective clothing is worn

Out of every 10 times you work with pesticides, how many times do you wear protective equipment?

Do you wash your spray/application clothes at home?	Yes or No
If you wash your spray/application clothes at home, do you wash them separately?	Yes or No or N/A
Do you handle or mix pesticide concentrates at work?	Yes or No

Are the following available in the pesticide storage or handling area? (Please circle)

Soap	Yes or No
Eye wash	Yes or No
Disposable towels	Yes or No
Water or sink	Yes or No

Do you have the following in your work vehicle? (Please Circle)

Pesticide labels	Yes or No
Emergency Numbers	Yes or No
Sta-Dri or cat litter	Yes or No
Eye wash	Yes or No
First Aid Kit	Yes or No
MSDS sheets	Yes or No
Shovel	Yes or No
Hand soap	Yes or No
Paper towels	Yes or No
Cell phone	Yes or No

Do you know how to respond to a spill at work? Yes or No

Have you been involved in a spill at work? Yes or No

Please list common pesticides that you apply or use at work. *Be as specific as possible and list from most common to least common.*

1.

2.

3.

4.

5.

Have you ever felt ill following pesticide applications? Yes or No

If so, did you seek medical health? Yes or No or N/A

Did you miss work as a result of feeling ill? Yes or No or N/A

Did you miss work as a result of the doctor's orders? Yes or No or N/A

If your opinion, does pesticide training help you become a safer applicator? Yes or No or Unsure

Does your employer provide ongoing training for pesticide use? Yes or No or Unsure

How satisfied are you about your knowledge of pesticides you use regularly?
(Please circle)

	Not Satisfied	*Moderately Satisfied*	*Very Satisfied*
Health and Safety	1	2	3
How to Use	1	2	3
Safety	1	2	3
Clean Up	1	2	3
Mixing Instructions	1	2	3

From 1-5, how would you rate yourself in regards to working with pesticides safely?
(Please circle)

1 Poor	2 Fair	3 Good	4 Very Good	5 Excellent

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Biographical Sketch

Kasandra Lambert is originally from Clearfield, Kentucky. She completed her Bachelor's of Science in Chemistry at Morehead State University in December of 2011. She is currently a Master of Public Health candidate in Environmental Health. She also works as a safety specialist in the College of Arts and Sciences at the University of Kentucky. She can be contacted at kvlamb2@uky.edu.