ATTITUDES AND PRACTICES OF OKLAHOMA AERIAL APPLICATOR HOUSEHOLDS REGARDING THE SELECTION, USE, AND CARE OF WORK CLOTHING

By

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TABLE OF CONTENTS

Chapter		Page
I.	INTRODUCTION	1
	Justification of the Study	4
	Purpose of the Study	5
	Objectives and Hypotheses	5
	Limitations	7
	Assumptions	8
	Definition of Terms	8
II.	REVIEW OF LITERATURE	9
	The Health Belief Model and Preventive Health Behavior	9
	Readiness to Act	9
	Perceptions Regarding the Advocated Health Action	10
	Cues to Action	12
	Use of the Model in Previous Research	12
	Summary of Health Belief Model Research Findings	15
	Pesticide Exposure: Populations at Risk	16
	Aerial Applicators	17
	Familial Exposure to Pesticides	20
	Laundry Variables	21
III.	METHODOLOGY	24
	Development of the Instrument	24
	Oklahoma Pilot Study	24
	Development of Core Regional Questionnaire	25
	Description of the Sample	26
	Data Collection	26
	Data Preparation	26
	Data Analysis	27
IV.	RESULTS AND DISCUSSION	30
	Description of the Respondents	30
	Clothing Selection of Applicators	32
	Formulation of Pesticides Contacting Applicators' Clothing	35
	Clothing Use Practices of Applicators	37
	Clothing Care Practices of Launderers	37

Chapter Page

Illness Symptoms Experienced by the Respondents 41
Summary 43
Testing the Hypotheses 44
Discussion of the Findings 70

V. SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS 78

Implications 83
Recommendations for Future Research 84

SELECTED BIBLIOGRAPHY 86

APPENDICES 90

APPENDIX A - COVER LETTER AND INSTRUMENT 91

APPENDIX B - POSTNOTIFICATION POSTCARD 115

LIST OF TABLES

Table		Page
I.	Socio-Demographic Characteristics of Applicators	31
II.	Socio-Demographic Characteristics of Launderers	33
III.	Distribution of Applicators' Clothing Item Selections . . .	34
IV.	Distribution of Pesticide Formulations Contacting Applicators' Clothing	36
V.	Distribution of Concentration of Liquid Pesticide Contacting Applicators' Clothing	36
VI.	Distribution of Applicators' Clothing Use Responses Concerning Repeated Wearing of Pesticide-Soiled Clothing Before Laundering	38
VII.	Distribution of Applicators' Clothing Use Responses Concerning Immediate Clothing Change After Spillage of Full Strength Liquid Pesticide	38
VIII.	Distribution of Applicators' Clothing Use Responses Concerning Immediate Clothing Change After Saturation with Pesticide Spray	39
IX.	Distribution of Launderers' Responses Regarding Clothing Care Practices for Clothing Worn for Pesticide Application	40
X.	Distribution of Applicators' Responses to Illness Symptoms Experienced Following Pesticide Application . .	42
XI.	Chi Square Value and Distribution of Association Between Applicators and Launderers Regarding Perceptions of Pesticide-Associated Health Risk	45
XII.	Summary of Chi Square Analyses for Applicators' Perceptions of Pesticide-Associated Health Risks by Socio-Demographic Characteristics	48

Table		Page
XIII.	Chi Square Value and Percentage Distributions for Applicators' Perceptions of Pesticide-Associated Health Risks by Experience with Pesticides	49
XIV.	Summary of Chi Square Analyses for Applicators' Perceptions of Susceptibility to Pesticide-Associated Health Risks by Socio-Demographic Characteristics	50
XV.	Summary of Chi Square Analyses for Applicators' Perceptions of Severity of Immediate Pesticide-Associated Health Risks by Socio-Demographic Characteristics	51
XVI.	Summary of Chi Square Values for Applicators' Perceptions of Severity of Long-Term Pesticide-Associated Health Risks by Socio-Demographic Characteristics	53
XVII.	Chi Square Value and Percentage Distribution for Applicators' Perceptions of Severity of Long-Term Pesticide-Associated Health Risks by Age	54
XVIII.	Summary of Chi Square Analyses for Launderers' Perceptions of Pesticide-Associated Health Risks by Socio-Demographic Characteristics	55
XIX.	Summary of Chi Square Analyses for Launderers' Perceptions of Benefits of Preventive Health Action Regarding Pesticide-Soiled Clothing by Socio-Demographic Characteristics	57
XX.	Summary of 2X2 Contingency Table Distributions Showing Agreement within Households Regarding Clothing Storage Practices	62
XXI.	2X2 Contingency Table Values for Association Between Toxicity of Pesticides Used and Clothing Use Practice, Repeated Wearing of Pesticide-Soiled Clothing Before Laundering	66
XXII.	2X2 Contingency Table Values for Association Between Toxicity of Pesticides Used and Clothing Use Practice, Immediate Clothing Change Following Pesticide Spillage	67
XXIII.	2X2 Contingency Table Values for Association Between Toxicity of Pesticides Used and Clothing Use Practice, Immediate Clothing Change Following Pesticide Spray Saturation	68

Table		Page
XXIV.	Chi Square Values for Applicators' Perceptions of Effectiveness of Clothing in Protecting Against Pesticide Exposure by Toxicity of Pesticides Used	69
XXV.	Summary of Chi Square Analyses for Applicators' Opinions Regarding Effectiveness of Clothing by How Often Pesticides Contact Applicators' Clothing and How Often Pesticides Get Through Clothing to Skin	71
XXVI.	Summary of Significant T-Tests for Attitude Differences Between Applicators and Launderers	71
XXVII.	Summary of Significant T-Test for Difference in Launderers' Clothing Care Practice Based on Launderers' Perceptions of Benefits of Preventive Health Action	72
XXVIII.	Summary of Significant Chi Square Analyses for Association Between Applicators' Perceptions of Risk, Long-Term Severity, and Toxicity of Pesticides and Socio-Demographic Characteristics	72
XXIX.	Summary of Significant Fisher's Exact Tests for Agreement Between Applicators and Launderers Concerning Clothing Storage Practices for Four Clothing Categories	73

FIGURE

Figure		Page
1.	The Health Belief Model	3

CHAPTER I

INTRODUCTION

Safety regarding pesticides is important to aerial pesticide applicators since these persons may experience exposure to toxic chemicals. As much as two-thirds of the agricultural pesticides used in the United States are applied by aircraft, according to Boraiko (1980). Reduction of pesticide exposure has become increasingly important not only because pesticide use has markedly increased in the last four decades, but also because the type of pesticides used has shifted from the lower toxic, but more long-lived chemicals, to the more toxic, but shorter duration chemicals (Freed, Davies, Peters, and Parveen, 1980).

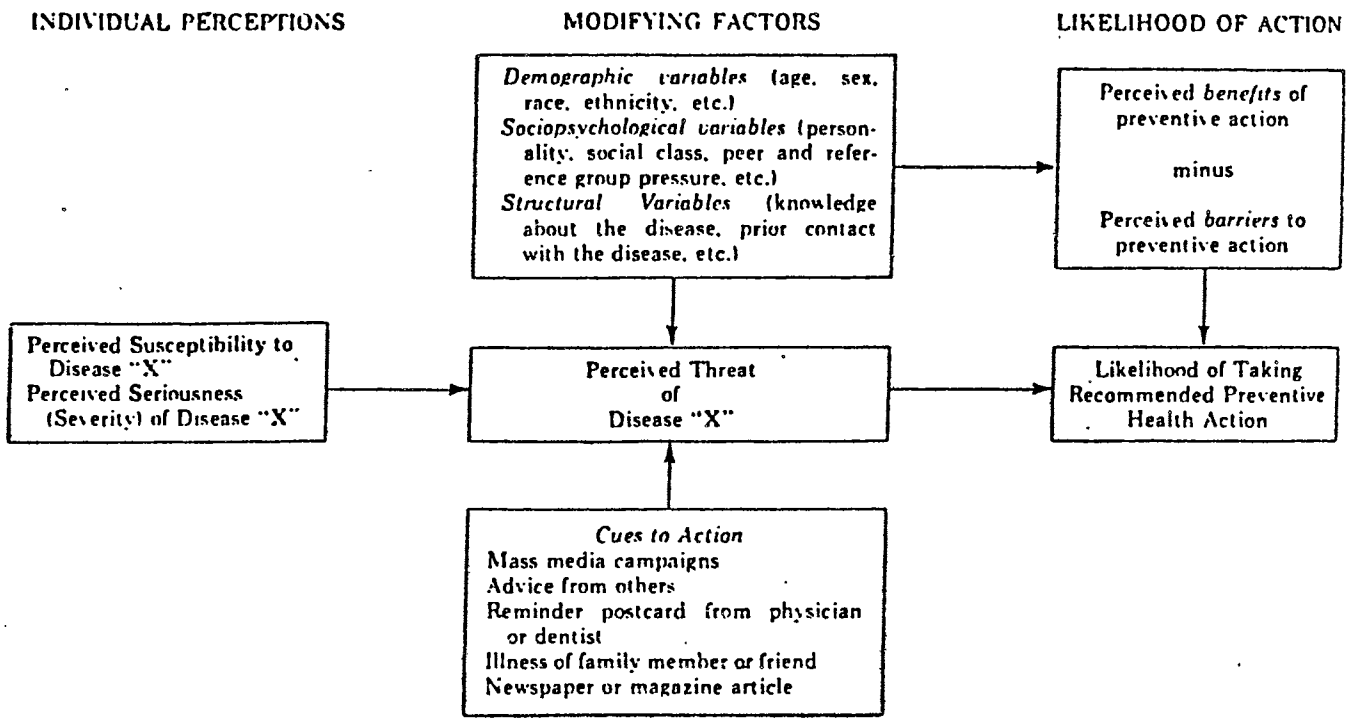
Several studies have documented various aspects of aerial applicators' exposure to pesticides. Hayes, Funckes, and Hartwell (1964) documented dermal contamination of aerial applicators, though no symptoms of poisoning were observed. Hartwell and Hayes (1965) studied pilots at two crop-dusting services and found that the pilots breathing from filter-type respirators showed signs of pesticide poisoning. Cohen, Richter, Weisenberg, Schoenberg, and Luria (1979) studied the exposure of Israeli aerial applicators to parathion, documenting both dermal and respiratory exposure. Ganelin, Mail, and Cueto (1964) reported three cases of pesticide poisoning which resulted from exposure to contaminated aircraft equipment. Other studies (Wolfe,

Armstrong, Staiff, Comer, and Durham, 1975; Kahn, 1976; Soliman, El-Sebae, and El-Fiki, 1979; Hayes, Wise, and Weir, 1980; and Leavitt, Gold, Holcslaw, and Tupy, 1982) documented exposure of other types of applicators (i.e., non-aerial) to pesticides and included discussion of specific body regions affected, route of exposure (oral, dermal, or respiratory), and resulting health effects.

The work clothing of applicators may become contaminated during the preparation and application of the pesticide (Wolfe, Durham, and Armstrong, 1967; Finley, Graves, Hewitt, Morris, Harmon, Iddings, Schilling, and Koonce, 1979). If the contamination is not removed, the applicator's skin may absorb the pesticide from the clothing, possibly causing physical disability, neurological or behavior disorders, or death (Davies and Freed, 1981). Persons handling contaminated clothing for storage or laundry purposes are also subject to dermal pesticide exposure (Easley, Laughlin, and Gold, 1981).

Because the wearing and handling of contaminated clothing may result in pesticide exposure and subsequent adverse health effects, both applicator and launderer should concern themselves with preventing pesticide exposure. Activities undertaken by the applicator and launderer in order to prevent exposure (which, for the purposes of this study, is a potential health threat) may be termed preventive health behavior. As defined by Kasl and Cobb (1966), preventive health behavior is any activity undertaken by a person who believes himself to be healthy for the purpose of preventing disease or detecting disease in an asymptomatic stage.

Aspects of preventive health behavior have been addressed in the Health Belief Model (Figure 1), a theoretical framework originally



Source: M. H. Becker, R. H. Drachman, and J. P. Kirscht, "A new approach to explaining sick-role behavior in low-income populations," American Journal of Public Health (1974).

Figure 1. The Health Belief Model

formulated to explain preventive health behavior (Rosenstock, 1974a). The Health Belief Model examines individual perceptions of a disease (e.g., the seriousness of the disease), factors which may modify those perceptions (e.g., stimuli or "cues to action" such as personal illness or advice from a friend), and individual perceptions regarding the advantages or disadvantages of taking preventive action against the disease. These three areas examined together may be used to predict the likelihood of an individual taking preventive health action. In this study, the Health Belief Model was used as a framework for examining the perceptions of two groups (aerial applicators, and persons responsible for the applicators' laundry) regarding the health risks of pesticide exposure and the importance of preventive health action against pesticide exposure.

Justification of the Study

The issue of pesticide usage has been examined from differing viewpoints. Pesticides free humans from deadly disease (such as malaria, carried by insects) and promote agricultural production. Pesticides can also cause human death or disability, neurological and behavior disorders, and potentially cancer, sterility, and birth defects (Davies and Freed, 1981; Boraiko, 1980). Given their occupation, aerial applicators most certainly deal with the potential health threat of pesticide exposure on a frequent basis.

While clothing can give humans increased protection from pesticides, it can also become contaminated. It is important to consider the applicator's awareness of potential hazards and risks of pesticide

exposure, attitudes regarding the potential hazards and risks, as well as his or her behavior regarding the selection, storage, and care of work clothing. The use of clothing, along with certain storage and care practices, can decrease the dangers associated with pesticide exposure, and therefore could be considered preventive health behavior.

Purpose of the Study

This study was part of a larger study entitled "Limiting Pesticide Exposure Through Textile Cleaning Procedures and Selection of Clothing" and was conducted to gather data on attitudes and practices of Oklahoma aerial applicator households regarding the selection, use, and care of work clothing. For the purpose of this study, an aerial applicator household consists of the aerial applicator and the person responsible for the applicator's laundry.

Objectives and Hypotheses

The objectives for the study are given below. Following each objective are the null hypotheses tested to meet the objective.

1. To determine the clothing selection, use, and care practices of Oklahoma aerial applicator households.

2. To determine the perceptions and attitudes of Oklahoma aerial applicator households regarding pesticide-associated health risks.

H_1: No significant agreement exists between the applicators and the launderers regarding the perception of pesticide-associated health risks.

H_{2-4}: No significant differences exist between the applicators and the launderers in terms of responses to three attitudinal statements regarding dangers of pesticides.

3. To determine if the perceptions of Oklahoma aerial applicator households were related to selected demographic variables.

H_{5-10}: The applicators' perceptions of pesticide-associated health risks will not vary significantly with age, education, income, toxicity of pesticides used, experience with pesticides, and history of pesticide-related health problems.

H_{11-16}: The applicators' perceptions of susceptibility to pesticide-associated health risks will not vary significantly with age, education, income, toxicity of pesticides used, experience with pesticides, and history of pesticide-related health problems.

H_{17-22}: The applicators' perceptions of severity of pesticide-associated health risks will not vary significantly with age, education, income, toxicity of pesticides used, experience with pesticides, and history of pesticide-related health problems.

H_{23-26}: The launderers' perceptions of pesticide-associated health risks will not vary significantly with age, education, employment status, and exposure to educational information concerning care of pesticide-soiled clothing.

H_{27-30}: The launderer's perceptions of benefits of preventive health actions regarding pesticide-soiled clothing will not vary significantly with age, education, employment status, and exposure to educational information concerning care of pesticide-soiled clothing.

4. To determine if relationships existed between the perceptions of pesticide-associated health risks and the clothing use and care practices of the Oklahoma aerial applicator households.

H_{31-33}: No significant relationships exist between the perceptions (of risk, severity, and susceptibility) and the clothing use practices of the applicators.

H_{34-38}: No significant relationships exist between the perceptions of pesticide-associated health risks and the clothing care practices of the launderers.

H_{39-43}: No significant relationships exist between the perceptions of benefits of preventive health actions regarding pesticide-soiled clothing and the clothing care practices of the launderers.

H_{44-50}: There is no association between the applicators and the launderers in terms of clothing storage practices.

5. To determine if relationships existed among toxicity of pesticides used, applicators' clothing use practices, applicators' perceptions of clothing effectiveness, and how often pesticides contact the applicators' clothing and skin.

H_{51-53}: There is no association between the toxicity of pesticides used and the clothing use practices of the applicators.

H_{54}: There is no association between the toxicity of pesticides used and the applicators' perceptions of clothing effectiveness.

H_{55-56}: There is no association between the applicators' perceptions of clothing effectiveness and how often pesticides contact the applicators' clothing and skin.

Limitations

Only those aerial applicators certified by the state of Oklahoma were surveyed, therefore the findings cannot be generalized to other populations of aerial applicators, or to populations of applicators employing non-aerial methods.

Assumptions

Three assumptions existed for the study:

1. Information on the aerial applicator certification list was accurate.

2. Subjects' attitudes and perceptions can be defined and measured.

3. The Health Belief Model is a valid tool for use in examining subjects' perceptions and for predicting subjects' preventive health behavior.

Definition of Terms

The following terms were used in the study:

Aerial Applicator - Person who applies pesticide(s) from an aircraft (airplane or helicopter).

Aerial Applicator Household - For the purpose of this study, the unit consisting of the aerial applicator and the person responsible for the applicator's laundry. The unit may consist of one member (if the applicator is responsible for his or her own laundry) or more members.

Pesticide - Chemical agent used to destroy pests, including fungicide, herbicide, rodenticide, and insecticide.

CHAPTER II

REVIEW OF LITERATURE

The Health Belief Model, introduced briefly in Chapter I, was originally formulated to explain preventive health behavior. The review of literature presents a more thorough examination of the Model, including the components of the Model and the Model's use in previous research. The literature on determination of the populations at risk of pesticide exposure, and the research on pertinent laundry variables for effective pesticide decontamination from clothing are also reviewed.

The Health Belief Model and Preventive Health Behavior

Formulated by Hochbaum, Leventhal, Kegeles, and Rosenstock, the Health Belief Model attempted to explain preventive health behavior (Maiman and Becker, 1974). The model proposed three theoretical components: the individual's readiness to take action, the individual's perceptions regarding the advocated health action, and cues to action (stimuli which occur to trigger the health action) (Maiman and Becker, 1974; Becker, Drachman, and Kirscht, 1974).

Readiness to Act

The first component is the individual's psychological readiness to take action relative to a particular health condition. Readiness to

act is determined by both the person's perceived susceptibility (vulnerability) to the health condition, and by his perceived severity of the consequences of contracting the condition (Maiman and Becker, 1974).

Individuals probably vary widely in their acceptance of personal susceptibility to a condition (Rosenstock, 1974b). At one extreme might be the person who denies any possibility of his contracting a given condition. In a more moderate position the person might admit to the statistical possibility of a disease occurrence, but a possibility that is not likely to happen. Finally, a person may believe that he is in real danger of contracting the disease.

Rosenstock (1974b) reported that individuals may also vary in attitudes concerning the severity of a given health condition, and further stated that degree of severity may be judged from several viewpoints. The emotional arousal created by the thought of the disease, as well as the kinds of difficulties the disease could create could affect degree of perceived severity. A person could view severity in terms of medical consequences, i.e., whether or not a disease could lead to death or a reduction of physical or mental functioning. Or, individuals could judge severity in terms of a condition's effects on his job, family life, or social relations (Rosenstock, 1974b).

Perceptions Regarding the Advocated Health Action

The second component described by Maiman and Becker (1974) is the individual's perception of an advocated health action in terms of benefits, weighed against his perception of barriers or costs of the proposed action (including the "work" involved in taking action).

Rosenstock (1974b) reported that a person who believed himself to be susceptible to a condition and who also perceived the condition to be serious would likely take some course of preventive health action. The direction that the action took was thought to be influenced by beliefs regarding the relative effectiveness of known available alternatives in reducing the disease threat to which the person felt subjected. The person's behavior depended upon how beneficial he believed the various alternatives to be in his particular case. If action was deemed beneficial, then it was seen as reducing one's susceptibility to or severity of an illness. Rosenstock (1974b) further reported that the person's beliefs about the availability and effectiveness of various courses of action, and not the objective facts about the effectiveness of the action, determined what course he would take. In addition, his beliefs were undoubtedly influenced by the norms and pressures of his peer group.

A person may believe that a certain action will be effective in reducing the threat of a disease, but at the same time see the action itself as inconvenient, expensive, painful, or upsetting. These negative aspects serve as barriers to action (Rosenstock, 1974b). If a person's readiness to act was high, and barriers were seen as weak, the action in question was likely to be taken. On the other hand, Rosenstock (1974b) reported that if readiness to act was low and barriers were seen as strong, the action was not likely to be taken. A more difficult situation existed when both benefits and barriers were seen as strong, i.e., when a person was highly motivated to act yet equally motivated to avoid action.

Cues to Action

Finally, a stimulus, either "internal" (e.g., perception of bodily states) or "external" (e.g., interpersonal interaction, media communications, personal knowledge of someone affected by the condition) must occur to trigger the appropriate health action. The stimulus was called a "cue to action" (Maiman and Becker, 1974; Rosenstock, 1974b).

Although the combined levels of susceptibility and severity could provide the force to act, and perception of benefits (minus perceived barriers) could provide a preferred course of action, Rosenstock (1974b) reported that the combination of these could reach considerable levels of intensity without resulting in action unless some event occurred to set the process in motion. Rosenstock (1974b) postulated that if susceptibility and severity were perceived as low, a person would likely require strong or intensive cues to trigger action. On the other hand, if susceptibility and severity were perceived as high, one would probably take action as a result of even slight or weak cues.

Use of the Model in Previous Research

Beginning in 1952, Hochbaum (1958) studied more than 1,200 adults in three cities in an attempt to identify factors underlying the decision to obtain a chest X-ray for tuberculosis detection. In particular, the subjects' beliefs in susceptibility to tuberculosis and beliefs in the benefits of early detection were studied. In the group of persons exhibiting both beliefs, 82 percent had had at least one voluntary chest X-ray during a specified period preceding the study. Of the group exhibiting neither of the beliefs, only 21 percent had obtained a voluntary X-ray during the specified period. Hochbaum

appeared to demonstrate that a particular preventive health action is a function of two variables, perceived susceptibility and perceived benefit.

Furthermore, Hochbaum (1958) found that perceived susceptibility was the more powerful of the two variables studied. For those subjects who exhibited this belief but not belief in the benefits of early detection, 64 percent had obtained X-rays. Of the subjects believing in the benefits of early detection but not in their susceptibility, only 29 percent had obtained X-rays.

Kegeles' (1963a) study dealt with the conditions under which 77 members of a dental care plan would come in for preventive dental check-ups in the absence of symptoms. He attempted to measure the respondents' beliefs regarding (1) perceived susceptibility to a number of dental diseases, (2) perceived severity of these conditions, and (3) perceived benefits of preventive action. Of three people who were low on all three beliefs, none made preventive visits; of 18 who were high on any one belief but low on the other two, 61 percent made such visits; of 38 persons high on two beliefs but low on one, 66 percent made preventive visits; and, of 18 who were high on all three beliefs, 78 percent made preventive dental visits. Therefore, with successive increases in the number of beliefs (from none to all three) the frequency of making preventive dental visits also increased (Kegeles, 1963a).

In a follow-up study three years later, Kegeles (1963b) attempted to determine whether the beliefs identified during the original study were associated with behavior during the subsequent three years. Perceptions of seriousness, Kegeles (1963b) found, were not associated

with subsequent behavior. Neither were perceptions of benefit, taken alone, related to subsequent behavior. However, perceptions of susceptibility did show a correlation with subsequent preventive dental visits. Of the subjects who had earlier seen themselves as susceptible, 58 percent made subsequent preventive dental visits, while 42 percent who had not accepted their susceptibility made such visits.

In a national study of health beliefs, Kirscht, Haefner, Kegeles, and Rosenstock (1966) found that a belief in susceptibility to disease was not widespread. A majority of the 1,493 adult subjects perceived other people in general as more susceptible than themselves to cancer, tuberculosis, and dental disease. Little evidence was found for a preventive orientation toward disease (Kirscht et al., 1966). In a follow-up study of a 50 percent subsample 15 months later, Haefner, Kegeles, Kirscht, and Rosenstock (1967) found that perceived susceptibility, severity, and benefits, taken singly or combined, failed to account for a major portion of the variance in subsequent preventive behavior.

Kegeles (1969) attempted experimentally to change beliefs and behavior of urban ghetto women concerning screening for cervical cancer. He found that women with high perceptions of susceptibility and high perceptions of the benefit of screenings made more screening visits than did their counterparts.

Haefner and Kirscht (1970) attempted to increase female college students' readiness to take preventive health action by presenting them with messages about certain health problems. The messages were intended to increase subjects' perceptions of susceptibility to and severity of the health problems, as well as increase their beliefs in the benefits of preventive health action. Significantly more persons exposed to such

messages visited a physician in the eight months following the experiment than in a control group not exposed to the messages. Rosenstock (1974b) indicated that this study provided evidence that it is possible to modify the perceived threat of a disease. The modification of perceived susceptibility to and severity of a disease, as well as the perceived benefit of preventive health action, led to predictable changes in health behavior (Haefner and Kirscht, 1970; Rosenstock, 1974b).

Summary of Health Belief Model Research Findings

Although Kirscht et al. (1966) did not find a general preventive orientation toward health among their respondents, later research provided important findings regarding several of the HBM components. Kegeles (1969) and Hochbaum (1958) found that preventive health action was a function of two variables, perceived susceptibility to the health threat and perceived benefits of the advocated health action. Two studies (Hochbaum, 1958; Kegeles, 1963b) found that perceived susceptibility in particular was related to preventive health action. Kegeles (1963a) found that successive increases in the number of beliefs held by individuals (regarding susceptibility, severity of the health threat, and benefits of preventive health action) resulted in more preventive dental visits. Finally, Haefner and Kirscht (1970) provided evidence that it was possible to modify the perceived threat of a disease. Changes in perceptions of susceptibility, severity, and benefits of preventive health action led to predictable changes in health behavior (Haefner and Kirscht, 1970).

Rosenstock (1974b) stated that continued work with the Health Belief Model could ultimately have great benefit. The aim in public

health education, Rosenstock (1974b) recorded, was to increase the proportion of people who consistently, rationally, and freely take preventive health action. Analysis of the decision processes of currently small groups of people could be useful in efforts to modify the behavior of large groups of people (Rosenstock, 1974b).

Pesticide Exposure: Populations at Risk

Organophosphate insecticides, frequently toxic to man, were used extensively for agricultural pest control (Kilgore and Akesson, 1980). The ease with which these pesticides were degraded required more frequent application to maintain a desired level of pest control. This shift in pesticide usage from persistent to short-lived chemicals created an increased potential for acute and chronic exposure among pesticide applicators (Kilgore and Akesson, 1980; Davies, Freed, Enos, Barquet, Morgade, and Danauskas, 1980). Morgan (1980) defined acute effects as those developing promptly after exposure and then resolving rapidly, and chronic effects as those which may appear sometime after exposure, but then persist for weeks or years.

Systemic pesticide exposure and poisoning may result from the pesticide application process (Davies, Shafik, Barquet, Morgade, and Danauskas, 1976) during which the worker at some time or another comes into contact with the pesticide concentrate. Illness may result either because of accidental spillage, malpractice, or inadequate protection (Davies et al., 1976). Further, Wolfe, Durham, and Armstrong (1967) established that the skin was the principal route of pesticide absorption into the body.

Aerial Applicators

Hayes, Funckes, and Hartwell (1964) reported that during a seven-week period of distributing parathion, an aerial applicator (who habitually used a device for respiratory protection and was otherwise careful) tolerated dermal contamination with parathion. Although significant quantities of p-nitrophenol were excreted, no signs or symptoms of poisoning were observed.

Hartwell and Hayes (1965) reported observations of a 1961 study of pilots at two crop-dusting services in which the two services used different types of respiratory protection equipment. Both services used the same type of aircraft, and all pilots wore similar work clothing and practiced good personal hygiene. The four pilots in service A breathed from an uncontaminated source of compressed air while applying organophosphates, while the two pilots in service B used filter-type respirators.

One of the pilots in service A became ill on the 21st day of observation, and another showed early signs of poisoning, including excessive sweating and upset stomach. Inquiry disclosed that the supply of compressed air had been exhausted late in the afternoon of the 19th day, and no respiratory protection was used during 12 of the next 18 hours of flying. The third pilot in service A stated that he was able to hold his breath during most of the actual spraying, thereby decreasing his respiratory exposure. Pilot 4, ill from other causes, did not work during the period when compressed air was unavailable. The air supply was replenished, and after several weeks the two affected pilots' health returned to normal, although spraying of the organic phosphorus insecticides continued.

Pilot 6 of crop dusting service B showed early signs of poisoning on the fourth day of the study, and work was suspended for him until the sixth day. He then resumed flying, continuing to use a filter-type respirator. Pilot 6 was again removed from exposure on the 20th day, when signs of poisoning recurred. Pilot 5, who began using a compressed air respirator on the fourth day (when Pilot 6 became ill), did not experience any signs of poisoning, although his work was conducted in an environment where exposure levels were the same (Hartwell and Hayes, 1965).

Cohen, Richter, Weisenberg, Schoenberg, and Luria (1979) studied the exposure of Israeli aerial applicators to parathion. Cockpit air exposure levels were measured for 12 flights. The aerial applicators were exposed to parathion during two stages of their work, at the loading site, and in flight. Pilots spent 20 to 40 minutes each day at the loading site where they were exposed to pesticide-contaminated dust, mist, and vapors. In-flight exposure resulted from flying back into clouds of pesticide aerosols and vapors which remained dispersed after spraying.

High temperatures, sweating, exposure lasting several hours, and delays before showering, all seemed to enhance dermal absorption. Cohen et al. (1979) reported that dermal absorption seemed to be in the same range as respiratory absorption. Further, flight exposure data from the study specifically indicated that pilots' sense of smell could not be relief upon in all instances to detect the possibility of hazardous parathion air exposures.

Personal control measures recommended by Cohen et al. (1979) for aerial applicators regarding parathion exposure included wearing

impermeable uniforms, boots, and gloves, and proper mask use, storage, and maintenance. They also recommended that filters to prevent aerosol pesticide penetration into the cockpit should be required to reduce dermal and respiratory exposure by the pilot. Finally, modification of flight patterns in certain settings might reduce aircraft exposure (and, therefore, pilot exposure) to the sprayed aerosol cloud.

The danger of working with contaminated aircraft equipment was documented by Ganelin, Mail, and Cueto (1964). In the first case study of three, a 36-year old insecticide loader was hospitalized due to nausea and vomiting. He had loaded parathion four days previously, but since that time had had no exposure to organophosphorus compounds. Approximately 28 hours before admission he had washed a plane which had been used for insecticide application; two hours after this work, dizziness, nausea, and blurred vision were noted. These symptoms persisted overnight in association with restlessness and insomnia.

In the second case observed, a 30-year old aerial applicator was hospitalized because of dizziness, nausea and vomiting which occurred shortly after he had dismantled the hopper (pesticide tank) of his airplane. In previous months the plane had been used for applying large amounts of parathion; in the previous two weeks, only the defoliant magnesium chlorate had been used. About 30 minutes after dismantling the hopper, the aerial applicator felt light-headed and began perspiring profusely. Nausea, vomiting, and numbness and tingling of the hands followed.

The third case involved a 21-year old male with no known exposure to organophosphorus insecticides during the week previous to his washing of three airplanes. The airplanes had been used extensively

for parathion application, and during the previous week for application of organophosphorus defoliants. Several hours after washing the planes, the man complained of nausea, vomiting, dizziness, and blurred vision.

Ganelin et al. (1964) reported that minimal safety precautions were used in cases one and three and that although the aerial applicator in the case two was generally cautious, he had assumed that the hazard of poisoning had been prevented by the long period of time since organophosphorus compounds had been used in the plane (i.e., about two weeks). Wolfe, Durham, Walker, and Armstrong (1961), however, demonstrated that lethal quantities of parathion have persisted in alledgedly empty containers left in open fields for periods up to a year. Ganelin et al. (1964) noted that it is not illogical to assume that equipment used for mixing and applying insecticides remains similarly contaminated.

Familial Exposure to Pesticides

Bellin (1981) discussed the development of a new concept in work-related disease, the recognition that occupational exposure to toxic chemicals can affect not only the worker, but his or her family as well. In a study by Finley, Metcalfe, McDermott, Graves, Schilling, and Bonner (1974) concerning the efficacy of home laundering in removal of DDT, methyl parathion, and toxaphene residues from contaminated fabrics, residues of the three insecticides were transferred to uncontaminated fabrics during the laundering. Even three launderings were not effective in removing all residues of the three insecticides (Finley et al., 1974). Finley, Graves, Hewitt, Morris, Harmon, Iddings, Schilling, and Koonce (1979) found that washing clean fabrics with fabrics containing methyl parathion residues again resulted in

contamination of the clean fabrics. Finley et al. (1974) recommended that contaminated clothing not be washed with regular family laundry since the possibility existed for pesticide transference to uncontaminated clothing.

Laughlin, Easley, Gold, and Tupy (1981) studied the transference of methyl parathion from contaminated fabrics to subsequent laundry and laundry equipment using laboratory procedures. Laughlin et al. (1981) reported that the percentages of methyl parathion transferred by contaminated laundry equipment were slight; however, the amount may have affected particularly susceptible individuals, and rinsing of laundry equipment was recommended. Laughlin et al. (1981) further noted that care should be exercised in laundering pesticide contaminated clothing in the home.

Laundry Variables

Kim, Stone, and Sizer (1982) reported that laundry variables (water temperature, type of detergent, and immediacy of laundering after contamination) as well as type of pesticide and fabric weight significantly affected removal of pesticides from fabrics. Lillie, Hamilton, Livingston, and Porter (1980) also found that water temperature affected decontamination of pesticide applicator clothing. Using three wash temperatures, 30°C, 43°C, and 60°C on fabrics contaminated with field strength solutions of bromacil, chlordane, diazinon, malathion, and propoxur, Lillie et al. (1980) found that all wash temperatures removed 80 percent of the pesticides from the fabrics, and that the hottest wash temperature removed 96 percent of the pesticides from the fabrics, except for chlordane and diazinon.

A study conducted by Southwick, Mechan, Cannon, and Gortatowski (1974) reported that potentially hazardous amounts of methyl parathion existed in clothing after laundering with detergent. Although bleach was found to be more effective than detergent alone in decreasing methyl parathion residual in contaminated clothes, Southwick et al. (1974) concluded that methyl parathion contaminated fabric may not be safe for wearing after one laundering.

Easley, Laughlin, Gold, and Tupy (1981) studied methyl parathion (MeP) removal fron denim fabrics by selected laundry methods. Three formulations of MeP were used to contaminate the denim fabrics: 1) emulsifiable concentrate (EC), 2) encapsulated (ENC), and 3) wettable powder (WP). The four laundry procedures were: 1) pre-rinse, followed by phosphate detergent wash; 2) phosphate detergent wash; 3) phosphate detergent wash plus ammonia laundry additive; and 4) phosphate detergent wash plus bleach laundry additive. Easley et al. (1981) reported that volumes of detergent weight and laundry additives were proportional to the 150 milliliter wash water, and that all volumes were proportionally calculated from a 45 liter wash load to duplicate the home laundering situation.

The investigators found that the laundry process removed a mean of 80 percent to 99 percent MeP. Mean percentages removed were higher for encapsulated (ENC) and wettable powder (WP) MeP formulations, with ranges of 93 percent to 99 percent removal. The emulsifiable concentrate (EC) formulation apparently was more difficult to remove, since removal ranged from 80 percent to 88 percent.

Of the laundry procedures studied, pre-rinsing was found to be the most effective. The use of ammonia additive was least effective in

amount of MeP removed, while bleach was slightly more effective than ammonia as a laundry additive (Easley et al., 1981).

Easley, Laughlin, Gold, and Schmidt (1982) conducted research to determine whether commercially available detergents were effective in pesticide removal when used in washing procedures of different water temperatures. Based on the results of their study, contaminated denim fabrics should not be laundered in 30°C temperature; hotter (49°C or 60°C) temperatures were more effective. Also, heavy duty liquid detergents appeared to be more effective in pesticide removal than phosphate or carbonate detergents in water temperatures of 49°C and 60°C. The investigators stated that the important and unique contribution of their study was the close duplication of in-home laundry procedures, with commercially available detergents and common laundry temperatures.

CHAPTER III

METHODOLOGY

The purpose of the study was to gather data on attitudes and practices of Oklahoma aerial pesticide applicator households regarding the selection, use, and care of work clothing.

Development of the Instrument

Development of the questionnaire (Appendix A) evolved from pilot questionnaire results gathered by researchers from five states participating in the survey portion of the NC-170 regional project, "Limiting Pesticide Exposure Through Textile Cleaning Procedures and Selection of Clothing." Input, which was received from Dr. O. Norman Nesheim and Mr. Jim Criswell, Oklahoma State University Extension Entomology, and Dr. William D. Warde, Oklahoma State University Department of Statistics, was used to further refine the questionnaire.

Oklahoma Pilot Study

Researchers participating in the survey portion of the regional project conducted pilot studies. Researchers at Oklahoma State University randomly selected the names of 50 aerial applicators from a 1983 list of certified commercial pesticide applicators compiled by the Oklahoma State Department of Agriculture Plant Industry Division. Prenotification postcards were mailed to a random selection of 25 of the 50

applicators in October, 1983, followed by the pilot questionnaire mailing to all 50 applicators. Two follow-up techniques were employed (telephone calls and letters) in an attempt to increase response rate. While prenotification did not appear to increase response rate, post-notification techniques were successful.

Development of Core Regional Questionnaire

A core questionnaire was developed and used by all regional project participants. Individual institutions had the option of adding questions deemed necessary. Oklahoma State University added questions pertinent to aspects of the Health Belief Model.

The questionnaire consisted of two parts: Part I was directed to the aerial applicator, and Part II was directed to the person responsible for the applicator's laundry. Part I requested information from the applicator regarding type(s) of pesticide and work clothing items typically used. The applicator was also asked to indicate typical storage practices followed regarding contaminated work clothing, as well as adverse health effects he or she may have experienced due to pesticide exposure. Part II focused on storage and laundry practices typically followed for pesticide-contaminated clothing.

Parts I and II included questions pertaining to subjects' perceptions of risks and benefits regarding pesticides, perceptions of susceptibility and severity in terms of pesticide-related illness, and perceptions of benefits regarding preventive health behavior. Basic demographic data were also obtained.

Description of the Sample

Questionnaires were mailed to 129 Oklahoma aerial applicator households. The 129 applicators represented the portion of the list of certified aerial applicators not used in the Oklahoma pilot study.

Data Collection

Because the use of prenotification postcards in the pilot study did not result in a significantly higher response rate when compared to the group not receiving postcards, regional project participants did not employ prenotification techniques. Initial mailing of the questionnaire was March 7, 1984. By April 6, 10 percent of the 129 questionnaires had been returned. Subjects not responding by April 6 were mailed a second questionnaire. During the following two week period an additional 17 percent of the 129 questionnaires were returned. Telephone calls were made on April 18 and postnotification postcards were mailed on April 30 to the remaining nonrespondents. By the close of the data collection period (May 23) 50 questionnaires were returned. Of this number, four questionnaires were blank, leaving 46 as usable. Therefore, a 36 percent response rate was achieved after two mailings and two follow-up procedures.

All questionnaires were sent by first class mail. For the initial mailing, all cover letters were personally signed by the researcher. Postage for returning the questionnaires was prepaid.

Data Preparation

Data obtained from the questionnaires were coded and keypunched for data analysis. The Oklahoma State University Computer Center and

Statistical Analysis System (SAS) Computer Programming (Helwig, 1978) were used for all analyses.

Data Analysis

After examination of the frequency data, the following regroupings were made. Responses to age were collapsed into the categories, under 40, 40 to 49, 50 to 59, and 60 or older, thereby achieving similar numbers in each category. The following educational categories were combined: less than eight grades, eight grades of elementary school, one to three years of high school, and completed high school; completed junior college, trade or vocational school, and one to three years of college; and, completed college, and graduate or professional degree. Thus, three educational categories resulted from the regroupings: completed high school or less, attended college, and completed college or more.

Due to insufficient cell size, the original 12 income categories were also regrouped. The income categories, less than 5,000 dollars, 5,000 to 9,999 dollars, 10,000 to 14,999 dollars, and 15,000 to 19,999 dollars were collapsed into one group, 20,000 to 29,999 dollars and 30,000 to 39,999 dollars were collapsed into a second group, 40,000 to 49,999 dollars and 50,000 to 59,999 dollars were collapsed into a third group, while the categories 60,000 to 69,999 dollars, 70,000 to 79,999, 80,000 to 89,000 dollars, and 90,000 dollars or more were combined to form the fourth and final income category.

Two questionnaire items in Part I were combined into a single item, experience with pesticides. The original questionnaire items had asked the applicator for (1) number of years he or she had used or applied

pesticides and (2) number of days per year pesticides had been used or applied. For each respondent, the number of years of application was multiplied by the number of days per year of application, resulting in a single number (total number of days pesticides were applied) representing the applicator's experience with pesticides. After examining the distribution of experience with pesticides, the following five categories were designated: 0 to 999 days, 1,000 to 1,999 days, 2,000 to 2,999 days, 3,000 to 5,999 days, and 6,000 days or more.

In questions 7 and 8 of Part I, the toxicity level of any type of pesticide (i.e., insecticide, herbicide, fungicide, rodenticide, etc.) were of interest to the researcher, rather than brand or intended end use of the chemical agent. A single toxicity level, therefore, was desired from the combination of these two items. Hence, when both items were answered by the respondent, the higher of the two toxicity levels (i.e., the most hazardous) was recorded, resulting in the variable, toxicity of pesticides.

Due to small numbers in the response categories for questions 9 and 10 of Part I, seldom and sometimes were combined, as were usually and always. Likert scale responses regarding perceptions were also collapsed: responses 1 and 2 were combined to form category one, responses 3, 4, and 5 were combined to form category two, and responses 6 and 7 comprised the third category. Likewise, for responses to opinion statements, strongly agree and agree were combined, as were strongly disagree and disagree.

The researcher used Chi square analyses to test significant relationships among categorical data. For 2 x 2 contingency tables, Fisher's Exact Test values were reported. According to Snedecor and

Cochran (1980) and Linton and Gallo (1975), for accurate work Fisher's Exact Test should be used if sample size is small and if the smallest expected cell number is less than five for 2 x 2 comparisons. Data for this study met those specifications.

Launderers were asked to indicate what relation they were to the person who filled out the applicator section of the questionnaire. Thirteen launderers indicated they were the same person as the applicator. Those 13 questionnaires were not included in analyses in which two persons' (applicator's and launderer's) perceptions, attitudes, or practices were compared.

CHAPTER IV

RESULTS AND DISCUSSION

This study was conducted to gather data on attitudes and practices of Oklahoma aerial applicator households regarding the selection, use, and care of work clothing. The analyses were organized around the 56 hypotheses given in Chapter I.

Description of the Respondents

Socio-demographic characteristics of the applicators are given in Table I. Thirty percent of the applicators were between the ages of 50 to 59. Twenty-four percent of the applicators were under 40 as well as between 40 and 49. Nineteen percent of the applicators were aged 60 or older.

Thirty-six percent of the applicators completed high school or less, while 34 percent attended college. Thirty percent of the applicators had completed college or received a graduate or professional degree.

Forty percent of the applicators reported incomes of 20,000 to 39,999 dollars. Twenty-four percent reported incomes of 0 to 19,999 dollars. Incomes of 60,000 dollars or more were reported by 19 percent of the applicators, while 16 percent had incomes from 40,000 to 59,000 dollars.

TABLE I

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF APPLICATORS

Categories	Frequency	Percent
Age		
Under 40	10	23.8
40-49	10	23.8
50-59	13	30.9
60 or older	8	19.0
Education		
Completed high school or less	16	36.3
Attended college	15	34.1
Completed college or more	13	29.5
Income		
0-19,999 dollars	9	24.3
20,000-39,999 dollars	15	40.5
40,000-59,999 dollars	6	16.2
60,000 dollars or more	7	18.9
Toxicity of Pesticides Applied		
High	26	83.9
Low	5	16.1
Experience with Pesticides		
0-999 days	8	17.8
1,000-1,999 days	11	24.4
2,000-2,999 days	8	17.8
3,000-5,999 days	9	20.0
6,000 days or more	9	20.0
Discontinued Pesticide Use Due to Health Problems		
Yes	6	13.0
No	40	87.0

Eighty-four percent of the applicators reported that high toxicity pesticides were used. Applicators were approximately evenly distributed among the five categories for experience with pesticides. Eighty-seven percent of the applicators responded that they had not stopped using a pesticide because of health related problems. For the purposes of this study, this characteristic was considered a cue to action.

Socio-demographic characteristics for the launderers are presented in Table II. Approximately one-third of the launderers were aged 50 to 59, while 28 percent were aged 40 to 49 and 23 percent were under 40. Fourteen percent of the launderers were aged 60 or older.

A majority of the launderers had completed high school or less. Thirty percent attended college, and nearly 17 percent had completed college or received a graduate or professional degree.

Fifty-two percent of the launderers were not employed outside the home or farm. A majority of the launderers responded that they had received educational information on care of pesticide-soiled clothing. For the purposes of this study, this characteristic was considered a cue to action.

Clothing Selection of Applicators

Table III presents frequencies regarding the clothing items usually worn by applicators when applying pesticides. Applicators were asked to check all items that they usually wore in each category.

Seventy-three percent of the applicators indicated that long-sleeved shirts were usually worn for pesticide application, with 30 percent selecting short-sleeved shirts. The item, jeans or work pants, was

TABLE II

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF LAUNDERERS

Characteristics	Frequency	Percent
Age		
Under 40	10	23.3
40-49	12	27.9
50-59	14	32.6
60 or older	6	13.9
Education		
Completed high school or less	22	52.3
Attended college	13	30.9
Completed college or more	7	16.6
Employment Status		
Employed outside home or farm	20	47.6
Not employed outside home or farm	22	52.4
Exposure to Educational Information		
Yes	25	58.1
No	18	41.9

TABLE III

DISTRIBUTION OF APPLICATORS' CLOTHING ITEM SELECTIONS

Variable	Frequency	Percent[a]
Work or Sport Shirts		
Long sleeves	34	73.9
Short sleeves	14	30.4
Sleeveless	1	2.2
Do not usually wear	1	2.2
Pants		
Coveralls with long sleeves	12	26.1
Bib overalls	3	6.5
Jeans or work pants	36	78.3
Shorts, cutoffs	2	4.4
Work Shoes, Boots		
Waterproof vinyl/rubber	3	6.5
Leather	40	87.0
Canvas	6	13.0
Gloves		
Waterproof vinyl/rubber	32	69.6
Leather	10	21.7
Canvas	5	10.9
Do not usually wear	2	4.4
Hats		
Hard plastic	13	28.3
Felt	4	8.7
Straw	3	6.5
Company/baseball	20	43.5
Do not usually wear	7	15.2
Other Clothes		
Jacket or coat	24	52.2
Sweatshirt	1	2.2
Sleeveless vest	4	8.7
Undershirt	18	39.1
Jockey/boxer shorts	29	63.0
Socks	31	67.4
Belt	27	58.7
Waterproof jacket	2	4.4
Waterproof pants	1	2.2

[a]Percent > 100.00 since respondents may have checked more than one item in each category.

selected by 78 percent of the applicators. Twenty-six percent indicated that coveralls with long sleeves were typically worn when applying pesticides.

Leather work shoes or boots were selected by 87 percent of the applicators. Seventy percent of the applicators indicated that waterproof vinyl or rubber gloves were worn.

Company or baseball type hats were selected as usual work clothing by 44 percent of the applicators, with 28 percent selecting hard plastic hats. Fifteen percent of the applicators responded that a hat was not usually worn.

In the category, other clothes, a majority of the applicators responded that jockey or boxer shorts, socks, belts, and jackets or coats were typically worn for pesticide application. Waterproof jackets and waterproof pants were selected by only four percent and two percent of the applicators, respectively.

Formulation of Pesticides Contacting Applicators' Clothing

Table IV presents frequency distributions regarding the formulation of pesticides which come into contact with the applicators' clothing. Ninety-five percent of the applicators reported the formulation to be liquid. Table V presents frequencies regarding the concentration of the liquid pesticide. Of the applicators responding to the item, 81 percent reported the concentration was diluted to field strength concentration, while 19 percent indicated that full strength liquid concentration of pesticide usually came into contact with their clothes.

TABLE IV

DISTRIBUTION OF PESTICIDE FORMULATIONS
CONTACTING APPLICATORS' CLOTHING
(N=42)

Formulation	Frequency	Percent
Granular	1	2.5
Powdered	1	2.5
Liquid	40	95.0

TABLE V

DISTRIBUTION OF CONCENTRATION OF LIQUID PESTICIDE
CONTACTING APPLICATORS' CLOTHING
(N=37)

Concentration	Frequency	Percent
Diluted to field strength	30	81.1
Full strength	7	18.9

Clothing Use Practices of Applicators

Tables VI, VII, and VIII present frequencies regarding how applicators use their work clothing. As shown in Table VI, nearly 98 percent of the applicators usually do not wear pesticide-soiled clothes again before they are laundered. The one applicator responding positively to this item reported wearing pesticide-soiled clothing an average of seven days before laundering.

Tables VII and VIII present information concerning the immediacy of clothing change after the applicators' non-waterproof clothing was contacted by pesticide. Nearly 83 percent of the applicators responded that they did immediately (within an hour) change non-waterproof clothing after a full strength liquid concentrate of pesticide was spilled on the clothing (Table VII). Eighty-three percent of the applicators responded similarly concerning immediate clothing change after non-waterproof clothing had become saturated with spray after pesticide application (Table VIII).

Clothing Care Practices of Launderers

Frequency distributions regarding launderers' clothing care practices are presented in Table IX. Nearly 93 percent of the launderers responded that clothes worn for pesticide application are washed at home, with 83 percent responding that the clothing was washed in a separate load rather than with the family laundry. Seventy-one percent of the launderers did not pre-rinse or soak clothing for pesticide application.

Eighty-eight percent of the launderers used a normal washing machine cycle for the clothing worn for pesticide application, and 80 percent

TABLE VI

DISTRIBUTION OF APPLICATORS' CLOTHING USE RESPONSES CONCERNING REPEATED WEARING OF PESTICIDE-SOILED CLOTHING BEFORE LAUNDERING (N=43)

Response	Frequency	Percent
Yes	1	2.3
No	42	97.7

TABLE VII

DISTRIBUTION OF APPLICATORS' CLOTHING USE RESPONSES CONCERNING IMMEDIATE CLOTHING CHANGE AFTER SPILLAGE OF FULL STRENGTH LIQUID PESTICIDE (N=41)

Response	Frequency	Percent
Not applicable	5	12.2
Yes	34	82.9
No	2	4.9

TABLE VIII

DISTRIBUTION OF APPLICATORS' CLOTHING USE RESPONSES CONCERNING IMMEDIATE CLOTHING CHANGE AFTER SATURATION WITH PESTICIDE SPRAY (N=42)

Response	Frequency	Percent
Not applicable	5	11.9
Yes	35	83.3
No	2	4.8

TABLE IX

DISTRIBUTION OF LAUNDERERS' RESPONSES REGARDING CLOTHING CARE PRACTICES FOR CLOTHING WORN FOR PESTICIDE APPLICATION

Variable	Frequency	Percent
Where Clothing is Washed		
At home	37	92.5
At a laundromat	3	7.5
How Clothing is Washed		
With the family laundry	7	17.1
In a separate load	34	82.9
Clothing Pre-rinsed or Soaked		
Yes	12	28.6
No	30	71.4
Washing Machine Cycle		
Normal	36	87.8
Permanent press	5	12.2
Washing Machine Water Level		
Full	34	80.9
Medium	1	2.4
Low	1	2.4
Adjusted to load size	6	14.3
Wash Water Temperature		
Hot	23	54.8
Warm	18	42.8
Cold	1	2.4
Rinse Water Temperature		
Hot	11	26.2
Warm	15	35.7
Cold	16	38.1
Rewash Clothes Before Drying		
Yes	10	24.4
No	31	75.6
Clean Washer After Washing Clothes		
Yes	12	28.6
No	30	71.4
Drying Method		
In a dryer	36	83.7
On a line	7	16.3
Clean Dryer in Any Way		
Yes	0	0
No	27	100.0
Different Treatment Used in Case of Full Strength Concentrate Spill		
Yes	32	91.4
No	3	8.6
Different Treatment Used		
Destroy, burn, discard	10	31.3
Pre-rinse, soak	9	28.1
Wash twice	6	18.8
Wash separately	5	15.6
Air before washing	1	3.1
Prewash with gasoline	1	3.1

used a full water level. A majority used hot wash water, while 43 percent used warm wash water. Thirty-eight percent of the launderers reported using cold rinse water, nearly 36 percent reported using warm rinse water, and 26 percent responded that hot rinse water was used for clothing worn for pesticide application.

Three-quarters of the launderers reported that clothes worn for pesticide application were not rewashed in a second cycle before drying. Seventy-one percent indicated that the washer was not cleaned in any way after washing clothes worn for pesticide application.

Drying the clothes in a dryer was reported by nearly 84 percent of the launderers as opposed to drying on a line. None of the launderers using a dryer responded that the dryer was cleaned in any way after drying clothes worn for pesticide application.

When asked if any different treatment was given to clothing which had had full strength liquid concentrate of a pesticide spilled on it, over 90 percent of the launderers responded positively. Of this group of launderers, nearly one-third destroyed, burned, or discarded the clothing, 29 percent pre-rinsed or soaked the clothing, nearly 19 percent washed the clothing a second time, and 15 percent responded that they washed the clothing separately.

Illness Symptoms Experienced by the Respondents

Table X presents frequencies regarding illness symptoms experienced by the applicators after working with pesticides. Generally, applicators reported seldom or never experiencing any of the illness symptoms listed. Nearly 24 percent reported sometimes experiencing unusual tiredness,

TABLE X

DISTRIBUTION OF APPLICATORS' RESPONSES TO ILLNESS SYMPTOMS EXPERIENCED FOLLOWING PESTICIDE APPLICATION

Symptom	Always or Usually		Sometimes		Seldom or Never		Total	
	N	%	N	%	N	%	N	%
Unusual tiredness	3	7.0	10	23.3	30	69.7	43	100.0
Headache	2	4.5	11	25.0	31	70.5	44	100.0
Dizziness	1	2.3	3	6.8	40	90.9	44	100.0
Eye irritation	0	0.0	3	6.9	40	93.1	43	100.0
Blurred vision	0	0.0	2	4.7	41	95.3	43	100.0
Nose bleeds	1	2.4	1	2.4	40	95.2	42	100.0
Nausea	0	0.0	2	4.7	41	95.3	43	100.0
Vomiting	1	2.3	1	2.3	41	95.3	43	100.0
Stomach cramps	1	2.3	2	4.7	40	92.9	43	100.0
Diarrhea	1	2.3	2	4.5	41	93.1	44	100.0
Weakness	1	2.3	4	9.3	38	88.4	43	100.0
Chest discomfort	1	2.3	0	0.0	42	97.7	43	100.0
Difficulty in breathing	1	2.4	0	0.0	41	97.6	42	100.0
Muscle twitches	1	2.3	2	4.7	40	93.0	43	100.0
Skin irritation	0	0.0	4	9.5	38	90.5	42	100.0
Fast heart rate	0	0.0	0	0.0	41	100.0	41	100.0
Excess sweating	3	7.1	0	0.0	39	92.9	42	100.0
Fever	1	2.5	0	0.0	39	97.5	40	100.0

while one-quarter reported sometimes experiencing headache. None of the launderers reported experiencing symptoms of illness after handling clothes worn for pesticide application.

Summary

Approximately one-third of the applicators and launderers were aged 50 to 59. Twenty-four percent of the applicators were between 40 and 49, and 24 percent were under 40. Twenty-eight percent of the launderers were aged 40 to 49.

The applicators were approximately evenly distributed among the three education categories. A majority of the launderers had completed high school or less.

Incomes of 20,000 to 39,999 dollars were reported by 40 percent of the applicators, with nearly one-quarter reporting incomes in the category 0 to 19,999 dollars. Applicators were approximately evenly distributed among the five categories for experience with pesticides. Eighty-four percent of the applicators reported using highly toxic pesticides, and 87 percent reported they had not stopped using a pesticide because of health related problems.

Over one-half of the launderers were employed outside the home or farm. Sixty-four percent of the launderers reported that they were spouses of the applicator, while nearly one-third indicated they were the same person as the applicator. A majority of the launderers reported receiving educational information concerning care of pesticide-soiled clothing.

Testing the Hypotheses

H_1: No significant agreement exists between the applicators and the launderers regarding perception of pesticide-associated health risks.

Applicators and launderers were asked to respond to the question, "Overall, for you personally, how would you rate the health risk associated with pesticide application?" Responses on the seven point Likert scale were collapsed resulting in a three point scale, consisting of high risk perception, neutrality, and low risk perception. The interest of the researcher was to determine if significant agreement existed within aerial applicator households regarding perception of pesticide-associated health risks. Therefore, responses from launderers who were also the applicators in a household were not included in analysis.

Table XI presents results from Chi square analysis, including percentage distributions, and shows that significant agreement regarding perception of pesticide-associated health risks did not exist within aerial applicator households. The diagonal cells within the table represent couples in agreement. Eleven of the 30 households were in agreement in perception that pesticide-associated health risk was low. Further examination of Table XI shows that 21 of 30 launderers perceived low risk, while only 13 of 30 applicators perceived low risk. Fourteen of 30 applicators took a neutral stand regarding pesticide-associated health risk. The finding that more launderers than applicators perceive <u>low</u> risk may not be surprising, since the launderers typically would not work as closely with pesticides as would the applicators.

TABLE XI

CHI SQUARE VALUE AND DISTRIBUTION OF ASSOCIATION BETWEEN APPLICATORS AND LAUNDERERS REGARDING PERCEPTIONS OF PESTICIDE-ASSOCIATED HEALTH RISK

Applicators' Perceptions	Launderers' Perceptions			Total
	High Risk N	Neutral N	Low Risk N	N
High Risk	0	1	2	3
Neutral	2	4	8	14
Low Risk	0	2	11	13
Total	2	7	21	30

$X^2=3.663$, df=4, p=0.4535, N=30

H_{2-4}: No significant differences exist between the applicators and the launderers in terms of responses to three attitudinal statements regarding dangers of pesticides.

Paired t-tests were conducted to determine differences in the responses of the applicators as a group and the launderers as a group. As in hypothesis one, responses from launderers who were also the applicators of the households were not included in analyses. Responses on the five point Likert scale were collapsed resulting in a three point scale, where a response of one indicated agreement with the attitudinal statement, two indicated neutrality, and three indicated disagreement.

T-test results showed significant differences between applicators and launderers for two of three attitudinal statements tested. Responses to the first statement, "Pesticides are not harmful if they are handled properly," were significantly different at the 0.0001 level ($t=6.86$, $df=28$) with applicators indicating stronger agreement with the item ($\overline{X} = 1.27$) than launderers ($\overline{X} = 2.30$). Responses to the second attitudinal statement, "There are lots of things on a farm that are far more dangerous than pesticide," were significantly different at the 0.0001 level ($t=6.95$, $df=39$), with applicators again indicating stronger agreement with the item ($\overline{X} = 1.27$) than launderers ($\overline{X} = 2.30$). Responses to the third attitudinal statement, "The risk involved in getting pesticide on clothes is nothing compared to breathing pollution in the air," were not significantly different ($t=1.61$, $df=28$, $p=0.1177$). For this attitudinal statement, launderers disagreed more strongly ($\overline{X} = 2.83$) than did applicators ($\overline{X} = 2.53$).

H_{5-10}: The applicators' perceptions of pesticide-associated health risks will not vary significantly with age, education, toxicity of

pesticides used, experience with pesticides, and history of pesticide-related health problems. As in hypothesis one, the perception question tested was, "Overall, for you personally, how would you rate the health risks associated with pesticide application?"

To test hypotheses five through ten, Chi square analyses were used. Table XII provides results of the analyses and shows that one significant relationship was found at the 0.02 level between applicators' perceptions of pesticide-associated health risks and experience with pesticides. Table XIII shows no apparent pattern except that as experience with pesticides increased, there was a tendency for neutrality to decrease.

H_{11-16}: The applicators' perceptions of susceptibility to pesticide-associated health risks will not vary significantly with age, education, income, toxicity of pesticides used, experience with pesticides, or history of pesticide-related health problems. Applicators were asked to respond to the question, "How likely do you think it is that you will experience ill health effects from working with pesticides in comparison to other people in your line of work?" Table XIV presents results of Chi square analyses and shows that no significant relationships were found between applicators' perceptions of susceptibility to pesticide-associated health risks and the socio-demographic variables tested.

H_{17-22}: The applicators' perceptions of severity of pesticide-associated health risks will not vary significantly with age, education, income, toxicity of pesticides, experience with pesticides, and history of pesticide-related health problems. The researcher was interested in the applicators' perceptions of severity of a) immediate health risk and b) long-term health risks. Table XV shows the results of Chi square

TABLE XII

SUMMARY OF CHI SQUARE ANALYSES FOR APPLICATORS' PERCEPTIONS OF PESTICIDE-ASSOCIATED HEALTH RISKS BY SOCIO-DEMOGRAPHIC CHARACTERISTICS

Variable	High Risk N	High Risk %	Neutral N	Neutral %	Low Risk N	Low Risk %	Chi Square Values	Level of Significance
Age								
Under 40	0	0.00	7	38.89	2	11.11		
40 to 49	1	16.67	7	38.89	5	27.78		
50 to 59	3	50.00	3	16.67	6	33.33		
60 or older	2	33.33	1	5.56	5	27.78		
Total[a]	6	100.00	18	100.01	18	100.00	10.645	0.1000
Education								
High school or less	5	83.33	4	22.22	7	35.00		
Attended college	1	16.67	7	38.89	7	35.00		
College or more	0	0.00	7	38.89	6	30.00		
Total	6	100.00	18	100.00	20	100.00	7.607	0.1071
Income								
0 to 19,999 dollars	3	60.00	3	17.65	2	13.33		
20,000 to 39,999 dollars	0	0.00	8	47.06	8	53.33		
40,000 to 59,999 dollars	1	20.00	3	17.65	2	13.33		
60,000 dollars or more	1	20.00	3	17.67	3	20.00		
Total[a]	5	100.00	17	100.01	15	99.99	6.749	0.3447
Toxicity of Pesticides								
High	2	66.67	10	83.33	14	87.50		
Low	1	33.33	2	16.67	2	12.50		
Total	3	100.00	12	100.00	16	100.00	0.815	0.6654
Experience with Pesticides								
0 to 999 days	1	20.00	6	31.58	1	4.76		
1,000 to 1,999 days	0	0.00	5	26.32	6	28.57		
2,000 to 2,999 days	0	0.00	5	26.32	3	14.29		
3,000 to 5,999 days	3	60.00	3	15.79	3	14.29		
6,000 days or more	1	20.00	0	0.00	8	38.10		
Total[a]	5	100.00	19	100.01	21	100.01	19.008	0.0200
Discontinued Pesticide Use Due to Health Problems								
Yes	1	16.67	4	21.05	1	4.76		
No	5	83.33	15	78.95	20	95.24		
Total	6	100.00	19	100.00	21	100.00	2.414	0.2991

[a]Totals do not equal 100 percent due to rounding.

TABLE XIII

CHI SQUARE VALUE AND PERCENTAGE DISTRIBUTIONS FOR APPLICATORS' PERCEPTIONS OF PESTICIDE-ASSOCIATED HEALTH RISKS BY EXPERIENCE WITH PESTICIDES

Perception Level		Experience with Pesticides (Days) 0-999	1,000-1,999	2,000-2,999	3,000-5,999	6,000 or More
High Risk	ROW PCT	20.00	0.00	0.00	60.00	20.00
	COL PCT	12.50	0.00	0.00	33.33	11.11
	N	1	0	0	3	1
Neutral	ROW PCT	31.58	26.32	26.32	15.79	0.00
	COL PCT	75.00	45.45	62.50	33.33	0.00
	N	6	5	5	3	0
Low Risk	ROW PCT	4.76	28.57	14.29	14.29	38.10
	COL PCT	12.50	54.55	37.50	33.33	88.89
	N	1	6	3	3	8

TABLE XIV

SUMMARY OF CHI SQUARE ANALYSES FOR APPLICATORS' PERCEPTIONS OF SUSCEPTIBILITY TO PESTICIDE-ASSOCIATED HEALTH RISKS BY SOCIO-DEMOGRAPHIC CHARACTERISTICS

Variable	High Susceptibility N	High Susceptibility %	Neutral N	Neutral %	Low Susceptibility N	Low Susceptibility %	Chi Square Values	Level of Significance
Age								
Under 40	0	0.00	2	22.22	7	23.33		
40 to 49	0	0.00	3	33.33	10	33.33		
50 to 59	2	100.00	4	44.44	6	20.00		
60 or older	2	0.00	0	0.00	7	23.33		
Total[a]	2	100.00	9	99.99	30	99.99	8.706	0.1908
Education								
High school or less	1	50.00	3	33.33	11	34.38		
Attended college	1	50.00	2	22.22	12	37.50		
College or more	0	0.00	4	44.44	9	28.13		
Total[a]	2	100.00	9	99.99	32	100.01	2.000	0.7355
Income								
0 to 19,999 dollars	1	100.00	1	11.11	6	23.08		
20,000 to 39,999 dollars	0	0.00	5	55.55	11	42.31		
40,000 to 59,999 dollars	0	0.00	3	33.33	3	11.54		
60,000 dollars or more	0	0.00	0	0.00	6	23.08		
Total[a]	1	100.00	9	99.99	26	100.01	8.337	0.2145
Toxicity of Pesticides								
High	0	0.00	4	100.00	21	80.77		
Low	0	0.00	0	0.00	5	19.23		
Total	0	0.00	4	100.00	26	100.00	0.923	0.3367
Experience with Pesticides								
0 to 999 days	0	0.00	3	33.33	5	14.71		
1,000 to 1,999 days	0	0.00	1	11.11	10	29.41		
2,000 to 2,999 days	0	0.00	2	22.22	6	17.65		
3,000 to 5,999 days	2	100.00	2	22.22	5	14.71		
6,000 days or more	0	0.00	1	11.11	8	23.53		
Total[a]	2	100.00	9	99.99	34	100.01	11.570	0.1715
Discontinued Pesticide Use Due to Health Problems								
Yes	1	50.00	2	22.22	3	8.82		
No	1	50.00	7	77.77	31	91.18		
Total[a]	2	100.00	9	99.99	34	100.00	3.541	0.1703

[a]Totals do not equal 100 percent due to rounding.

TABLE XV

SUMMARY OF CHI SQUARE ANALYSES FOR APPLICATORS' PERCEPTIONS OF SEVERITY OF IMMEDIATE PESTICIDE-ASSOCIATED HEALTH RISKS BY SOCIO-DEMOGRAPHIC CHARACTERISTICS

Variable	High Risk N	High Risk %	Neutral N	Neutral %	Low Risk N	Low Risk %	Chi Square Values	Level of Significance
Age								
Under 40	5	29.41	3	27.27	1	10.00		
40 to 49	4	23.53	5	45.45	2	20.00		
50 to 59	4	23.53	1	9.09	6	60.00		
60 or older	4	23.53	2	18.18	1	10.00		
Total[a]	17	100.00	11	99.99	10	100.00	8.198	0.2239
Education								
High school or less	9	50.00	2	18.18	4	36.36		
Attended college	7	38.89	5	45.45	1	9.09		
College or more	2	11.11	4	36.36	6	54.54		
Total[a]	18	100.00	11	99.99	11	99.99	8.996	0.6120
Income								
0 to 19,999 dollars	3	18.75	2	22.22	3	30.00		
20,000 to 39,999 dollars	6	37.50	4	44.44	4	40.00		
40,000 to 59,999 dollars	3	18.75	1	11.11	2	20.00		
60,000 dollars or more	4	25.00	2	22.22	1	10.00		
Total[a]	16	100.00	9	99.99	10	100.00	1.397	0.9660
Toxicity of Pesticides								
High	7	70.00	8	80.00	8	100.00		
Low	3	30.00	2	20.00	0	0.00		
Total	10	100.00	10	100.00	8	100.00	2.776	0.2496
Experience with Pesticides								
0 to 999 days	5	29.41	2	16.67	1	9.09		
1,000 to 1,999 days	4	23.53	1	8.33	4	36.36		
2,000 to 2,999 days	2	11.76	4	33.33	2	18.18		
3,000 to 5,999 days	2	11.76	3	25.00	3	27.27		
6,000 days or more	4	23.53	2	16.67	1	9.09		
Total[a]	17	99.99	12	100.00	11	99.99	6.973	0.5395
Discontinued Pesticide Use Due to Health Problems								
Yes	1	5.56	4	33.33	1	9.09		
No	17	94.44	8	66.67	10	90.90		
Total[a]	18	100.00	12	100.00	11	99.99	4.817	0.9000

[a]Totals do not equal 100 percent due to rounding.

analyses regarding applicators' perceptions of severity of immediate health risks. The findings indicate no significant relationships between applicators' perceptions of severity of immediate health risks and the socio-demographic characteristics tested.

Table XVI presents results from Chi square analyses regarding applicators' perceptions of severity of long-term pesticide-associated health risks. The findings indicated a significant relationship between applicators' perceptions of severity of long-term health risks and age. Table XVII shows that of the applicators aged 50 or older, equal numbers perceived a high degree of severity of long-term health risks (7 of 35) and a low degree of severity of long-term health risks (7 of 35). Only one applicator aged 50 or older was neutral regarding this perception.

H_{23-26}: The launderers' perceptions of pesticide-associated health risks will not vary significantly with age, education, employment status, or exposure to educational information concerning care of pesticide-soiled clothing. The launderers were asked to respond to the question, "Overall, for you personally, how would you rate the health risk associated with pesticide application?" As in hypothesis one, responses were collapsed to three categories, where a response of one indicated high risk perception, two indicated neutrality, and three indicated low risk perception of pesticide-associated health risk.

Chi square analyses were used to test hypotheses 23 through 26. Table XVIII provides results of the analyses and shows that no significant relationships were found between launderers' perceptions of pesticide-associated health risks and any of the socio-demographic characteristics tested.

TABLE XVI

SUMMARY OF CHI SQUARE VALUES FOR APPLICATORS' PERCEPTIONS OF SEVERITY OF LONG-TERM PESTICIDE-ASSOCIATED HEALTH RISKS BY SOCIO-DEMOGRAPHIC CHARACTERISTICS

Variable	High Risk N	High Risk %	Neutral N	Neutral %	Low Risk N	Low Risk %	Chi Square Values	Level of Significance
Age								
Under 40	3	27.27	3	25.00	3	25.00		
40 to 49	1	9.09	8	66.67	2	16.67		
50 to 59	5	45.45	0	0.00	4	33.33		
60 or older	2	18.18	1	8.33	3	25.00		
Total[a]	11	99.99	12	100.00	12	100.00	13.341	0.0400
Education								
High school or less	5	41.67	3	27.27	6	42.86		
Attended college	5	41.67	6	54.54	2	14.29		
College or more	2	16.67	2	18.18	6	42.86		
Total[a]	12	100.01	11	99.99	14	100.01	5.615	0.2298
Income								
0 to 19,999 dollars	2	18.18	2	20.00	4	33.33		
20,000 to 39,999 dollars	5	45.45	4	40.00	5	41.67		
40,000 to 59,999 dollars	1	9.09	2	20.00	2	16.67		
60,000 dollars or more	3	27.27	2	20.00	1	8.33		
Total[a]	11	99.99	10	100.00	12	100.00	2.288	0.8914
Toxicity of Pesticides								
High	4	66.67	8	100.00	8	72.73		
Low	2	33.33	0	0.00	3	27.27		
Total	6	100.00	8	100.00	11	100.00	3.030	0.2198
Experience with Pesticides								
0 to 999 days	2	18.18	4	33.33	2	14.29		
1,000 to 1,999 days	2	18.18	2	16.67	5	35.71		
2,000 to 2,999 days	2	18.18	3	25.00	2	14.29		
3,000 to 5,999 days	2	18.18	2	16.67	3	21.43		
6,000 days or more	3	27.27	1	8.33	2	14.29		
Total[a]	11	99.99	12	100.00	14	100.01	4.176	0.8409
Discontinued Pesticide Use Due to Health Problems								
Yes	1	8.33	4	33.33	1	7.14		
No	11	91.67	8	66.67	13	92.86		
Total	12	100.00	12	100.00	14	100.00	4.067	0.1309

[a]Totals do not equal 100 percent due to rounding.

TABLE XVII

CHI SQUARE VALUE AND PERCENTAGE DISTRIBUTION FOR APPLICATORS' PERCEPTIONS OF SEVERITY OF LONG-TERM PESTICIDE-ASSOCIATED HEALTH RISKS BY AGE

Perception Level		Age (Years)			
		Under 40	40-49	50-59	60 or Older
High Severity	ROW PCT	27.27	9.09	45.45	18.18
	COL PCT	33.33	9.09	55.56	33.33
	N	3	1	5	2
Neutral	ROW PCT	25.00	66.67	0.00	8.33
	COL PCT	33.33	72.73	0.00	16.67
	N	3	8	0	1
Low Severity	ROW PCT	25.00	16.67	33.33	25.00
	COL PCT	33.33	18.18	44.44	50.00
	N	3	2	4	3

X^2=13.341, df=6, p=0.04, N=35

TABLE XVIII

SUMMARY OF CHI SQUARE ANALYSES FOR LAUNDERERS' PERCEPTIONS OF PESTICIDE-ASSOCIATED HEALTH RISKS BY SOCIO-DEMOGRAPHIC CHARACTERISTICS

Variable	High Risk N	High Risk %	Neutral N	Neutral %	Low Risk N	Low Risk %	Chi Square Values	Level of Significance
Age								
Under 40	1	50.00	0	0.00	10	30.30		
40 to 49	1	50.00	4	50.00	7	21.21		
50 to 59	0	0.00	3	37.50	12	36.36		
60 or older	0	0.00	1	12.50	4	12.12		
Total[a]	2	100.00	8	100.00	33	99.99	6.058	0.4167
Education								
High school or less	2	100.00	5	62.50	14	43.75		
Attended college	0	0.00	2	25.00	11	34.38		
College or more	0	0.00	1	12.50	7	21.88		
Total[a]	2	100.00	8	100.00	32	100.01	3.027	0.5533
Employment Status								
Employed outside home or farm	1	50.00	3	37.50	16	50.00		
Not employed outside home or farm	1	50.00	5	62.50	16	50.00		
Total	2	100.00	8	100.00	32	100.00	0.406	0.8167
Exposure to Education Information								
Yes	0	0.00	5	62.50	20	60.61		
No	1	100.00	3	37.50	13	39.39		
Total	1	100.00	8	100.00	33	100.00	1.516	0.4686

[a]Totals do not equal 100 percent due to rounding.

H_{27-30}: The launderers' perceptions of benefits of preventive health actions regarding pesticide-soiled clothing will not vary significantly with age, education, employment status, and exposure to educational information concerning care of pesticide-soiled clothing. Launderers were asked the question, "For you and your family, how would you rate the health benefits of taking extra precautions in storing and laundering pesticide-soiled clothing?" Responses on the seven point Likert scale were collapsed into a three point scale, consisting of high perception of benefits, neutrality, and low perception of benefits. Table XIX presents results of Chi square analyses and shows that no significant relationships were found between launderers' perceptions of benefits of preventive health actions regarding pesticide-soiled clothing and any of the socio-demographic characteristics tested.

H_{31-33}: No significant relationships exist between the perceptions (of risk, severity, and susceptibility) and the clothing use practices of the applicators. Applicators were asked to respond to six items intended to measure their perceptions of pesticide-associated health risks, severity of the health risks, and susceptibility to the health risks. The six items were as follows:

1. Overall, for you personally, how would you rate the health risk associated with pesticide application?

2. How likely do you think it is that you will experience ill health effects from working with pesticides in comparison to other people in your line of work?

3. How likely is it that getting pesticides on your skin will cause an immediate health risk?

4. How serious do you think that immediate health risk is apt to be?

TABLE XIX

SUMMARY OF CHI SQUARE ANALYSES FOR LAUNDERERS' PERCEPTIONS OF BENEFITS OF PREVENTIVE HEALTH ACTION REGARDING PESTICIDE-SOILED CLOTHING BY SOCIO-DEMOGRAPHIC CHARACTERISTICS

Variable	High Benefit N	High Benefit %	Neutral N	Neutral %	Low Benefit N	Low Benefit %	Chi Square Values	Level of Significance
Age								
Under 40	7	28.00	3	25.00	1	20.00		
40 to 49	7	28.00	2	16.67	3	60.00		
50 to 59	9	36.00	4	33.33	1	20.00		
60 or older	2	8.00	3	25.00	0	0.00		
Total	25	100.00	12	100.00	5	100.00	5.402	0.4934
Education								
High school or less	13	54.17	6	50.00	2	40.00		
Attended college	8	33.33	4	33.33	1	20.00		
College or more	3	12.50	2	16.67	2	40.00		
Total	24	100.00	12	100.00	5	100.00	2.248	0.6903
Employment Status								
Employed outside home or farm	13	52.00	6	50.00	1	20.00		
Not employed outside home or farm	12	48.00	6	50.00	4	80.00		
Total	25	100.00	12	100.00	5	100.00	1.749	0.4171
Exposure to Education Information								
Yes	14	58.33	7	58.33	3	60.00		
No	10	41.67	5	41.67	2	40.00		
Total	24	100.00	12	100.00	5	100.00	0.005	0.9975

5. How likely is it that getting pesticides on your skin will cause long-term harm?

6. How serious do you think that long-term harm is apt to be?

Because the researcher was interested in examining an overall measure of applicators' perceptions regarding pesticides and health, the responses of each applicator to all six items were combined by adding the seven point Likert scale responses and dividing by six. In each case, a response of one indicated a "high" perception, while a response of seven indicated a "low" perception. The result of the combination of items was the variable, perception.

In examining the Health Belief Model again (p. 3), it is apparent that all perceptions included in the model were not included in the variable, perception. Perceived benefits of preventive action and perceived barriers to preventive action were not incorporated as items in Part I of the questionnaire, and therefore could not be included in the variable, perception.

Independent t-tests were conducted to determine if differences existed in applicators' overall perception based on positive or negative responses to three items concerning clothing use practices. The first clothing use practice concerned whether or not applicators repeatedly wore pesticide-soiled clothing before laundering. Because only one applicator had responded positively to this item, it was not surprising that no significant difference between groups was found ($t=1.59$, $df=33$, $p=0.1202$) based on perception.

The second clothing use practice concerned whether or not applicators immediately changed clothes following spillage of full strength liquid pesticide concentrates. Of the applicators reporting that they

did immediately change clothes versus those who did not, no significant difference in perception was found ($t=0.73$, $df=28$, $p=0.4743$).

The third clothing use practice concerned whether or not the applicators immediately changed clothing if the clothing had become saturated with spray during pesticide application. No significant difference in perception was found ($t=1.19$, $df=28$, $p=0.2410$) between the group of applicators responding positively to the item and the group responding negatively. It is not known if lack of significant differences for the three items concerning clothing use practices was due to the absence of a benefits/barriers measure in the variable, perception, small sample size, or the possibility that one variable was more powerful than another (e.g., perception of susceptibility more powerful than perception of severity).

H_{34-38}: No significant relationships exist between the perceptions of pesticide-associated health risks and the clothing care practices of the launderers. Launderers were asked to respond to the question, "Overall, for you personally, how would you rate the health risk associated with pesticide application?" Independent t-tests were conducted to determine if differences existed in launderers' perceptions of pesticide-associated health risks based on positive or negative responses to five items concerning clothing care practices. The clothing care practices tested were as follows:

1. Do you usually wash the clothes that were worn for pesticide application with the family laundry? (Negative response indicated that the clothes were washed in a separate load.)

2. Do you usually pre-rinse or soak the clothes worn for pesticide application?

3. Do you usually rewash the clothes worn for pesticide application in a second cycle before drying?

4. Do you usually clean the washer in any way after washing clothes worn for pesticide application?

5. Do you do anything different with clothing you know has had full strength liquid concentrate of a pesticide spilled on it?

T-test results indicated no significant relationships between launderers' perceptions of pesticide-associated health risks and care practices based on launderer's responses to item one (t=0.33, df=38, p=0.7400), item two (t=0.33, df=38, p=0.7425) and item three (t=0.14, df=38, p=0.8898). Likewise, no significant relationships were found when testing item four (t=0.11, df=39, p=0.9158) and item five (t=1.21, df=32, p=0.2364).

H_{39-43}: No significant relationships exist between the perceptions of benefits of preventive health actions regarding pesticide-soiled clothing and the clothing care practices of the launderers. Launderers were asked to respond to the question, "For you and your family, how would you rate the health benefits of taking extra precautions in storing and laundering pesticide-soiled clothing?" A response of one indicated high perception of benefit, two indicated neutrality, and three indicated low perception of benefit. As in hypotheses 34 through 38, independent t-tests were conducted to determine if differences existed in launderers' perceptions of benefits of preventive health action based on positive or negative responses to the same five items tested in hypotheses 34 through 38.

T-test results indicated a significant relationship between launderers' perceptions of benefits and care practices based on positive

or negative responses to item one (clothing care practice, washing clothes worn for pesticide application with the family laundry) at the 0.002 level (t=3.2165, df=38). Those launderers responding positively perceived less benefits ($\overline{X}$=2.86) than the group of launderers washing the clothing in a separate load ($\overline{X}$=1.82). No significant relationships were found for launderers based on perception of benefits of preventive health action for the remaining four items (pre-rinsing or soaking, t=0.4273, df=38, p=0.6716; rewashing the clothes before drying, t=0.4407, df=37, p=0.6620; cleaning the washer, t=0.825, df=38, p=0.4145; and different treatment given to clothing in case of spillage, t=0.9519, df=31, p=0.3485).

H_{44-50}: There is no association between the applicators and the launderers in terms of clothing storage practices. Applicators and launderers were asked to indicate whether items in seven clothing categories were stored with other family laundry or separate from other family laundry before washing. Responses of launderers who reported they were also the applicators in the households were not included in these analyses. The seven clothing categories were 1) shirts, jeans, workpants, 2) underwear, 3) jackets, coveralls, 4) boots, shoes, 5) hats, caps, 6) gloves, and 7) belts.

Since 2X2 contingency tables were used to test agreement within households regarding storage practices, Fisher's Exact Test values are reported where significance was found. Table XX presents the 2X2 contingency table summary for each clothing category.

Significant agreement within aerial applicator households was found at the 0.0053 level for the clothing category, shirts, jeans, workpants (Table XX). Twenty-two of 27 households (81%) were in

TABLE XX

SUMMARY OF 2X2 CONTINGENCY TABLE DISTRIBUTIONS SHOWING AGREEMENT WITHIN HOUSEHOLDS REGARDING CLOTHING STORAGE PRACTICES

Clothing Category	Agree, Store Separate from Family Laundry N	%	Agree, Store with Family Laundry N	%	Disagree N	%	Total[a]		Level of Significance
Shirts, jeans, workpants	22	81.48	3	11.11	2	7.41	27	100.00	0.0053
Underwear	16	59.26	9	33.33	2	7.41	27	100.00	0.00001
Jackets and coveralls	25	92.59	1	3.70	1	3.70	27	99.99	0.0741
Boots and shoes	23	79.31	2	6.90	4	13.79	29	100.00	0.0684
Hats and caps	23	85.19	2	7.41	2	7.41	27	100.01	0.0250
Gloves	24	85.71	1	3.57	3	10.71	28	99.99	0.2063
Belts	16	61.54	6	23.08	4	15.38	26	100.00	0.0022

[a]Totals do not equal 100 percent due to rounding.

agreement that shirts, jeans, and workpants were stored separate from other family laundry before washing; while three of 27 households (11%) agreed that the items were stored with the family laundry.

For the second clothing category, underwear, there was significant agreement within aerial applicator households at p=0.00001. Table XX shows that 25 households were in agreement regarding how underwear was stored. Sixteen households reported that underwear is stored separate from other family laundry, while nine households reported that underwear was stored with other family laundry prior to washing.

No significant agreement (p=0.0741) within households in terms of clothing storage practices was found for the third clothing category tested, jackets and coveralls. Table XX shows that 96 percent of the households (26 of 27) were in agreement regarding how jackets and coveralls were stored, while four percent of the households (1 of 27) did not agree. A possible explanation for no significant agreement is that practically all of the households are agreeing in a single category (i.e., that jackets and coveralls are stored separately from other family laundry) and only one household was in agreement that the items were stored with other family laundry.

For the fourth clothing category tested, boots and shoes, no significant agreement within aerial applicator households was found (p=0.0684). Table XX shows that while 25 of 29 households (86%) were in agreement, four households (14%) did not agree on how boots and shoes were stored before washing.

Table XX shows that significant agreement (p=0.0250) was found within aerial applicator households in terms of storage practices for the clothing category, hats and caps. Only two of 27 (7%) households

were not in agreement regarding how hats and caps were stored prior to washing. Twenty-three households (85%) were in agreement that the items were stored separate from other family laundry.

For the sixth clothing category tested, gloves, significant agreement regarding storage practices was not found ($p=0.2063$) within aerial applicator households. Table XX shows that while 25 of 28 households (89%) were in agreement regarding how gloves were stored before laundering, three households (11%) were not in agreement.

Results for the final clothing category tested, belts, indicated significant agreement ($p=0.0022$) within aerial applicator households in terms of storage practices. As shown in Table XX, 85 percent of the households agreed regarding how belts were stored, with 62 percent of those households indicating that belts were stored separate from other family laundry prior to washing. Four of 26 households (15%) were not in agreement regarding storage practices for belts.

H_{51-53}: There is no association between the toxicity of pesticides used and the clothing use practices of the applicators. As in hypotheses 31 through 33, applicators were asked to respond to the following three items concerning clothing use:

1. Do you usually wear clothes soiled with pesticide again before they are laundered?

2. If you are not wearing waterproof clothing and you spill the full strength liquid concentrate of pesticide on your clothes, do you usually change them immediately (within an hour)?

3. If you are not wearing waterproof clothing and your clothes become saturated with spray during application of pesticide, do you usually change them immediately (within an hour)?

TABLE XXI

2X2 CONTINGENCY TABLE VALUES FOR ASSOCIATION BETWEEN TOXICITY OF PESTICIDES USED AND CLOTHING USE PRACTICE, REPEATED WEARING OF PESTICIDE-SOILED CLOTHING BEFORE LAUNDERING

Toxicity		Repeated Wearing	
		Yes	No
High	ROW PCT	4.00	96.00
	COL PCT	100.00	82.76
	N	1	24
Low	ROW PCT	0.00	100.00
	COL PCT	0.00	17.24
	N	0	5

Fisher's Exact Test p = 0.8333

TABLE XXII

2X2 CONTINGENCY TABLE VALUES FOR ASSOCIATION BETWEEN TOXICITY OF PESTICIDES USED AND CLOTHING USE PRACTICE, IMMEDIATE CLOTHING CHANGE FOLLOWING PESTICIDE SPILLAGE

Toxicity		Immediate Clothing Change	
		Yes	No
High	ROW PCT	87.50	12.50
	COL PCT	80.77	100.00
	N	21	3
Low	ROW PCT	100.00	0.00
	COL PCT	19.23	0.00
	N	5	0

Fisher's Exact Test p = 0.5539

TABLE XXIII

2X2 CONTINGENCY TABLE VALUES FOR ASSOCIATION BETWEEN TOXICITY OF PESTICIDES USED AND CLOTHING USE PRACTICE, IMMEDIATE CLOTHING CHANGE FOLLOWING PESTICIDE SPRAY SATURATION

Toxicity		Immediate Clothing Change	
		Yes	No
High	ROW PCT	87.50	12.50
	COL PCT	80.77	100.00
	N	21	3
Low	ROW PCT	100.00	0.00
	COL PCT	19.23	0.00
	N	5	0

Fisher's Exact Test p = 0.5539

TABLE XXIV

CHI SQUARE VALUES FOR APPLICATORS' PERCEPTIONS OF EFFECTIVENESS OF CLOTHING IN PROTECTING AGAINST PESTICIDE EXPOSURE BY TOXICITY OF PESTICIDES USED

Toxicity of Pesticides		Perception		
		Effective	Neutral	Ineffective
High	ROW PCT	19.23	69.23	11.54
	COL PCT	100.00	90.00	50.00
	N	5	18	3
Low	ROW PCT	0.00	40.00	60.00
	COL PCT	0.00	10.00	50.00
	N	0	2	3

$X^2 = 6.605$, df = 2, p = 0.04, N = 31

For each item, the responses seldom and sometimes were combined, as were the responses, usually and always. Responses of applicators indicating that they did not know how often pesticide got on their clothing and skin were not included in the analyses

Table XXV presents results of Chi square analyses and shows that no significant associations were found between applicators' perceptions of clothing effectiveness and how often the applicators thought a)pesticide got on their clothing, and b) pesticide got through the clothing to the skin.

Discussion of the Findings

Tablex XXVI through XXIX present summaries of the significant relationships found during statistical analyses of the data. Significant differences were found between the applicators and the launderers in terms of responses to two of three attitudinal statements tested regarding dangers of pesticides (Table XXVI). Applicators indicated stronger agreement than did launderers for the first attitudinal statement, "Pesticides are not harmful if they are handled properly." Applicators also showed stronger agreement than did launderers for the second attitudinal statement, "There are lots of things on a farm that are far more dangerous than pesticide." One possible explanation for these findings is that the applicators handled or were more involved with farm operations more often than launderers, therefore being more aware of potential dangers of pesticides.

A significant difference was found in terms of one of five clothing care practices according to launderers' perceptions of benefits of preventive health action. The clothing care practice, stated as a

TABLE XXV

SUMMARY OF CHI SQUARE ANALYSES FOR APPLICATORS' OPINIONS REGARDING EFFECTIVENESS OF CLOTHING BY HOW OFTEN PESTICIDES CONTACT APPLICATORS' CLOTHING AND HOW OFTEN PESTICIDES GET THROUGH CLOTHING TO SKIN

Variable of Interest	df	X^2	Level of Significance	N
How often pesticides get on clothing	2	0.322	N.S.	42
How often pesticides get through clothing to skin	4	2.372	N.S.	42

TABLE XXVI

SUMMARY OF SIGNIFICANT T-TESTS FOR ATTITUDE DIFFERENCES BETWEEN APPLICATORS AND LAUNDERERS

Variable of Interest	t-Value	df	Level of Significance
Attitude: Pesticides are not harmful if handled properly	2.07	27	0.05
Attitude: Lots of things on farm far more dangerous than pesticide	2.19	28	0.04

TABLE XXVII

SUMMARY OF SIGNIFICANT T-TEST FOR DIFFERENCE IN LAUNDERERS' CLOTHING CARE PRACTICE BASED ON LAUNDERERS' PERCEPTIONS OF BENEFITS OF PREVENTIVE HEALTH ACTION

Clothing Care Practice	t-Value	df	Level of Significance
Washing clothes worn for pesticide application separate from family laundry	3.36	38	0.002

TABLE XXVIII

SUMMARY OF SIGNIFICANT CHI SQUARE ANALYSES FOR ASSOCIATION BETWEEN APPLICATORS' PERCEPTIONS OF RISK, LONG-TERM SEVERITY, AND TOXICITY OF PESTICIDES AND SOCIO-DEMOGRAPHIC CHARACTERISTICS

Variable of Interest	X^2	Level of Significance
Applicators' perceptions of risk/experience with pesticides	19.008	0.02
Applicators' perceptions of long-term severity/age	13.341	0.04
Applicators' perceptions of clothing effectiveness/ toxicity	6.605	0.04

TABLE XXIX

SUMMARY OF SIGNIFICANT FISHER'S EXACT TESTS FOR AGREEMENT BETWEEN APPLICATORS AND LAUNDERERS CONCERNING CLOTHING STORAGE PRACTICES FOR FOUR CLOTHING CATEGORIES

Clothing Category	Level of Significance
Shirts, jeans, workpants	0.0053
Underwear	0.00001
Hats, caps	0.0250
Belts	0.0022

question to the launderers, was, "Do you usually wash the clothes that were worn for pesticide application with the family laundry?" The finding indicated that the launderers with higher perceptions of benefits also washed clothing worn for pesticide application separately from other family laundry. This may suggest a relationship between perceptions of benefits and the clothing care practice (Table XXVII).

Table XXVIII presents a summary of significant Chi square analyses. A significant association was found between applicators' perceptions of pesticide-associated health risks and experience with pesticides. As experience with pesticides increased, there was a tendency for neutral perceptions to decrease. A possible explanation for this finding is that definite perceptions about risk regarding pesticide usage may not be formed until an applicator has worked with pesticides for a number of years. No applicators who had used or applied pesticides for 6,000 days or more were neutral, a finding which might lend credibility to the aforementioned suggestion.

In addition, over one-third of the applicators perceiving low risk had used or applied pesticides 6,000 days or more. One possible reason for this finding is that this group of applicators had not experienced adverse health effects from pesticide exposure, and therefore perceived low health risk.

A significant association was also found between applicators' perceptions of long-term severity of pesticide-associated health risks and age. Generally, older applicators (50 years or older) were not neutral and perceived either high severity or low severity. Equal numbers of younger applicators (under 40 years) perceived high severity, low severity, or were neutral. These findings may suggest that the

passing of time is needed to form definite perceptions regarding long-term severity. Another possible explanation in regard to the younger applicators' (under 40 years) perceptions and neutrality may be a lack of educational information regarding severity of long-term pesticide-associated health risks. Perhaps, as time passes, applicators gather more information on potential dangers of pesticide exposure, therefore forming more definite perceptions as age increases.

In addition, a significant association was found between applicators' perceptions of clothing effectiveness and toxicity of pesticides used. Users of highly toxic pesticides, comprising nearly 70 percent of the sample of applicators, tended to be neutral regarding perception of effectiveness of clothing in protecting against pesticide exposure. Because this group made up the majority of respondents to the item, it would be valuable to examine reasons behind their neutrality on clothing effectiveness. Additionally, no users of low toxic pesticides perceived their clothing to be effective in protecting them against pesticide exposure. Perhaps this group of applicators deliberately chose to use low toxic pesticides because they perceive clothing to be ineffective as protection.

A summary of significant Fisher's Exact Tests is presented in Table XXIX. Significant agreement was found between applicators and launderers within a household concerning clothing storage practices for four of seven clothing categories tested (shirts, jeans, workpants; underwear; hats, caps; and belts). The findings indicated agreement within aerial applicator households that clothing items in those four categories are stored separately from other family laundry prior to washing. A possible explanation for these findings is that most items

in these four categories are items which are typically washed (and therefore stored for washing) on a regular, frequent basis. Applicators and launderers may be more aware of these items, because of the frequency of their laundering, and therefore store the items separately from other family laundry.

Although applicators' and launderers' perceptions of barriers to preventive health action were not a part of the study, the researcher wanted to examine the launderers' responses to a particular attitudinal statement which addressed the concept of barriers. A similar attitude statement was not a part of the applicators' section of the survey, therefore only the launderers' responses were examined.

The attitudinal statement, "If I gave pesticide-soiled clothing special treatment, I'd never get the laundry done," and the launderers' response, agree, could possibly be interpreted to mean that preventive health action (special laundry treatment) was viewed as a barrier (inconvenience) for the respondent. Conversely, the response, disagree, could be interpreted to mean that respondents did not view the preventive health action as barrier-laden.

Of the launderers responding to the attitudinal statement, 79 percent strongly disagreed or disagreed with the statement, 16 percent strongly agreed or agreed, and five percent were not sure. This information might be interpreted to mean that the launderers surveyed generally did not view special laundry treatment for pesticide-soiled clothing as a barrier to preventive health action.

Given the above information on the launderers' responses to the attitudinal statement, independent t-tests (for which the original five response categories were retained) were conducted to determine if

launderers' attitudes differed based on their responses to five clothing care practice items. The five questions asked of launderers regarding clothing care practices were as follows:

1. Do you usually wash the clothes that were worn for pesticide application with the family laundry?

2. Do you usually pre-rinse or soak the clothes worn for pesticide application?

3. Do you usually rewash the clothes worn for pesticide application in a second cycle before drying?

4. Do you usually clean the washer in any way after washing clothes worn for pesticide application?

5. Do you do anything different with clothing you know has had full strength liquid concentrate of a pesticide spilled on it?

The researcher was interested in whether there was a relationship between the launderers' attitudes and their clothing care practices. A significant difference was found for the fourth clothing care practice, cleaning the washer after washing clothes worn for pesticide application ($t=2.28$, $df=38$, $p=0.03$). Launderers responding that they did clean the washer disagreed more ($\overline{X}=4.6$) with the attitudinal statement than those responding that they did not clean the washer in any way ($\overline{X}=3.7$). It appears possible, then, that a relationship existed between launderers' attitudes regarding preventive health action and their behavior regarding this particular clothing care practice.

No hypotheses were formulated concerning the concept of barriers. Therefore, the findings discussed above regarding barriers are presented here for the interested reader and are not included in the summary of t-tests used to test the hypotheses of the study.

CHAPTER V

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of the study was to gather data on attitudes and practices of Oklahoma aerial applicator households regarding the selection, use, and care of work clothing. The study was part of the NC-170 regional project, "Limiting Pesticide Exposure Through Textile Cleaning Procedures and Selection of Clothing." The sample consisted of 129 aerial applicator households selected from a 1983 list of certified Oklahoma aerial applicators. The researcher collected data through mailed questionnaires whereby 36 percent of the questionnaires were completed and returned. Development of the questionnaire evolved from pilot studies conducted by researchers from five states participating in the regional project.

The questionnaire consisted of two parts. Part I, directed to the aerial applicator, requested information from the applicator regarding type(s) of pesticide and work clothing items typically used, typical storage practices followed regarding pesticide-soiled clothing, as well as adverse health effects he or she may have experienced due to pesticide exposure. Part II, directed to the launderer of the household, focused on storage and laundry practices typically followed by the launderer for pesticide-soiled clothing. Parts I and II included questions pertaining to subjects' perceptions of risks and benefits regarding pesticides, perceptions of susceptibility and severity in

terms of pesticide-related illness, and perceptions of benefits regarding preventive health behavior. Basic demographic data were also obtained. Data were analyzed using descriptive statistics, Chi square analyses, paired and independent t-tests, and Fisher's Exact Test for 2X2 contingency tables.

Approximately one-third of the applicators and launderers (persons in the households responsible for the applicators' laundry) were aged 50 to 59. Twenty-four percent of the applicators were aged 40 to 49, and 24 percent were under 40. Twenty-eight percent of the launderers were aged 40 to 49.

Applicators were approximately evenly distributed among the three educational categories, completed high school or less, attended college, and completed college or more. Fifty-two percent of the launderers had completed high school or less.

Incomes of 20,000 to 39,999 dollars were reported by 40 percent of the applicators, with nearly one-quarter reporting incomes in the category, 0 to 19,999 dollars. Nineteen percent of the applicators reported incomes of 60,000 dollars or more, while 16 percent responded in the category, 40,000 to 59,999 dollars.

Applicators were approximately evenly distributed among the five categories for experience with pesticides. The variable, experience with pesticides, resulted from the number of years the applicator had used or applied pesticides multiplied by the number of days per year pesticides were used or applied.

Eighty-four percent of the applicators reported using highly toxic pesticides. In addition, 87 percent reported they had not stopped using pesticides because of health related problems.

Fifty-two percent of the launderers reported that they were not employed outside the home or farm, while 48 percent were. Launderers were asked to indicate how they were related to the person who had filled out the applicator section of the questionnaire. While 64 percent of the launderers reported that they were spouses of the applicators, nearly one-third indicated that they were also the applicator. Questionnaires which had been completed by the same person were not used in analyses in which a comparison of applicators and launderers was desired.

When launderers were asked if they had received any educational information concerning care of pesticide-soiled clothing, 58 percent responded positively. Forty-two percent reported never receiving this type of educational information.

Seventy-four percent of the applicators, when asked to report clothing items worn for pesticide application, responded that long-sleeved shirts were typically worn. Jeans or workpants were reported typically worn by 78 percent of the applicators, and 87 percent indicated that leather workshoes or boots were worn. Seventy percent of the applicators reported that waterproof vinyl or rubber gloves were typically worn for pesticide application.

Ninety-five percent of the applicators reported that, when pesticides came into contact with their clothes, the formulation was liquid. Of that group of applicators, 81 percent reported the liquid concentration was usually diluted to field strength.

Applicators' responses to clothing use items indicated that nearly 98 percent do not wear pesticide-soiled clothing again before it is washed. Eighty-three percent of the applicators reported that clothing was changed immediately in the case of pesticide spill or spray saturation.

Launderers' responses to clothing care items indicated that large majorities (71 to 93 percent) washed the applicators' work clothing at home, in a separate load from other family laundry, and without pre-rinsing or soaking. Eighty-eight percent of the launderers used a normal washing machine cycle, 80 percent used a full water level, and 55 percent used hot wash water. Three-quarters of the launderers reported that the applicators' work clothing was not washed a second time before drying, and 71 percent reported that the washer was not cleaned in any way after washing the work clothes.

Nearly 84 percent of the launderers reported a dryer, rather than a clothesline, was used for drying the work clothes. None of the launderers using a dryer reported cleaning the dryer in any way after drying clothes worn for pesticide application. Over 90 percent of the launderers responded positively when asked if any different treatment was given to clothing which had had full strength liquid concentrate of a pesticide spilled on it. Of this group, nearly one-third destroyed, burned, or discarded the clothing, 29 percent pre-rinsed or soaked the clothing, nearly 19 percent washed the clothing a second time, and 15 percent responded that they washed the clothing separately.

Applicators generally reported that illness symptoms were seldom or never experienced after working with pesticides. None of the launderers reported experiencing illness symptoms after handling clothes worn for pesticide application.

Results of the analyses showed that applicators and launderers differed significantly in terms of responses to two of three attitudinal statements tested. The attitudinal statements concerned dangers of pesticides. Applicators agreed more strongly than the launderers that

pesticides are not harmful if handled properly, and that there are lots of things on a farm that are far more dangerous than pesticide.

A significant difference was found in terms of the clothing care practice, washing clothes worn for pesticide application separately from other family laundry, according to launderers' perceptions of benefits of preventive health behavior. The findings indicated that launderers who washed the work clothing separately from other family laundry perceived higher benefits of taking extra precautions with this clothing than launderers who did not wash the clothing separately.

Chi square analyses showed significant associations between applicators' perceptions of pesticide-associated health risk and experience with pesticides. As applicators' experience with pesticides increased, there was a tendency for neutral perceptions to decrease. Additionally, one-third of the applicators who reported using pesticides 6,000 days or more perceived low health risks associated with pesticide usage.

Applicators' perceptions of long-term severity of pesticide-associated health risks was found to be significantly associated with age. Of the applicators aged 50 years or older, only one was neutral regarding this perception. The rest of the applicators age 50 years or older held definite perceptions. Seven applicators perceived high long-term severity, and seven perceived low long-term severity.

In addition, applicators' perceptions of the effectiveness of clothing as protection against pesticide exposure was significantly associated with toxicity of pesticides used. The users of highly toxic pesticides, representing 70 percent of the respondents, were neutral regarding clothing effectiveness. Further, no users of low toxic

pesticides perceived their clothing to be effective as protection against pesticide exposure.

Fisher's Exact Test values for agreement between applicators and launderers within households regarding clothing storage practices for clothing items worn for pesticide application were significant for four of seven clothing categories tested. Results indicated agreement within aerial applicator households regarding storage practices (i.e., with family laundry, or separate from family laundry) for the clothing items, shirts, jeans, workpants, underwear, hats, caps, and belts. Of those households in agreement, the majority reported storing the clothing items separate from other family laundry. It is not known if applicators and launderers not responding to the questionnaire would differ from respondents in terms of their perceptions or reported behavior.

Implications

The findings present a number of implications for those persons concerned with the attitudes and practices of aerial applicator households regarding clothing selection, use, and care. Additionally, the findings have implications for those persons researching individuals' various perceptions of a potential health threat and those individuals' preventive health behavior.

This study found that applicators' perceptions of long-term severity of pesticide-associated health risks was significantly associated with age. Rosenstock (1974b) reported that individuals may vary regarding severity of a given health condition, and that degree of severity may be judged from several viewpoints. This study's findings possibly suggest that age may affect how a person perceives severity. Those applicators

aged 50 years or older were more definite in their judgments or perceptions of severity.

Launderers' perceptions of benefits of preventive health action were found to be significantly related to the clothing care practice, washing clothes worn for pesticide application separately from other family laundry. Although launderers' subsequent health behavior was not examined, nor were their perceptions of susceptibility, there appears to be some agreement with the findings of Kegeles (1969). In his study, Kegeles found that women with high perceptions of susceptibility and high perception of the benefit of cervical cancer screenings made more screening visits than did their counterparts. Examination of launderers' perceptions of susceptibility and a follow-up study of their clothing care practices would need to be conducted before a true comparison of findings could be made.

A significant association was also found between applicators' perceptions of pesticide-associated risk and experience with pesticides. There was a tendency for neutral perceptions to decrease as experience with pesticides increased. It is possible that applicators with relatively little experience with pesticides have not been exposed to educational information regarding potential hazards of pesticide usage. Persons in extension services and educational institutions may need to identify those applicators with relatively little experience with pesticides and supply them with appropriate educational information.

Recommendations for Future Research

The results of this study suggest several directions for future research. First, researchers need to examine clothing selection and

care practices of aerial applicator households in other geographical localities to examine differences in these practices.

Second, study of perceptions and attitudes of pesticide-associated health risks of the geographically different applicator households, in association with study of clothing selection and care practices, is needed to further determine relationships among perceptions, attitudes, and respondents' reported behavior.

Third, results showed a significant relationship between perceptions of effectiveness of clothing in protecting against pesticide exposure and toxicity of pesticides used. Further research is needed to determine reasons why users of lower toxicity pesticides do not perceive clothing as effective, and why users of highly toxic pesticides are neutral regarding clothing effectiveness.

Fourth, a study of aerial applicator households' perceptions of barriers to taking preventive health action is needed in conjunction with study of perceptions of benefits.

Fifth, the component, cues to action, should be examined in relation to other components of the Health Belief Model and to subsequent health action. A follow-up study would need to be conducted for this purpose.

Sixth, other populations of pesticide applicator households employing non-aerial methods should be studied to determine differences in clothing selection and care, perceptions and attitudes, and reported behavior.

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APPENDICES

APPENDIX A

COVER LETTER AND INSTRUMENT

Clothes and Pesticides: What is the Relationship?

SURVEY OF PESTICIDE APPLICATOR FAMILIES

OKLAHOMA STATE UNIVERSITY • STILLWATER

Department of Clothing, Textiles and Merchandising 74078
(405) 624-5034 Home Economics West 315

February 27, 1984

Dear Friends:

Information on the relationship between clothing and pesticide exposure is limited, especially with respect to the effects of different laundry methods on removal of pesticides. You are being invited to participate in a survey concerned with the use and care of clothing worn when applying pesticides. Our purpose is to learn about the kind of clothes worn when applying pesticides, where these clothes are stored after wearing, and what laundry procedures are used for cleaning them. The study is being conducted by the Department of Clothing, Textiles and Merchandising at Oklahoma State University, in conjunction with four other universities as part of a regional research project.

Results of this research will be used to direct laboratory experiments to determine more effective cleaning methods for clothing worn when applying pesticides. Your participation is totally voluntary. Your answers will remain confidential and will be summarized with responses of other persons similar to yourself for purposes of reporting. You may refuse to answer any question or set of questions. However, we hope you will complete the questionnaire to insure that we have the best information on which to base our laboratory studies.

The questionnaire has two parts. Each part should take no more than 15 minutes to complete. The first part should be completed by the adult in the family who uses pesticides most frequently. The second part should be completed by the adult who is usually responsible for doing the laundry. For purposes of this study, herbicides, fungicides, insecticides, and rodenticides are all considered to be pesticides.

If you have any questions about this survey, please call Donna Branson. If no one in your family has applied any pesticides in the past two years, please return the blank questionnaire.

Thank you for your help in answering our questions.

Sincerely,

Donna H. Branson, Ph.D.
Associate Professor

Joanne Carter
Graduate Research Assistant

(1-5, 6/1)

PART I: TO BE FILLED OUT BY THE ADULT WHO APPLIES PESTICIDES MOST OFTEN

SECTION A: EXPERIENCE WITH PESTICIDES

Q-1. Do you work with pesticides primarily as (check one)
(7)

1. _____ AN INDEPENDENT FARM OPERATOR
2. _____ A COMMERCIAL APPLICATOR
3. _____ OTHER (please specify) _____

Q-2. About how many years have you used or applied pesticides?
(8-9)

_____
number of years

Q-3. About how many days each year do you work with pesticides?
(10-12)

_____
number of days

Q-4. Have you used any of the following insecticides or other types of pesticides (herbicides, fungicides, and rodenticides) in the past two years?
(check all you have used)
(13-22)

INSECTICIDES

1. _____ Parathion
2. _____ Methyl Parathion
3. _____ Di-Syston
4. _____ Parathion 6-3
5. _____ OTHER (please specify)

_____

OTHER PESTICIDES

6. _____ 2,4-D
7. _____ Treflan
8. _____ Prowl
9. _____ Banvel
10. _____ OTHER (please specify)

_____

Q-5. Which insecticide have you used in the greatest quantity in the past two years? (list one)

(23)

_____

A. What was the formulation of the insecticide listed in question 5? (check one)

(24)

1. _____GRANULAR
2. _____POWDERED
3. _____LIQUID
4. _____OTHER (please specify)

_____

5. _____DON'T KNOW

B. How was this insecticide applied? (check one)

(25-26)

1. _____AIRPLANE/HELICOPTER
2. _____GROUND EQUIPMENT
3. _____IRRIGATION WATER
4. _____OTHER (please specify)

_____

Q-6. What other type of pesticide (herbicide, fungicide, or rodenticide) have you used in the greatest quantity in the past two years? (list one)

(27)

_____

A. What was the formulation of the pesticide listed in question 6? (check one)

(28)

1. _____GRANULAR
2. _____POWDERED
3. _____LIQUID
4. _____OTHER (please specify)

_____

5. _____DON'T KNOW

B. How was this pesticide applied? (check one)

(29-30)

1. _____AIRPLANE/HELICOPTER
2. _____GROUND EQUIPMENT
3. _____IRRIGATION WATER
4. _____OTHER (please specify)

_____

SECTION B: PESTICIDES AND CLOTHING

Q-7. (31) Which brand of insecticide most frequently gets on your clothes? (PLEASE ANSWER QUESTIONS 9 THROUGH 15 IN TERMS OF THIS INSECTICIDE)

_____

0. _____ INSECTICIDE NEVER GETS ON CLOTHES

Q-8. (32) What other type of pesticide (herbicide, fungicide, or rodenticide) most frequently gets on your clothes? (IF YOU NEVER GET INSECTICIDE ON YOUR CLOTHES, PLEASE ANSWER QUESTIONS 9 THROUGH 15 IN TERMS OF THIS OTHER TYPE OF PESTICIDE)

_____

0. _____ OTHER PESTICIDES NEVER GET ON CLOTHES

↓

GO TO QUESTION 9 IF INSECTICIDE GETS ON CLOTHES.
GO TO QUESTION 16 IF NEITHER INSECTICIDE NOR OTHER PESTICIDES GET ON CLOTHES.

Q-9. (33) How often would you say pesticide gets on your clothes? (check one)

1. _____ SELDOM (about once per application season)
2. _____ SOMETIMES (two or three times per application season)
3. _____ USUALLY (about once a week during application season)
4. _____ ALWAYS (nearly every day)
5. _____ DON'T KNOW

Q-10. (34) When pesticide gets on your clothes, how often does it get through the clothing to the skin? (check one)

1. _____ NEVER
2. _____ SELDOM (about once per application season)
3. _____ SOMETIMES (two or three times per application season)
4. _____ USUALLY (about once a week during application season)
5. _____ ALWAYS (nearly every day)
6. _____ DON'T KNOW

Q-11. What clothing do you usually wear when applying pesticide? Check all that apply in each category of clothing (A-F) listed below.

A. WORK OR SPORT SHIRTS
(35-38)
1. _____ LONG SLEEVES
2. _____ SHORT SLEEVES
3. _____ SLEEVELESS
4. _____ DO NOT USUALLY WEAR

B. PANTS
(39-43)
1. _____ COVERALLS WITH LONG SLEEVES
2. _____ BIB OVERALLS
3. _____ JEANS OR WORK PANTS
4. _____ SWEAT PANTS
5. _____ SHORTS, CUTOFFS

C. WORK SHOES/BOOTS
(44-47)
1. _____ WATERPROOF VINYL/ RUBBER
2. _____ LEATHER
3. _____ CANVAS
4. _____ OTHER (describe)

_____

D. GLOVES
(48-52)
1. _____ WATERPROOF VINYL/ RUBBER
2. _____ LEATHER
3. _____ CANVAS
4. _____ OTHER (describe)

_____

5. _____ DO NOT USUALLY WEAR

E. HATS
(53-58)
1. _____ HARD PLASTIC
2. _____ FELT
3. _____ STRAW
4. _____ COMPANY/BASEBALL
5. _____ OTHER (describe)

_____

6. _____ DO NOT USUALLY WEAR

F. OTHER CLOTHES
(59-68)
1. _____ JACKET OR COAT
2. _____ SWEATSHIRT
3. _____ SLEEVELESS VEST
4. _____ UNDERSHIRT
5. _____ JOCKEY/BOXER SHORTS
6. _____ SOCKS
7. _____ BELT
8. _____ WATERPROOF JACKET
9. _____ WATERPROOF PANTS
10. _____ OTHER (describe)

_____

Q-12. When pesticide comes in contact with your clothes, is it usually (check one)

(69-70)

1. _____ GRANULAR
2. _____ POWDERED
3. _____ LIQUID → 12a. Is the concentration usually (check one)
4. _____ OTHER (explain)

   _____

5. _____ DON'T KNOW

   1. _____ DILUTED TO FIELD CONCENTRATION
   2. _____ FULL STRENGTH
   3. _____ OTHER (explain)

      _____

   4. _____ DON'T KNOW

Q-13. Do you usually wear clothes soiled with pesticide again before they are laundered? (check one)

(71-74)

1. _____ YES (give average number of days of wearing) _____ days
2. _____ NO

Q-14. If you are not wearing waterproof clothing and you spill the full strength liquid concentrate of pesticide on your clothes, do you usually change them immediately (within an hour)? (check one)

(75-76)

1. _____ NOT APPLICABLE → [GO TO QUESTION 15]
2. _____ YES
3. _____ NO → 14a. How soon do you change clothes? (check one)

   1. _____ 1 TO 3 HOURS
   2. _____ 4 TO 6 HOURS
   3. _____ 7 OR MORE HOURS

Q-15. If you are not wearing waterproof clothing and your clothes become saturated with spray during application of pesticide do you usually change them immediately (within an hour)? (check one)

(77-78)

1. _____ NOT APPLICABLE → [GO TO QUESTION 16]
2. _____ YES
3. _____ NO → 15a. How soon do you change clothes? (check one)

   1. _____ 1 TO 3 HOURS
   2. _____ 4 TO 6 HOURS
   3. _____ 7 OR MORE HOURS

(1-5, 6/2)

Q-16. Where do you usually store clothing worn for pesticide application before it is washed? (check one answer for each type of clothing)

(7-9)

	With other family laundry	Separate from other family laundry
a. shirts, jean, workpants ...	1._____	2._____
b. underwear	1._____	2._____
c. jackets, coveralls.....	1._____	2._____

Q-17. Where do you usually store other items worn for pesticide application until next use? (check one answer for each type of item).

(10-13)

	With other family clothing	Separate from other family clothing
a. boots, shoes	1._____	2._____
b. hats, caps	1._____	2._____
c. gloves	1._____	2._____
d. belts	1._____	2._____

Q-18. How effective do you feel the clothes you usually wear are in protecting you from pesticide exposure? (circle one)

(14)

VERY EFFECTIVE						VERY INEFFECTIVE
1	2	3	4	5	6	7

SECTION C: PESTICIDES AND HEALTH

Q-19. How likely is it that getting pesticides on your skin will cause an immediate health risk? (circle one)

(15)

VERY LIKELY						VERY UNLIKELY
1	2	3	4	5	6	7

↓

[GO TO QUESTION 21]

Q-20. How serious do you think that immediate health risk is apt to be? (circle one)

(16)

VERY SERIOUS						VERY MILD
1	2	3	4	5	6	7

Q-21. How likely is it that getting pesticides on your skin will cause long-term harm? (circle one)

(17)

VERY LIKELY						VERY UNLIKELY
1	2	3	4	5	6	7

[GO TO QUESTION 23]

Q-22. How serious do you think that long-term harm is apt to be? (circle one)

(18)

VERY SERIOUS						VERY MILD
1	2	3	4	5	6	7

Q-23. With over-exposure to some pesticides there is danger of poisoning. After working with pesticides how often would you say you have experienced the following? (circle one answer for each item)

(19-36)	ALWAYS	USUALLY	SOMETIMES	SELDOM	NEVER
UNUSUAL TIREDNESS.....	1	2	3	4	5
HEADACHE.....	1	2	3	4	5
DIZZINESS.....	1	2	3	4	5
EYE IRRITATION.....	1	2	3	4	5
BLURRED VISION.....	1	2	3	4	5
NOSE BLEEDS.....	1	2	3	4	5
NAUSEA.....	1	2	3	4	5
VOMITING.....	1	2	3	4	5
STOMACH CRAMPS.....	1	2	3	4	5
DIARRHEA.....	1	2	3	4	5
WEAKNESS.....	1	2	3	4	5
CHEST DISCOMFORT.....	1	2	3	4	5
DIFFICULTY BREATHING...	1	2	3	4	5
MUSCLE TWITCHES.....	1	2	3	4	5
SKIN IRRITATION.....	1	2	3	4	5
FAST HEART RATE.....	1	2	3	4	5
EXCESS SWEATING.....	1	2	3	4	5
FEVER.....	1	2	3	4	5

Q-24. Have you stopped using any pesticide because of health related problems? (check one)

(37-47)

1. _____ YES ⟶ 24a. If yes, please list the pesticide and the related problem.

	Pesticide	Health Problem
2. _____ NO	_____	_____
		_____
	_____	_____
		_____

Q-25. Overall, for you personally, how would you rate the health risk associated with pesticide application? (circle one)

(48)

VERY HIGH 1 2 3 4 5 6 7 VERY LOW

Q-26. Overall, for you personally, how would you rate the crop yield benefit associated with pesticide application? (circle one)

(49)

VERY HIGH 1 2 3 4 5 6 7 VERY LOW

Q-27. How likely do you think it is that <u>you</u> will experience ill health effects from working with pesticides <u>in comparison to other people</u> in your line of work?

(50)

Very Likely 1 2 3 4 5 6 7 Very Unlikely

SECTION D: OPINIONS CONCERNING PESTICIDES. We would like to know what your opinions are concerning pesticides. For each of the following statements, circle 1 if you strongly agree (SA), 2 if you agree (A), 3 if you are not sure (NS), 4 if you disagree (D), or 5 if you strongly disagree (SD). Circle <u>one</u> number for <u>each</u> statement.

(51-62)

	SA	A	NS	D	SD
Q-28. Clothes keep pesticide off the skin.....	1	2	3	4	5
Q-29. Pesticides differ in their level of toxicity--some are very dangerous and others are not.....	1	2	3	4	5

Circle one number for each statement

	SA	A	NS	D	SD
Q-30. Most people are tough enough to take exposure to pesticides without harm.....	1	2	3	4	5
Q-31. People really can't avoid getting pesticide on their clothes if they farm nowadays.....	1	2	3	4	5
Q-32. Insecticide should be used only when monitoring of the insects indicates it is needed.....	1	2	3	4	5
Q-33. People should not go into the house wearing clothes that have pesticide on them.....	1	2	3	4	5
Q-34. Pesticides are not harmful if they are handled properly.....	1	2	3	4	5
Q-35. There are lots of things on a farm that are far more dangerous than pesticide.....	1	2	3	4	5
Q-36. The benefits of pesticides far exceed whatever risks may be involved.....	1	2	3	4	5
Q-37. The risk involved in getting pesticide on clothes is nothing compared to breathing pollution in the air.....	1	2	3	4	5
Q-38. It is better to pay someone else to apply pesticide and avoid the health risk.....	1	2	3	4	5
Q-39. Risks are just part of the job in pesticide application.....	1	2	3	4	5

SECTION E: This section contains some questions we need to ask about you and others who live in your household. This information will be kept confidential, but will be helpful to us in interpreting the information you have already provided.

Q-40. Please list everyone living in your household, starting with yourself, and indicate age and sex for each.

(7-34)

PERSONS IN HOUSEHOLD (myself, spouse, son, daughter, etc.)	AGE	Circle one: M=male F=female	
_____	_____	M	F
_____	_____	M	F
_____	_____	M	F
_____	_____	M	F
_____	_____	M	F
_____	_____	M	F
_____	_____	M	F

Q-41. How many years of schooling have you completed? (check one)
(35)

1._____ LESS THAN 8 GRADES
2._____ 8 GRADES OF ELEMENTARY SCHOOL
3._____ 1-3 YRS OF HIGH SCHOOL
4._____ COMPLETED HIGH SCHOOL
5._____ COMPLETED JR. COLLEGE, TRADE OR VOCATIONAL SCHOOL (2 yr. program)
6._____ 1-3 YRS COLLEGE
7._____ COMPLETED COLLEGE (4 yr. degree)
8._____ GRADUATE DEGREE OR PROFESSIONAL DEGREE
9._____ OTHER (please explain) _____

Q-42. About how many acres of land do you farm? (check one)
(36)

1._____ 10-200
2._____ 201-400
3._____ 401-600
4._____ 601-800
5._____ 801-1000
6._____ 1001 or more

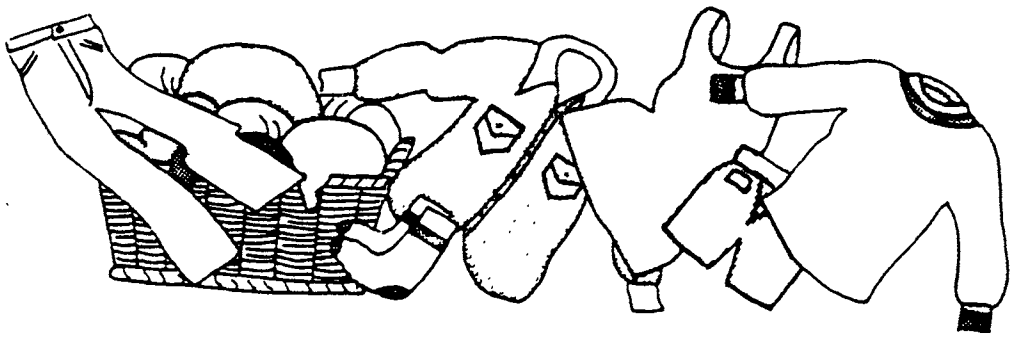
Q-43. Which of the following categories best describes your total family income before taxes during 1983? (check one)
(37-38)

1._____ less than $5000	7._____ $40,000 to $49,999
2._____ $5000 to $9,999	8._____ $50,000 to $59,999
3._____ $10,000 to $14,999	9._____ $60,000 to $69,999
4._____ $15,000 to $19,999	10._____ $70,000 to $79,999
5._____ $20,000 to $29,999	11._____ $80,000 to $89,999
6._____ $30,000 to $39,999	12._____ $90,000 or more

Thank you very much for providing information on pesticide application and clothing practices. If there is any additional information that you feel would be helpful to us, please add it below.

If you would like to receive additional information, please check here...☐

Clothes and Pesticides: What is the Relationship?



PART II:

TO BE COMPLETED BY THE PERSON RESPONSIBLE FOR THE LAUNDRY

(1-5, 6/4)

PART II: TO BE FILLED OUT BY THE ADULT WHO USUALLY DOES THE LAUNDRY

SECTION A: LAUNDRY PRACTICES

Q-1. How often do you know when clothing you are going to wash has been worn for pesticide application? (check one)

(7-11)

1. _____ ITEMS WORN FOR PESTICIDE APPLICATION ARE SENT TO A COMMERCIAL SERVICE → GO TO QUESTION 20
2. _____ NEVER
3. _____ SELDOM → 1a. How do you know if items have been worn for pesticide application? (check all that apply)
4. _____ SOMETIMES
5. _____ USUALLY
6. _____ ALWAYS

1. _____ SMELL
2. _____ APPEARANCE (STAINS, ETC.)
3. _____ APPLICATOR TELLS ME
4. _____ OTHER (please explain)

_____

Q-2. Where do you usually store clothing you know has been worn for pesticide application before it is washed? (check one answer for each type of clothing)

(12-14)

	With other family laundry	Separate from other family laundry
a. shirts, jean, workpants ...	1._____	2._____
b. underwear	1._____	2._____
c. jackets, coveralls.....	1._____	2._____

Q-3. Where do you usually store other items you know have been worn for pesticide application until next use? (check one answer for each type of item).

(15-18)

	With other family clothing	Separate from other family clothing
a. boots, shoes	1._____	2._____
b. hats, caps	1._____	2._____
c. gloves	1._____	2._____
d. belts	1._____	2._____

Q-4. Where do you usually wash clothing that has been worn for pesticide application? (check one)

(19)

1. _____ AT HOME
2. _____ AT A LAUNDROMAT
3. _____ SOMEWHERE ELSE (please explain)

_____

Q-5. Do you usually wash the clothes that were worn for pesticide application (check one)

(20)

1. _____ WITH THE FAMILY LAUNDRY?
2. _____ IN A SEPARATE LOAD?

Q-6. Do you usually pre-rinse or soak the clothes worn for pesticide application? (check one)

(21-23)

1. _____ YES → 6a. Where do you usually pre-rinse or soak these clothes? (check all that apply)
   1. _____ IN A WASHING MACHINE, SPINNING OUT BEFORE THE REGULAR WASH
   2. _____ IN A WASHING MACHINE WITH NO SPINNING OUT BEFORE BEGINNING THE REGULAR WASH
   3. _____ IN A TUB OR BUCKET
   4. _____ OUTSIDE ON A CLOTHESLINE USING A HOSE
   5. _____ IN A WASH BASIN OR BATHTUB
   6. _____ OTHER (please explain)

   _____

   6b. How long do you usually pre-rinse or soak? (check one)

   1. _____ LESS THAN 5 MINUTES
   2. _____ 5 TO 30 MINUTES
   3. _____ MORE THAN 30 MINUTES, UP TO 2 HOURS
   4. _____ LONGER THAN 2 HOURS, BUT NOT OVERNIGHT
   5. _____ OVERNIGHT

2. _____ NO

Q-7. Which washing machine settings do you usually use for clothes worn for pesticide application? (check one answer per item)

(24-27)

7a. CYCLE

1. _____ normal
2. _____ permanent press
3. _____ other (please explain)

_____

7b. WATER LEVEL

1. _____ full
2. _____ medium
3. _____ low
4. _____ adjusted to load size

7c. WASH WATER TEMPERATURE

1. _____ hot
2. _____ warm
3. _____ cold

7d. RINSE WATER TEMPERATURE

1. _____ hot
2. _____ warm
3. _____ cold

Q-8. Do you usually <u>rewash</u> the clothes worn for pesticide application in a second cycle before drying? (check one)

(28)

1. _____ YES
2. _____ NO

Q-9. Which laundry products do you usually use for clothes worn for pesticide application? (check all that you usually use)
(29-44)

1. _____ LIQUID DETERGENT
2. _____ POWDERED DETERGENT
3. _____ SOAP
4. _____ POWDERED BLEACH
5. _____ LIQUID BLEACH
6. _____ FABRIC SOFTENER IN WASHER
7. _____ FABRIC SOFTENER IN DRYER
8. _____ ENZYME PRESOAK
9. _____ OTHER PRESOAK
10. _____ BORAX
11. _____ WASHING SODA
12. _____ PREWASH STAIN REMOVER (hand pump or liquid)
13. _____ PREWASH STAIN REMOVER (in spray can)
14. _____ AMMONIA
15. _____ WATER SOFTENER
16. _____ OTHER (please describe)

_____

Q-10. Which brand of soap or detergent do you usually use to wash clothes worn for pesticide application? _____
(45-46)

Q-11. When washing clothes worn for pesticide application, do you usually measure and use the amount of soap or detergent the manufacturer recommends? (check one)
(47-48)

1. _____ YES

2. _____ NO ⟶ 11a. How much detergent do you usually use to wash clothes worn for pesticide application? (check one)

   1. _____ MORE THAN THE MANUFACTURER RECOMMENDS
   2. _____ LESS THAN THE MANUFACTURER RECOMMENDS
   3. _____ DON'T KNOW

Q-12. Do you usually clean the washer in any way after washing clothes worn for pesticide application? (check one)
(49-51)

1. _____ YES ⟶ 12a. Describe the cleaning method you use.
2. _____ NO

_____

_____

Q-13. What is the source of your water supply? (check one)
(52)

1. _____ WELL WATER
2. _____ CITY WATER SUPPLY
3. _____ OTHER (please specify) _____

Q-14. What is the temperature setting of your water heater? (check one)
(53)

1. _____ LOW
2. _____ MEDIUM (NORMAL)
3. _____ HIGH

Q-15. Do you have a water softener? (check one)
(54)

1. _____ YES
2. _____ NO

Q-16. After washing clothes worn for pesticide application how do you usually dry them? (check one)
(55-58)

1. _____ IN A DRYER ⟶ 16a. Do you clean the dryer in any way after use? (check one)
2. _____ ON A LINE
3. _____ OTHER (explain)

_____

_____

1. _____ YES (describe)

_____

2. _____ NO

Q-17. Do you do anything different with clothing you know has had full strength liquid concentrate of a pesticide spilled on it? (check one)
(59-61)

1. _____ DOES NOT APPLY ⟶ GO TO QUESTION 18
2. _____ NO
3. _____ YES ⟶ 17a. What do you do?

_____

_____

Q-18. How satisfied are you that the clothes worn for pesticide application are really clean and free of pesticide after washing? (circle one)

(62)

VERY SATISFIED						VERY DISSATISFIED
1	2	3	4	5	6	7

Q-19. After washing clothes worn for pesticide application, have you experienced any symptoms of illness? (check one)

(63-68)

1. _____ YES ⟶ 19a. Please check all that apply:
2. _____ NO

1. _____ NAUSEA
2. _____ HEADACHE
3. _____ DIZZINESS
4. _____ SKIN IRRITATION
5. _____ OTHER (please list)

_____

Q-20. Overall, for you personally, how would you rate the health risks associated with pesticide application? (circle one)

(69)

VERY HIGH						VERY LOW
1	2	3	4	5	6	7

Q-21. Overall, for you personally, how would you rate the crop yield benefits associated with pesticide application? (circle one)

(70)

VERY HIGH						VERY LOW
1	2	3	4	5	6	7

Q-22. For you and your family, how would you rate the <u>health</u> benefits of taking <u>extra precautions</u> in storing and laundering pesticide-soiled clothing?

(71)

Very High						Very Low
1	2	3	4	5	6	7

SECTION B: OPINIONS CONCERNING PESTICIDES. We would like to know what your opinions are concerning pesticides. For each of the following statements, circle 1 if you strongly agree (SA), 2 if you agree (A), 3 if you are not sure (NS), 4 if you disagree (D), or 5 if you strongly disagree (SD). Circle <u>one</u> number for <u>each</u> statement.

(7-17)

	SA	A	NS	D	SD
Q-23. It is important to be as careful as possible in washing clothes that have pesticide on them.....	1	2	3	4	5
Q-24. Pesticides differ in their level of toxicity--some are more dangerous than others.....	1	2	3	4	5
Q-25. People really can't avoid getting pesticide on their clothes if they farm nowadays.....	1	2	3	4	5
Q-26. Handling pesticides doesn't involve much health risk.....	1	2	3	4	5
Q-27. People should not come into the house wearing clothes that have pesticide on them....	1	2	3	4	5
Q-28. Pesticides are not dangerous if they are handled properly...	1	2	3	4	5
Q-29. The amount of pesticides that gets on clothes in our family doesn't worry me.....	1	2	3	4	5
Q-30. If I gave pesticide soiled clothing special treatment, I'd never get the laundry done.....	1	2	3	4	5
Q-31. There are lots of things on a farm that are far more dangerous than pesticide.....	1	2	3	4	5
Q-32. Without pesticides, crop yield would go way down.....	1	2	3	4	5
Q-33. The risk involved in getting pesticide on clothes is nothing compared to breathing the pollution in the air.....	1	2	3	4	5

SECTION C: BACKGROUND INFORMATION. This section contains some questions we need to ask about you so we can interpret the answers you have given in a more meaningful way.

Q-34. What is your age? _____
(18-19) (years)

Q-35. What is your sex? (check one)
(20)

1. _____ MALE

2. _____ FEMALE

(1-5, 6/5)

Q-36. Are you presently employed outside the home or farm? (check one)
(21-24)

1. _____ YES ——→ 24a. _____ Part time (please describe)

2. _____ NO _____

24b. _____ Full time (please describe)

_____

Q-37. How many years of schooling have you completed? (check one)
(25)

1. _____ LESS THAN 8 GRADES
2. _____ 8 GRADES OF ELEMENTARY SCHOOL
3. _____ 1-3 YRS. OF HIGH SCHOOL
4. _____ COMPLETED HIGH SCHOOL
5. _____ COMPLETED JR. COLLEGE, TRADE OR VOCATIONAL SCHOOL (2 yr. program)
6. _____ 1-3 YRS. COLLEGE
7. _____ COMPLETED COLLEGE (4 yr. degree)
8. _____ GRADUATE DEGREE OR PROFESSIONAL DEGREE
9. _____ OTHER (please explain) _____

Q-38. Have you received any educational information on care of pesticide soiled clothing? (check one)

(26-35)

1._____ YES → 26a. Did this information come from (check all that apply)

2._____ NO

1._____ EXTENSION SERVICE

2._____ COLLEGE OR UNIVERSITY

3._____ CHEMICAL COMPANY

4._____ CHEMICAL DEALER

5._____ NEWSPAPER

6._____ MAGAZINE

7._____ RADIO

8._____ TELEVISION

9._____ OTHER (please specify)

_____

Q-39. How are you related to the person who completed the Pesticide Applicator part of this survey? (check one)

(36-37)

1._____SAME PERSON

2._____SPOUSE

3._____SON

4._____DAUGHTER

5._____FATHER

6._____MOTHER

7._____OTHER (please explain)

_____

Thank you very much for providing information on pesticide application and clothing practices. If there is any additional information that you feel would be helpful to us, please add it below.

If you would like to receive additional information, please check here...☐

APPENDIX B

POSTNOTIFICATION POSTCARD

April 24, 1984

Two weeks ago a second questionnaire seeking information on your family's use and care of clothing worn for pesticide application was mailed to you. If you have already completed and returned it to us, please accept our sincere thanks. If not, please do so today. Because it has been sent to only a small, but representative, sample of Oklahoma applicators it is extremely important that yours also be included in the study if the results are to accurately represent the responses of Oklahoma applicators.

If by some chance you did not receive the questionnaire, or it got misplaced, please call 405/624-5036, and we will get another one in the mail to you today.

Sincerely,

Donna H. Branson

Joanne Carter

VITA 2

Joanne Irons Carter

Candidate for the Degree of

Master of Science

Thesis: ATTITUDES AND PRACTICES OF OKLAHOMA AERIAL APPLICATOR HOUSEHOLDS REGARDING THE SELECTION, USE, AND CARE OF WORK CLOTHING

Major Field: Clothing, Textiles and Merchandising

Biographical:

Personal Data: Born in Fort Smith, Arkansas, July 11, 1959, the daughter of Mrs. Druzelle Irons and Mr. Jeff E. Irons. Married to Michael Floyd Carter, May 10, 1981.

Education: Graduated from Northside High School, Fort Smith, Arkansas, in May, 1977; received Bachelor of Business Administration degree in Marketing from University of Central Arkansas, in May, 1981; completed requirements for Master of Science degree at Oklahoma State University in May, 1985.

Professional Experience: Graduate teaching assistant, Department of Home Economics Education and Community Services, Oklahoma State University, 1984; Graduate research assistant, Department of Clothing, Textiles and Merchandising, Oklahoma State University, 1983-1984; Communications consultant, Southwestern Bell Telephone Company, 1981-1983.

Professional Organizations: Omicron Nu, American Home Economics Association.