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COMPARISON OF TWO ENVIRONMENTAL HEALTH EDUCATION METHODS TO REDUCE EXPOSURE TO RESIDENTIAL PESTICIDES IN HISPANIC HOUSEHOLDS IN THE U.S.-MÉXICO BORDERLAND

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By

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2011

DEDICATION

The culmination of this effort is dedicated to very special people. An immense gratitude should be mentioned for my beloved husband Alejandro Carrillo Moreno and my children Gerardo Alonso Estrada Juárez, Patricia Alejandra Estrada Juárez, and Manuel Alberto Estrada Juárez whose unconditional love and words of wisdom encouraged me to accomplish this endeavor despite numerous challenges. It was always in my mind to give an example to my children, showing them obstacles can be solved and that other doors open even in times of hopelessness.

To my dear sisters Ana María Juárez Fernández, Guadalupe Juárez Fernández, Cecilia Juárez Fernández, and Jazmín Juárez Fernández, and my brothers Alvaro Juárez Fernández, Marcos Juárez Fernández, and Oscar Alonso Juárez Fernández for reminding me to put things into perspective and clearing the clouds in times of despair.

Unforgettably, my thoughts are bound for my parents Alvaro Juárez Manzo and Rita Fernández Valenzuela, who showed me the way and taught me to dream, and whose memories maintain my courage to achieve each of these dreams. *Un fuerte abrazo de eterno agradecimiento a todos ellos.*

COMPARISON OF TWO ENVIRONMENTAL HEALTH EDUCATION METHODS TO REDUCE EXPOSURE TO RESIDENTIAL PESTICIDES IN HISPANIC HOUSEHOLDS IN THE U.S.-MEXICAN BORDERLAND

by

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DISSERTATION

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ABSTRACT

Exposure to pesticides is associated with adverse health outcomes including poisonings, short-term signs and symptoms, and long-term adverse health outcomes including developmental and cognitive impairments, certain types of cancer, and damages to the endocrine, nervous, and reproductive systems. This study tested two educational methods aimed to help Hispanic, Spanish-speaking mothers living in the U.S.-México border make informed decisions about pesticides applied in their homes. 230 women were randomly allocated to a) a small group talk, b) a graphic booklet, or c) a control group. The outcomes were the knowledge level about the risks of pesticides and the pest prevention and safety practices conducted by participants. Participants were 33.6 years of age and 8.4 school years on average. 48% participants decided to apply pesticides at the first sign of a problem, 8% hired professional applicators, and 40.3% applied pesticides during pregnancy and 54% during the first the first three years of age of their children. 36.2% participants used pesticides with a label on a language they don't understand. Of the 230 participants of the three groups, 144 reported no application of pesticides in the house between the first and second visits; the main reasons given by the participants were because it was not necessary (i.e. no pests) (68.7%), because they decided not to apply pesticides (26.4%), and for another reasons (4.9%). Both educational methods increased the knowledge scores of participants, with the small group talk resulting in significantly higher increase ($p<.001$). Similarly, the small group talk was slightly more effective in increasing the number of pest prevention practices ($p=.93$) and marginally more effective in the number of safety practices conducted by participants ($p=.074$). The knowledge score of participants was significantly correlated with their pest prevention ($r=.154$) and safety practices ($r=.219$) before any educational intervention.

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Introduction

1.1 Background

1.1.1 Pesticide Usage in Residential Settings

Pesticides are those chemical substances or mixtures intended to prevent, destroy, repel, or mitigate pests (Environmental Protection Agency, 2009, Feb. 3). *Pest* is defined by the Federal Insecticide, Fungicide, and Rodenticide Act – FIFRA §152.5, as any organism considered as "deleterious to man or the environment" (Electronic Code of Federal Regulations, 2010, p.8). Pesticides can be differentiated by their origin (i.e. chemical or biological) and by the pest which is targeted (e.g. insecticides, herbicides, fungicides, rodenticides, bactericides, repellents, among others); the biological pesticides are known as biopesticides (EPA, 2009b).

Residential pesticides are those products used to control pests on humans, pets, and on any place considered a household, building, non-commercial greenhouse, recreational vehicle, preschool, or day care facility (Electronic Code of Federal Regulations, 2010). At home, pesticides are used to control and eliminate pests inside and outside the house and to repel insects from people and control pests from domestic animals and pets. During these uses, people may expose themselves and their children unknowingly and increase health risks because of mishandling, overusing, and lacking preventive and protective practices.

Pesticides are immersed in public debate regarding the balance between their benefits and risks to the environment and human populations. The impact of pesticides on the environment and to human health brought public attention since 1962 with the publication of the book *Silent Spring* by Rachel Carson (Hazlett, 2003; Taylor, 2002) – a book that documented the nefarious effects of DDT on the food chain. Presently, residential pesticides are of concern to the health of

people because of the adverse health impacts, both acute and chronic, to children and adults, and because of the increasing prevalence of pesticide usage for residential purposes. In this study, *residential pesticides* refer to all those commercial substances or mixes used inside homes to eliminate pests and to repel insects.

1.1.2 Health Outcomes Associated with Exposure to Pesticides

Exposure to pesticides is associated with adverse health outcomes including poisoning, short-term signs and symptoms such as headaches, dizziness, allergies, and asthma attacks, long-term adverse health outcomes such as asthma, developmental and cognitive impairments, certain types of cancer, and endocrine, nervous, and reproductive systems problems (Environmental Protection Agency, 2009; Mott, Fore, Curtis, & Solomon, 1997).

Of 201 known neurotoxic substances to humans, 44.8% substances belong to the category of pesticides, followed by organic solvents and substances such as benzene and PCBs (42.8%), and metals and inorganic compounds such as lead and arsenic (12.44%) (Grandjean & Landrigan, 2006). Moreover, pesticides are considered as one of the principal man-made chemicals associated with the disruption of the endocrine mechanisms modulating the neural and behavioral development of animals and humans (Toxicology and Industrial Health, 1998).

1.1.3 Pesticides and Children

Children are of special concern because of their increased physiological and behavioral susceptibility. Their unique biological and physiological characteristics (immature body systems), higher intake amounts (proportionally eating, drinking, and breathing more than adults), and behavioral characteristics (hands-to-mouth, explorative, closer to the ground) increase their vulnerability of adverse health outcomes associated to several pollutants (Landrigan, 2005; World Health Organization-WHO, 2006). Additionally, the social, physical,

and policy contexts interplay with children's own biological and behavioral characteristics (National Academy of Sciences, 2004) augmenting their vulnerability to such exposures in their homes, schools, and community.

On one hand, of 96,998 total exposures to pesticide substances reported in 2008 to the American Association of Poison Control Centers (AAPCC), 46.3% of these incidents involved children 5 years of age and younger (Bronstein, et al., 2009). However, the incidence rates of severe pesticide poisonings declined 42% and deaths 62% from1995 to 2004 (Blondell, 2007). On the other hand, pesticide exposure is associated with developmental and cognitive delays in preschool children (Guillette, Meza, Aguilar, Soto, & Garcia, 1998), childhood brain tumors (Nielsen, Mckean-Cowdin, Farin, Holly, Preston-Martin, & Mueller, 2010), childhood leukemia (Wigle, Turner, & Krewski, 2009), and child acute leukemia and non-Hodgkin lymphoma (Rudant, et al., 2007).

Furthermore, Hispanic/Latino children confront greater risks of pesticide exposure because of their unique social-economic conditions. Issues such as inadequate inclusion in research, disproportionate disease burden and risk factors, special cultural and linguistic considerations affecting health and health care-seeking behaviors, and substantial access barriers to quality health care among others (Flores, et al., 2002) increase disparities among Hispanic/Latino children. Moreover, language, cultural factors, and beliefs prevalent in Hispanic/Latino communities have been shown to be barriers to taking preventive actions to avoid exposures when using pesticides (Rao, Quandt, Doran, Snively, & Arcury, 2007; Quandt, Hernandez-Valero, Grzywacz, Hovey, Gonzalez, & Arcury, 2006).

1.1.4 Trends of Pesticide Usage

Between 70% to 90% of U.S. households use some type of pesticides (Berkowitz, Obel, Deych, Lapinski et al., 2003; Whyatt, Camann, Kinney, Reyes et al., 2002; Adgate, Barr, Clayton, Eberly, 2001) and over 850 varied pesticide products were found in households in a single study (Adgate, Kukowski, Stroebel, Shubat et al., 2000). In the United States, the estimated amount of conventional active ingredients for pesticides consumed for home and garden purposes increased from 72 million pounds in 1998 (Environmental Protection Agency, 2002) to 102 million pounds in 2001 (Environmental Protection Agency, 2004), a 41.7% increase in a 4-year period. Conversely, the amount of active ingredients consumed for agricultural purposes was reduced 6.7% and for industry, commercial, and government uses was reduced 4.3% during the same 4-year period.

Long term exposure to low doses, the uncertainty of causation on the health impacts, and the cumulative effect of chemical exposures merit additional research (Weiss, 2000; Jurewicz, et al., 2006) with new approaches to test the safety of pesticides (Colborn, 2006) and under ethical guidelines of human protection (Lockwood, 2004; Weiss, 2000). Additionally, experts recommend increasing surveillance and testing (McCauley, Anger, Keifer, Langley, Robson, & Rohlman, 2006) while promoting protection and preventive practices with the public (Grandjean & Landrigan, 2006; Weiss, Amler, & Amler, 2004), and most especially with disadvantaged groups and minorities, such as Latino populations (Quintero-Somaini, Quirindongo, Arevalo, Sashof, Olson, & Solomon, 2004).

1.2 Study Design

1.2.1 Statement of the Problem

The risks associated with exposure to pesticides, the beliefs and practices of border residents related with the use of pesticides in their homes, and the cross-border issues prevailing in the U.S.-Mexico border merit the study of educational methods that are effective in helping residents reduce the risks of residential pesticides. Such educational methods ought to be culturally appropriate, easy to access and understand, follow health education and adult learning theories, and be effective in encouraging residents in making informed decisions about residential pesticide usage. The interventions to reduce risks have demonstrated important changes in the levels of knowledge, practices, and attitudes of participants when exposed to varied types and combination of interventions. Acknowledging that in-home interventions are resource and time consuming, there is a need to test the effectiveness of single, simple, and low-cost educational interventions such as a group talk or a graphic booklet in promoting changes in knowledge, practices, and attitudes toward residential pesticide usage.

Understanding and defining risk are not only the cornerstones to reduce the impacts of the environment on health and for the identification of the protection standards, but also for the design of communication measures to prevent and reduce risks (Covello & Merkhofer,1993). However, the communication of risks between experts and the public may be disconnected because of the language and terms used on the messages, or by overlooking public's perceptions in the design of risk communication campaigns. Unfamiliar terms, complicated presentation of the information, limited access to and mistrust of sources of information, and the lack of consideration of adult learning needs, perceptions, and culture may be some of the deficiencies in risk communication strategies. Deficiencies in risk communication strategies preclude lay people

making informed decisions and discouraging them to adopt preventive and protective practices. Based on the principles of adult education, scientific information for lay people should be not only easy to understand but to include basic background information (i.e. toxicological information) to help lay people understand the physiological mechanisms and the variations in susceptibilities of exposures to motivate them in adopting preventive and safety practices when exposed to chemical substances.

Several questions arise when identifying the information needs of the lay public about pesticide usage, such as if the public is aware that the chemical product used in the home is a pesticidal product? How sure is the public that a pesticidal product is adequate for household use? Is the public certain that the information found elsewhere about the risks of pesticides extrapolates to the products they are actually using at home? Are the less educated and the most-at risk relying solely on the information on the label to understand and be aware of the risks of the products they use? Is the label in the appropriate language and with simple terms to understand? What are the sources of information of the people with no access to electronic information? Moreover, comprehensive risk communication methods and environmental health promotion interventions that consider those questions within a cultural perspective would help lay people understand and adopt practices to reduce and prevent risks.

With the premise that risk is null when there is no exposure to pesticides, the educational strategies tested in this study were aimed to help families make informed decisions about pesticide usage and reduce exposures in their own homes, either by deciding to use safer measures and avoid pesticide use, by deciding to use pesticides only when completely necessary, and by adopting protective measures when applying pesticides.

Moreover, this study examined the perceptions of the participants according to all the constructs of the Health Belief Model (HBM) to understand the perceived risks, barriers, benefits, and self-efficacy factors that predict the actual adoption of safer practices. Furthermore, the HBM, the cultural and social conditions of the U.S.-México border, and the principles of adult education and risk communication principles formed the framework guiding the educational interventions tested in this study – a group talk and a graphic booklet, about residential pesticides for Hispanic women living in the U.S.-México border.

The results of this study would inform future studies to develop a full scale of the constructs of the HBM to explain the behaviors of the families related with pesticides in urban settings. Such scale would help implement interventions addressing the perceptions of Hispanic populations with low-income and low-education levels about residential pesticide exposure. Hopefully, the results of this study would expand to culturally adequate public health interventions directed to at-risk population groups.

1.2.2 Goal

The aim of this study is to compare the results of two educational methods in changing knowledge levels and practices regarding residential pesticides among Hispanic, Spanish-speaking mothers with children 11 years of age and younger living in the U.S.-Mexico border region. This study tested two educational interventions including 1) a small-group talk, and 2) an educational graphic booklet. In addition, this study examines the perceptions of participants about pesticides and health according to the constructs of the Health Belief Model.

1.2.3 Research Questions

The overall goal of this study was to help Hispanic families living in the U.S.-Mexico border prevent and reduce exposures to residential pesticides. Four research questions guided

this study: 1) which of the two educational methods tested in this study is more effective in increasing the level of knowledge of participants about residential pesticides and health? 2) Which of the two educational methods tested in this study is more effective in the adoption of practices that prevent and control pest proliferation by participants? 3) Which of the two educational methods tested in this study is more effective in the adoption of safer practices by participants? Lastly, 4) what are the perceptions of participants about residential pesticides and health according to the constructs of the Health Belief Model?

Moreover, the demographic characteristics of participants and the perceptions of the participants were examined for association with the level of knowledge, pest prevention and safety practices scores of the participants.

1.2.4 Research Design

This study followed a randomized control design with two experimental and one control groups on which 252 participants were allocated randomly to three groups. During the implementation, 84, 83, and 85 participants were allocated to groups 1, 2, and 3 respectively

1.2.5 Study Settings: The U.S.-Mexico Border

This study was conducted in the Paso Del Norte Region, located at the center of the border strip between the U.S. and México. The Paso Del Norte region is comprised by the counties of El Paso, Texas and Doña Ana, New Mexico in the U.S. and by the *Municipio* of Ciudad Juárez, Chihuahua in México. By 20005, this region has an estimated population of 2.2 million residents (U.S. Census Bureau, 2010; Instituto Nacional de Estadística y Geografía, 2010). Residents living in the U.S.-México border region share common socio-economic problems, use pesticide products from either México or the United States, and share behavioral practices regarding pesticide use in residential settings.

Participants were recruited from six sites in the Paso Del Norte region of the U.S.-México border – three sites on each side of the border. The study was implemented with a simple random procedure (Environmental Protection Agency, 2002) to select the households in randomly selected blocks of the six locations. These sites included the blocks within a 0.5-kilometer radius of community centers or the homes of community health workers collaborating in this study. In México, the blocks within the .5-kilometer areas were located in the *Colonia 16 de Septiembre*, *Colonia Luis Olague*, and *Colonia Kilómetro 27*. In the U.S., the blocks within the study area were located in the south-central El Paso, Texas, San Elizario, Texas, and in Sunland Park, New Mexico. The recruitment, data collection, and implementation of the educational activities were conducted from September 1 to November 14, 2009. Participants answered two structured questionnaires during two household visits.

1.2.6 Environmental Health Educational Methods Tested in this Study

The educational interventions tested focused in the individual participants and the aims were to inform and motivate participants to prevent exposures to residential pesticides. The educational methods tested in this study were a small-group talk and an educational graphic booklet. The small-group talk was developed specifically for this study by the author of this dissertation. The small group talk is titled *Reduciendo los riesgos de los pesticidas del hogar. Guía para trabajadores comunitarios de la salud para dar pláticas en la comunidad* [Reducing the risks from pesticides used at home. A guide for community health workers to facilitate group talks]. The educational graphic booklet is titled *Poco veneno…¿no mata?Consejos para prevenir las plagas y los envenenamientos con pesticidas* [Little poison…Does it kill you? Recommendations to prevent pests and poisonings with pesticides] and was developed by Galván, Juárez-Carrillo, Liebman, Sáenz, Sáenz, & Corella-Barud (2008). These two educational

methods were evaluated by experts through the Validity Content Index and were tested with volunteers to measure immediate knowledge changes before and after attending the group talk or reading the graphic booklet.

The two educational methods tested in this study shared the same foundations and key messages. In contrast, these educational methods differed in the way the information was delivered to participants; the small group talk delivered the messages through a presentation facilitated by a community health worker, whereas the comic book delivered the messages with a story through colorful entertaining drawings on a printed material. The key messages included information about the health risks and the preventive practices to reduce these risks. The educational interventions were conducted in Spanish. These educational methods were informed by the constructs of the Health Belief Model. The Health Belief Model was developed by a group of health practitioners and researchers such as Hochbaum (1958), Rosensock (1960), Kirscht (1974), Becker (1974), and later enhanced by Rosenstock, Strecher, & Becker (1998) (Rosenstock, Strecher, & Becker, 1994) and included the concepts of self-efficacy (Bandura, 1997b).

The two educational methods were selected because they had been widely used by community-based organizations and agencies to disseminate information and motivate people to improve or adopt protective practices toward the reduction of toxic exposures (Quandt, Arcury, Austin & Cabrera, 2001; Perry & Layde, 2003; Arcury, Marin, Snively, Hernandez-Pelletier, & Quandt, 2009; Liebman, Juárez, Leyva & Coronado, 2007). Similarly, these educational strategies have been implemented throughout the world as compiled by the International Programme on Chemical Safety (International Programme on Chemical Safety, 2004).

Moreover, they were also selected because were deemed appropriate for disadvantaged Hispanic-Spanish speaking populations living in the U.S.-Mexico border region (National Cancer Institute, 2003; Doak, Doak, & Root, 1996; Buki, Salazar, Pitton, 2009).

1.2.7 Inclusion Criteria of Participants

Interviewers approached the households within the neighborhoods selected requesting an adult to answer a screening form. The form included six questions to check eligibility. The criteria to be eligible to participate included: be a mother 18 years of age and older with at least one child 11 years of age and less, able to read and speak in Spanish, report using any pesticide inside the home or an insect repellent product during the summer 2009, and ever participated in an educational intervention or received materials related with pesticides. If pregnant, the participants were included if they were at 24 weeks or less of gestation.

1.2.8 Algorithm of Implementation of the Study

Recruiters approached 1,532 households in all the six sites of the study. Recruitment was conducted during various times of the day, from Monday to Saturday to assess eligibility. Three attempts to contact an adult in the household were made before moving to the next house on the block. Of the households approached, 864 households had an adult present willing to answer the screening form, of which, 416 were eligible and accepted to participate and 164 refused to participate. At the end of the recruitment process, 252 residents agreed to participate and were randomly allocated to the groups after completing the first questionnaire. The random assignment was conducted by asking each participant to choose a card from an envelope with the group number 1, 2 or 3. At the end of the implementation, 244 participants completed the first and second questionnaires. Of these, 230 participants completed the educational interventions, 79 on group 1, 70 on group 2, and 81 in group 3 (i.e. control) (see Figure 1.1).

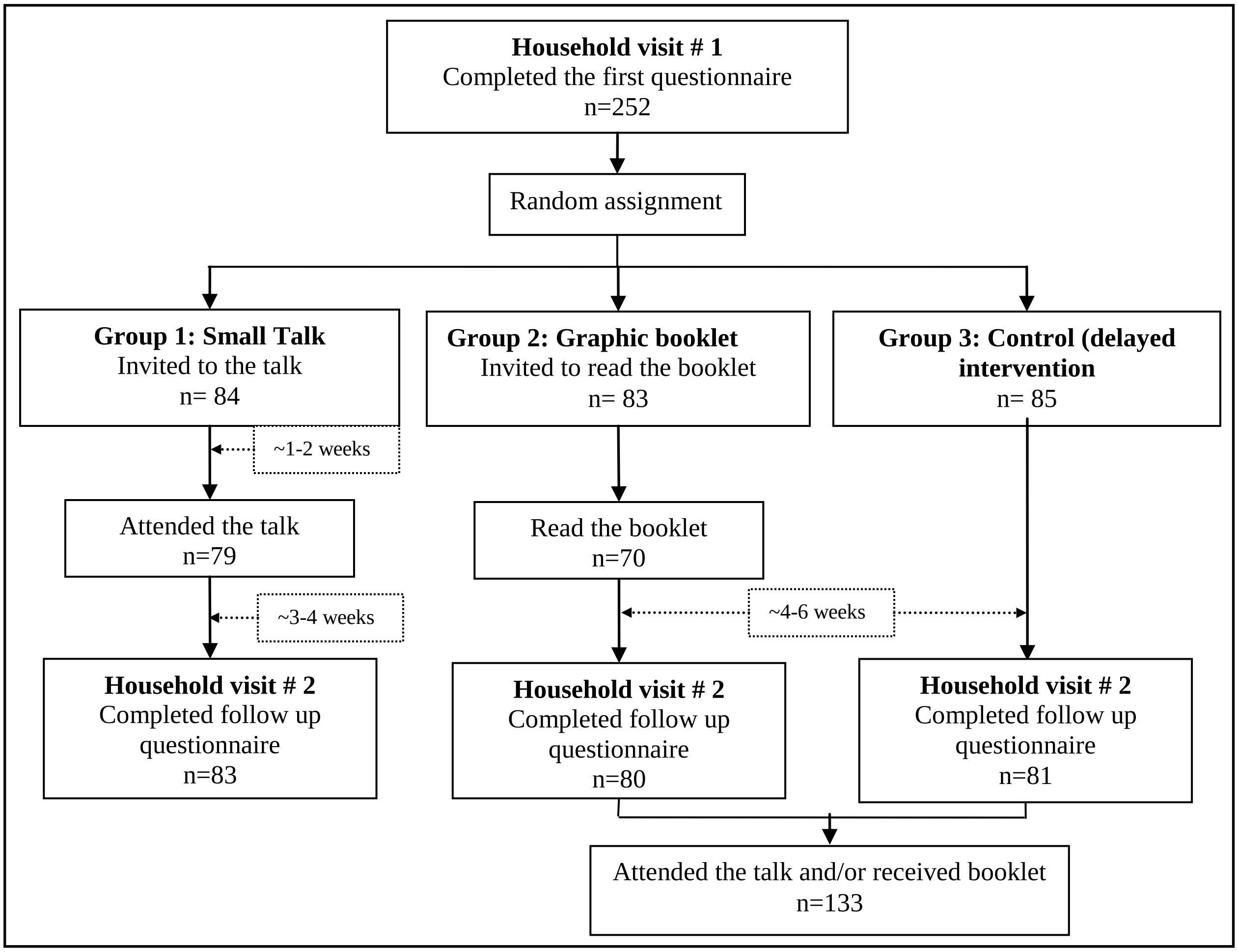

Figure 1.1. Algorithm of the Final Results of the Implementation of the Study.

1.2.9 An Interdisciplinary Approach: Environmental Health and Health Promotion

This study followed the interdisciplinary approach of environmental health promotion to examine the effects of the two educational methods tested to reduce exposure to residential pesticides by Hispanic residents of the U.S.-México region. The strategy of implementation was based on community health workers – also known as lay health advisers or *promotoras*, to educate child caregivers about how to reduce exposure to residential pesticides.

Traditionally, the focus of environmental health has been on public-health policy, risk assessment and characterization, and regulation to define strategies that minimize exposures to hazards in the physical natural and anthropogenic environment. By addressing the relationship

between humans and the environment in terms of impacts of the environment on the health of people, the focus of environmental health is to prevent adverse health outcomes resulting from these environment-human interactions (World Health Organization, 2007; Frumkin H. , 2005).

Examples of such environment-human public health interventions include the definition and monitoring of the air quality index, removal of polluted soil, or installation of air filters, among many others (Gochfeld & Goldstein, 1999). However, except for community-based participatory research and interventions, researchers frequently omit health promotion strategies focusing on the social processes or behavioral changes as primary research objectives (Howze, Baldwin, & Kegler, 2004; Kegler & Miner, 2004). Thus, environmental public health interventions require a shift from being reactive to proactive (Tickner, 2005).

On the other hand, health promotion is defined as “the process of enabling people to increase control over, and to improve their health” (World Health Organization, 1998, p. 1). In this sense, health promotion is achieved with strategies such as advocating for improving the health conditions, facilitating that people achieve their health potential, and by mediating among various health interests. As one mechanism of health promotion, health education promotes the adoption of positive behavioral changes with the goal to increase health awareness, screening, care, and treatment (Glanz, Rimer, & Lewis, 2002). Health education strategies have been conducted in varied settings such as in the community, schools, worksites, health organizations, consumer market places, and in homes (Glanz, Rimer, & Lewis, 2002). Following an interdisciplinary approach, the purposes of health promotion and health education are attuned with the goal of environmental health, now envisioned to prevent and reduce environmental exposures that affect health with a proactive approach.

The integration and combination of goals and approaches between the disciplines of environmental health and health promotion may result in the reduction of exposure over the long-term and promote primary prevention related to environmental exposures (Parkes & Panelli, 2001). With such an interdisciplinary approach, environmental health promotion is defined as "any planned process employing comprehensive health promotion approaches to assess, correct, control, and prevent those factors in the environment that can potentially harm the health and quality of life of present and future generations" (Howze et al., 2004, p. 433).

As an interdisciplinary approach, environmental health promotion applies health promotion methods to design interventions oriented to promote changes on resources (i.e. redistribution of resources and power), policies, community capacity, social networks and norms, and behaviors to reduce exposures and improve health status (Crozier Kegler & Miner, 2004). According to Crozier et al. (2004), the successful strategies to achieve the goals of environmental health promotion include social action, policy advocacy, media advocacy, coalition building, organizational change, lay health advisors, risk communication, and tailoring the health education according to the characteristics or needs of the individual. This study implemented a health education intervention with community health workers and applied the interdisciplinary approach of health promotion methods for environmental health purposes to reduce exposures to residential pesticides for Hispanic populations with unique characteristics.

The main factors that define the uniqueness of the U.S.-Mexico border area – and therefore border residents as a unique population, include the distance from the heart of their own country and thereby both geographically and politically located at the "periphery," and the constant interaction with the "other" (Martinez, 1994). The two countries intermingle culturally, economically, and politically in the border region. Major historical events of the 20th century

(i.e. Great Depression, World War II) favored not only the interaction, but also the interdependence of border residents as manifested through the exchange of people, goods, raw materials, technology, and investment (Ganster & Lorey, 2008). However, the border represents not only economic, social, and cultural interdependence, but also is characterized by significant challenges for its residents (Ganster & Lorey, 2008). As a natural channel to exchange goods, services, people, and cultures between the two countries, the border confronts rapid population growth that results in urban sprawl, greater demand for infrastructure and public services, increased traffic and waste generation, and frequent chemical emergencies (Environmental Protection Agency, 2009).

Moreover, for some residents, the border environment increases toxic exposures. On the one hand, the EPA recognizes that border residents have increased risks of dust and pesticide exposure and of disproportionate rates of exposure to water-borne and respiratory diseases (Environmental Protection Agency, 2009). On the other hand, U.S. Border States rank very high on the percentage of the population lacking health insurance (DeNavas-Walt, Proctor, & Smith, 2007) and on the percentage of persons living below the poverty level (U.S. Census Bureau, 2008). Similarly, despite proximity to a highly developed country and greater employment opportunities, the Mexican cities in the border region have a large proportion of families without access or with inadequate access to sanitation and potable water, adequate housing, and safe neighborhoods (Ganster & Lorey, 2008).

The recognition of the shared geographic and socio-economic conditions of border residents and their practices related with pesticide use is essential to design effective educational approaches within a regional perspective.

1.2.10 Preliminary Studies

This study was grounded on the results of previous projects implemented by the author and by the experience gained during the design of graphic educational booklets for Hispanic populations and manuals and trainings implemented with community health workers, all regarding various environmental exposures at the community and household levels. The Healthy Environments and Living Places for Kids (H.E.L.P.) module from the Indoor Air Quality Section of EPA Region 6 (EPA, 2000) was implemented in San Elizario, Texas in 2004 in partnership with a local community organization. Of 100 participants, 75% of the participants indicated that they apply pesticides inside the home and 71% outside the home less than once per year. When pesticides are applied, over 66% stated that they rarely or never wear protective clothing or equipment (Corella-Barud, Juárez, & Villegas, 2004).

A similar project was conducted in 2005 with 100 households in low-income neighborhoods in Sunland Park, New Mexico. The intervention consisted of providing tailored education during household visits. The education was tailored according to the answers provided by the participant according to a structured questionnaire conducted by community health workers. The results showed that of 35% of participants applying commercial pesticides indoors before the intervention, none of the participants reported using pesticides inside after the intervention, and from 45% applying pesticides outdoors before the intervention to 5% of participants applying pesticides outdoors after the intervention (Juárez, Corella-Barud, Sáenz, Tuda, & Roddy, 2006).

The author of this study has experience in the design of various graphic booklets (i.e. comic books and brochures) for Hispanic populations and training modules for community health workers. She co-authored the messages, reviewed the story and graphics, ensured that

language and graphics were simple and culturally appropriate, conducted focus groups to pilot if messages were conveyed as planned and edited according to experts' reviews. The graphic booklets co-designed and co-authored by the author of this study include: *Poco veneno… ¿no mata? Consejos para prevenir las plagas y los envenenamientos con pesticidas* [A Little bit of poison…will it kill you? Recommendations to prevent pests and pesticide poisonings] (Galván, Juárez-Carrillo, Liebman, Saénz, Sáenz, & Corella-Barud, 2008) available in Spanish to educate urban low income populations about the exposure to pesticides, *Lo que bien empieza…bien acaba* [What starts well… ends well] (Juárez-Carrillo, Kugel, Liebman, Sáenz, & Sáenz, 2008) available in Spanish to educate about the risks of exposure to pesticides during pregnancy, *Aunque cerca…sano* [Even if pesticides nearby…healthy] (Sáenz, Liebman, & Juárez, 2004) available in Spanish and English to educate farmworker families about the risks of pesticides.

She also co-designed manuals and implemented trainings for community health workers. These included the *Poco veneno…¿no mata?Una guía para promotores de salud* [A little bit of poison…will it kill you?] (Liebman, Galván, Juárez, 2006), available in Spanish and English to help community health workers educate the community about pesticide exposure, the *Manual de entrenamiento en salud y medio ambiente: Guía comunitaria* [Training manual on environmental health: A community guide] (Juárez, Liebman, Corella-Barud, & Sáenz, 1999), and the *Environmental Health and Justice Training Manual: A community guide to understanding the environment* (Liebman, Juárez, Corella-Barud, & Sáenz, 1999) available in English and Spanish.

1.3 Structure and Organization of this Document

This dissertation is comprised of five chapters and a set of documents included in the appendix section. Chapter I includes an overview of the entire study and a brief description of the health implications of exposure to pesticides, Chapter II summarizes the literature review,

and Chapter III provides information about the methods used in the study, including design, recruitment, and the statistical analyses conducted. Chapter IV describes the results of the data collected, including demographic information of participants, the description of the practices, beliefs, and perceptions of participants regarding residential pesticides, and the comparison of the results of the two educational methods. Chapter V provides the analysis of the data, limitations, conclusions, and recommendations for environmental public health and health promotion practitioners.

All documents, educational materials, and trainings were prepared and conducted in Spanish. Yet, the author of this study translated the documents into English to seek approval of the Internal Review Board (IRB) Committee of the University of Texas at El Paso and of the dissertation committee members, and to obtain the reviews of the experts invited to validate the educational methods. Amy K. Liebman, staff at Migrant Clinician Network, meticulously reviewed the English version of the instruction guide and the Power Point presentation of the small group talk. The community health workers reviewed the Spanish versions of the instruction guide, Power Point presentation, and handouts thoroughly and provided useful suggestions to ensure the small group talk was culturally and linguistically appropriate for Hispanic Spanish-speaking populations living in the U.S.-México border.

1.3.1 Hispanic and Latino Terms – A technical Note

Hispanic and *Latino* are terms used interchangeably when referring to people with origins from Spanish speaking regions of Latin America. In the U.S., these terms define an ethnic group or the cultural identity of people of such origins. *Hispanic* and *Latino* are terms used interchangeably by the National Institutes of Health (NIH, 2001) and all federal agencies for reporting purposes as mandated by the U.S. Office of Management and Budget (U.S. Office of

Management and Budget). *Hispanic* or *Latino* is a population category defined by health agencies in the U.S. that represents an ethnic group, “a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race” (NIH, 2008, p. 153). However, the connotation of these terms differs. The term *Latino* is distinguished from the term *Hispanic* by some researchers when the origin of a person can be traced to Spanish-speaking regions of Latin America (including the Caribbean) that considers the influence of indigenous cultures from America and Africa in Latin American history. Conversely, the term *Hispanic* places emphasis on origins from European colonialism (Aguirre-Molina & Molina, 1994). Cognizant of this distinction, this document employs the term *Hispanic* given the popularity of this term in the border and the easiness to translate to Spanish as *Hispano or Hispana* while respectfully recognizing the origin of Spanish-speaking population groups in America, Africa, and Europe as defined in the term *Latino* by some researchers.

1.3.2 Funding and Disclaimer

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CHAPTER II

Literature Review

2.1 Pesticides

2.1.1 Definitions

In the United States (U.S.), *pesticide* is defined as "…(1) any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest, (2) any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant, and (3) any nitrogen stabilizer…" (U.S.A., 2008, p.12). According to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of the U.S., *pest*, is defined as the organism "under circumstances that make it deleterious to men or the environment" (e-CFR, 2010, p.8). These organisms may include any terrestrial or aquatic plant and vertebrate and invertebrate animals, and microorganisms such as fungus, bacterium, virus, or other (except those on or in man or animals).

In México, according to the *Ley General de Salud* [General Health Law] Chapter XII, Article 278, *pesticide* is "any substance or mixture of substances intended to control any pest, including vectors that transmit diseases to humans and animals, the undesired species that cause harm or that interfere with the agricultural and forest production, as well as the defoliant and desiccant substances" [translated to English by the author of this study] (México: Cámara de Diputados del H. Congreso de la Unión, 2009, p. 86). As can be seen, the definition of pesticide by the U.S. law is more descriptive of the substances included as pesticides. Despite the definitions of pesticide between the U.S. and México differ slightly in the wording, the overall meaning of pesticides is conveyed through their respective laws.

Pesticides can be differentiated by their origin (i.e. chemical or biological) and by the pest targeted such as insecticides, herbicides, fungicides, rodenticides, bactericides, and repellents, among others; the biological pesticides are known as biopesticides (Environmental Protection Agency, 2010). *Residential use of pesticides* includes those pesticides used directly "on humans and pets… in, on, or around any structure, vehicle, article, surface, or area associated with the household, including but not limited to areas such as non-agricultural outbuildings, non-commercial greenhouses, pleasure boats and recreational vehicles, or in any preschool or day care facility" (e-CFR, 2010, p.8). In the present study, residential pesticides refer to all those commercial pesticidal products (e.g. substances or mixtures) used inside the household to control pests such as cockroaches, rats, mice, flies, mosquitoes, ants, and on people to repel mosquitoes (e.g. Raid, Off).

2.1.2 Laws and Regulations

The benefits of pesticides are widely recognized for food production and public health purposes. Worldwide, 5,046 million pounds of active ingredients for herbicides, insecticides, fungicides and all other types of pesticides were used in 2001 (Kiely, Donaldson, & Grube, 2004). In the U.S., the estimated amount of conventional active ingredients for pesticides consumed for home and garden purposes increased from 72 million pounds in 1998 (Donaldson, Kiely, & Grube, 2002) to 102 million pounds in 2001 (Kiely, Donaldson, & Grube, 2004), a 41.7% increase in a 4-year period. Conversely, the amount of active ingredients for agricultural purposes was reduced 6.7% and for industry, commercial, and government uses was reduced 4.3% during the same 4-year period.

Internationally, pesticides are addressed by the United Nations under the *Rotterdam Convention* for the international trade of pesticides and the *United Nations Environmental*

Programme (UNEP) through the *Code of Ethics on the International Trade in Chemicals* for the management and registry of pesticides. Additionally, the *Food and Agriculture Organization* of the United Nations (FAO) takes a predominant role about pesticide issues through the *International Code of Conduct on the Distribution and Use of Pesticides*, the *Stockholm Convention on Persistent Organic Pollutants*, and the *Strategic Approach to International Chemicals Management.* Similarly, the FAO collaborates with the World Health Organization (WHO) through the *Codex Alimentarius* to address the maximum limits of pesticide intake by agricultural products (Food and Agriculture Organization of the United Nations (FAO), 2008).

Nations are urged to apply judicious and ethical management of pesticides to maximize the benefits and protect human health and the environment (FAO, 2003). As a result, the Rotterdam Convention, declared since September 1998 by the United Nations, was issued with the purpose to enhance cooperation in the trade of certain hazardous chemicals – including pesticides, and promote exchange of information and the sound use of these chemicals to help decision-makers in their efforts to protect health and the environment (Rotterdam Convention, n.d.). By February 2004, 140 parties (i.e. countries) ratified the agreement of the Rotterdam Convention, on which the U.S. signed the agreement in 11/09/98 but has not been ratified and México did not sign the agreement in 1998 but accessed the agreement in 05/04/2005 (United Nations, nd) . The Annex III of the Rotterdam Convention lists the 40 hazardous chemicals that have been banned or severely restricted, of which 29 chemicals are included in the group of pesticides and 11 to the industrial chemicals group (Rotterdam Convention, n.d.). Moreover, the WHO calls for an integrative vector control programs to reduce the human and environmental effects of the arsenal of pesticides used worldwide (World Health Organization, 2008) providing

the specifications for pesticide use for public health vector control purposes (World Health Organization, 2006)

To support food security while protecting health and environment, the United Nations adopted the *International Code of Conduct on the Distribution and Use of Pesticides* (FAO, 2003) in the 123th Session of the Council of the Food and Agriculture Organization (FAO) in 2002 (FAO, 2002). Among other issues, the Code lists the actions adopted by the governments on issues such as management, testing, regulation and technical requirements, distribution and trade, information exchange, labeling, packaging, storage and disposal, advertising, and monitoring of pesticides.

In the United States, pesticides are regulated by two acts, the *Federal Insecticide, Fungicide, and Rodenticide Act* (FIFRA) passed in 1947 and managed by the *Environmental Protection Agency* (Environmental Protection Agency, 2010), and the *Food, Drug, and Cosmetic Act* (FD&CA) passed in 1938 and managed by the *Food and Drug Administration* (Food and Drug Administration, 2009).

In México, pesticides are regulated by two general laws, the *Ley General de Salud* [General Health Law] and the *Ley General de Equilibrio Ecológico y la Protección al Ambiente* (LGEEPA) [General Law of Ecological Equilibrium and Environmental Protection]. These laws are updated and managed through norms (e.g. regulations) and monitored by a commission formed in 1987. The commission is formed by three secretariats such as the *Comisión Intersecretarial para el Control del Proceso y Uso de Plaguicidas, Fertilizantes y Sustancias Tóxicas* (CICOPLAFEST) [Intersecretarial Commission for the Control of the Process and Use of Pesticides, Fertilizers, and Toxic Substances] (CICOPLAFEST, 2004).

The process to register pesticides is managed by the agency *Comisión Federal para la Protección contra Riesgos Sanitarios* (Cofepris) [Federal Commission for the Protection against Sanitary Risks] (Cofepris, 2010). The CICOPLAFEST through the Cofepris and SEMARNAT are the agencies providing approval of permits to import pesticides to Mexico according to the DOF of May 23, 2008 (México, Secretaría de Economía, 2008). Refer to Table 2.1 with a summary of the laws and sections referring to pesticides in the United States and México.

Since 1997, México, United States and Canada created a Technical Working Group (TWG) on pesticides within The North American Free Trade Agreement (NAFTA).

Table 2.1. Laws and Regulations about Pesticides in the U.S. and México

Issues related with pesticides	**U.S.**	**México**
Definition of pesticides and pests	FIFRA, Title 40 § 152.3 and 152.5	Catálogo de Pesticidas, 2004 [Pesticide Catalog] CICOPLAFEST
Levels of Toxicity	FIFRA, Title 40 § 152.160	Catálogo de Pesticidas, 2004, CICOPLAFEST [Pesticide Catalog]
Registration procedures	FIFRA, Title 40 § 152.1 to 152.500	Diario Oficial de la Federación (DOF) [Federation Official Periodical] Published on December 28, 2004
Labeling of products for domestic uses	FIFRA, Title 40 § 156.3 to 156.212	Norma Oficial Mexicana (NOM) NOM-046-SSA1-1993 [Official Mexican Norm]
Import/Export	FIFRA, Title 40 § 168.75	Secretaría de Salud, 1984. Capítulo 12, Artículo 298 [Health Secretariat]

The purpose of the TWG is to facilitate a cost-effective regulation for trade and work sharing activities among these three countries to protect the human health and the environment from pesticides (North American Free Trade Agreement Technical Working Group on Pesticides, 2008).

Similarly, the three countries collaborate within the North American Commission for Environmental Cooperation (CEC) for the initiative “Sound Management of Chemicals” that

includes some pesticides among other toxic chemicals (Commission for Environmental Cooperation of North America, 2010). The initiative aims to strengthen the effective management of chemicals during trade and to reduce or eliminate the use of certain toxic chemicals agreed by the three countries to protect human health and the environment. Additionally, México and the United States signed a cooperation agreement in 2009 through the agencies Cofepris of México and the FDA of the United States to exchange information to protect consumers of both countries on sanitary risks and the safety of food and medications (COFEPRIS, 2009).

2.1.3 Risks to Chemical Exposures

Exposure to pesticides can result in acute and long-term adverse health outcomes, and can even lead to death. However, the causal relationship between exposure to any chemical substance and health impacts involves various factors and complex interactions. First, the exposure-health relationship requires close analysis of the toxicity of the substance, mode of entry to the body, duration, and individual susceptibility. The duration of exposure is one of the key factors that determines the toxic manifestation or damages to the body. Exposure to any chemical can occur during short, intermediate, or long-term periods. Acute exposure is the contact with a substance that happens in a period of less than 14 days, an intermediate exposure occurs during a period longer than 14 days to less than one year, and chronic exposure occurs during long-term periods for more than one year (ATSDR, 2009). Secondly, the effect of substances has varied levels of toxicity to humans and animals, from No Observable Effect Levels (NOAEL) to the Lethality Dose (LD) (Eaton & Klaassen, 2001).Such level of toxicity would depend on the properties of the substance and the body's ability to metabolize it.

Thirdly, every person has a varied susceptibility of being harmed after the exposure to a substance. The susceptibility to environmental exposures of individuals is influenced by factors such as genetic traits, age, sex, health status, and nutrition among others (Faustman & Omenn, 2001), plus certain social and psychological conditions that augment stress and reduce the capacity of the body to maintain equilibrium (Brunner & Marmot, 2006). Moreover, recognizing the effects of toxic substances requires attention to diagnose and treat adequately; therefore, health care providers must recognize the distinction between being *exposed* and *poisoned* (Criddle, 2007). Accordingly, *exposure* refers to the act of being in contact with a substance (e.g. ingested, breathed, or touched), and being *poisoned* refers the actual appearance of signs and symptoms (Criddle, 2007).

Moreover, conducting research to examine the effects of toxic chemicals in humans is difficult to conduct because of the ethical concerns prevalent in non-therapeutic trials (Lockwood, 2004; Resnik & Portier, 2005; Colborn, 2006). Presently, concerned legislators and experts are launching a campaign to improve policies that protects people from toxic chemical exposures. The Toxic Chemical Safety Act 2010 (HR5820), issued in1976, and introduced by Rep. Bobby Rush in July 22, 2010 protects the public and the environment from the risks of chemical exposure by requiring manufacturers to probe the safety of chemicals before these are being marketed (Physicians for Social Responsibility).

The U.S. government has regulated the marketing and use of pesticides since 1947 through the FIFRA; however, most of the public was not entirely aware of such risks until the publication of the book *Silent Spring* by Rachel Carson in 1962. This publication attracted worldwide public attention about the human and environmental risks of exposure to pesticides and other pollutants (Hazlett, 2003).

2.1.4 Pesticides and Health Effects

The signs and symptoms that can appear shortly after exposure to pesticides vary according to the type of pesticide; these may include headaches, hyper secretion, muscle twitching, nausea, diarrhea, skin irritation, seizures, and loss of consciousness, among others, and death (Reigart & Roberts, 1999). In 2008, the American Association of Poison Control Centers (AAPCC) registered 2,491,049 exposure cases, 0.36% more cases than in 2007, with the majority of these reported cases (93.4%) originating in residences (Bronstein, Spyker, Cantilena, Green, Rumack, & Giffin, 2009). Further analysis demonstrates that of the total exposures reported, 4.8% of exposures were related to pesticides in adults and 3.8% in children ≤ 5 years of age. Yet, this percentage increases to 12.4% if we add the cases of exposure to household cleaning substances – a category considered within the group of pesticides (Environmental Protection Agency, 2010; U.S. Congress, 2008). Further analysis of the data presented by Bronstein et al. (2009) illustrates that 46.3% of the cases of the category of pesticides (93,998 cases) involved children ≤ 5 years of age (43,526 cases).

Fatalities by exposure to pesticides, however, declined in unintentional moderate, major, or fatal pesticide poisonings from 1995 to 2004 (Blondell, 2007). In 2004, the rate of fatalities in children due to exposure to any chemical substance was considered as very low compared to other causes of death (Criddle, 2007). However, one must consider that these total cases are included in the AAPC report because symptoms were observed, diagnosed, and reported. Of concern are those health harms resulting from exposure to pesticides that are unnoticed by people or health care providers because were asymptomatic, misdiagnosed or misclassified as chemical exposures and because of the risks of health damages that could appear long time after the exposure occurred.

On the one hand, there is a lack of understanding and assessment of pesticide exposure by health care providers. Balbus, Harvey, and McCurdy (2006) found that the majority of health care providers in their study omit asking questions about pesticide exposures when filling out patient histories, rely more on the poison control centers to assist them in defining causes of poisonings, and lack a thorough understanding of chronic toxicity as compared to acute toxicity. Furthermore, authors found that 64% of health care practitioners and 69% of nurses in the study felt poorly prepared to answer questions by patients regarding pesticide exposures (Balbus, Harvey, & McCurdy, 2006)

On the other hand, determining causal association between the human signs and symptoms shortly after exposure to pesticides is difficult. Health care providers face challenges to diagnose signs and symptoms appearing hours or few days after exposure (e.g. headaches, stomach ache, dizziness, general malaise, etc.) because these signs and symptoms could be confounded with other causes but pesticide exposure (CDC, 1984; Chen, et al., 2010; Environmental Protection Agency, 1999; Weiss, Amler, & Amler, Pesticides, 2004) and be mistreated (CDC, 1984).

Nonetheless, some studies conclude on the association between exposure to pesticides and health effects to the respiratory, endocrine, neurological, developmental, and reproductive systems, and cancer. Santibañez et al., (2010) found evidence of association between occupational exposure to some kind of pesticides (i.e. insecticides, herbicides, and fungicides) and pancreatic cancer (OR 3.54) and ductal adenocarcinoma (OR 2.16) (Santibanez, et al., 2010). Dennis, Lynch, Sandler, & Alavanja (2010) found that pesticide applicators have an increased risk of cutaneous melanoma by exposure to pesticides (i.e. maneb/mancozeb, parathion, and,

carbaryl) in addition to common melanoma risk factors such as sun sensitivity and sun exposure (Dennis, Lynch, Sandler, & Alavanja, 2010).

The greatest proportion of 201 known neurotoxic substances to humans belong to the group of pesticides (44.8%), followed by organic solvents and substances such as benzene and PCBs (42.8%), and metals and inorganic compounds such as lead and arsenic (12.44%) (Grandjean & Landrigan, 2006). Pesticides are considered as one of the most significant neurotoxicants found in homes, especially in urban and semi-urban settings where cockroach and rodent pests could be a significant problem (Breysse, Farr, Galke, Lanphear, Morley, & Bergofsky, 2004). In the U.S., 70% to 90% of households use any kind of pesticides (Whitmore, Kelly, & REading, 1992; Berkowitz, et al., 2003; Whyatt, et al., 2002; Adgate, et al., 2001; Bass, Ortega, Rosales, J. Petersen, & Philen, 2001; Davis, Brownson, & Garcia, 1992). Moreover, a single study inventoried over 850 varied pesticide products in 308 households in Minnesota (Adgate, et al., 2000).

Exposure to pesticides by parents at any point during preconception to pregnancy and during early childhood periods can result in potential and serious health effects for both the mother and child such as fertility problems, poor birth outcomes, certain developmental abnormalities and deficits, and some cancers (Sanborn, Cole, Kerr, Vakil, Sanin, & Bassil, 2004; Rao, 2008). Perera et al. (2005) report an inverse correlation between birth weight and length and the levels of two types of pesticides in umbilical cord plasma. However, the correlation results with stronger statistical significance when the levels of these types of pesticides are combined during the statistical analysis (Perera, et al., 2005).

Despite the risks for mothers and their children, Berkowitz and colleagues (2003) found that pesticides were used in 72.3% of low-income urban houses with pregnant women. Similarly,

Whyatt and colleagues (2002) found that 85% of participants used pesticides in their home during pregnancy and 30% of the women had detectable levels of eight pesticides in personal air samples (Whyatt, et al., 2002).

Calvert et al. (2007) examined the case of three women working in the same tomato grower farm in Florida and North Carolina that gave birth to three children with congenital anomalies, born 8 weeks apart. Despite the suggestive evidence of being exposed to highly toxic pesticide substances during critical organogenesis period of the pregnancy, researchers found no conclusive data linking the mothers' exposures to the pesticides applied in the farm early in the pregnancy and the congenital anomalies of their children. The pesticides reported by the growers that were suspected of application when these women were working in the farm are known teratogenic substances in animal studies (Calvert, et al., 2007).

In a study with children 4 to 5 years of age, Guillette et al. (1998) compared certain developmental characteristics of children living in towns with known high levels of pesticides in cord blood and breast milk with children of a town known for not using agricultural pesticides. Children living in the towns utilizing pesticides resulted with decreased stamina, gross and fine eye-hand coordination, 30-minute memory, and the ability to draw a person (Guillette, Meza, Aguilar, Soto, & Garcia, 1998).

Recently, on the other hand, an epidemiological review of studies related with exposure to environmental contaminants and reproductive and early childhood health, determined the evidence of association between exposure to certain pesticides and adverse health effects as inconclusive (Wigle, et al., 2008). The adverse health outcomes examined in this review included early pregnancy loss, stillbirth, preterm birth, fetal growth deficit, neural tube defects, and urinary tract birth defects. Additionally, authors determined a limited epidemiological

evidence of association between parental and/or early childhood exposures to certain types of pesticides and some childhood cancers such as leukemia, lymphoma, brain cancer, and adult neuroblastoma and soft tissue sarcoma (Wigle, et al., 2008). According to Wigle et al., the limitations to find causal association of studies reviewed include inadequate and inconsistent evidence among studies, no control of potential confounders, small sample sizes, and non-significant statistical dose-response relationship analysis. Similarly, Lopez-Cervantes, Torres-Sanchez, Tobias, & Lopez-Carrillo (2004) found no evidence of association between breast cancer and exposure to DDT in a meta-analysis conducted with 22 epidemiologic studies published from 1993 to 2000 (Lopez-Cervantes, Torres-Sanchez, Tobias, & Lopez-Carrillo, 2004).

Some environmental health professionals argue that risks to human health and ecosystems rely on assessment techniques that define the association between direct exposures and short term effects, mostly with in vitro or in animal studies, leaving out the long-term effects to humans and the ecosystems (Martuzzi & Tickner, 2004). Furthermore, the vulnerability of children is a great concern because of their physical, physiological, and behavioral characteristics (Landrigan, 2005), and mostly those children facing social disparities that increase their susceptibility to harmful effects (Kohlhuber, et al., 2006), including children of Hispanic/Latino origin (Carter-Pokras, Zambrana, Poppell, Logie, & Guerrero-Preston, 2007).

In addition, at higher risk are those children living in poor urban settings with deficient maintenance of aged house stock and that use high amounts of pesticides to control cockroaches, rats and other pests (Landrigan, et al., 1999). Just in terms of non-intentional injuries, 46.3% of accidental exposures to pesticides reported to the American Association of Poison Control Centers (AAPC) in 2008 involved children 5 years of age and younger (Bronstein, Spyker,

Cantilena, Green, Rumack, & Giffin, 2009). The need of pesticides plus the availability of pesticide products reachable to children could increase the risks of unintended poisonings.

The science behind the understanding of the human health effects caused by environmental long-term exposures is a complex task for varied reasons. These issues include the widespread availability of persistent synthetic products and compounds, the varied sources of exposure (i.e. air, water, food, soil, consumer products) and points of contact (i.e. home, school, work, buildings, etc.), the varied susceptibility and vulnerability by some population groups (i.e. children, elderly, sick people, minorities, social disparities, etc.), the lack of studies about low-level exposures over long periods of time, and the technical difficulties to measure the toxic doses in targeted organs and to extrapolate animal data to human populations (Institute of Medicine, 1997). Additionally, serious concerns emerge with the cumulative and interactive effects of multiple stressors – physical, chemical, and psychosocial, that are present during exposures (Callahan & Sexton, 2007; Sexton & Hattis, 2007).

Despite exposure to pesticides is being recognized as a risk to the health of the people, mostly during developmental and childhood stages (Environmental Protection Agency, 2008; Weiss, Amler, & Amler, Pesticides, 2004; Grandjean & Landrigan, 2006; Jurewicz, et al., 2006; Karr, Solomon, & Brock-Utne, 2007), chemicals are believed to be harmless until significance of harmfulness is proven (Landrigan & Trasande, 2004).

According to Landrigan and Trasande (2004), the risk assessment models (based on data from animal and in vitro studies) lack power to protect people and animals because these models fail to prove significant causality under complex interactions of humans with varied chemical exposures. Thus, substances are deemed innocuous until significance of harm is proven. As

Landrigan and Trasande (2004) vehemently state "…populations continue to be exposed to chemicals in a potentially dangerous and uncontrolled natural experiment" (p. 124).

2.2 Geo-social Issues and Pesticides

2.2.1 The U.S.-México Border

Historical events in the 20th century (i.e. Great Depression, World War II) and the geographical location of the border have tended to favor the interaction and interdependence of residents in the U.S.-México border manifested through the exchange of people, goods, raw materials, technology, and investments (Ganster & Lorey, 2008). The economy in the U.S.-Mexico border is thus, complementary and interdependent, given that the lack of a good or service on one side can be found in the other and because investment and trade is highly marked by the offer-demand relationship between these two divergent economies (SCERP, 2002).

In the early 1930s, events such as the Great Depression in the U.S. and the World War II provided opportunities for significant industrial, commercial, and economic investments and population growth in border areas. Later, the *Braceros* Program between México and the U.S. from 1942 to 1964 attracted over half million of Mexican workers to the agricultural sector in the U.S. that passed, spent, and often settled on border communities. Finally, by the 1950s, the globalization movement facilitated the exchange of investments and goods among countries, and more recently, the passage of the North American Free Trade Agreement (NAFTA) in 1993 between Canada, United States, and México, established the mechanisms to boost the *maquiladora* program (i.e. assembly plants) in border regions. According to Ganster & Lorey (2008), these worldwide and regional economic forces made a significant impact not only in the economy, but also on the political, environmental, social, and cultural borderland milieu.

By 2005, the total estimated population for the U.S.-Mexico border counties was over 13 million people, with 6.8 million of residents in the U.S. counties (U.S. Census Bureau, 2010) and 6.2 million of residents in the Mexican counties (Instituto Nacional de Estadistica y Geografia, 2010). The majority of the population resides in 14-pairs of cities on the U.S. and México borderland (Ganster & Lorey, 2008).

The U.S.-Mexico border region is characterized by continuous international mobility of people and vehicles. By 2008, the U.S. Department of Transportation registered 44.8 million pedestrian crossings, 78.9 million private vehicle crossings, and 4.9 million truck crossings in year 2008 through the 25 ports of entry located in the U.S.-Mexico border (Department of Transportation, 2009). The ports of entry with the largest number of pedestrian crossings in 2008 are the San Ysidro and Otay Mesa in California with over nine million crossings and through the three ports of entry located in the Paso del Norte Region (El Paso, Santa Teresa, and Fabens) with over 8.1 million crossings (Department of Transportation, 2009).

2.2.2 The Paso Del Norte Region

Located at the center of the U.S.-Mexico border, the Paso del Norte region (PDN) is comprised by the counties of El Paso, Texas and Doña Ana, New Mexico in the U.S. and by the *Municipio* of Ciudad Juárez, Chihuahua in México. This region totals an estimated population of 2.2 million residents in 2005. Hispanic is the predominant ethnic population category at the PDN region, 81.4% and 65% of residents in the El Paso and Doña Ana Counties respectively are Latino, which is five and four times greater than the national proportion in the U.S. (14.8%). Of these, 65.8% and 45% respectively are of Mexican origin (U.S. Census Bureau, 2010). By 2006, El Paso and Doña Ana counties had a higher percentage of families living below the poverty levels (24.9% and 20.2% respectively) than in the rest of the U.S. (9.8%). In addition, Texas and

New Mexico have the highest percentage of people without health insurance in the U.S. (24.1% and 21% respectively, 3-year average from 2004-2006) compared to 15.3% in the U.S. (DeNavas-Walt, Proctor, & Smith, 2007). The population of the *Municipio* of Ciudad Juárez shares similar burdens. Since residents of Ciudad Juárez comprise more than 40% of the population of the state, health care institutions at the *Municipio* of Ciudad Juárez are challenged to provide services in this growing region, where 30.1% of people are uninsured (Instituto Nacional de Estadistica y Geografia, 2010).

2.2.3 Pesticide Use in the U.S.-México Border

In the U.S.-Mexico border region, reporting the amounts and type of pesticides applied for agricultural purposes varies by state and country. In the U.S., California and Arizona developed a system where pesticide users report the type of pesticides, amounts, and dates of application, whereas New Mexico and Texas require users to keep records and submit reports only when requested by the state; however, there is no similar record-keeping regulation for pesticide applicators in México (Barud, 2005).

In the U.S.-México border, previous studies have shown that some residents face risks and report practices and perceptions suggesting risks of exposure to residential pesticides. Shalat and colleagues (2003) found that 82.2% of participants living in the south Texas border reported using pesticides within the last 6 months. Over 48% of participants reported using pesticides in the kitchen applied on floors, 41% in cupboards, and 31% in cabinets. Moreover, significant levels of organophosphate metabolites in children's urine samples were correlated with pesticide levels in dust from hands than from dust on floors (Shalat, et al., 2003).

In a study conducted in semi rural areas in El Paso, Texas, 88.7% of participants reported using residential pesticides and 9.8% of respondents agreed using *polvo de avión* (methyl

parathion) (Saller, Reyes, Maldonado, Gibbs, & Byrd, 2007). Methyl parathion is considered a highly toxic pesticide banned for indoor use in 1997 in the U.S. and authorized for restricted use in certain crops for agricultural purposes (Environmental Protection Agency, 2008). However, methyl parathion has been sold illegally for domestic purposes in the Mexican border. The belief that pesticides are safe to use in their homes is similar between those participants using *polvo de avión* and those using commercial pesticides, a perception that could increase the use of this and other illegal pesticides in the border area (Saller, Reyes, Maldonado, Gibbs, & Byrd, 2007).

In a study conducted with urban and semi urban residents in El Paso area, Roddy et al (2005) found that over 7.4% of participants from El Paso and 3.8% of Doña Ana stored 'very unsafely' two or more highly toxic products at home. Authors also reported that over 50% participants from El Paso and 53% of Doña Ana reported never heard about the Poison Control Center (Roddy, O'Rourke, & Mena, 2005).

In Ciudad Juárez, Graham et al. (2004) found significant differences in storage of chemical products in the home between residents in unplanned and planned neighborhoods (i.e. *colonias*). Of 202 households in unplanned neighborhoods, authors found that 66% and 17% of residents stored cleaning and pesticide products innapropriately respectively, whereas of 98 households in planned neighborhoods 46% and 7% of residents stored cleaning and pesticide products inappropriately respectively (Graham, Gurian, Corella-Barud, & Avitia-Diaz, 2004). In addition, 8% of participants reported using *polvo de avión* in their homes (Graham, Gurian, Corella-Barud, & Avitia-Diaz, 2004). In another study with residents of two socio-economically disadvantaged neighborhoods in Ciudad Juárez, 65.3% residents reported using pesticides inside the home and between 5% to 10% of respondents reported using *polvo de avión* (Graham, Corella-Barud, Avitia-Diaz, & Gurian, 2005).

In another study in Douglas, Arizona, a border county, Bass et al. (2001) found that 30% of participants hired an exterminator, had 1.4 pesticide products per home in average, and 7% of pesticide products found in homes were from México (Bass J. , Ortega, Rosales, J. Petersen, & Philen, 2001). In addition, authors found pesticide products classified as class I (i.e. highest toxicity category for acute exposures) in 14% of the homes and class II in 28.4% of the homes (Bass J. , Ortega, Rosales, J. Petersen, & Philen, 2001).

2.3. The Environment and Human Behavior

2.3.1 People and the Physical Environment: Philosophical Views

The relationship between humans and the environment can be seen from at least two perspectives: the first perspective examines the relationship of humans *toward* the environment (e.g. conservationism, animal protection, and global depletion, etc.) and the second perspective examines the relationship of humans *within* the environment on which humans survive. The later perspectives examines the risks of exposure to environmental threats, either natural or man made. Despite the fact that at the end both approaches affect human health, the issues regarding environmental health would fall within the latter view because this discipline addresses the risks and management of risks to humans from environmental exposures.

There are three main philosophical worldviews that explain the relationship between humans and the environment; these are *Anthropocentric*, *Biocentric-Ecocentric*, and *Theocentric* views (Mugerauer & Manzo, 2008). These three major views, however, may overlap in concepts and/or contain not mutually exclusive views. The *Anthropocentric* view places the importance of the relationship on humans and its needs instead of the environment. The *Biocentric-ecocentric* view is related to naturalism where nature is highly valued and it is concerned with micro and macro organisms or ecosystems. The *Theocentric* view refers to the divine and it is concerned

with the relationship between the divine, nature, and humans (Mugerauer & Manzo, 2008). According to authors, the *Antrophocentric* view is divided into two approaches, the individualistic and the social. The individualistic perspective defends and protects the individual rights of humans over the environment. This individualistic perspective is oriented to obtain the benefits from nature to address the needs of the individuals and sees nature as a mere resource of raw materials to sustain human life and wellbeing. In contrast, the social perspective explains the relationship between humans and nature as a complicated interconnection between diverse networks of sources and needs, of community groups and cultures. The decisions within the environment and human relationship are oriented toward the wellbeing of the public instead of the individual (Mugerauer & Manzo, 2008). Environmental health is an interdisciplinary field addressing the relationship between human health and environmental risks, mainly of anthropogenic origin. This discipline is defined in various ways in a continuum from a particular focus on hazards and risk assessments to focusing on public health applications to promote healthy enviornments (Frumkin, 2005). In general, environmental health is the discipline addressing "all the physical, chemical, and biological factors external to a person, and all the related factors impacting behaviours. It encompasses the assessment and control of those environmental factors that can potentially affect health. It is targeted towards preventing diseases and creating health-supportive environments" (World Health Organization, 2010, n.p). Accordingly, the environmental health discipline would be considered within the anthropocentric view, more specifically attuned with the social perspective.

2.3.2 Culture and Hispanic Populations

Presently, it is recognized that multiple factors and interactions between individual, socio-cultural, and environmental factors determine health and well-being (Marmot, 2006) and

the chances to prevent, reduce or increase risks of exposure and health impacts (Stokols & Clitheroe, 2005; Gee & Payne-Sturges, 2004; Payne-Sturges & Gee, 2006). At this point, most researchers and experts recognize the need to examine cultural contexts in determining the risks, access, and quality of health care, and prevention strategies.

Culture is defined as a set of patterns, beliefs and all the behaviors, means of communication, and ways of interaction that are conformed to by groups of people sharing racial, ethnic, religious or other social characteristics, and that are transmitted and perpetuated through generations (Office of Minority Health, 2005; Institute of Medicine, 2003); including the beliefs, art, customs and accumulated knowledge transferred from one generation to the next generation (Nye, 1971). According to Handwerker (2002), culture is not a static concept; on the contrary, culture is molding and molded by those conforming to that culture; thus, culture is an evolving concept (Handwerker, 2002). Currently, the Institute of Medicine (IOM, 2006) recommends that research examining the impacts of interactions among social, behavioral, and genetic factors must include the measurement of key variables over the life course and within the context of culture and amongst diverse groups and settings(Institute of Medicine, 2006). Similarly, the perceptions and beliefs about environmental risks vary between racial/ethnic, lower, and upper socio-economic population groups because of their surrounding local environments (Taylor-Clark, Koh, & Viswanath, 2007).

The most common cultural norms of Hispanic/Latino populations include concepts such as *familia* [family], *respeto* [respect], *personalismo* [personalism], *confianza* [trust], and *espíritu* [spirit]. These social norms cross over all Hispanic/Latino cultures, and are considered to be strengthening and protective factors (Migrant Clinicians Network, 2007). Additional values and practices of Hispanic/Latino populations include beliefs such as the *cold-hot* balance to maintain

health, *community,* and *traditional medicine* among others (Migrant Clinicians Network, 2007). However, caution must be applied by practitioners to avoid stereotyping individuals according to their culture of origin (Migrant Clinicians Network, 2007; Hunt, Schneider, & Comer, 2004)).

Moreover, the understanding of the inter-cultural differences within the Hispanic/Latino category is recommended for the designing and implementation of effective programs and policies for Latino immigrants (Joint Center for Political and Economic Studies and Policy Link, 2004) and for the understanding of health-seeking behaviors (Larkey, Hecht, Miller, & Alatorre, 2001). Thus, culture-specific approaches must be used in research and interventions with Hispanic/Latino groups, with emphasis according to the major Hispanic descent groups (e.g. Mexican, Puerto Rican, Cuban, etc.) because cultures are diverse despite sharing language and common cultural practices and values (The Latino Coalition, 2006), such as extended family, respect, personalization, trust, and traditional medicine, among others (Migrant Clinicians Network, 2007).

In terms of cultural expressions, experts distinguish the difference between cultural expressions as high or popular; the difference between these two types of cultural expressions are the final consumer reached (e.g. highly educated elite vs. popular) and purpose (e.g. philosophical purposes vs. commercial, standard, and artificial forces) (Harrington & Bielby, 2001; Cawelti, 2001; Nye, 1971, as cited in Rubin, 2008). *Popular culture* is defined as "all those elements of life which are not narrowly intellectually or creatively elitist and which are generally, though not necessarily disseminated through the mass media…and consists of the spoken and printed word, sound, pictures, objects and artifacts" (Browne, 2006, p. 21). According to Rubin (2008), popular culture is a unifying force (Rubin, 2008) that helps individuals to locate "their present lifestyles along a continuum somewhere between the "best

possible' and the 'worst possible' of all social worlds" (Neal, 1995, p. 122). Popular culture has been useful in counseling and therapy by using mass media products such as comic books, TV, videos, and movies, among others (Rubin, 2008) to enhance typical therapy models with narratives and metaphors of the situations encountered in such mediums (Rubin, 2008). U.S.-Mexico border culture regarding pesticide use, could be no more than the word-of-mouth transference of practices from one side to the other, and the tacit knowledge and similarities in language and perceptions about the use and risks inherent to pesticide use in a particular geo-spatial and typical binational setting.

2.4 Knowing and Understanding Health Risks

2.4.1 A Call to Prevent Risks

On one hand, as a public health measure pesticides are of great importance to control organisms that cause diseases in humans such as insect, snail, and rodent borne diseases, which account for 17% of the estimated global burden of infectious diseases (World Health Organization, 2006). Conversely, the increasing availability and widespread use of chemical products attract worldwide attention about the risks for both humans and the environment (Food and Agriculture Organization of the United Nations (FAO), 2008).

A growing number of experts and researchers worldwide recommend countries applying the *Precautionary Principle* when making decisions regarding the protection of human health of exposure to toxic substances (World Health Organization, 1998; Martuzzi & Tickner, 2004), including pesticides among others (Landrigan & Trasande, 2004; Weiss, Amler, & Amler, Pesticides, 2004). The concept of the Precautionary Principle was originated in the 1970s by environmental laws in Germany and re-introduced in 1992 during the Rio Declaration of the United Nations during the Conference on Environment and Development (aka Agenda 21)

(Tickner, Raffensperger, & Myers, 1999). The principle #15 of the Rio Declaration states that "…Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (United Nations, 1992, n.p.). Since 1998, environmental health scientists worldwide propose applying the precautionary principle to prevent and reduce adverse impacts in human health as a result of exposure to chemical exposures and environmental pollutants (World Health Organization, 2010).

On the other hand, some practices and attitudes toward pesticide use by the public can be attributed to the lack of understanding of the factors of the relationship between exposure and health effects, due to the limited knowledge about safer ways to reduce pests and protective measures, and to the perceptions about the risks of pesticides to humans. Individuals are urged to take control over the risks of exposure to chemical substances and to adopt protective practices. With the claim that "prevention is the best antidote" (World Health Organization, 2004, p. xi), the International Program on Chemical Safety of the World Health Organization (2004) recommends the implementation of information and education campaigns to promote the safe use of chemicals and the prevention of poisonings (World Health Organization, 2004).

People may ignore or neglect practices that prevent the effects of chemicals, mostly because of "the lack of information and education" (World Health Organization, 2004) and because the public understands and perceives environmental risks differently from experts and decision-makers (Garvin, 2001). Thus, risk communication strategies are imperative not only to prevent and reduce the adverse impacts of these risks, but also to reduce the risk perception divide between experts and the public (Leiss, 2004). Educating people to maintain and improve health and reduce environmental exposures, however, should be grounded in theories and

frameworks because these can help explain not only the problem, but to define effective actions that reduce risks (Parker, Baldwin, Israel, & Salinas, 2004).

2.4.2 Health Literacy

Health literacy is recognized as the cognitive and social skills that increase confidence of and motivates individuals to increase access, understanding, and use of the information to maintain and improve health (World Health Organization, 1998) and the capacity to make appropriate health decisions and access health services (Institute of Medicine, 2004). According to the World Health Organization (1998), health literacy gives people more than the ability to read materials and schedule visits, but empowers them to change lifestyles and living conditions, at the personal and community levels.

Despite health literacy as an important factor in health outcomes, the level of health literacy is usually moderated and mediated by other factors, such as perceived overall health, access to and utilization of health information and services, the interaction between patient and provider, and compliance. In the U.S., over one third of the population has limited health literacy skills (National Libary of Medicine, 2010). The population groups with the lowest health literacy levels in the U.S. include minorities, people with low education and income levels, non-native English speakers, older adults, and those with poor health conditions (Kutner, Greenberg, Jin, & Paulsen, 2006). Hispanic adults had lower literacy levels than other racial/ethnic groups. Moreover, authors found an association between low levels of health literacy and self-reported overall health, type of health insurance (e.g. Medicare, Medicaid, or none versus government and private health insurance, and with the type of sources of health information (e.g. TV or radio versus printed materials and family, friends and co-workers) (Kutner, Greenberg, Jin, & Paulsen, 2006).

Von Wagner, Steptoe, Wolf, and Wardle (2009) conclude that despite the fact that it is well recognized the effect of health literacy on health outcomes, the process by which health literacy ends in actions about health can be explained with a multidirectional framework. Thus, they propose a health literacy framework that combines individual factors such as skills to decode texts and understand numeracy, perceptions and attitudes, existing knowledge, cognitive aptitudes, and planning skills, with external factors such as environmental influences (e.g. insurance, employment, family issues, etc.), formal educational opportunities that enhance the comprehension of text and numerical information, and experiential learning (e.g. life events, community-based literacy interventions, etc.) (von Wagner, Steptoe, Wolf, & Wardle, 2009).

2.4.3 Access to and Trust on Sources of Health Information

In 2007, a sample of 7,446 adults were asked to mention the first source of information most recently accessed about health or medical topics in the U.S. The first source of information accessed by respondents was the Internet (58.1%), doctor or health care provider (14.6%), books (10.2%), magazines (3.9%), brochures, pamphlets, etc. (3.8%), and family (2.2%) among other sources. Once the information was accessed, 24.8% of respondents agreed that the information found was hard to understand (National Cancer Institute, 2007). The great majority (91%) access the Internet for health information in their homes. The proportion of adults accessing the Internet from home has been steadily increasing in a 5-year period, from 85.7% in 2003, 88% in 2005, to 91% in 2007 (National Cancer Institute, 2007). Amongst other factors, Internet is preferred by people if they think is useful and trust the site (Lemire, Pare, Sicotte, & Harvey, 2008)

However, despite the Internet being the first source of health information accessed by adults, over a third of the U.S. adult population did not go on-line to access the Internet or used email services in 2007 (National Cancer Institute, 2007). Despite the fact that the delivery of

information through the Internet would be more cost-effective, low-income and minority populations would face challenges to access and process information of such medium (Taylor-Clark, Koh, & Viswanath, 2007).

When participants were asked how much they trust the information about health and medical issues from various sources, the first five most trusted sources of information included doctors or other health professional, government health agencies, the Internet, family or friends, and charitable organizations (see Table 2.2).

Table 2.2. Level of Trust on Sources of Information (Health Information National Trends Survey (HINT, 2007)

In general, how much would you trust information about health or medical topics from…?	A lot %	Some %	A little %	Not at all %
A doctor or other health care professional	68.5	25.8	4.5	0.8
Government health agencies	29.4	43.8	17.8	7.5
Internet	18.8	46.9	15.4	11.7
Family or friends	14.1	47.7	31.3	6.3
Charitable organizations	9.3	38.2	31.9	18.3
Religious organizations and leaders	7.7	27.7	31.7	31.3
Newspapers or magazines	7.0	45.8	33.6	12.5
TV	5.6	36.8	36.9	19.7
Radio	2.9	30.2	37.5	25.9

Source: Percentages were obtained from the results of the Health Information National Trends Survey 2007 (HINTS] from responses to the questions coded as HC07a, HC07b, HC07c, HC07d, HC07e, HC07f, HC07g, HC07h, and HC07i "In general how much would you trust information about health or medical topics…"
Note. Total percentages do not add up to 100% because the percentages of *refusals* and *don't know* are not included in this table.

The great majority of respondents trusted a lot or some the information provided by a doctor or other health care professional (94.3%), government health agencies (73.2%), Internet (65.7%), family or friends (61.8%), charitable organizations (57.5%), TV (42.4%), and radio (33.1%). Health information provided by religious organizations and leaders, radio, or TV was deemed as "not trusted at all" by 31.3%, 25.9%, and 19.7% of respondents respectively (National Cancer Institute, 2007).

The trend in the level of trust from 2005 to 2007 shows a decline on sources such as the Internet (72% to 65.7%), family and friends (67.7% vs. 61.8%), TV (72% vs. 42.4%), and radio

(56.2% vs. 33.1%), with an increasing rate of trust of the information provided by doctors or other health care professional (91.8% vs. 94.3%) (National Cancer Institute, 2007). Furthermore, access to and levels of trust of sources of information vary by race/ethnicity and language. Of the participants to the HINT Survey of 2005 (Clayman, Manganello, Viswanath, Hesse, & Arora, 2010), Hispanics were grouped according to their level of comfort to speak English. Of those Hispanics less comfortable speaking English, 86% reported not using the Internet. In contrast, of those Hispanics more comfortable speaking English, 45% reported not using the Internet. Thus, the Hispanic populations speaking less English prefer other methods than the Internet to access information. Similarly, Hispanic groups vary in their levels of trustiness on sources of information. The Hispanics grouped as less comfortable with English rated with higher scores the physician, family/friends, and TV as the most trusted sources of health information. In contrast, the Hispanics grouped as more comfortable with English rated the physician, the Internet, and the TV as the most trusted sources of information (Clayman, Manganello, Viswanath, Hesse, & Arora, 2010).

In conclusion, Hispanic population groups with barriers to speak and understand English, such as recent or first-generation immigrants, have less access to Internet and trust more their interpersonal contacts to access information, such as doctors and family and friends. Moreover, community pluralism – measured by community size and degree of structural differentiation, influences the degree of interpersonal and mass media dependency for health information. People living in more pluralistic environments would depend more in non-personal channels of communication such as mass media, in contrast to less pluralistic communities where people prefer interpersonal communication means (Viswanath, Randolph Steele, & Finnegan, 2006).

2.4.4 Understanding the Information about Risks

The understanding of numeracy is considered as an important factor of decision-making process of individuals and in risk communication interventions (Lipkus & Peters, 2009). Some people do not understand the probability of contracting diseases. In 2007, adults in the U.S. were asked to select which number represents the biggest risk of contracting a disease by the Health Information National Trends (HINT) Survey conducted by the National Cancer Institute. People were asked to choose between 1 in 100, 1 in 1000, or 1 in 10. When is 1 in 10 would represent the biggest risk, over 13.3% of estimated adult population believed that 1 in 100 represents the biggest risk of getting a disease, and 8.4% of people believed that 1 in 1000 represents the biggest risk of getting a disease (National Cancer Institute, 2007). This is over a fifth of the U.S. adult population not knowing how to interpret numbers to understand the probability of a disease. Moreover, the HINT survey found that 55% of the U.S. adult population agree or somewhat agree with the statement “in general, I feel uncomfortable with health information that has a lot of numbers and statistics” (National Cancer Institute, 2007).

Numeracy levels, according to authors, help people understand, compute, and transform numeric information into concepts such as risk, probability, and uncertainty of numeric estimations to make decisions and adopt behaviors related with health. Furthermore, authors add, the people’s understanding of risk communication messages is influenced by external factors such as the channels and forms the numeric information is presented. Thus, less numerate people would benefit more with face-to-face exchanges and visual forms of information to help them understand and provide corrective feedback. Finally, Lipkus and Peters (2009) propose a comprehensive framework to examine the factors involved in the levels of numeracy and health and to inform interventions that encourage the comprehension and understanding of quantitative

information for adequate health behavior and decisions among those less numerate populations (Lipkus & Peters, 2009).

Understanding information about risks from pesticides could be difficult for at-risk populations. Vaughan & Dunton (2008) examined the effect of perceived economic distress and education levels of low-income immigrant farm workers of Mexican origin in judging the novel risk information, the strength of scientific evidence of a health risk, and the persistence of the chemical in the body or environment that could affect health. Male farm workers of various rural areas in California were asked three questions to measure their judgment of *novel risk* information and two questions to *weight* new scientific risk information. Novel risk information was measured with a composite variable that included participants' perceptions about the dangerousness of a substance, the probability that exposure to this substance will affect health, and the certainty that the health effect would occur. Weighting of the scientific evidence of the health effects caused by a chemical was measured with two dichotomous variables, the strength of the evidence of scientific information and the persistence of a chemical in the body or environment. Participants weighted the scientific evidence as *weak* if the information is based on animal studies or *strong* if it is based on human evidence. To weight the persistence of a chemical in the body or environment, participants rated as *short* if the substance is expelled shortly after exposure or as *long* if the substance is stored in the body or in the environment for longer periods (Vaughan & Dunton, 2007).

Moreover, researchers found that the perceptions of participants toward novel risk information were not significantly associated with their economic dependency or their level of education. In contrast, education and economic dependency were associated with some of the variables measuring the participants' weighting of scientific evidence. Of the variables to

measure participants' weighting of risk evidence, education levels were significantly associated to the strength of scientific information presented, but not to the persistence of the chemical (Vaughan & Dunton, 2007). Participants' perceived economic dependency on farm work had also a significant association with their weighting of risk evidence, the higher economic dependency on farm work the less risk judgment of both variables, the strength of the health risk information and the persistence of chemicals. Moreover, authors examined the association between the scores of perceived risk of novel information and the responses of weighting evidence. Results show that the perception of risk is higher when the persistence of the chemical in the body is longer and when the scientific information is stronger.

One can conclude that people of any income and educational levels understand the health risks of short and long-term exposures. The understanding and judgment of scientific information, in contrast, depend significantly on the education levels. Scientists and health educators must make an extra effort to present information that is understood and compelling for at-risk population groups (e.g. low income and education levels, immigration status, foreign language, etc.). Moreover, Vaughan & Dunton (2007) add that in order to reduce risks of populations at higher risk of exposures, information and educational efforts should be accompanied by environmental and social changes and enforcement to support the adoption of safer practices. Health promotion strategies are being recommended in the United States that focus on high impact interventions such as creating healthy social and physical environments and raising awareness, especially with those with limited health literacy and experiencing health disparities (National Prevention, Health Promotion and Public Health Council, 2010).

2.5 Approaches to Prevent and Reduce Exposures

There is an urgent need not only to probe causality in pesticide exposure and health effects, but to establish adequate exposure thresholds to protect people and children with new strategies to determine the safety of all pesticides under ethical and human protection principles (Lanphear, Paulson, & Beirne, 2006; Olesky, et al., 2004; Weiss, Amler, & Amler, Pesticides, 2004; Colborn, 2006). In the midst of research advances to make a definite association between exposure to pesticides and health, decision-makers and the public are urged to adopt preventive practices and to understand the risks involved in exposure to pesticides. Several factors determine health and influence disease and risk behaviors, including genetic, biological and psychological factors of individuals and the social and physical environments on which they live (Institute of Medicine, 2006; Marmot, 2006; Gee & Payne-Sturges, 2004). The interactions among all these factors must be considered in research while also considering the cultural contexts and using multidisciplinary approaches (Institute of Medicine, 2006). Preventing and reducing the risks of exposure to pesticides can be addressed at the public health, community, and individual levels.

2.5.1 Health and Communication

2.5.1.1 Communicating health messages.

When communicating health messages, the most common strategies to attract the attention of people are messages that combine information with argumentation and emotion with entertainment; these two broad strategies can be implemented alone or combined (Gregory, 2006). When presented with printed materials based on these two distinct categories, readers preferred the materials with information/argumentation messages when they were looking for

specific information. In contrast, readers not looking for specific information preferred and were persuaded to read the materials because of the emotion/entertainment messages (Gregory, 2006).

Some disparities on health communication are experienced by disadvantaged populations. Ackerson and Viswanath (2009) examined the data from the Health Information National Trends Survey (HINT) of 2003 concluding that Spanish-speaking Hispanics and individuals in the lowest education and income levels are less likely to receive thorough information from their physicians, of being respected by the physician about the things they say, and of being involved in their own medical care decisions (Ackerson & Viswanath, 2009) .

Despite the fact that tailoring messages to specific cultural and minority groups is highly recommended, caution is recommended when designing interventions because targeted groups may prefer multiple racial and ethnic groups depicted, do not identify with the role models, or would prefer dual language use in the materials and educational interventions (Resnicow, Braithwaite, Dilorio, & Glanz, 2002).

Communication disparities are the differential access to health information and knowledge according to the socioeconomic status; communication disparities could be considered one of the determinants of health disparities, and thus, a "communication inequality" (Viswanath & Emmons, 2006; p. S242). Communication inequality, according to authors, is the "differences in the generation, manipulation, and distribution of information among social groups; and differences in (a) access and use, (b) attention, (c) retention, and (d) capacity to act on relevant information among individuals" (Viswanath & Emmons, 2006).

In a review of interventions regarding the communication of health messages from 2003 to 2007, Morris et al. (2009) concluded that health communication interventions in the community need to address and examine message exposure and develop methodologies to

measure message exposures to health messages (Morris, Rooney, Wray, & Kreuter, 2009). The studies included in the review used strategies such as mass media (i.e. TV, newspaper, magazines, etc.) and small media (i.e. brochures, flyers, comic books, Internet, etc.) and interpersonal communication (i.e. lay health advisors, community classes and events, discussion groups, etc.). Another study compared physical activity interventions through face-to-face, the Internet, or a combination of (Steele, Mummery, & Dwyer, 2009) finding no significant difference on the outcomes of these experimental groups.

The recall of health messages is influenced by social participation. Viswanath, Randolph Steele, and Finnegan (2006) examined the influence of social participation in community groups – active or non-active, and the recall of health messages about cardiovascular issues of 2,968 participants of six communities. Results show that participants with more group ties recalled more messages, on which being a member of three or more groups resulted in more health messages recalled. Women recalled more messages, independently of group ties or community size. Additionally, authors found that active members of a community group recalled more messages than members less active in a group. Moreover, active members of groups providing health information resulted with the largest average of messages recalled than members of groups that do not provide health information (Viswanath, Randolph Steele, & Finnegan, 2006). In summary, community-based communication interventions are efficacious in reaching out and motivating participants to read materials if these materials include messages based on emotion/entertainment strategies. Emotion/entertainment messages would encourage minority population groups and those in the lower levels of education, income to access and read novel, unfamiliar, unwanted, and unexpected information about environmental risks and their impacts on health.

2.5.1.2 Risk communication.

In environmental health, the term *risk* is defined as “the probability that something will cause injury or harm” (Agency for Toxic Substances and Disease Registry, n.d.) to health or the environment (Environmental Protection Agency, 2010). The process of risk communication is defined as “an interactive process of exchange of information and opinion among individuals, groups, and institutions” (National Research Council, 1983, p. 21). In the environmental health discipline, risk is understood as the probability of an adverse event or health effect to occur (ATSDR, 2007) by the actual or potential presence of pollutants (EPA, 2006). Risk perception, on the other hand, is based in the paradigm that the public perceive and understand the environmental risks differently. Cothern (1996) argues that “perceptions are flavored by emotional feelings (such as fear, guilt, and embarrassment), limited by lack of educational background (e.g. they are quantitative in probability, uncertainty, reading graphs), steeped in biases (cultural, social, gender), confused by language (we hear what we want to, different connotations of words), and thus provide a block to the communication of facts in general and environmental risk specifically” (Cothern, 1996, p. 43). The risk communication model is oriented to help people understand the potential risks to themselves, their properties and their community (Reckelhoff-Dangel & Petersen, 2007). Once informed, the public can reduce significantly the adverse outcomes from environmental exposures (Johnson, 2005).

However, the public examines risks differently from scientists and decision makers. According to Garvin (2001), scientists, policy-makers, and the public examine risks under different paradigms; these are the scientific, political, and social paradigms. Scientists rationalize risk, policy makers contextualize risks, and the public judge risks according to the certainty these may occur. The public is the group making more straightforward analysis of uncertainty because

the public conceptualizes science in terms of the social, cultural, economic and political contexts, this is within a comprehensive a social paradigm (Garvin, 2001). Therefore, the National Research Council (NRC) recommends acknowledging and understanding the characteristics of the intended audience, the form these risk messages are being transferred (i.e. face-to-face, mailings, advertising, presentations to groups, etc.), and the level of trust of the source of the message (i.e. who, the degree of expertise, credibility, etc.). Moreover, an effective risk communication process must be explanatory, interactive, timely, accurate, clear, objective, consistent, and complete (National Research Council, 1983) (Covello, 2006). When the audience is engaged in such process of risk communication, according to Covello (2006), they will not only make informed decisions about the risks but will also be more involved, interested, cooperative, and collaborative, and will take appropriate actions and engage in appropriate behavior (Covello, Risk Communication, 2006).

Explaining and understanding risks is a two-way communication process and should be carefully designed and implemented at all levels of the processes of risk assessment and risk management. If the risk communication process is deficient and ineffective in communicating scientific facts, the public's perceptions would overwrite science and form a new reality, thus, when the public "rejects the science and all risk communication efforts, then their word is final" (Trautman, 2001; p.1133). The public thus, would confront unnecessary and unwanted risks.

Moreover, experts and scientists can transfer risk messages to the public through local trusted sources as intermediaries when official or public agencies are mistrusted (National Research Council, 1989). These trusted citizens can be more effective in communicating risk messages to citizens "even if their informants are less expert than those available through public sources" (NRC, 1989, p. 25). In health related outreach, the community health workers (i.e. lay

health advisors) had been found considerable successful in linking the community with health care (Department of Health and Human Services, 2007). Similarly, community health workers would be an example of trusted citizens providing environmental risk information to neighbors in their communities.

The public is exposed to health messages intended to change health behavior and communicated through mass media (e.g. TV, radio, advertisements, newspapers, magazines, etc), small media (e.g. flyers, posters, comic books, Internet, newsletters, etc.), and interpersonal interactions (e.g. peers, lay advisors, church, classes, discussion groups, or social networks) (Morris, Rooney, Wray, & Kreuter, 2009). A combination of small media and interpersonal interactions was used by the majority of the studies. Overall, authors estimated that the effect sizes of behavioral changes ranged from .03 to 3.53 (Cohen's *d*) as a consequence of message exposure to small media and interpersonal communication of messages (Morris, Rooney, Wray, & Kreuter, 2009). The consequential behavioral changes from the risk communication messages that can be measured include the behaviors acquired or changed, the participation in protective community actions, the time the behavioral changes are sustained, and the problem solved and conflict resolutions as a result of the risk messages oriented to collaboration and policy making (Lundgreen & McMakin, 2004; Reckelhoff-Dangel & Petersen, 2007).

2.5.2 Labels of Pesticidal Products

The label in a pesticide product represents the most direct mechanism for consumers to make informed decisions in selecting the product appropriate to their needs and to use them safely (Abt Associates Inc., 1999). The laws of both countries (i.e. U.S. and México) define specific instructions about the design, letter size, colors, and all the information to be included in the label of a pesticide, through FIFRA 40 §156.10 in the U.S. and the NOM-046-SSA1-1993 in

México. However, reading the label would depend mainly on factors such as familiarity with the product (i.e. if the product is new for the consumer), perceived risk of the product (i.e. if he or she perceives the product as hazardous), and the perceived ease of use of the product (Environmental Protection Agency, 1996).

In the U.S., 61% of consumers of indoor pesticides reported not looking at the ingredient information on the pesticide label; the major reason being that they do not understand the information of this section (Abt Associates Inc., 1999). Of those consumers reading the label when shopping a product, the main reasons to look for information about the ingredients were to compare the effectiveness of the pesticide product (66% of participants) (i.e. the product with higher amount of active ingredient is more effective), and 41% of participants read the ingredient section to locate the products they are allergic to (Abt Associates Inc., 1999). When asked about what would be the most important information in the label, a great majority of users of indoor pesticides responded that directions on how to use it (80%), what the product does (69%) and followed by a lower proportion of pesticide users considering the health effects (49%), what to do in case of an emergency (45%), and where not to use the product (42%) as the most information to look for in a pesticide label (Abt Associates Inc., 1999).

Additionally, besides relying on the information included in the packaging of the product, a greater proportion of consumers of indoor pesticides obtained information about these products in newspaper and magazines (55.8%) and stores (53%) than from other sources such as universities (11.8%) or the internet/web (5.8%) (Abt Associates Inc., 1999). Nonetheless, consumers of indoor pesticides reported being very (55%) to somewhat satisfied (32%) with the statements available in the label, and the majority preferred alternate statements when revised versions were presented to them. The report by Abt and associates (1999), however, does not

fully describe the demographic information of participants (i.e. race, ethnicity, origin, income, educational level, geographical location, etc.) to examine more thoroughly the perceptions and practices of U.S. consumers of indoor pesticides.

Another study found that labels on pesticide products might represent a physical and cognitive readability barrier for pesticide users. Lockwood, Wangbert, Ferrell &Hollon (1994) examined the labels of 20 general and 34 restricted pesticides as well as the beliefs and practices of 1,623 participants in the State of Wyoming. Participants were categorized as farmers or ranchers (58.6%), licensed applicators (15.4%), and the general population (24.6%). Of the labels examined, authors found these had a mean cognitive reading ability at 11th grade with a range from seventh to more than 12th grade. Additionally, some labels had a combination of font and background colors that provide extremely poor contrast (Lockwood, Wangberg, Ferrell, & Hollon, 1994).

Of those participants reading the label (n=1,623), the majority were between 20 and 40 years of age (56.9%), female (59.2%), and had more than high school education (59.9%). Regarding the perceptions of those reading the label, 41.5% of participants believed that not all of the information was relevant and 32.3% of participants believed that it was too much to read. Moreover, of those reading the label partially, 11.5% of participants reported not understanding the label and 30.8% of participants reported knowing what to do without reading the label. In addition, Lockwood et al. (1994) recognize gender differences in label usage and understanding. Female participants reported that labels included too much to read (36.9% vs. 31.8% of males) and not understanding the information (24.3% vs. 9.3% of males). However, more women than men reported always following label directions (70.2% vs. 66%) (Lockwood, Wangberg, Ferrell, & Hollon, 1994).

The levels of readability, font sizes, language, label colors, and the information included in the label are of great importance to reduce risks of pesticide usage in households. However, foreign born and English-as-a-Second-Language populations have increased risks because of language barriers and cultural practices. The proportion of foreign-born population in the U.S. increased 200% from 1970 to 2004 representing over 12% of the non-institutionalized population (National Center for Health Statistics, 2007). By 2009, it is estimated that 12.4% of the U.S population is foreign born and 19.6% speaks a language other than English at home. Significantly higher proportions are estimated for U.S. border counties, such in El Paso, Texas with 26.6% of the population is foreign born and 74.9% of residents speak any language other than English at home (U.S. Census Bureau, 2010). Populations of Mexican or other Latin American origin living in the U.S. may confront difficulties in understanding thoroughly the information on the label of a pesticide product, with major challenges for U.S. border populations. The population trends observed above would require agencies and manufacturers to re-design the information in the label of pesticide products to address and reach out all consumers, including those with language disadvantages.

2.5.3 Lost in Translation: Terms for Pesticides in the U.S. and Hispanic Countries

2.5.3.1 English terms.

Reading and understanding concepts is often confusing for the consumer of pesticidal products. On the one hand, there are various ways to refer to the overarching term *pesticides*, both in English and Spanish. On the other hand, these overarching terms are omitted in the first source of information to consumers, the label of pesticide products. In the end, consumers may fail linking the terms referring to pesticides with the information about risks; and much worse, ignoring the recommendations to avoid risks.

In the U.S., the overarching term *pesticides* is broadly used by the public and by scholars to refer to the products used for pests. However, according to the labeling requirements for pesticides delineated by FIFRA §156.10, the pesticidal products are not required to include the general term *pesticide* in the label but to include the name, brand or trademark by which the product is sold. Therefore, one can observe in public stores that pesticidal products include in the label the type of pesticide it is such as insecticide, repellent, rodenticide, or even the word *poison*, but not the general term *pesticide*.

The Environmental Protection Agency (EPA) is the leading government organization in the United States providing information about pesticides to the public through its official links and publications. These publications are available at no charge and most of them are also available in Spanish (Environmental Protection Agency, 2009, Feb 3). Additional electronic sources of information about pesticides include websites from other agencies such as the Medline Plus (Medline Plus, 2010) of the National Library of Medicine, the Household Products Database of the U.S. Department of Health and Human Services (Department of Health and Human Services, 2010), and the NIEHS (National Institute of Environmental Health Sciences, 2010), as well as the information provided by the manufacturers. All these agencies title their website with the overarching term *pesticide* to address its definition, types, health concerns, programs, and regulation and include links useful for scholars and the public. Additionally, the public can access the definition of the term *pesticide* and all related information from academic centers such as the National Pesticide Telecommunications Network (National Pesticide Telecommunications Network, n.d.), the Environment Working Group with the Shopper's Guide to Pesticides (Environmental Working Group, 2010), in Wikipedia (Wikipedia, 2010), and in printed English dictionaries.

The general public can also find the definition of pesticides in English dictionaries. The term *pesticide* is defined as “a chemical preparation for destroying plant, fungal, or animal pests” (Random House, 1987, p. 1448) or as simply as “an agent used to destroy pests” (Merriam-Webster, 1997, p. 868). For researchers, the term *pesticide* is listed in the Medical Subject Headings (MeSH) database since 1999 and is defined as “chemicals used to destroy pests of any sort. The concept includes fungicides, insecticides, rodenticides, etc.” (National Library of Medicine, 2010).

In addition to using the term *pesticide*, scientists use a variety of terms in the title of their reports and publications according to the specific common chemical name of the substance or compound they are reporting about, such as organophosphate, chlorpyrifos, pyrethroids, carbamates, persistent organic compounds, etc. or the name according to the type of pest targeted such as insecticide, rodenticide, fungicide, etc. A quick search was conducted in PubMed Central database free and embargoed publications from September 2009 to August 2010 to explore the terms most often used in the title. The terms used in the title and the number of articles listed were pesticides (831), organophosphates (142), carbamates (185), chlorpyrifos (109), pyrethroids (130), insecticides (562), rodenticides (9), fungicides (132), and repellents (166) (PubMed Central, n.d.).

For educational purposes, the term *pesticide* is the main overarching term included in training materials and public campaigns, adding sometimes additional information such the type of pesticide, the chemical group classification, and other pertinent information for the public and workers. As an example, the overarching term *pesticides* is used in materials such as the booklet “Citizen’s guide to pest control and pesticide safety” (Environmental Protection Agency, 2005) for the public, the book “Recognition and Management of Pesticide Poisonings” (Reigart &

Roberts, 1999) for health care providers, and the materials for agricultural workers such as "Protect yourself from pesticides" (Environmental Protection Agency, 1993) and "Managing risk of pesticide poisoning and understanding the signs and symptoms" (Ogg & Schulze, 2006).

2.5.3.2 Spanish terms.

In contrast to the United States where only one overarching term is available for pesticidal products, in Spanish speaking countries there are two terms referring to *pesticides*; these are *plaguicidas* and *pesticidas*. The challenges observed in the United States to communicate risks and preventive actions mentioned above could be augmented in Spanish speaking countries. The use of either or both of these terms may have implications in the communication of risks, in educating the public about the health concerns, and in enhancing awareness about the most effective methods to control pests and reduce risks.

Historically, the recognition and the meaning of these two terms in the Spanish lexicon evolved from being absent to synonymous and from being recognized as an agricultural product to a more general use product. Table 2.3 includes the sources and definitions of these terms as they appeared in Spanish dictionaries in a 20-year period.

In 1984, the term *plaguicida* was the only term included in Spanish dictionaries with an overt connotation of a product used for agricultural purposes. By 1992, the term *pesticide* was introduced in Spanish dictionaries while the term *plaguicida* continued with the same definition. These definitions suggest a contrasting connotation according to the intended use – domestic and urban versus agricultural use. By 1994, one dictionary recognizes both terms as synonymous, and a more general connotation. By 1997, a Spanish dictionary augments the definitions and overtly distinguishes the terms according to its use; *pesticide* to refer to products for general purposes and *plaguicida* referring to products for agricultural purposes. By year 2004, both terms

are included in a dictionary with the same definition, without the connotation of agricultural purposes of the term *plaguicida*.

Table 2.3. Spanish Terms *Pesticida* and *Plaguicida* by Selected Spanish Dictionaries

Source	**Definition of the term pesticide in Spanish dictionaries (verbatim)**	
	Pesticida	***Plaguicida***
Real Academia de la Lengua Española (1984. *Diccionario de la Lengua Española*. 20ª Edición, Tomo II. Madrid, Spain.	Term not included.	*Dícese del agente que combate las plagas del campo* (p. 1071). [Agent to combat pests in the field]
Real Academia de la Lengua Espanola (1992). *Diccionario de la Lengua Española*. 21ª Edición, Tomo II. Madrid, Spain.	*Que se destina a combatir plagas* (p. 1588). [That it is intended to combat pests]	*Dícese del agente que combate las plagas del campo* (p. 1617). [Of the agent to combat pests in the field]
Garcia-Pelayo y Gross (1994). *Pequeño Larousse Ilustrado*. Ediciones Larousse. Barcelona, Spain	*Dícese de las sustancias empleadas para combatir plagas* (p. 796). [Of a substance employed to combat pests]	*Pesticida* (p. 811). [Pesticide]
CLAVE (1997). *Diccionario de Uso del Español de América y España*. Mc Graw Hill, Madrid, Spain.	*Referido a un producto que se usa para combatir una plaga u otra cosa dañina y abundante. Etimología: "peste" y "cida"* (p. 1409). [referring to a product used to combat a pest or other damaging and abundant thing]	*Referido a un producto que sirve para combatir las plagas del campo. Etimología: "plaga" y "cida"* (p. 1431). [of the products that help to combat pests of the field]
VOX Diccionario de Uso Español de América y España (2004). Mc Graw Hill, Madrid.	*[Sustancia química] que destruye las plagas de animales y plantas* (p. 1465). [Chemical substance that destroys the pests on animals and plants]	*[Sustancia química] que destruye las plagas de animales y plantas* (p. 1490). [Chemical substance that destroys the pests of animals and plants]

Note. The Spanish definitions were translated to English by the author of this study.

Both Spanish terms are used in Hispanic countries, of which *pesticida* was the most prevalent term. A search was conducted with the key words *pesticida* and *plaguicida* in the title of thesis and dissertations in Spanish through the database Worldcat (OCLC/FS) in May 2010 by the author of this study. The search resulted in 40 documents from Latin America and Spain

using the term *pesticidas* in the title, whereas 2 documents were found with the term *plaguicidas* in the title (Worldcat (OCLC/FS), 2010).

However, the term *plaguicidas* is the only one recognized and defined in the laws and regulations in México (regulations are called *normas* [norms] in Mexican law). As expected, not only it is the unique term used in the official websites and publications but also in the majority of scholarly publications on this country. Few publications such as books and manuals were found on which the term *pesticida* is additionally used (Lopez Torres, 2008; Valdez & Segovia, 2007).

Despite both terms *plaguicida* and *pesticida* being included in Spanish dictionaries, the English term *pesticide* is translated to Spanish as *pesticida* by most of the English-Spanish Dictionaries. Table 2.4 summarizes some translations to Spanish of the terms used in various dictionaries.

Table 2.4. Translation of the Term *Pesticide* by Selected English-Spanish Dictionaries

Dictionary	**The term 'pesticide' is translated to Spanish as**
The Oxford Spanish Dictionary Spanish English, English-Spanish (2001). Oxford University Press, NY.	*Pesticida* (p. 567) *Plaguicida* (p. 575)
Collins Dictionary (2002) English-Spanish, Español-Inglés, 4th Ed. Harper Collins Publishers, NY.	*Pesticida* (p. 1032)
Webster New World Concise Spanish Dictionary (2006). 2nd Ed. Wiley Publishing, Inc. NJ.	*Pesticida* (p.336)
Collins Spanish Concise Dictionary (2008). 5th Ed. Harper Collins Publishers, Great Britain.	*Pesticida* (p. 704)

Spanish publications by organizations such as the Pan American Health Organization and the World Health Organization use both terms interchangeably. The book *Salud en las Américas, Volumen I* [Health in the Americas, Volume I] by the Pan American Health Organization focusing on the health status of Latin American populations, includes the term *plaguicida* in Chapter 3: Sustainable Development and Environment and Health (Organización Panamericana de la Salud, 2007). Similarly, the chapter devoted to the health status of the U.S-Mexico border

populations included in Volume II of the same book, includes the term *plaguicida* when referring to the risks of exposure to pesticides (Pan American Health Organization, 2007) and the term *pesticida* in a comic book for children "*Mónica, ambientes saludables para niños*" [Monique, healthy environments for children] (Pan American Health Organization, 2003).

In contrast, in the U.S. the term *pesticida* is most often used in Spanish publications. The acclaimed book *Environmental Health: From Global to Local*, Edited by Howard Frumkin (2005) includes the term *pesticidas* in its Spanish version (Pan American Health Organization, 2010). The Spanish version of the book *Recognition and Management of Pesticide Poisonings* [*Reconocimiento y Manejo de los Envenenamientos por Pesticidas*] focusing on the treatment of pesticide poisonings for health care provider (Environmental Protection Agency, 1999), uses the term *pesticida* as can be noted in the title. The EPA's website in Spanish for the Pesticide Program uses the term *pesticida* (Environmental Protection Agency, 2006, May 5) as well as in their website of the U.S.-Mexico Border 2012 program (Environmental Protection Agency, 2010). Other publications include the term *pesticida* such as the book "Where there is no doctor" (Werner, Thuman, & Maxwell, 2010) for community-based health workers and other educational materials for the public such as "*Dígale adiós a las plagas*" [Say goodbye to pests] (Wake Forest University School of Medicine, n.d.) and *¿Tiene preguntas sobre pesticidas? ¡Tenemos respuestas!* [Have questions about pesticides? We have answers!] (National Pesticide Information Center, n.d.).

Both Spanish terms are recognized in Spanish and English dictionaries and the term *pesticida* is widely used in Spanish publications and websites in Latin America countries and Spain. However, Bejarano Gonzalez (2002) argues that it is not correct to use the term *pesticida* because it is "*una mala traducción del ingles pesticide*" (Bejarano Gonzalez, 2002, p. 2) [it is a

bad translation of the English *pesticide*], despite the fact that this term is widely used by scholars and international organizations and most often used in English-Spanish dictionaries.

The terms *pesticide* in English and the terms *plaguicida* and *pesticida* in Spanish are the overarching terms referring to any product intended to prevent, destroy, repel, or mitigate pests, however, none of these terms is included on the label of commercial products for domestic use, neither in México or in the United States. The regulations from these two countries do not require manufacturers to include these terms in the labels (U.S.A., 2008; México, 1993). The Consumer Protection Agency of México lists the pesticidal products under the category of cleaning products and according to the type of product it is labeled – this is insecticide, rodenticide, etc. (Profeco, 2010), but omits including any of the overarching Spanish terms *plaguicida* or *pesticida*.

In the U.S., the FIFRA 40 §156.10 (3) recommends manufacturers including the information on the label in another language if it is deemed necessary to protect the public. Similarly, in México, the NOM-046-SSA1-1993 Section 4.8 requires that pesticide products imported to México must bear a label with information in Spanish. Therefore, it is expected to find pesticidal products in the market on either side of the U.S.-México border available either in English, Spanish, or both, but without the overarching terms *pesticide* in English or *pesticida* or *plaguicida* in Spanish labels.

As can be seen, there is ample access to materials in English and Spanish and electronic sources with an array of information about the terms, types, health concerns, and recommendations about the use of pesticidal products. Similarly, there is great availability of brands and varied presentations of commercial pesticidal products in the market with over 20,000 that are actually registered in the National Pesticide Information Retrieval System

(National Pesticide Information Retrieval System, 2010). However, the overarching terms *pesticide* in English and *pesticida* and *plaguicida* in Spanish are not included in the labels of commercial products. Such discrepancy in what the public read in publications and websites and purchase may challenge their understanding and they may feel overwhelmed to link the array of names of the types and uses of pesticides with the pesticidal products they actually find in the market. The lack of consistency between the terms used in publications and the information in actual products could mislead the public in the understanding and reduce awareness of the seriousness and severity of exposure to pesticides in their own home. Moreover, Hispanic populations with English as a second language or not feeling comfortable reading and accessing such information in the Internet would be unable to judge the risks of pesticides. Given the geospatial, social, economic, and cultural interactions among border populations, consumers in either side of the U.S.-Mexico border may face increased challenges in understanding and linking the varied terminology referring to pesticidal products in publications and websites plus the variety of products and languages on the labels of these products.

2.6 Educating People toward Healthy Behaviors

2.6.1 Health Promotion and Environmental Health Promotion

Health behavior is understood as “the actions of individuals, groups, and organizations and to those action’s determinants, correlates, and consequences including social change, policy development and implementation, improved coping skills..., and enhanced quality of life” (Glanz, Lewis, & Rimer, 1997, p. 9). According to Gochman (1997), health behaviors can be grouped into six categories. These are health cognitions (e.g. personal representation of health), care seeking, risk behaviors, lifestyle, responses to illness (including adherence), and preventive, protective, and safety behaviors (Gochman, 1997).

Health education, as a mechanism of health promotion, promotes the adoption of positive behavioral changes with the goal to increase health awareness, screening, care, and treatment (Glanz, Rimer, & Lewis, 2002). Health education strategies are implemented in settings such as in the community, schools, worksites, health organizations, consumer market places, and in homes (Glanz, Rimer, & Lewis, 2002). Health promotion is defined "the process of enabling people to increase control over, and to improve their health" (World Health Organization, 1998, p. 1). The health promotion strategies including advocacy to improve health conditions, facilitation to help people achieve their health potential, and mediation among various health interests can be extrapolated to environmental issues impacting health. The integration and combination of goals and approaches between the disciplines of health promotion and environmental health may result in the reduction of exposure over the long-term and promote primary prevention related to environmental exposures (Parkes & Panelli, 2001).

Therefore, environmental health promotion (EHP) integrates the health promotion methods in interventions oriented to promote changes on resources, policies, community capacity, social networks and norms, and behaviors to reduce exposures and improve health status (Crozier Kegler & Miner, 2004). EHP programs apply health promotion comprehensive approaches to assess, correct, control, and prevent environmental factors that impact health and quality of life (Howze, Baldwin, & Crozier Kegler, 2004). The interventions are oriented to promote changes in the "distribution of resources (power, funding, programs), policies and regulations, community capacity, social networks and norms, and behaviors of individuals" (Crozier Kegler & Miner, 2004, p. 516). According to Crozier Kegler& Miner (2004), the most promising EHP strategies to reduce and prevent risks include social action, policy advocacy, media advocacy, coalition building, organizational change, lay health advisers, risk

communication, and tailoring education according to the characteristics and needs of the individual (Crozier Kegler & Miner, 2004).

In a review of household interventions from 1990 to 2001 about environmental health impacts, the most common type of intervention included one-time household improvement (43% of studies), addressing knowledge, attitudes, or behaviors of participants (18%), or on a combination of various approaches (32%) (i.e. household, individual, or community) (Saegert, Klitzman, Freudenberg, Cooperman-Mroczek, & Nassar, 2003). The strategies used by the 72 interventions reviewed, 35% used a combination of education and environmental remediation, 32% used education only, and 31% of these studies used environmental remediation only (31%) (Saegert, Klitzman, Freudenberg, Cooperman-Mroczek, & Nassar, 2003). Cognitive, behavioral, and socio-cultural approaches to educate adults can be applied to improve and maintain health and reduce risks of exposures to toxic chemicals.

2.6.2 Adult Education

Adult learners are psychologically, physiologically, and socially more diverse than children (Long, 1998). The concept of adult learner is highly embedded in the U.S. culture that privileges self-directed competence, recognizing that "adults are highly pragmatic learners" (Wlodkowski, 1998, p. 11). According to Knowles (1978), experience plays an important role in adult learning (Knowles, 1978). The concept of *andragogy* was coined by Knowles in 1971 to define what he first recognized as informal adult education. In contrast to the concept of pedagogy (e.g. the science to teach children), *andragogy* would be the science to teach adults (Knowles, 1973). Andragogy is based on four major assumptions of adult learning, such as that adult learners are self-directed, the learning experience is largely based and directed by experience, the readiness to learn departs from academic demands and becomes more attuned

with the adult's social needs, and the orientation of adult learners is centered on problem solving rather than on subject-centered (Knowles, 1973).

To be motivated to learn, adults must perceive that they are going to succeed in such endeavor, find the learning worthy, and see it is an enjoyable experience (Wlodkowski, 1998). The strategies to motivate adults to learn include promoting a positive attitude toward learning by ensuring successful learning and with adequate quality and challenges, stimulating adults to learn through varied instructional methods and materials, making the experiences familiar and applicable to their lives, and by promoting competence and providing constant feedback and reinforcement of the lessons learned (Wlodkowski, 1998)

To design the appropriate techniques and devices which facilitate adult learning, teachers or facilitators must consider the role of the teacher, the varied audience (learners), content, and the context (i.e. place, equipment, etc.) in which the learning experience is going to happen (Conti & Kolody, 1998). The teaching methods deemed useful for adult learners are similar to those for younger learners, these methods include lectures (Farrah, 1998), discussion groups (Brookfield, Discussion, 1998), forums, panels and symposiums (Sisco, 1998), and teaching techniques such as questioning (Sanders, 1998), case studies (Marsick, 1998) and case stories (Maslin-Ostrowski & Ackerman, 1998), demonstration and simulation (Gilley, 1998), among others.

Lecture, as a technique for adult learners, can be effective mostly if it is accompanied by illustrations and follows the basic principles of effective facilitation such as recognition of learners' experience, fostering the sense of worthiness to learn, provision of challenges for thinking, encouraging critical reflection, providing opportunities to practice, combining with other learning methods, and creating an environment with multidirectional flow of

communication between facilitator and learners and amongst learners through small discussion groups (Farrah, 1998). Moreover, such learning experience can be enriched if it is combined with critical thinking (Brookfield, 1998), questioning, rapid assessments, and reflections of the lessons learned (Angelo & Cross, 1993).

Additionally, informal learning settings are important learning opportunities for adults. According to the National Academy of Sciences (2009), adults embrace informal learning settings (i.e. non school-based environments) because these places provide people with opportunities to bring prior learning and experience that support new knowledge, practice, and find potential uses of the newly learned information (National Academy of Sciences, 2009). Wlodkowski (1998) developed the Motivational Framework for Culturally Responsive Teaching comprised of four conditions for effective and motivating learning experiences; these conditions are establishing inclusion, developing attitude, enhancing meaning, and engendering competence (Wlodkowski, 1998). These conditions help transcend the diversity of cultures while creating a new culture that enhances the motivation to learn, which is the culture of learning (Wlodkowski, 1998).

Accordingly, the keys of adult education is to give higher consideration of the circumstances, needs, motivations, and experience of adult learners and provide more opportunities to exchange, discuss, and understand information within a more democratic and empowering conditions. Therefore, interventions addressed to adult populations about health and risk reduction should be based on these adult learning principles and teaching techniques. This is the opportunity to move from motivation to facilitation to influence behavior because "motivation seeks to manipulate behavior through external control, whereas facilitation is empowering" (McAlister, Perry, & Parcel, p. 174).

2.6.3 Health Behavior: Theories and Frameworks

Health behavior theories aim to understand the determinants of behavior and the process of behavioral changes (Noar & Zimmerman, 2005). The type of problem, goals, and units of practice should guide the selection of a theory and not the popularity, familiarity, or novelty of a theory (Glanz, Rimer, & Lewis, 2002). Additionally, in assessing a theory, Kuhn (in Godfrey-Smith, 2003) states that "theories should be *predictively accurate*, *consistent* with well established theories in neighboring fields, *able to unify* disparate phenomena, and *fruitful* of new ideas and discoveries" (p. 89).

Glanz, Rimer, and Lewis (2002) reviewed the publications of health behavior, education, and preventive medicine of 1999 and 2000, finding that the Social Cognitive Theory, the Transtheoretical Model, and the Health Belief Model where the first three out of ten theories most often used (Glanz, Rimer, & Lewis, 2002). Authors conclude these theories are not only currently used in health behavior research, education, and practice, but are also valid to predict or change health behavior (Glanz, Rimer, & Lewis, 2002).

Later, Painter et al (2008) reviewed the health behavior publications about health behavior theories from 2000 to 2005, including those informed by a theory to those that apply, test, and expand theories (Painter, Borba, Haynes, Mays, & Glanz, 2008). Of 193 articles related with health behavior research, 26.9% were intervention studies, 71.1% were randomized controlled trials, and 66.3% focused on a single health behavior. The major health topics studied were tobacco, physical activity, alcohol use, nutrition, and disease testing/screening (Painter, Borba, Haynes, Mays, & Glanz, 2008). Similar to the findings by Glanz, Rimer and Lewis (2002). Painter et al (2008) concluded that the most frequent theories used were the Transtheoretical Model/Stages of Change, Social Cognitive Theory, and the Health Belief

Model. Moreover, Painter et al. recognize the scarce use of these theory-based interventions in community settings as well as that the great majority of these studies were only informed by a theory without major impact in testing or expanding the theory (Painter, Borba, Haynes, Mays, & Glanz, 2008).

As an example, the instructional strategies that are based on health behavior theories and on the best practices of health education about smoking cessation interventions include gaining attention through messages about threats and benefits; presenting stimulus materials with tailored and easy to understand messages; demonstrating desirable behaviors; providing guidance to learners; facilitating opportunities for practice with feedback; and providing opportunities for retention and transfer from one behavior to a healthier behavior (Kinzie, 2005). Similar instructional strategies would be applicable on behavioral interventions about environmental health issues.

2.6.4 The Health Belief Model

The Health Belief Model, originated in the 1950s (Hochbaum, 1958 and Rosenstock, 1966, as cited by Strecher, Champion, and Rosenstock, 1997), aimed to explain the reasons of people to engage or not in health prevention actions such as vaccination and screening. Later, this theory evolved to a model to predict illness and actions related with health (Gochman, 1997). The Health Belief Model (HBM) falls within the framework of cognitive behavior. The concept of *cognition* is defined as the "personal thought processes that serve as frames of reference for organizing and evaluating experiences" (Gochman, 1997, p. 41). *Health cognitions,* thus, are the "beliefs, expectations, perceptions, values, motives, and attitudes that provide frames of reference for organizing and evaluating health, illness, disease, and sickness" (Gochman, 1997, p. 41). This cognitive process about health is independent of the health

condition and if the process is objective (Gochman, 1997). Moreover, the HBM is based on *value-expectancy* theories, which state that behavior is the result of the personal value provided to the outcomes and the expected probability of achieving these outcomes (Janz, Champion, & Strecher, 2002). The HBM shares concepts and theoretical background with other behavioral theories used to understand and predict health behavior in health promotion and health behavior research (Noar & Zimmerman, 2005).This model has been used both to explain health behavior and to guide interventions (Janz, Champion, & Strecher, 2002) (see Figure 2.1). The HBM assumes that individuals take actions toward health if they believe harm can be serious, if they believe are susceptible, and if they think they can overcome the barriers to achieve or maintain health (Strecher, Champion, and Rosenstock, 1997).

Perceptions about health behavior are grouped into constructs such as perceived susceptibility, severity, benefits, and barriers, while considering additional factors that impact the likelihood of a behavior such as knowledge levels, age, sex, ethnicity, and socioeconomic factors, and external factors that trigger behavior (named cues to action) such as education, symptoms, or media messages. Since its inception, the HBM has been refined and current researchers include the construct of self-efficacy proposed by Albert Bandura (Bandura, 1997). The construct of *perceived susceptibility* includes the beliefs of the person regarding the likelihood of being harmed and the construct of *perceived severity* includes the beliefs of the person about the seriousness of these harms. These two constructs would result in the computation of the *perceived threat*. The construct of *perceived benefits* includes the beliefs of the person regarding the gains on adopting healthier behaviors or of taking preventive measures. The construct of *perceived barriers* includes the beliefs of the person about the challenges to adopt such behavioral changes.

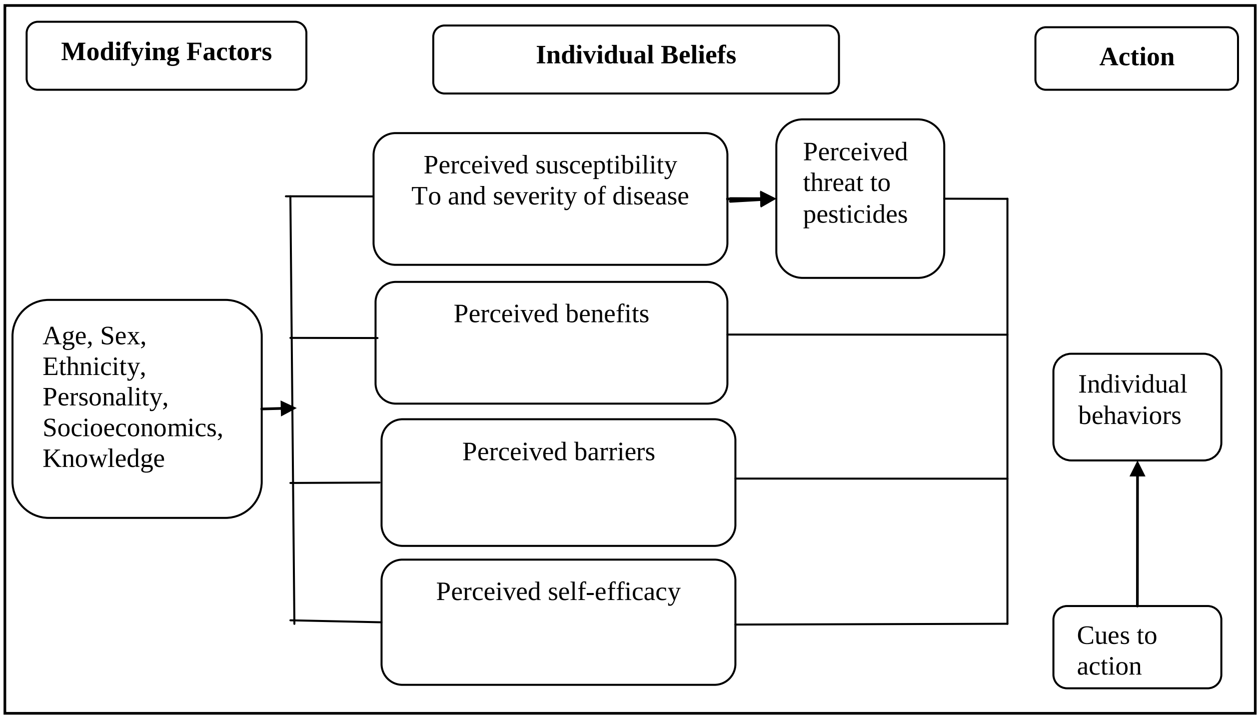

Figure 2.1. The Health Belief Model.
Adapted from "The Health Belief Model" by Champion & Skinner, 2008, Figure 3.1: Health Belief Model Components and Linkages, page 49 in *Health Behavior and Health Education. Theory, Research, and Practice*. Glanz, Rimer, and Viswanath, Editors. Copyright 2008 by John Wiley & Sons, Inc. Jossey-Bass Publishers. Permission by Wiley & Sons (Refer to Appendix 9).

These two constructs affect the construct of perceived threat and therefore the subsequent behavior. The concept of *self-efficacy* is understood as the perceived capability of the self "to organize and execute the courses of action required to manage prospective situations." (Bandura, 1995, p. 2).

The concept of self-efficacy was developed by Bandura in 1977 and recommended to the HBM by Rosenstock, Strecher, and Becker in 1988 (Janz, Champion, & Strecher, 2002). People's beliefs of self-efficacy are generated and strengthened by the *sense of mastery* to conduct the actions, by the *vicarious experience* built upon observing the skills modeled by others, by the *social persuasion* received with positive appraisals, and by the *physical and emotional status* necessary to reduce stress and negative emotions (Bandura, 1995). To influence

people's self-efficacy, it is necessary to foster cognitive mechanisms that enact, model, persuade, and motivate people while considering the situational circumstances they face (Bandura, p. 5). Although "knowledge crates the precondition for change" (Bandura, 1997, p. 282), individuals require additional traits to overcome barriers when adopting healthier life styles such as the belief of having what is needed according to the circumstances, in other words, the "belief of personal efficacy"(Bandura A. , 1997, p. 282). Furthermore, Bandura states that to be effective, health related interventions must provide information to increase awareness and knowledge about the risks, develop the skills to self-regulate and control habits, create opportunities to exercise repeated and guided practice, and establish a network of social support to influence the desired health behavior (Bandura, 1995). Presently, the concept of self-efficacy is the cornerstone of Social Cognitive Theory, developed mainly by Albert Bandura and other researchers (Baranowski, Perry, & Parcel, 2002).

Janz and Becker (1984) conclude that the constructs of the HBM are appropriate determinants to explain and predict health behaviors (Janz & Becker, 984). Additionally, Janz, Champion, and Strecher (2002) conclude that the dimensions of the HBM can be adapted to different cultures and help explain their behaviors (Janz, Champion, & Strecher, 2002).

There are some issues to consider about the explanatory benefits of the HBM. The HBM is not considered strictly as a theory and presents limitations on constructs such as the perceived severity, lacks empirical research to test the construct of "clues to action," and the HBM would be a better explanatory theory if it is supported by other theories that examine the role of fear on behavioral changes (Rimer, 2002) (Champion & Skinner, 2008). The relationship between the constructs of the HBM require a more detailed and complicated analysis; for example, the level of *perceived threat* should result from a multiplicative computation between *perceived*

susceptibility and *perceived sev*erity instead of an additive computation, and the *perceived threat* should be affected and affect the *perceived benefits* and *perceived barriers* (Champion & Skinner, 2008). Moreover, Strecher, Champion, and Rosenstock (1997) suggest ways to improve the application of the HBM in health behavior studies. Authors recommend researchers apply the whole model or at least combine the constructs of the HBM. Authors add that the analysis of the variables to test the constructs should not be considered with equal weight because these do not function simultaneously. Thus, they recommend avoiding multivariate analysis. Additionally, authors recommend following the variables and constructs as published to avoid inconsistency, avoiding grouping variables in general categories of constructs such as benefits, barriers, and cues to action because these have low inter-item correlation, and lastly, designing questions with an introductory phrase to measure the construct of perceived susceptibility (Strecher, Champion, & Rosenstock, 1997).

2.6.4.1 Interventions about Pesticides and the Health Belief Model

The HBM and other behavioral theories and frameworks have been used by researchers to examine the perceptions and beliefs about pesticide exposure and to design interventions. Seventeen studies were located from years 2000 to 2009, using a total of 13 distinct theories, models or frameworks. Six of these studies were interventions. The HBM was the theory most frequently used, in six out of the 13 theories located. Of these studies, seven examined the health behaviors and perceptions of farmworkers, one study included pesticide applicators, and nine studies included families (adults or children) of farmworkers, or families living in or nearby agricultural areas.

No studies about residential pesticides were located applying or being informed by a theory about the knowledge levels, perceptions, and practices of urban and semi-urban

populations. One study was found which examined the risk factors of farmworkers and their families in residential settings. Quandt, Hernandez-Valero, Grzywacz, Hovey, Gonzales, and Arcury (2006) conducted a review to locate the proximal and distal pesticide risk factors of farmworkers and/or their families.

The proximal measures to define the risk factors recommended by the authors include type and frequency of pesticide usage, work-home pathway practices (e.g. wash/bath before entering home, work clothing wearing and laundry practices, and play areas of children (e.g. inside versus outside).The distal risk factors to predict the residential settings such as household location, structure, condition, and size.(Quandt, Hernandez-Valero, Grzymwacz, Hovey, Gonzales, & Arcury, 2006) (see Table 2.5).

Table 2.5. Theories and Frameworks Used in Studies about Pesticides

Authors	**Theory or Framework**	**Type of study**	**Population group**	**Results**
Quandt, Arcury, Austin, & Cabrera (2001)	PRECEDE – PROCEED Model Health Belief Model	Intervention (community-based) Setting: Rural areas in North Carolina, US	84 farm workers Language: English and Spanish	Behaviors addressed on the intervention included: hand washing before eating, drinking, smoking, or toileting; wearing protective clothing; wearing clean clothing every day; washing work clothing separately from family clothing. Farm workers lack knowledge about pesticide residues, worker rights and regulations, and do not perceive themselves as vulnerable of pesticide risks
Arcury, Quandt, & Russell (2002)	Health Belief Model	Observational Setting: Rural areas in North Carolina, US	293 Latino farm workers Language: Spanish	Exposure to information about pesticides increases perceived risk. 20-30% of participants do not perceive health risks of pesticides as a major concern. Knowledge level of participants is associated with perceived pesticide risk scores. Found a limited association between safety behaviors and perceived risk. No significant association was found between knowledge and perceived control scores.
Salazar, Napolitano, Scherer, & McCauley, (2004)	Ecological Theory	Observational Setting: Rural areas in Oregon, US	33 adolescent farm workers (11-17 years of age) Language: English and Spanish	Adolescents had vague perception of vulnerability of health impacts; recognized the difficulties to comply with protective practices; identified several bosses in their farm work and the lack of opportunities to exercise preventive practices. Adolescents complained that trainings were not clear, complete, or thoroughly understood. Parents/family were the main sources of information about pesticide risks
Martinez, Gratton, Coggin, Rene, & Waller (2004)	Health Belief Model	Observational Setting: North Central Texas, US	89 pesticide applicators Language: English	Knowledge scores were significantly associated with the use of protective equipment and inversely associated with the beliefs about health impacts by direct exposure. No significant associations were found between knowledge and the scores of risk perceptions and self-efficacy

Table 2.5 (continued). Theories and Frameworks Used in Studies about Pesticides

Authors	Theory or Framework	Type of study	Population group	Results
Quandt, Doran, Rao, Hoppin, Snively, & Arcury (2004)	Risk Communication Framework	Intervention (community-based) Setting: Rural areas in North Carolina and Virginia, EU	33 Latino women, spouses of farm workers Language: Spanish	The communication strategies were useful to inform participants and trigger questions on how the exposure may occur and how to prevent exposures. Participants' responses to the pesticide levels found in their homes by researchers varied considerably. Those having less residue levels were more concerned of health effects than those with higher levels of pesticide residues.
Quandt, Hernandez-Valero, Grzymwacz, Hovey, Gonzales, & Arcury (2006)	Proximal and Distal Determinants of Exposure	Observational Setting: US	Review of studies about farmworkers exposure factors	The factors associated with residential exposure to pesticides include location, housing structure, overall repair, size, bathing facilities, laundry facilities, house size, occupation in farms, and crowding
Arcury, Vallejos, Marin, Feldman, Smith, & Quandt (2006)	Explanatory Models of Illness Framework	Exploratory Setting: Rural areas in North Carolina, US	30 Latino Farm workers Language: Spanish	The major factors causing skin diseases recognized by participants were sun/heat, chemicals (pesticides and fertilizers), plants, insects, moisture, and hygiene-contagion. Participants also recognized that the individual and interactive effect of these factors are enhanced by allergies and individual susceptibility
Rao, Quandt, Doran, Snively, & Arcury (2007)	Explanatory Model of Illness and Cultural Models	Observational Setting: Rural areas in North Carolina, US	41 Latino women, spouses of agricultural workers Language: Spanish	Overall participants believed that pesticides were not those products used in households; thought that smell is the primary indicator of harmfulness; were not aware of the pesticides used in their nearby environments; had difficulties understanding the concept of exposure; related exposure to contagiousness, lack knowledge about acute effects and the differences in susceptibility by age and gender
Saller, Reyes, Maldonado, Gibbs, & Byrd (2007)	Health Belief Model	Observational Setting: Rural and semi rural areas in far southwest Texas, US	150 households Language: English and Spanish	62.7% believed that pesticides purchased for household purposes were safe if used as instructed and 87.3% believe these can make a child sick. 89.3% believe pesticides help keep home clean by killing pests and 46% know other ways to get rid of pests. Perceptions do not differ according to the type of pesticide product, either legal or illegal (i.e. methyl parathion)

Table 2.5 (continued). Theories and Frameworks Used in Studies about Pesticides

Authors	**Theory or Framework**	**Type of study**	**Population group**	**Results**
Liebman, Juárez, Leyva, & Corona (2007)	Popular Education	Intervention (community-based) Setting: Rural and semi-rural areas in Southern New Mexico, US	190 Hispanic mothers in farm worker households Language: Spanish	The education provided by community health workers (i.e. *promotoras*) increased knowledge levels about pesticide uses, routes of exposure, and reasons of vulnerability of children. Participants also increased their knowledge levels about the practices to reduce exposures and the most frequent acute symptoms of pesticide exposure
Forster-Cox, Mangadu, Jacquez, & Corona (2007)	Health Belief Model	Intervention (community-based) Setting: Rural and semi rural areas in Southern New Mexico, US	367 Hispanic women Language: English and Spanish	The education provided by community health workers (i.e. *promotoras*) increased participants' knowledge and adoption of some safer practices
Vaughan & Dunton (2007)	Dual-Process Models of Reasoning	Observational and experimental Setting: Rural areas in California, US	437 Mexican immigrant farm workers Language: Spanish	Processing of new information and the responses to risk messages is influenced by low levels of education and economic conditions. The education and economic factors affect perceptions, understanding, and judgment of scientific risk information by lay people.
Strong, Thompson, Koepsell, & Meischke (2008)	Health Belief Model	Exploratory Setting: Rural areas in eastern Washington, US	554 farm workers (89% Hispanic) Language: English and Spanish	Overall, participants believe that pesticide exposure is a threat to health and that protective practices reduce these risks. Hispanic participants were the major group concerned with the health risks for themselves and children, perceived that protective equipment is a barrier for work activities, and perceived the organization as barrier to protect themselves from pesticides

Table 2.5 (continued). Theories and Frameworks Used in Studies about Pesticides

Authors	**Theory or Framework**	**Type of study**	**Population group**	**Results**
Thompson, Coronado, Vigoren, Griffith, Fenske, Kissel, et al. (2008)	Community Organization Framework	Experimental intervention Setting: Rural areas in eastern Washington, US	Hispanic children of farm worker families: 211 baseline and 207 final assessment Language: English and Spanish	Community-wide intervention had no significant reduction on pesticide metabolites in urine samples of children or pesticide residues in dust on vehicles and households
Nicol & Kennedy (2008)	Precede-Proceed Framework, Psychometric Paradigm, Farm Structure Theory	Observational Setting: Rural areas in British Columbia, Canada	293 Adults living in/nearby farms Language: English and Punjabi	The knowledge, attitude, and training variables tested in this study were significantly associated with the use of personal protective equipment.
Arcury, Marin, Snively, Hernandez-Pelletier, & Quandt (2009)	Theory of Reason Action	Experimental design intervention Setting: Rural areas in North Carolina, US	115 Latino women living in farm worker dwellings Language: English and Spanish	After intervention with community health workers, participants did not significantly change overall knowledge about pesticides. Significant changes included recalling the safety and risk messages, the effects on children, and the items of the label of pesticides. No significant changes on participants' adoption of safety behaviors (i.e. integrated pest management practices). Some concepts of pesticide exposure and safety were unknown by several members of the community.
Strong, Starks, Meischke, & Thompson (2009)	Ecological Framework	Observational Setting: Rural areas in eastern Washington, US	37 Mexican and Mexican-American mothers in farm worker households Language: English and Spanish	Women were unfamiliar with the term *pesticide*, considered pesticides as dangerous, were aware of the risks and take-home pathways. Influential motivators to take precautions included information from family-child programs, family, participation in a research study, and radio and TV. Barriers to adopt protective practices included competing responsibilities, partner dynamics, cultural beliefs (i.e. hot-cold), and lack of control over environmental and social factors.

Of those studies informed by or applying the Health Belief Model, none of these examined all of the constructs of the model in a single study. The HBM constructs examined or applied in these studies included perceived susceptibility, severity, barriers, benefits and self-efficacy (control) of risks. Some studies examined the association of these constructs with knowledge levels and the practices of participants.

The Health Belief Model (HBM), a health behavior theory, was selected for this study among various other health behavioral theories of health education and health promotion because it has been thoroughly tested in health interventions, is the most frequently used theory in studies about pesticide risks, and because the constructs measuring the perceptions about health risks can be applied to examine the perceptions about environmental risks, more specifically about pesticide risks, and because the understanding of these perceptions would help design interventions to modify behaviors that prevent and reduce exposure to pesticides or other environmental health threats. Given the lack of studies using all the constructs on the HBM to examine pesticide risks in residential settings, this present study proposes a new comprehensive HBM scale to examine the perceptions, personal characteristics, and behaviors related with residential pesticide usage of Hispanic women living in the U.S.-México borderland.

2.6.5 Community Health Workers – Promotores de Salud

Community health workers (CHWs), also known as lay health advisors, *promotores de salud*, lay health advocates, and peer health promoters, are a proven mechanism to implement health promotion interventions and convey education to the community (Swider, 2002; Nemcek & Sabatier, 2003; Brownstein, et al., 2007; Andrews, Felton, Wewers, & Heath, 2004). CHWs have specific cultural and social competencies that help them negotiate health access and services for families by providing not only information and knowledge about health but also by

increasing the readiness of families to receive information and knowledge because they understand the particular conditions and needs of the families they serve (Anders, Balcazar, & Paez, 2006).

The U.S. Department of Labor defines that community health workers help people and communities adopt healthy behaviors through the provision of information on resources and services, social support, and advocacy (United States Department of Labor, 2010). CHWs are volunteers or paid lay members of the community that share characteristics with the community they serve such as language, ethnicity, socioeconomic status, and life experience (Department of Health and Human Services, 2007).

The U.S. Department of Health Resources and Services Administration (HRSA) estimated a 41.1% increase in the number of CWHs from over 86,000 in 2000 to 121,206 in 2005, locating five nation-wide and 12 state associations and networks of CHWs. The special populations served by the CHWs through the U.S. included the uninsured, immigrants, homeless, isolated rural residents, migrant workers, and *colonia* residents. The main services provided by CHW included gaining access to medical services and programs (84.4%), providing culturally appropriate information and education (81.7%), gaining access to non-medical services/programs (71.6%), and community advocacy (53%).

According to a national study, over a third of CHWs employed in the U.S. are Hispanic. The CHWs work or volunteer in health departments and agencies, community organizations, clinics, hospitals, etc. Of the 900 self-selected participants of 50 U.S. states, 39% were non-Hispanic white, 35% were Hispanic, 15.5% were African-Americans, 5% were Native Americans, and 4.6% were Asian and Pacific Islanders. CHWs were mainly employed in programs about women's health, nutrition, child health, and sexual behavior, as well as in more

specific interventions including HIV/AID, diabetes, high blood pressure, cancer, and cardiovascular and heart diseases. Similarly, the great majority of the CHWs were female (86%) and in age ranged from 30 to 50 years of age (55%). These trends can be explained because the majority of the programs on which CHW worked were about family and children and because females are more accepted by caregivers (Department of Health and Human Services, 2007).

Pertaining to environmental health, studies employing CHWs in their health promotion and research efforts include topics such as reduction of pesticide exposures (Thompson, et al., 2008; Arcury, Marin, Snively, Hernandez-Pelletier, & Quandt, 2009; Williams, et al., 2006; Bass, Ortega, Rosales, Petersen, & Philen, 2001; Quandt, Doran, Rao, Hoppin, Snively, & Arcury, 2004), asthma triggers (Parker, et al., 2008; Levy, Brugge, Peters, Clougherty, & Saddler, 2006; Balcazar, et al., 2010; Krieger, Takaro, Song, & Weaver, 2005), and other health and environmental issues (McConnell, et al., 2005).

In the U.S.-México border region, CHWs have been pivotal in addressing environmental risks through education, research, and advocacy in low-income urban and semi-urban neighborhoods and in areas such as *colonias* lacking access to health services and basic public infrastructure such as water and sewage systems and paved roads (Liebman A. , Juárez, Leyva, & Corona, 2007; Forster-Cox, Mangadu, Jacquez, & Corona, 2007; May, et al., 2003; Ramos, Baker Davis, He, May, & Ramos, 2008).

In conclusion, CHWs are recommended as a successful health promotion mechanism to understand and reduce health disparities in community-based participatory research because they connect “the research and the researchers to the grassroots of local communities” (p. 62), combine research with practice (Anders, Balcazar, & Paez, 2006; Ramos, May, & Ramos, 2001) (Ramos, May, & Ramos, 2001), are knowledgeable about and successful providers of popular

education (Wiggins, et al., 2009), integrate social justice principles and values (Spencer, Gunter, & Palmisano, 2010), and engender community agency in isolated neighborhoods, such as in *colonias* (May, et al., 2003).

2.6.6 Graphic Materials: A Tool to Convey Health Messages

The evolution of graphic media promotes the integration between culture, society and medicine, showing and promoting acceptance of cultural diversity (Grady, 2007). Eisner (1996) defines that comic books are “the printed arrangement of art and balloons in sequence” (p. 6) characterized with representations through simple images and symbols easily recognizable by readers that reflect people’s ideas, experiences, physical characteristics, and conduct (Eisner, 1996). The first graphic stories were comic strips inserted in newspapers since 1916 through episodes or series to retain readers (Eisner, 1996). In contrast to comic strips, graphic books rely heavily on a story that starts with an incident or event that attracts the attention of the reader. The key to retaining the attention of the reader, according to Eisner (1996), is to employ a story that is relevant, of interest to, and satisfies the curiosity of the reader. Graphic novels, comic books, and narratives are based on stories. Stories evoke emotions and trigger psychological reactions allowing readers to engage in it through the structure of the discourse that help readers realize the story in a safer way than in true life (Oatley, 2002).

Graphic booklets have been successful in transferring information with characters depicted as opinion leaders teaching about the risks of environmental exposures (Galada et al., 2009). Caution is recommended, however, in selecting leaders and role models in comic books. Hsu & Lincoln (2009) argue that a comic book using a white/educated leader in a story would contradict Black/uneducated population targeted by a comic book, thus reinforcing the north-south divide and race/ethnic differences (Hsu & Lincoln, 2009).

In contrast to comic books that are short stories and directed to younger population groups, graphic novels consist of lengthier and complex story or series of stories based on the design characteristics of comic books (Rothschild, 1995). Based on the term *graphic book* defined by Eisner in 1978, *graphic novels* "use words and pictures in ways that transcend ordinary art and text" (p. xiv) and these mechanisms do not compete in attracting attention of the reader (Rothschild, 1995).

Graphic booklets, in turn, follow the design, presentation techniques, and emphasis as of the comic books, but aimed to attract adult readers in shorter presentations than graphic novels. As a printed material such as any pamphlet or fact sheet related with health education, the graphic booklets or comic books rely heavily on the visual representation of information to transfer information through a story, using images combined with text to convey messages (Eisner, 1996). The images are impressionistic and the objects and characters are heightened to provoke emotional reactions. Internally, the reader provides the sounds and imaginary actions that support the images described by the material making the reader a participant rather than a spectator. Moreover, the messages and images can be understood at the pace of the reader. These types of materials require less literacy experience and effort from the reader than a common text and it is designed according to the literary skills and the reading ability of the intended audience (Eisner, 1996).

To achieve empathy and retain the attention of the reader, the story and the drawings should comply with a logic and intelligible arrangement of images and engage the reader in a virtual dialogue with the characters. The dialogue between characters is provided in balloons. To emphasize the messages according to the action described, the font is bolded or in bigger sizes and accentuated with exclamation symbols and all the grammar mechanisms to convey not only

the messages but the feelings and emotional state of the characters (Eisner, 1996). Allison Grady provides an overview of using comic books in public health campaigns.

According to a review of community-based interventions communicating health messages, the use of small media, which includes flyers, comic books, graphic booklets, pamphlets, newsletters, etc., was used by the majority of studies alone or in combination with interpersonal communication of health messages (Morris, Rooney, Wray, & Kreuter, 2009). McAllister concludes on the characteristics making comic books a useful resource for AIDS interventions. It would be easy to extrapolate these beneficial characteristics to health interventions addressing all types of health topics; these are that the natural graphic and textual sequences of comic books are ideal educational tools to demonstrate “how to do” things; that texts and drawings can be adapted easily depending on the targeted audience; that in contrast to longer articles and brochures, comic books convey messages safely because their visual and humor characteristics enhance the acceptance of the messages with high threatening and emotional weight; and lastly, because comic books combine the visual effects of videos and films with the advantages of literature through texts that help personalize and hold the attention of readers (McAllister, 1992).

Despite the fact that comic books have been evolving from being poorly to highly accepted medium by academia and the public to convey health information, the publications about interventions using this type of material omit evaluating the efficacy of these in promoting behavioral changes (Branscum & Sharma, 2009). Moreover, the design of graphic materials should avoid certain barriers to increase the acceptance of comic books by readers. Barriers include that some readers would not like to be caught reading this type of material because they may feel stigmatized as low income/educated because, since it is typical that these materials are

oriented to those particular population groups or because these type of materials are considered as an entertainment instead of educational material(Branscum & Sharma, 2009). More research addressing these issues is recommended by the authors of the review in order to determine the effectiveness of the usefulness of comic books in health promotion interventions. Such studies should carefully design the comic book tailoring it according to specific demographic group, age and gender without stigmatization and be based on behavioral theories (Branscum & Sharma, 2009).

2.6.7 Environmental Health Interventions for Hispanic Populations

Forster-Cox et al. (2007) report the effectiveness of community-based education using the *promotora* model (i.e. community health workers) to change practices of border residents regarding pesticide safety. The study was conducted in selected *colonias* in the southern area of the Doña Ana County, New Mexico in the U.S.-México border region. The intervention consisted of two home visits by the *promotora* to identify home exposures and to provide one-to-one education recommending exposure reduction actions and delivering materials (e.g. comic books, pamphlets, magnets) and household safety products as incentives (e.g. smoke detector, electrical safety caps, etc.). As a result, the proportion of participants knowing how to protect themselves from pesticide exposure increased from 4.9% before the intervention to 94% after the intervention, and the proportion of participants reporting using protective gear such as gloves or masks when applying pesticides increased from 0.6% before the intervention to 61.9% after the intervention (Forster-Cox, Mangadu, Jacquez, & Corona, 2007).

Liebman and colleagues (2009) conducted an educational intervention regarding residential pesticide use in partnership with various community organizations working in the Paso Del Norte area in the U.S.-México border. The interventions included various types of

educational approaches preferred by each organization such as one-to-one, group talks, health fairs, puppet presentations, and trainings to residents facilitated by community health workers. Important changes were observed in some sites. Of 21% to 42% of respondents admitting using *polvo de avión* prior to the intervention, 0% of participants reported using it after the intervention. Prior to the interventions, 60% to 91% participants agreed with the statement that pesticides could harm health. After the interventions, 90% to 100% of participants acknowledged that exposure to pesticides could harm health (Liebman, Galván, & Juárez, 2009). The strategies to promote changes in practices and beliefs were examined in general thus the effects of each type of educational intervention (e.g. door-to-door, group talks, trainings, etc.) were not identified during the evaluation of the interventions.

McConnell et al. (2005) randomly assigned participants to control and experimental groups to examine the impacts of an in-home educational intervention in controlling and reducing cockroach allergen in the homes of Hispanic families in Los Angeles. Peer health educators provided information with a flipchart, put allergen impermeable casing on pillows, mattresses and box springs of the children's beds, and delivered products such as boric acid, caulking, and printed materials to the families and conducted a follow up visit 4 months later. Authors measured changes in allergen concentration in dust, on caregiver's knowledge and practices, and evidence of cockroaches in the home noticing significant increase in knowledge and adoption of cleaning practices and in the reduction of allergen in dust in some parts of the house of participants (McConnell, et al., 2005).

Significant changes in knowledge and intentions were reported by participants in an intervention based on the mental model approach to reduce carbon monoxide exposure with residents in Ciudad Juárez (Galada, Gurian, Corella-Barud, Pérez, Velázquez-Angulo, et al.,

2009). Among other activities, researchers designed and tested a graphic booklet (i.e. comic book) according to the findings of the mental model approach with significant results. The proportion of participants agreeing with the statement that CO is generated when something is burning increased from 31% prior to reading the graphic booklet to 68% after reading the comic book. Similarly, prior to reading the comic book, 29% of participants agreed with the statement that a carbon monoxide could be detected by an alarm, a proportion increasing to 86% of participants after reading the graphic booklet. Moreover, the proportion of participants willing to purchase a carbon monoxide alarm increased from 70% to 89% after reading the comic book, a key behavioral change intended by the intervention. The carbon monoxide campaign with the comic book was considered successful because the campaign was based on the entertainment education model and because included the participants in the implementation of the campaign, followed the social change theories, and considered the intercultural principles (Perez, et al., 2009).

CHAPTER III

Research Design and Methods

3.1 Description of the Study

3.1.1 Aims

The overall aim of this study was to compare the changes between two community-based educational intervention methods on participants' level of knowledge about pests, pesticides, and health, and on their practices related with the use of residential pesticides. The ultimate goal of the educational intervention was to help participants reduce exposure to residential pesticides to prevent harms to their health and the health of their children. The educational methods tested in this study were a small group talk and a graphic booklet. The research questions guiding this study were:

1. Which of the two educational methods tested in this study is more effective in increasing the level of knowledge of participants about residential pesticides and health?
2. Which of the two educational methods tested in this study is more effective in the adoption of practices by the participants that prevent pest proliferation without the use of pesticides?
3. Which of the two educational methods tested in this study is more effective in the adoption of safety practices related to the application of pesticides by participants?
4. What are the perceptions of participants about residential pesticides and health according to the constructs of the Health Belief Model?

Additionally, this study answered other questions to understand the practices of residential pesticide usage by the participants according to their demographic characteristics and their perceptions, and to acknowledge differences according to the country of residence in the Paso del Norte Region on the U.S.-México border. The additional research questions were:

a) What demographic characteristics of the participants are correlated with their perceptions about residential pesticide use?

b) What perceptions of participants according to the Health Belief Model are correlated with the level of knowledge of participants and the pest prevention and safety practices conducted by participants?

3.1.2 Study Design

This study followed a randomized controlled design in which participants were allocated to two distinct educational methods groups or to a delayed participation (control group) (see Figure 3.1).

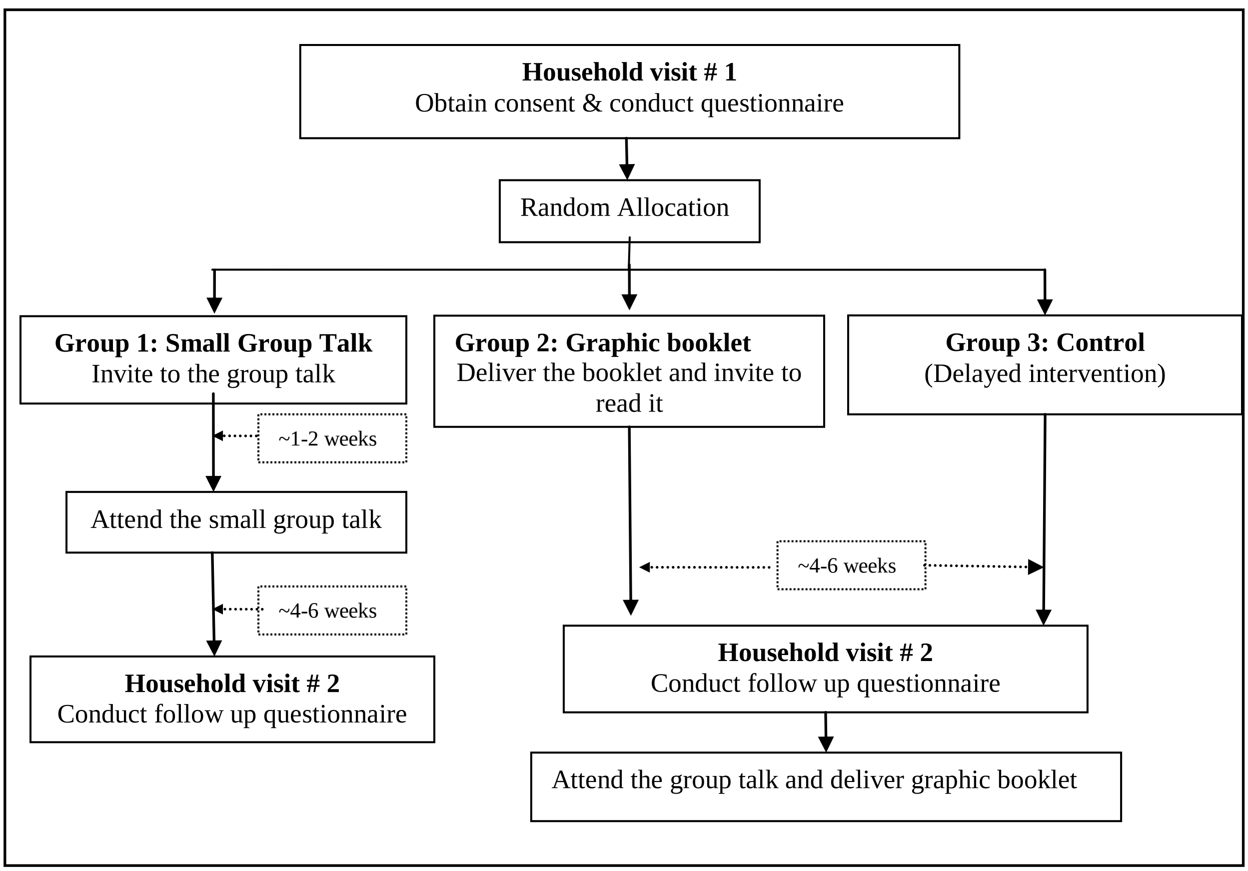

Figure 3.1. Algorithm of Study Design.

Participants answered a baseline and post intervention structured questionnaires in Spanish in their household 4-8 weeks apart. Recruitment, data collection and the implementation of the educational interventions were conducted from September 1 to November 14, 2009. The Institutional Review Board of the University of Texas at El Paso (UTEP) approved this study and all participants signed a consent form in Spanish before starting participation.

3.1.3 Sample Size

This study estimated a total sample size of 252 participants allocated randomly to three groups with 84 participants per group. According to Hinkle and Oliver (1983, as cited in Bruning & Kintz, 1997, Appendix P, page 356), to compare the means of pre and post-tests of three experimental groups it is required to have a sample size of 234 total participants, 78 participants per group, with an effect size of 0.50 in the standard deviations between the comparison groups, with a power of 0.80 and a significance of $\alpha=0.05$. However, we oversampled to 18 more participants (6 per experimental group) to adjust for attrition and incomplete participation and to allocate an equal number of participants per experimental group in all the six study sites. Thus, this study planned the recruitment of 252 participants with 84 participants per experimental group. The unit of statistical analysis was the participant woman answering the questionnaires. This study examines the effects of two educational methods (independent variables) in changing knowledge levels and safety practices (dependent variables) of participants about pesticide usage.

The sample size required to observe the effects in knowledge levels is calculated with a level of statistical significance of $\alpha=0.05$ and with a beta error of 0.20; thus, the power to detect the effect of either educational method (independent variable) in the knowledge level score (dependent variable) would be 0.80. This is “80% of probability of detecting a relationship when

one exists" according to Norwood (2000, p. 25 as cited in Cottrell & McKenzie, 2005, p. 132). This power level is considered adequate to examine research questions (Crosby, Diclemente, & Salazar, 2006). Additionally, a non-directional test (two-tail) is recommended when the information of the effect of the independent variable on the dependent variable is not available (Cottrell & McKenzie, 2005), as is the case in this study. Thus, the estimation of the sample size and the analysis of the effects of the educational methods tested here were conducted as two-tail tests.

Regarding behavioral changes, a review of health education interventions in which the public was exposed to small media and interpersonal communication messages, the observed effect sizes in behavioral changes ranged from .03 to 3.53 (Cohen's *d*) (Morris, Rooney, Wray, & Kreuter, 2009). Therefore, similar to the estimation of the sample size required to detect the significance of the changes in knowledge levels, this study estimates a moderate effect size of 0.50 for changes in practices (behaviors) after the interventions with $\alpha=0.05$, a standardized effect size of 0.50, and a power of 0.80 for comparison of pre and posttests between three experimental groups, resulting in the same sample size of 78 per experimental group.

3.1.4 Study Location and Sites

The recruitment of participants and implementation of the educational methods were conducted in the Paso Del Norte region in the U.S.-México border. This region is comprised of the municipality of Ciudad Juárez, Chihuahua in México and El Paso County, Texas, and Doña Ana County, New Mexico in the U.S. The study was conducted in six sites of the Paso Del Norte region, three sites on each side of the border. These sites were the *Colonias* (e.g. neighborhoods) *16 de Septiembre*, *Luis Olague*, and *Kilómetro 27* in Ciudad Juárez, and the neighborhoods of south-central El Paso, Texas, San Elizario, Texas, and Sunland Park, New Mexico in the U.S.

The study areas were comprised of the blocks in the 0.5 kilometer-radius of a community center, clinic, or the home of a community health worker located in each of the six sites.

The geographical sites were selected between the researcher of this study and the partner community organizations according to certain factors. First, the researcher and the partners had been collaborators for several years in the past for various environmental health projects; this fact that could ensure the implementation of activities as planned and the retention of participants throughout the study. Secondly, the goal of the study was to examine the effectiveness of two educational methods typically used by these organizations in the past with clients living in disadvantaged neighborhoods in the border (e.g. Hispanic origin, language barriers, low education years, low income). Thus, the community organizations were interested in acknowledging the effectiveness of these methods in transferring information to people with similar characteristics to their clients.

Thirdly, the community partners wanted to acknowledge the risks of the population living in the areas they serve. Fourthly, the fieldwork of this study would help partner organizations disseminate flyers announcing the services offered to increase the number of clients to serve. Thus, the results of this study would help the partner organizations designing appropriate and effective interventions in the future. Fifthly, the safety of the interviewers conducting this community-based study influenced the selection of locations in Ciudad Juárez. Finally, additional factors influenced the sampling frame such as the funds and resources available as well as the adequate timeframe to complete the study with a geographically representation of women living in the study sites, achieve sufficient statistical power to make comparisons between groups, and to suggest tendencies about pesticide usage among Hispanic women living in the border.

The plan was to recruit 42 participants in their households in each of the six sites. Community health workers (CHWs) of the community organizations collaborating in the implementation of this study conducted the recruitment, household interviews, and facilitation of the educational methods. The author of this dissertation directed and monitored the implementation of this study with the support of two field coordinators, one for the areas in Ciudad Juárez and one for the areas of El Paso.

3.1.5 Characteristics of the Population in the Sites of the Study

The demographic characteristics of the population living in the sites of the study were obtained according to the corresponding census tracts in the U.S. and to the AGEB in México (AGEB-*Area Geoestadística Básica*). The AGEBs (basic geo-statistical area) are the geospatial units that link geographical areas with statistical information in México (Instituto Nacional de Estadistica y Geografia, 2009). The census tracts and the AGEB were located according to the address of the central point selected for each site; the central point of each site was a community center, clinic, or house of the CHWs. The census tracts and the AGEB were utilized to determine the feasibility of finding participants and the overall demographic descriptors of the study area that are comparable for both countries. These descriptors included the number of households available, education, income, and family size (see Table 3.1). The number of households available in the census tract and AGEB selected for this study provide a good estimate of households available for inclusion in the study. Similarly, the demographic characteristics of the population living in these sites helped identify the population intended for this study, which is the prevalence of disadvantaged populations that could have increased vulnerability of risks to pesticide exposures.

In the U.S., the census tract numbers of the sites selected are 0019.0 (South-Central El Paso, Texas), 0104.3 (San Elizario, Texas), and 0017.01 (Sunland Park, New Mexico). The sample size of 42 households per site represents 4.1%, 1.1%, and 3.5% of the total households in these census tracts respectively.

Table 3.1. Selected Characteristics of the Population Living in the Sites of the Study

Items	**U.S. (Census Tract #)**[1]			**México (AGEB #)**[2]		
	El Paso, TX 0019.0	**San Elizario, TX 0104.3**	**Sunland Park, NM 0017.01**	**16 de Septiembre 415-6**	**Luis Olague 4432-A**	**Kilómetro 27 481-3**
Number of families	732	3,276	940	431†	923†	473†
Total population	3,400	14,888	3,234	1,817	3,831	1,975
Hispanic population	3,313 (97%)	14,514 (99%)	1,872 (58%)	N/A	N/A	N/A
Total households	1,023	3,704	1,197	435	910	467
Income 2000	$14,388[4]	$5,915[4]	6,576[4]	44%[3] <$7,275	46%[3] <$7,275	45% [3] < $7,275
Average years of education	19.5%[5]	49.2%[5]	47.7%[5]	6.7[6]	7.3[6]	5.9[6]
Average family size	3.54[7]	4.40[7]	4.24[7]	4.43[7]	4.43[7]	4.18[7]

[1] Federal Financial Institutions Examination Council (FFIEC), 2008. Geocoding System; [2] Instituto Nacional de Población y Vivienda, II Conteo Nacional de Población y Vivienda 2005; [3] Percentage of residents earning less than $7,275 dollars per year in 2000 (5 times the minimum salary); [4]Per capita income in 1999; [5] Percentage of the population with less than 9th grade of educational attainment by city (2000); [6] Average numbers of academic years attained per census tract (2005); [7] Average family size in every city in the U.S. (2000) and average number of people living in a housing unit in every AGEB in Mexico by year 2000; † The total number of occupied homes provided by AGEB is considered in this table as equivalent to the number of families provided by the U.S. Census Bureau.

The average family size in each census tract selected is 3.5, 4.4, and 4.2 members per family respectively. The estimated proportion of the population of each census tract with less than 9th grade of education is 19.5%, 49.2%, and 47.7% respectively (U.S. Census Bureau, 2009).

In México, the AGEB numbers of the sites selected in Ciudad Juárez are 415-6 (*Colonia 16 de Septiembre*), 432-A (*Colonia Luis Olague*), and 481-3 (*Colonia Kilómetro 27*) (see Table 3.1).

The sample size of 42 households per site represents 4.6%, 9.6%, and 8.9% of the total households in each AGEB respectively. The average family size on each AGEB is 4.4, 4.4, and 4.2 respectively. The average number of school years attained by residents is estimated at 6.76, 7.3, and 5.9 school years in each AGEB respectively (Instituto Nacional de Estadistica y Geografia, 2009). Table 3.1 summarizes the demographic information of the population living in the sites selected for this study in the U.S. and México areas.

3.1.6 Sampling procedure

This study used a simple random sampling procedure (Environmental Protection Agency, 2002) to recruit 42 participants per site in the six sites of the study following three steps. First, maps locating the blocks within a 0.5-kilometer radius of each site were produced. The *Instituto Municipal de Investigación y Planeación de Ciudad Juárez* (Municipal Institute of Research and Planning of the City of Juárez) generated the maps for the sites in Ciudad Juárez and the Regional Geospatial Service Center at the University of Texas at El Paso generated the maps for the sites in the U.S. area. The number of blocks per site ranged from 36 to 73 blocks.

Secondly, all the blocks within the selected radius were numbered and entered into a database to select 10 blocks through the random generator of the SPSS Version 14.0 for Windows (SPSS®). Some blocks were not included in the random selection because these were non-residential (i.e. commercial, government offices, parking lots, empty lots, or schools). An additional 3 to 5 blocks were selected randomly when more than 10 blocks were required.

Thirdly, the interviewers received the map and the lists of blocks selected and were instructed to approach all the households of the blocks selected. The interviewer continued with the next block listed once all the households of the block were approached. The recruitment of participants started in any point of the block. The recruitment of participants was conducted at

varied days of the week (including Saturday) and times of the day to ensure the likelihood of participation of all eligible women living in the blocks selected.

When no one responded to the door or no adult was available in the house, the interviewer approached the house for a second time on another day of the week, but at a different time of the day. When the block had an apartment complex, no more than three participants were included from the apartment complex to avoid clusters of participants in one block. This recruitment procedure was repeated in the next block of the list until 42 participants were recruited in each study site.

3.2 The Educational Methods Tested in This Study

3.2.1 Aims of the Educational Methods

The two educational methods tested in this study were a group talk and a graphic booklet. The aims of these educational methods were to increase participants' knowledge about the adverse health outcomes when exposed to residential pesticides, the activities that prevent pest proliferation and thus reducing the need for pesticide usage, and the safe practices recommended to reduce the exposure of family members to pesticides and its residues when using pesticides in the home. The ultimate goal of the educational intervention was to help participants reduce exposures to residential pesticides to prevent harms to their health and the health of their children. These educational methods were intended to increase participants' knowledge about the risks and exposure factors while appealing to the beliefs and perceptions about the pesticides applied at home. It is expected that these educational methods motivate participants to conduct behavioral changes that prevent and reduce exposures to the pesticides used at home.

3.2.2 Framework of the Educational Methods

The overarching concepts guiding both educational methods were that pesticides used at home expose family members to pesticides that could result in health impacts and that these exposures can be prevented and reduced in the household. Figure 3.2 describes the framework guiding the educational interventions tested in this study.

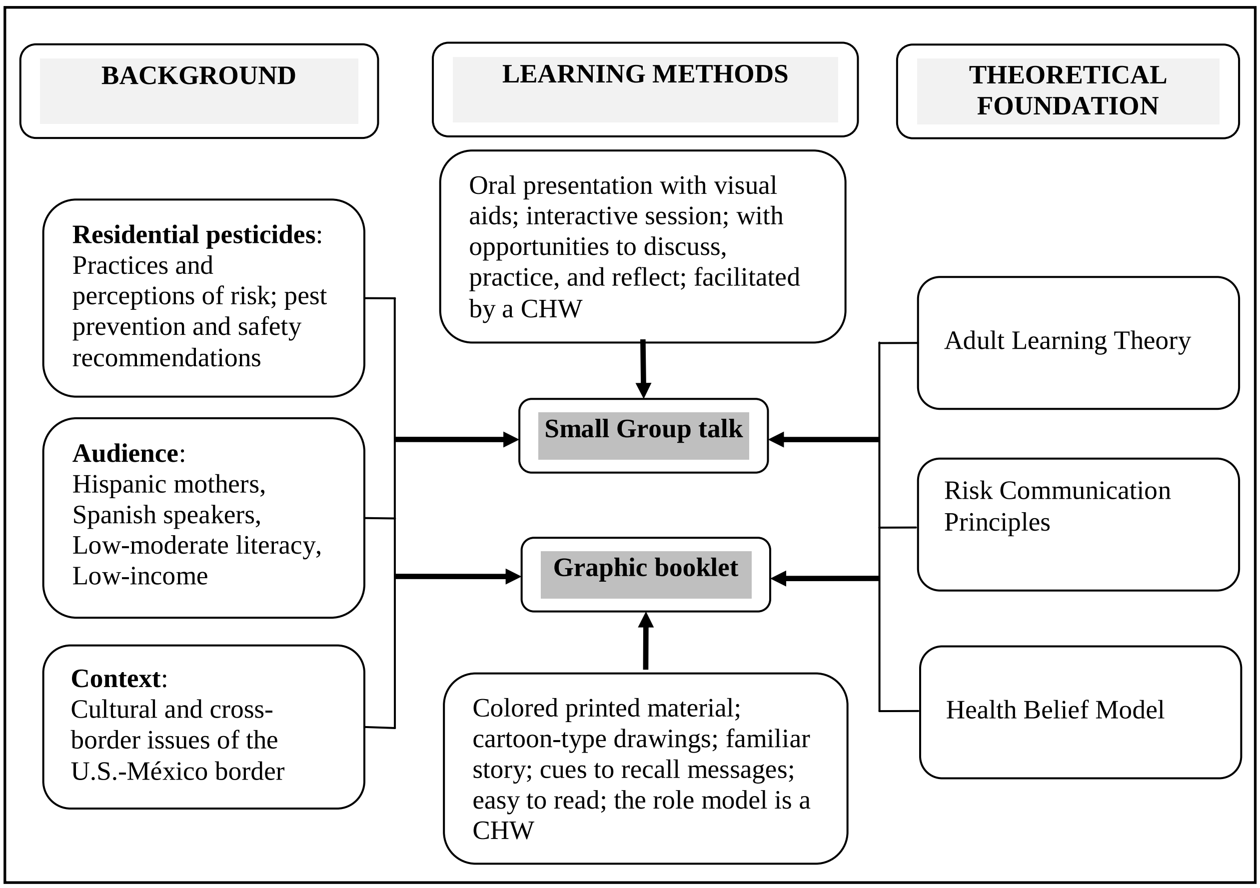

Figure 3.2. Framework of the Design of the Educational Methods Tested in this Study.

The two educational methods shared the same risk messages and recommendations to prevent and reduce exposures to residential pesticides, were oriented to the same population, designed according to the cultural and cross-border context of the U.S.-México border, and were informed by the same theoretical foundations. In contrast, these two methods differed in the pedagogical mechanism to convey the risk messages and recommendations to the public. The

small group talk delivered the messages through an oral presentation facilitated by a community health worker with PowerPoint slides as visual aid, whereas the graphic booklet delivered the messages through a printed material with a colorful graphic story delivered by the community health worker.

These educational methods were selected for several reasons. These educational methods had been widely used by community-based organizations and health agencies to disseminate information and motivate people to improve or adopt practices to protect their health, were deemed appropriate for the population targeted in this study, and were cost-effective to implement in community-based health promotion interventions. The community Health Workers (CHWs) facilitated the group talk and delivered the graphic booklet to participants. These two methods were informed by the adult learning theory, the guidelines for risk communication, and by the perceptions located for Hispanic populations according to the constructs of the Health Belief Model. Chapter II described all these frameworks thoroughly and the following sections describe the application of these principles and theories in each of the educational methods tested.

3.2.3 Theoretical Foundations of the Educational Methods

3.2.3.1 Adult learning theory.

The educational methods tested in this study were designed according to the adult learning principles (Knowles, 1978; Galbraith, 1998; Wlodkowski, 1999; Conti & Kolody, 1998) and based on the strategies to educate low-literacy populations (Doak, Doak, & Root, 1996) to enhance the participants' levels of knowledge. These instructional methods recognize the characteristics of adult learners such as experienced, self-directed, and pragmatic, and promote a positive attitude to learn while making the experience enjoyable and attainable.

To increase retention and reinforce the information, the talk provides opportunities for discussions by working in teams, links the verbal information with the slides, and delivers handouts and a summary of the most important information. The booklet increases retention and reinforces the information through colorful and descriptive drawings, bold fonts, and bigger font sizes of the main messages and by inserting yellow balloons with “actions to recall” and captions, as well as a summary of recommendations in the last page. Additionally, both methods provided opportunities to reflect on the information learned. The last activity of the small group talk asked attendees to reflect about the information learned and the potential benefits of changing practices. The booklet includes a character as the role model that advises and invites the other characters to reflect on the recommendations provided.

3.2.3.2 Risk communication principles.

The guidelines of risk communication principles argue that to be successful, perceptions, level of knowledge, language, and emotions must be considered to enhance the people’s understanding and adoption of preventive actions. Effective risk communication involves a two-way process between communicators and the public to convey comprehensive, clear, opportune, and sensible messages according to the particular situation and population (Covello, Risk Communication, 2006; National Research Council, 1989; Cothern, 1996).

The risk messages and the recommendations to reduce these risks included in both educational methods (e.g. the group talk and the graphic booklet) were ultimately intended to produce behavioral changes. The behavioral changes intended by the educational methods were based on facts about exposures and risks to pesticides and in the prevention and safety measures recommended by various agencies such as the U.S. Environmental Protection Agency (2009), Centers for Disease Control and Prevention(2008), American Academy of Pediatrics (2003), and

by experts and researchers (Weiss, Amler, & Amler, Pesticides, 2004; National Pesticide Information Center, 2001; Quandt S. , Hernandez-Valero, Grzywacz, Hovey, Gonzales, & Arcury, 2006).

Furthermore, the two educational methods tested in this study shared the same theoretical foundations addressing the beliefs about the risks about pesticides and health. These beliefs were based on various research studies examining risk behaviors and perceptions related with pesticides and on the practices and beliefs observed in Hispanic populations living in the U.S.-México border.

3.2.3.3 The Health Belief Model.

The risk messages and recommendations included in the content of the group talk and on the graphic booklet were categorized according to the constructs of the Health Belief Model (HBM) (see Table 3.2).The Health Belief Model proposes that people examine threats to their health according to their perceptions about the likelihood of being hurt, the severity of the health impacts, and the barriers to and benefits of adopting safer practices. In addition, the HBM argues that people may adopt safer practices if they perceive themselves as capable of performing the behaviors recommended. Moreover, the proponents of the HBM argue that the health behaviors of people are not only impelled by their perceptions but also by external factors that remind people about the actions that reduce or prevent health harms. (Chapter II includes more detailed information about the HBM). Thus, the risk messages and recommendations were grouped in constructs such as perceived susceptibility, perceived severity, perceived barriers, perceived benefits, and perceived self-efficacy.

The group talk addressed these messages during the session and the graphic booklet addressed these messages through the texts and drawings. Table 3.2 details the activity number

of the talk and the page number of the booklet on which these messages were included. Refer to Appendix 1 with the guide of the small group talk to locate the activity number and to Appendix 2 with the graphic booklet to locate the pages.

Table 3.2. Key Messages of the Educational Methods Tested According to the Health Belief Model

HBM construct	Main concept guiding the messages	Key messages and opportunities provided in the educational methods	Educational Method	
			Group Talk (A=activity)	Graphic Booklet (P=page)
Perceived Susceptibility	People, and mostly children, are susceptible of being harmed by exposure to pesticides used at or nearby home.	Pesticides are used at home to kill, repel, or control pests and can harm people's health, mostly children	A3	P5
		Pesticides enter to the body in many ways	A4	P5
		Insect repellents are pesticides and can be harmful to children	A9	P13
		Pesticides applied nearby the home can be harmful to the family	A10	P14
Perceived Severity	People, and mostly children, are susceptible of being harmed by exposure to pesticides used at or nearby home.	Pesticides cause serious health harms that can be seen in the short term and/or in the long term	A5	P6
		Pesticides are more harmful to children and unborn children	A5	P3, P5, P6
	Pesticides used at home can cause short and long term health effects. Children are particularly susceptible	Pesticides impose risks even when not smelled or seen	A8	P13
	Some health effects are long-lasting and irreversible	Pesticides are dangerous if these lack registration number and/or adequate label with the information mandated by the law	A8	P12

Table 3.2 (continued). Key Messages of the Educational Methods Tested According to the Health Belief Model

HBM construct	Main concept guiding the messages	Key messages and opportunities provided in the educational methods	Educational Method	
			Group Talk (A=activity)	Graphic Booklet (P=page)
Perceived Barriers	The actions to prevent pests and reduce exposures to pesticides are simple and easy-to-do. All the public can perform these actions at home to protect themselves and their children from exposure to pesticides and residues.	Exposures to pesticides could be reduced by preventing pest proliferation with basic house cleaning and maintenance, and by using methods without pesticides. Exposures to pesticides could be reduced with safety actions performed before, during, and after the application of pesticides. The label of pesticides provides information about how to use them and what to use them for. It is important to read the label, or ask someone to read it, and follow instructions. The label must include at least 5 basic sections of information.	A6 A7 A8	P7, P8, P9, P10 P11, P12, P13 P11
Perceived Benefits	People can prevent the harms for themselves and their children by conducting actions to prevent pests and reduce exposures when applying pesticides. The health of adults and children would not be harmed when using less pesticide at home and using them correctly, and reducing exposures of pesticides applied nearby the house.	Children and fetuses can be protected from pesticide exposures. Exposures to pesticides are reduced by preventing and controlling pest proliferation with low cost and easy-to-do actions (cleaning, drying, and sealing the home) and using methods without pesticides (glues, traps). Exposures to pesticides are reduced with precautionary actions performed before, during, and after application of pesticides. Insect repellents can be used safely with children. Exposure to pesticides applied nearby the house could be minimized.	A7, A9 A6 A7 A9 A10	P12, P13 P7, P8, P9, P10 P11, P12, P13 P13 P14

Table 3.2 (continued). Key Messages of the Educational Methods Tested According to the Health Belief Model

HBM construct	Main concept guiding the messages	Key messages and opportunities provided in the educational methods	Educational Method	
			Group Talk (A=activity)	**Graphic Booklet (P=page)**
Perceived Self-efficacy	The information is provided through four steps that would augment the confidence of the public to perform actions that reduce pest proliferation and the reduce exposures when applying pesticides.	Step 1: Deliver information through opportunities to increase knowledge and awareness.	A3, A4, A5, A6, A7, A8, A9, A10	P5, P6, P7, P8, P9, P10, P11, P12, P13, P14
		Step 2: Practice and enhance skills through opportunities to learn and experience the new behaviors.	Exercises in A6, A7, A8, A9, A11, A12	Drawings show what to do. Readers keep the booklet for further consultation to "see" how to perform the actions.
		Step 3: Offer vicarious experience through opportunities by which the public "see" the actions performed by others and learn about the potential health consequences.	Teamwork, slides with pictures, facilitator confirming the correct actions devised by attendees.	Characters model the risk and preventive actions.
		Step 4: Create a motivating environment: Talk Session: provides opportunities to ask questions, engage in discussions, and reflect on the information learned. Graphic booklet: provides the opportunity to read in privacy and at the most preferred time.	The facilitators of the talk provide support and guidance during the session to create a motivating environment to learn.	The booklet provides a colorful and attractive presentation of an intriguing story that motivates the public to learn without blaming or judging the risk behaviors.

Furthermore, both the group talk and the graphic booklet provided “cues to action” as opportunities that attract the attention of participants, reinforce the information to increase retention, and remind participants about the preventive actions that reduces their exposure to pesticides. To increase knowledge, the talk session provided opportunities to ask and answer questions, promoted discussions, and offered visual representation of the concepts related with health and pesticides. The booklet gains attention through the story of a child feeling sick because he was exposed to pesticides accidentally and included texts and boxes to retain attention about the risks to motivate readers continue reading it. The following sections describe each of these educational methods and the mechanisms to evaluate and validate them; including the scientific content, the level of readability of the information, the cultural appropriateness, and the effectiveness to convey information of these two educational methods were assessed through expert panel reviews, readability tests, focus groups, and through a small pilot study testing immediate knowledge changes.

3.2.4 Educational Method 1: The Small-Group Talk

3.2.4.1 Description of the small group talk.

A guide to conduct the small group talk was specifically designed for this study. The guide to facilitate small group talks was designed for community-based interventions for Hispanic populations. The guide was titled *“Reducing the risks from pesticides used at home: A guide for community health workers to facilitate group talks*” (Refer to Appendix 1). The guide was intended to aid community health workers (CHWs) facilitate group talks in their communities and is accompanied by a PowerPoint Presentation on a CD. The guide was developed for CHWs serving clients living in low-income neighborhoods. The structure and organization of the guide was designed to ensure adherence to the instructions and content while

easing the facilitation by the CHWs and requiring minimum costs and preparation for implementation in community-based settings. Additionally, the talk was fine-tuned for an audience comprised of Hispanic women, mothers of children 11 years of age or less, and with low to moderate literacy levels.

The design of the small group talk followed the recommendations by Doak, Doak & Root (1996) to design health education materials. The guide to facilitate the talk defined the learning objectives according to the key messages intended to convey, was focused on behaviors and in enhancing skills, and presented the context first and then the new information (e.g. asking open questions or inquiring about the typical practices of the audience to promote discussion, detect the behaviors, and then address the correct information or reinforce the correct behaviors). Additionally, the small group talk was divided in activities to provide information in small parts, provided opportunities to assess the concepts learned (e.g. modified-concept test, completion of handout exercises, team competition), to practice the skills learned (e.g. complete handouts, read a pesticide label), and to reflect on the concepts learned. The activities of the talk promoted interaction among attendees (e.g. team work, open discussions) and helped attendees finding connections between their own experience and the information provided during the talk (e.g. open questions, group discussions, challenges foreseen). During the group talk, the CHWs conveyed the key messages by following the step-by-step instructions, making verbatim statements, and by showing and reading the slide of the presentation indicated on each activity.

The risk messages and recommendations were based on those of the graphic booklet (e.g. comic book) "*Poco veneno…¿no mata? Consejos para prevenir las plagas y los envenenamientos con pesticidas*" [A little bit of poison…Will it kill you? Recommendations to

prevent pests and pesticide poisonings] that was developed in 2008 by Galván, Juárez-Carrillo, Liebman, Sáenz, Sáenz, and Corella-Barud (Galván, Juárez-Carrillo, Liebman, Sáenz, Sáenz, & Corella-Barud, 2008). The author of this dissertation designed the guide of the group talk and received feedback from two experienced professionals on developing materials and trainings for the public: *Amy K. Liebman*, an environmental and occupational health specialist of Migrant Clinicians Network in the U.S. and *Claudia J. Laffont Castañón*, an environmental health education expert and executive director of Aqua 21, A.C., a community-based organization in Ciudad Juárez, Chihuahua, México.

The instructional design of the talk was based on the *Taxonomy of Significant Learning* by L. Dee Fink (Fink, 2003) adapted to adult learners in informal learning settings. The *Taxonomy of Significant Learning* argues that any kind of learning should promote changes and that the learners should consider these changes important. This taxonomy recognizes six levels of learning, these are *foundational knowledge*, *application*, *integration*, *human dimension*, *caring*, and *learning how to learn*. Learners enter into a process by which they understand and remember the information (e.g. foundational knowledge), apply that information into useful actions (e.g. application), make connections between and among ideas and people (e.g. integration) that empowers learners through the process of thinking through these connections, find the social and personal application of the ideas and concepts to understand and explain learners' own and other people's behaviors (e.g. human dimension), increase their motivation and care of the lessons learned (e.g. caring), and learn the personal mechanisms to optimize learning and to continue learning (e.g. learning how to learn).

Additionally, the design of the talk applied the concepts of *backward design* as recommended by Wiggins (1998). First, I determined the risk messages and behaviors that attendees would embrace and adopt when returning to their homes and then I defined the learning objectives and followed with the definition of activities that create the opportunities to achieve the learning objectives. Secondly, to make the learning experience significant for attendees, I followed the holistic active learning strategies recommended by Fink (2003), by which attendees learn information, enhance the learned information by practicing or observing, and reflect on the issues learned. To learn the information, attendees were provided with statements orally and visually. To enhance the information learned, attendees were requested to complete exercises individually and in teams. To reflect, attendees were engaged in discussions with their teams and the whole group, and finally were asked to think on the overarching concepts learned during the talk and the challenges to adopt the new behaviors and follow the recommendations to reduce the risks of pesticides.

Additionally, the guide of the talk adopted some instructional and assessment techniques recommended by Angelo and Cross (Angelo & Cross, 1993) adapted and slightly modified to suit adults attending a one-time exposure to information in informal settings. The techniques included in the small group talk included the *think-pair-share* and the *concept test* modified to reflect and self-assess the concepts learned. Moreover, the guide of the talk was informed by the strategies to motivate adults to learn in a context of cultural diversity. According to Wlodkowski (1998, 1999), for adults to be motivated to learn, the learning activities should foster inclusion in a learning environment that embraces respect (establishing inclusion), promotes a favorable disposition to learn (developing attitude), favors linking the information with the life of the

learners (enhancing meaning), and generates challenges for learners to achieve higher knowledge levels (engendering competence).

The guide of the talk for the facilitators was divided in four main sections: *background information*, *activities*, *handouts*, and the *list of references and resources*. The section with the background information contains basic scientific information and concepts about pesticide exposure and health. This section is the first section of the guide and is covered in four pages. These pages include various subtitles in bold and colored fonts that include information succinctly and bulleted. The content is described objectively, explaining the benefits of pesticides while informing about the risks to humans and the environment and the need to take precautions to reduce exposures to them. The content is accurate, valid, and consistent with the information from several sources such as the Environmental Protection Agency, the Centers for Disease Control and Prevention, and other publications by experts in environmental health. The terms and concepts in the statements are written with short sentences and common words, and none of these statements include numbers or statistics. This section was designed to enhance interest in learning the risks of exposure to pesticides and health issues and to promote retention of the information by the facilitator. These strategies are intended to ensure adherence to the scientific content and to convey the risk messages as planned for the talk.

The section with the background information included colored boxes on the right side of the first two pages. These boxes contain bulleted lists with the learning objectives, the key ideas, and the most important actions to do to reduce exposure to pesticides. The boxes were intended for easy location and recognition of the learning objectives and main messages. The four main learning objectives of the talk that are listed in one of these boxes are: “After the talk participants

will identify the ways of exposure to pesticides in the home; recognize the short and long-term health effects caused by pesticides; list the actions to reduce pests in the home; and, describe the actions to reduce the contact with pesticides, before, during, and after using pesticides."

The background section was divided into titles and subtitles. Some subtitles were written in the form of a question, for example, "What are pesticides?" and "Can pesticides affect a person's health?" Other subtitles were written in generic form, for example, "The household pesticides" and "What to do before using pesticides." The background information starts with general information about pesticides and some of the most common health risks associated with exposure to pesticides. Then the section continues with recommendations to prevent pest proliferation and reduce exposures to the pesticides used at home, the insect repellents applied to children, and the pesticides used in the community nearby the home. This background information section also includes information on what to do in the case of a poisoning. The subtitles of the background information section are: what are pesticides; the household pesticides; can pesticides affect a person's health? Why children are more likely to be exposed to pesticides? What can be done to reduce exposures to pesticides? This last subtitle includes three categories such as "preventing pests in the home", "getting rid of pests without using pesticides" and "using pesticides safely." This last category (using pesticides safely) provides the recommendations through three main groups, these are "what to do before using pesticides," "what to do during the use of pesticides," and "what to do after using pesticides." Other subtitles are "Can insect repellents be harmful to people's health?" "How to reduce exposure to pesticides sprayed in the community," and "What to do in case of pesticide poisoning." This section describes what to do if the event happens in the U.S. or in México.

The final section of the background information is titled “How to give a talk about pesticides and health” and is directed to help community health workers (CHWs) facilitate the talk. This subsection contains succinct suggestions for the facilitators to increase the efficacy of the talk in conveying the messages and make the session a pleasant opportunity for adults to learn. This section explains the guide to the facilitators such as recommending to read and practice the activities before conducting the talk. It also explains the structure of the guide and the information included on each activity (e.g. purpose of the activity, time, materials needed, and steps to follow). This subsection recommends facilitators to arrange the seats in semi-circle to promote interaction, exchange of information, and discussions between attendees and the facilitator. This section addresses the importance of respecting each other during the talk, by recommending facilitators to promote respect between attendees and between the facilitator and the attendees when hearing comments or making opinions, to consider the difficulties of low-literacy attendees, and to thank attendees often for their participation or for answering questions. Moreover, the subsection recommends facilitators to promote linking the concepts learned to attendees’ life by asking questions to attendees about their experience and tying it to the concepts reviewed in the activity of the talk. During this last subsection, facilitators are recommended to invite attendees to link their own experience when using pesticides with the information just learned and to think about the challenges they would face to implement the recommendations provided during the talk.

Next to the background information section, the guide includes a series of activities to follow during the session of the talk. The talk was divided into12 activities presented in boxes and according to the order these should be implemented. Each activity includes the learning

objective, duration, the materials required and slides of the presentation to show, and a sequence of numbered steps to perform during the activity. The language and presentation of the information on each activity box are presented in an easy-to-follow format with bold or colored fonts and bullets to ease the facilitation of the talk by the community health workers (CHWs). The activities included those to make the experience significant for attendees and those deemed necessary to achieve the learning objectives intended by the talk.

Although some learning objectives were designed for basic cognitive dimensions (e.g. recall and comprehend the information), the activities were enriched with opportunities to achieve higher level learning dimensions such as practicing, linking, integrating, and reflecting on the lessons learned through teaching techniques such as team work, open discussions, think-pair-share, and self-assessment of the concepts learned. *Activity 11* requests attendees to answer a handout (concept test) on which they are required to think, synthesize, and evaluate their level of learning. *Activity 12* asks specifically to reflect on the lessons learned.

Table 3.3 shows the overall objectives of the talk, the learning objectives of each activity, and the instructional techniques utilized in these activities to achieve the learning objectives. The overall objectives of the educational session were "to help participants learn about the ways to lessen their exposure and their children exposures to pesticides to prevent harming their health, how to keep pests away without using pesticides, and how to use them safely if they use pesticides" (*Activity 2* on page 7 of the guide of the talk). The guide instructed facilitators to read these learning objectives verbatim. Each activity provided instructions to the facilitator in short sentences starting with a verb indicating the action, for example "*Form* two teams to compete" "*Read* the following question and *listen* to the answers" or "*Show* page 5."

These action verbs are colored and bolded for easy location by the facilitator during the facilitation of the talk. The PowerPoint presentation contains 33 numbered colorful slides (called pages in the activities). The slides provided a graphic summary of the information to reinforce the information given orally or guided the discussions between attendees and the facilitator.

Table 3.3. Small Group Talk: Learning Objectives, Activities, and Instructional Techniques

Learning Objective of The Talk	**Activity number**	**Learning objective**	**Instructional techniques**
Create a learning environment	1	Meet the attendees	Interviewing and introducing a partner
	2	Acknowledge the goal of this talk	Lecture with slide presentation Define expectations
Identify the ways of exposure to pesticides in the home	3	Define pesticides	Team work Lecture with slide presentation
	4	Locate the ways pesticides enter to the body	Think-pair-share team work Lecture with slide presentation Handout (the human body)
Recognize the short and long-term health effects caused by pesticides	5	List the health effects of pesticides	Open discussion Lecture with slide presentation
List the actions to reduce pests in the home	6	List the ways to prevent pests without using pesticides	Think-pair-share team work Lecture with slide presentation Handout (three columns to list actions to prevent pest proliferation)
Describe the actions to reduce the contact with pesticides, before, during, and after using pesticides	7	List the ways to reduce risks when using pesticides	Think-pair-share team work Lecture with slide presentation Handout (matching concepts with the safety recommendations)
	8	List the basic sections in the label of a pesticide	Team work Lecture with slide presentation Read the sections of a pesticide products (with and without labels)
	9	List the ways to use insect repellent with children	Team competition Lecture with slide presentation
	10	List the ways to reduce the risks of pesticides used nearby the home	Team work Lecture with slide presentation
Assess the concepts learned	11	Summarize the information learned	Concept test with team work Lecture with slide presentation Handout (concept test)
Reflect on the information learned	12	Reflect about the lessons learned today	Open discussion

The 12 activities with the power point presentation were designed for a 1:36 hour-talk, with a range between 3 to 15 minutes each activity. The first two activities were intended to create a learning environment with an exercise to know each other and to define the purpose and expectations of the talk. *Activities 3, 4,* and *5* introduced the topics about pesticides and the health impacts.

Activity 6 addressed the recommendations to prevent pest proliferation and *Activity 7* was designed to present the recommendations to reduce risks before, during and after applying pesticides. *Activity 8* addressed the basic sections of the label of pesticides. *Activity 9* addressed the recommendations to use insect repellents safely with children and *Activity 10* explained how to reduce exposures to pesticides applied nearby the house. *Activity 11* asked attendees to self-assess the concepts learned by with the purpose to evaluate their level of understanding of the concepts. Finally, *Activity 12* invited attendees to reflect on the lessons learned.

Following the list of activities to conduct during the talk, the guide for the facilitator included a section with handouts. These were five forms that attendees used during the session. The last handout is a list summarizing the main topics for attendees to take home. Finally, the guide concluded with a section with a list of references and electronic sites with free resources for the facilitators and with the acknowledgments and contact information.

3.2.4.2 Evaluation of the group talk.

The scientific content, appropriateness of the learning objectives and activities for adult learners, and the consideration of cultural issues of border residents of the talk guide were examined through a readability analysis, a review by a panel of experts, and a small pilot study

to test immediate knowledge changes after attending the talk. First, the guide of the group talk was developed in Spanish and then translated to English. The English version of the background information and the activities resulted in a Flesch Kincaid Grade Level of 7.1, a Flesch reading ease of 65.8%, and with 2.4 sentences per paragraph (Microsoft Word©).

Secondly, the guide and the PowerPoint presentation were tested for immediate knowledge changes and was reviewed by the CHWs during their training as explained in the section "Trainings for Community Health Workers" on page 55.The CHWs answered pre and post tests to measure immediate knowledge changes. The tests included 86 items or questions such as what is considered as a pest, the purpose of pesticide (e.g. destroy, repel, and control pests), ways pesticides enter the body, common symptoms appearing shortly after exposure, the basic sections of the label, common diseases associated with pesticide exposures, the characteristics of children that make them more vulnerable, the likelihood of unborn children being harmed by pesticides, what to do in the case of an accidental exposure, and the things to do to reduce exposure to pesticides (i.e. purchase products with a label, avoid application when pregnant women or children are present, wear long sleeves, gloves when applying pesticides, avoid contamination of cookware, toys, and clothes with pesticides, wash or take a bath after application of pesticides, prevent children apply insect repellent by themselves, wash toys being outside during application of pesticides nearby the house, etc.)

The immediate knowledge changes of the CHWs between the pre and posttests were significant ($p=0.001$). Out of 86 total score points of the pre and posttests, the 11 CHWs attending the talk changed from an average 79.27 points (Standard deviation 3.85, range of 72-85) before the talk to an average of 83.82 points (Standard deviation 1.6, range of 81-86) after

the talk. At the end of the training, CHWs provided comments and suggestions to make it culturally appropriate, attractive, and easy to read by participants, and the step-by-step instructions were improved to make these easy to follow by the facilitators.

Thirdly, the guide of the talk was reviewed by a panel of experts and evaluated with the Content Validity Index (CVI) to assess the accuracy of the content, appropriateness of the structure of the talk, and the adequacy of the learning objectives to increase knowledge and motivate behavioral changes. The CVI is recommended by Colleen Di Iorio (Di Iorio, 2005) to rate the validity of the content of scales in a research instrument. In this study, the CVI was applied to evaluate the content of the group talk guide.

A panel of four experts in health promotion interventions and Hispanic culture reviewed the English version of the guide of the group talk. These experts were *Patrick L. Gurian, Ph. D.*, Assistant Professor in Drexel University with experience in risk communication campaigns with border populations; *Sara A. Quandt, Ph. D.*, Professor at Wake Forest University School of Medicine who has experience in environmental health research and interventions with Hispanic populations; *Rodolfo Rincones, Ph. D.*, Associate Professor at the University of Texas at El Paso and of the Autonomous University of Ciudad Juárez, who has experience in education leadership and environmental education with border populations; and *Sharon Thompson, MPH, Ph. D., CHES*, Associate Professor at the University of Texas at El Paso, who has experience in health promotion research and public health interventions in the border.

The reviewers received a form with the dimensions to review the talk. The experts were asked to rate the relevancy of the content of the talk according to six dimensions (refer to Appendix 3 with the form for the evaluation by the panel of experts). The experts evaluated the

following dimensions: *structure and organization* (e.g. logical order, clear instructions, etc.), *background information* (e.g. accurate, complete, important to reduce exposures, etc.), *teaching techniques for adult learners* (e.g. opportunities for learners to link the information with their experience, the session is interactive, opportunities to practice, etc.), *cultural and linguistic appropriateness* (e.g. consideration of practices, language, and beliefs of Hispanics), *active learning approach* (e.g. opportunities to discuss, practice, and reflect), and *self-efficacy* (e.g. the effectiveness of the information and activities to increase participants' confidence to reduce exposures). The experts were asked to rate these dimensions with a scale of 1 *(not relevant)*, *2 (somehow relevant)*, *3(quite relevant)*, and *4 (very relevant*) for a total range from 4 to 16 points on each dimension.

The dimensions rated by the experts were *structure and organization, background information, teaching techniques for adult learners, cultural and linguistic appropriateness, active learning approach*, and *self-efficacy*. Of a scale from 1 (not relevant) to 4 (very relevant), the review of the talk resulted in an average score of 3.08 points (data not shown). Table 3.4 shows that average score of each dimensions ranged from 2.75 to 3.25 points. To compute the CVI, the ratings by each reviewer were computed as follows.

Table 3.4. Small Group Talk: Content Evaluation Results by the Panel of Experts

Measurements to evaluate the Group Talk	Structure and organization	Background information	Teaching techniques for adult learning	Cultural & linguistic appropriateness	Active learning	Self-efficacy
Total score by dimension	13	15	12	11	11	9†
Average score	3.25	3.75	3	2.75	2.75	3
Percentage of experts rating the dimension as 3 or 4 (quite and very relevant respectively)	100%	100%	75%	50%	75%	67%

† This dimension was not rated by one reviewer.

The ratings of each dimension by each reviewer were computed by adding the number of items rated as 3 and 4 (e.g. quite and highly relevant scores) and divided by the total items rated by the reviewer. The proportion of items rated as 3 and 4 by the reviewers on each dimension resulted in100%, 100%, 75%, 50%, 75%, and 67% respectively.

Next, the items rated as 3 and 4 by all reviewers were added and divided by the total number of items to obtain the Content Validity Index. The guide of the talk resulted with an overall CVI score of 78.3%. Di Iorio (2005) suggests that a good CVI total score evaluating scales would be around 90%. Since this method of CVI was used in this study to evaluate the content of a guide to conduct a talk, the ratings of the experts were considered sufficient to revise the content of the guide and their comments were considered to some extent according to the circumstances of this study and the aims of the guide of the talk. Thus, each dimension of the talk below 90% was examined to determine which was problematic and therefore required a revision. In this case, the dimensions scored below 90% were *cultural and linguistic appropriateness* (50%), *self-efficacy* (67%), *teaching techniques for adult learning* (75%), and *active learning* (75%).

In addition to rating each dimension, the reviewers were invited to provide comments and suggestions to improve the guide of the talk. I was able to consider some of these comments and edit the guide of the talk, however, the revision was made with great caution because the guide of the talk was designed following the messages of and population intended by the graphic booklet designed in 2008 and substantial changes would make comparisons difficult between these two educational methods.

Regarding the *cultural and linguistic appropriateness* dimension, one reviewer provided the following comment: "While the curriculum does not look <u>in</u>-appropriate, I am not sure (beyond Spanish & references to Mexican pesticides) how this has been made cult/ling appropriate. I would have expected to see using particular <u>values</u> for encouraging behavior change, as addressing common health behaviors practiced by some, (though not all), persons (e.g. use of folk remedies, any humoral medicine beliefs)." Such an important comment should be considered during the design of the educational interventions tested in this study. However, to my knowledge, there is scarce knowledge about the cultural beliefs and practices of border Hispanic Spanish-speaking populations living in urban and semi-urban areas about residential pesticides. Consequently, the messages included in the talk are based on the typical cultural beliefs and practices that increase the risks of exposure observed with this population during the implementation of previous projects about pesticides.

Examples of these common beliefs include that border residents tend to refer to pesticides with the Spanish term *veneno* (e.g. poison) instead of the generic Spanish terms *pesticida* or *plaguicida*; and the belief that pesticides with no smell or good smell are less harmful than those with strong smell. Common practices observed in the border area is the usage of products such as *"polvo de avión*" [airplane dust] for domestic purposes that lack proper label and registration number, and the availability of pesticide products with labels with different type of registration number (e.g. of the U.S. and México) and language (e.g. English and Spanish); and the purchase of pesticide products in either country.

Although the use of folk medicine was not directly addressed during the group talk, the recommendation provided to attendees during the talk was to take the sick person to the doctor

(in México) and to call the poison center (in the U.S.). Although other studies have observed that Hispanic farm workers believe that washing hands with cold water when people are hot (e.g. working) could harm health, this may refer to the availability of only ice-water in the field to wash hands (Quandt, Arcury, Austin, & Cabrera, 2001) and not precisely to room-temperature water in residential settings. Women in household settings may not hold these beliefs because they frequently change from hot to cold temperatures during the household chores. However, the humoral belief of Hispanic cultures has not been examined with Hispanic populations regarding exposures to pesticides in residential settings. These cultural beliefs could impose barriers to the recommendation of washing hands or taking a shower after the application of pesticides in the house as provided during the group talk and in the graphic booklet to reduce exposure to pesticides after application of pesticides.

A comment from the reviewers about the dimension of *self-efficacy* was that "I think a discussion of barriers and what needs to be done to overcome barriers is appropriate. May be work into an exercise." Besides motivating attendees of the talk to conduct actions that prevent pest proliferation without using pesticides, I understand that the strategies recommended (e.g. clean, dry, seal the house, use mechanical methods such as traps and glues) would be difficult and that sometimes the use of pesticides is the only way to destroy pests. Therefore, the talk includes messages and recommendations to help people reduce exposure to pesticides when the use of pesticides is rightfully needed.

A comment of one reviewer about the *teaching techniques for adult learners* was "Learning objectives should be measurable & include who, when, what, and by how much…I would specify under each objective the activity that will achieve the objectives & how exactly

you will measure it." The guide of the talk was revised to address this concern. The design of the talk was based heavily on the characteristics and conditions of the intended facilitators and audience. Facilitators and audience would be adults usually working in or served by community-based organizations in low-income neighborhoods, with little or no experience with environmental health issues. The topic of pesticides and health would be considered an unsolicited theme and absent in typical classes such as nutrition, healthy child, prenatal classes, etc. offered for mothers on these community settings. Both facilitators and attendees were adults with other responsibilities that would limit their time to learn issues of unsolicited and infrequent topics. Following these conditions, the session was designed according to the recommendations by Doak, Doak, and Root (1996) to design materials for low-literacy populations. More information about these recommendations can be found in the section "Theoretical foundation of the educational methods tested in this study" on page 44 and at the beginning of this section.

Thus, to address the comment from the expert, the group talk session was divided into segments called "activities," and each activity is clearly distinguished and ordered to ease the facilitation by the CHW. The guide was enhanced by rewriting the list of learning objectives in the background information section and on each activity. The learning objectives of the activities of the talk were stated in simple and clear way to avoid confusion by the facilitators (e.g. CHWs) (see Table 3.21).

The guide of the talk was not intended to measure immediate knowledge changes in this study, but to examine changes in 4-6 weeks after the talk. Therefore, the guide does not include instructions or pre and posttest forms to measure the learning objectives by the CHWs. Several constraints reduce the opportunity to assess the achievement of each learning objective during

the talk, such as reduced time, limited funds, and the unknown skills of the facilitators to evaluate the responses of the attendees. However, the design of this study evaluates the impacts in knowledge changes of participants with questions included in the first and follow-up questionnaires conducted in the house of the participant 4-6 weeks apart. During the session of the talk, the guide of the talk requested facilitators to use some alternative techniques to assess if attendees are understanding the messages such as explaining a concept and then asking attendees to match or find these concepts in some exercises, asking teams to compete on the number of recommendations listed, and to think on the main messages learned and answer if sure or uninsured on the answers to several questions addressing these messages.

The comments about the *active learning* dimension were “Emphasis seems to be on summary. How will participants use this information to make decisions? Can you ask them to think through how they will teach this info to their children? This requires a higher level of attention than simply learning for oneself” and “there may be other activities that are not based on paper and pencil that could be explored.” The session is intended to be facilitated at low cost, with few preparations, and to be facilitated in short periods of time. Thus, some activities require the use of paper and pencil to conduct exercises as briefly as possible while ensuring the understanding of the information by attendees.

The group talk also provides some activities on which participants perform or observe the new skills. Additionally, now the guide of the talk includes one last activity specifically requesting participants to reflect on the lessons learned. In this activity, the facilitator is asked to trigger the discussion with questions such as “Before this talk, have you ever thought of the risks to your health caused by the pesticides you use?” What would be the challenges to follow the

recommendations you learned today? What are the issues or information that impacted you the most? And, “what is the first thing you would do to reduce exposure to pesticides?”

In summary, as a result of the evaluation and comments of the panel of experts, the guide of the talk was revised and enhanced in various ways while keeping in mind the main objectives of the guide of the talk. The guide should be simple and clear for CHWs with low-moderate literacy levels and little or no experience on environmental health and assessment techniques to follow; target am audience that have experience in using pesticides in their homes, live in low-income neighborhoods, and have limited time to attend a talk to learn about an unsolicited topic; and help community organizations implement group talks to inform their clients on the ways to reduce exposures to residential pesticides, during a talk facilitated in less than 2 hours and that requires little preparation and with minimum cost. Finally, the group talk was examined for immediate knowledge changes during a small pilot study as detailed in the section titled “Pilot study: Examination of immediate knowledge changes” on page 44.

3.2.5 Educational Method 2: The Graphic Booklet

3.2.5.1 Description of the graphic booklet.

The graphic booklet titled “*Poco veneno…¿no mata? Consejos para prevenir las plagas y los envenenamientos con pesticidas*” [A little bit of poison…Will it kill you? Recommendations to prevent pests and pesticide poisonings] was designed in 2008 by a group of professionals comprised of (in alphabetical order) Alma R. Galván, Patricia M. Juárez-Carrillo, Amy K. Liebman, Salvador Sáenz, Ernestina Sáenz, and with the support of Verónica Corella-Barud (Galván, Juárez-Carrillo, Liebman, Sáenz, Sáenz, & Corella-Barud, 2008) (refer to Appendix 2 with the booklet). Typically, this type of printed material might be considered as a

"comic book." However, this material was intended for educational purposes oriented to adults, was heavily based on valid scientific information, depicted a story of a family confronted with problems about pests, pesticides and health harms, and was different in size and length from other materials (i.e. bigger than commercial comic books but smaller than an educational booklet, and with more pages than typical brochures but shorter than booklets). Note that the graphic booklet has been used worldwide as a tool in public health intervention with low-literacy populations to educate people about topics as varied as HIV prevention, the dangers of sharing needles, condom use, safe application of pesticides for farmworkers and other health related issues. Moreover, the term comic book may have the connotation of a material intended for young audiences by some readers. Thus, this material is considered in this study as a graphic booklet rather than a comic book. These distinctions merge the entertainment component of comic books with the seriousness of health information typical in pamphlets and booklets distributed in health related settings for adult populations. Entertainment education utilizes mass media such as TV, radio, film, videos, and print materials as well as arts, crafts, toys, textiles, and any other creative way to send educational messages to the public (Singhal & Rogers, 2004).

This booklet was conceived as a graphic educational booklet that conveys information and *how to* actions to reduce exposure, especially of children, to the pesticides used in residential settings that could fall into the frame of entertainment education. The story of the booklet educates through the texts while the images describe the concepts and depict the behaviors through graphs, thus it was expected that readers would learn by imitation and by reading the texts. The booklet was designed for Hispanic Spanish-speaking populations with low to

moderate literacy levels living in low-income urban and semi-urban neighborhoods in the U.S.-México border.

The experience of the authors with prior environmental health education projects, the cultural and socioeconomic context in the border, and theories such as Adult Learning and the Health Belief model informed the design of the graphic booklet as detailed in the section 3.2.2 "Framework of the Educational Methods." The messages and concepts addressed in the booklet were designed according to the constructs of the Health Belief Model as detailed on Table 3.2. The booklet builds mainly on previous print materials about pesticides such as a graphic booklet for farm worker families (Sáenz, Liebman, & Juárez, 2002), a manual for community health workers (Liebman, Galván, Juárez, & Sáenz, 2006), and a graphic booklet for pregnant women (Juárez-Carrillo, Kugel, Liebman, & Sáenz, 2007) and in numerous train-the-trainer manuals for community health workers addressing environmental health and healthy home environments. The author of this dissertation co-authored and participated in the design and development of all these materials.

The graphic booklet "*Poco veneno…¿no mata?Consejos para prevenir las plagas y los envenenamientos con pesticidas* was developed in Spanish as part of a larger project about household pesticides implemented in 2007-2008 in the Paso Del Norte region. This booklet is the volume six of a series of environmental health educational materials designed by the Center for Environmental Resource Management of the University of Texas at El Paso. The comic book is 7.7 by 10.5 inches and includes 14 pages, plus the cover and back pages. The panels are of different sizes to prevent boredom. The booklet includes 25 panels of one third of the page, 9 panels of one sixth of the page, 6 panels of half page size, and one full-page panel. The texts

includes some fonts that are bold, capitalized, or in bigger sizes, and texts are inserted in bright colored boxes through the panels to emphasize the risk messages according to the actions depicted in the drawings.

The team of experts developed the overall narrative, dialogue, and scientific content along with a team of designers for the artistic design and arrangement of images. Primarily, the experts developed the concepts, the plot, and the basic dialogues according to the risk messages and the scientific content and then the designers developed the narrative chain of images, the settings, and the basic characteristics of the characters such as appearance, age, sex, clothing, etc. The designers provided rough drafts of the panels according to the narrative and key messages developed by the experts. Several drafts were prepared and reviewed by the team to ensure the key message and concepts were embedded in the sequence of images. The characteristics of the characters, size of panels according to the emphasis desired, colors, number of text balloons, font sizes, and the readability of the texts were constantly checked.

The booklet relies heavily on a serious health issue with a story that starts with an incident or event that attracts the attention of the reader. The key to retain the attention of the reader is to employ a story that is relevant, of interest to, and satisfies the curiosity of the reader (Eisner, 1996). To achieve empathy and retain the attention of the reader, the story and the drawings of this booklet follows a logical and intelligible arrangement of images to engage the reader in a virtual dialogue with the characters while learning the risk messages and recommendations about pesticides. The dialogue between characters is provided in balloons and accentuated with exclamation symbols and all the grammar mechanisms to convey not only the messages but the feelings and emotional state of the characters (Eisner, 1996).

The story describes the concerns of a family with two young children and a pregnant mother about the need and use of pesticides at home while providing information about the risks of pesticides and the recommendations to reduce these risks. The booklet takes the reader through the exchange of dialogues between the characters and the educator. The story initiates with an incident – a child accidentally exposed to a household pesticide, and evolves with the support of a character that takes the role of educator, the *comadre* (e.g. godmother). The *comadre* is a typical and important personage in Mexican families. Additionally, this character has the characteristics of a community health worker, a knowledgeable and trusted advocate in the neighborhood. Thus, the role of the *comadre*/community health worker is in charge of linking the dialogues between the characters with the risk messages and recommendations provided in the texts.

To reinforce the messages inserted throughout the booklet, a summary is included in the last page with bulleted statements grouped in five main sections. The sections of the summary are what are pesticides, the health harms to people and mostly for susceptible populations (e.g. children, unborn children), the practices to prevent pest proliferation (e.g. cleaning, humidity free, sealing the house), the safety practices to reduce exposures when applying pesticides, and what to do in the case of an accidental exposure to pesticides.

3.2.5.2 Evaluation of the graphic booklet.

The graphic booklet was reviewed for readability, evaluated by a panel of experts, piloted through two focus groups, one on each side of the border, and piloted in a small study to examine the immediate changes in knowledge before and after reading it. First, the transcript of the comic book was translated to English to examine the readability thorough the Microsoft Word Software

(2000©), resulting with a Flesch-Kincaid grade level of 5.3, Flesch reading ease of 76.4.1%, sentences per paragraph 1.8, and with 11.8 words per sentence.

Secondly, the booklet was reviewed by a panel of three experts. The experts reviewing the content were *Matthew Keifer, MD* professor of the University of Washington experienced in community-based environmental health education for Hispanic populations, *John F. Haynes Jr., MD*, Director of the West Texas Regional Poison Center and his education team in El Paso, Texas, and *Verónica Corchado*, an experienced community health educator for residents in Ciudad Juárez, Chihuahua, México. These experts were asked to rate the validity and usefulness of the content of the booklet according to six dimensions and with a scale from 1 (disagree) to 5 (agree). The sections evaluated by the panel of experts were *cover and title* (the cover attracts attention and is adequate?), *definitions and terms* (e.g. routes of entry of pesticides to the body, susceptibility of special population groups, acute and chronic health effects), *usefulness of recommendations to prevent pest proliferation*, *usefulness of home-made recipes to destroy pests*, *usefulness of recommendations to reduce exposure during pesticide application*, and *usefulness of the summary*.

Of the scale from 1 (disagree) to 5 (agree) the average score of the booklet resulted in 4.2 points. The scores by each reviewer were examined by each dimension to acknowledge the need of edition or revision. Table 3.5 summarizes the evaluation of the content of the graphic booklet by the panel of experts.

The ratings by each reviewer were computed to determine the overall CVI score of the entire guide. The scores by each reviewer was computed by adding the number of items rated as 4 and 5 and dividing the number by the total items rated by the reviewer.

Table 3.5. Graphic Booklet: Content Evaluation Results by the Panel of Experts

Measurements to evaluate the Graphic Booklet	Cover and title	Definitions and terms	Usefulness of pest prevention recommendations	Usefulness of home-made recipes to control pests	Usefulness of safe practices recommended	Usefulness of the summary of messages
Total score by dimension	15	15	12	8	12	14
Average score	5	5	4	2.7	4	4.7
Percentage of experts rating the dimension as 4 or 5	100%	100%	67%	67%	100%	100%

The proportion of items rated as 4and 5by the reviewers resulted in 100%, 100%, 67%, 67%, 100%, and 100% of each dimension. Next, the number of times all the dimensions were scored with 3 and 4 were added and then divided by the total number of items to obtain the final CVI. The booklet resulted with an overall CVI score of 77.8%.According to Di Iorio (2005), a good CVI total score would be around 90%. Thus, each dimension of the booklet was examined carefully to determine which was problematic and therefore required reconsideration. The dimensions reconsidered and edited were the *pest prevention recommendations* (67%) and the *home-made recipes to control pests* (67%).

According to the recommendations from the reviewers, the team reorganized the structure and presentation of the recommendations addressing the prevention of pest proliferation and safety practices when using pesticides, and deleted the section about the homemade recipes from the booklet. According to the three reviewers, the recipes to prevent and destroy pests lack sufficient scientific evidence to demonstrate their effectiveness. The team also decided to re-state some scientific content, rephrase some dialogues and texts to improve readability, and to add the toll-free phone number of the poison center in the U.S. as recommended by the reviewers.

Thirdly, two focus groups were organized in two community centers, one on each side of the U.S.-México border, to explore the appropriateness of the recommendations and receive

feedback from an audience similar to the readers intended with the graphic booklet (Juárez-Carrillo, Liebman, & Corella-Barud, 2009). This small project to evaluate the booklet was approved by the Internal Review Board of Migrant Clinicians Network in May 2008. All participants signed a consent form and received $20 compensation for their time, as well as childcare services available during the session.

Attendees to the focus groups were selected randomly from a list of 22-25 women clients of two community organizations, one on each side of the border. 12 women from each organization were selected while considering that 8 to 10 women would finally attend the session. One focus group was facilitated by the author of this dissertation with 9 participants on the U.S. side (e.g. San Elizario, Texas) and the other focus group was facilitated by *Alma R. Galván*, a coauthor of the booklet with 11 participants on the Mexican side (e.g. Ciudad Juárez, Chihuahua, México). Both focus groups were audio recorded and were assisted by the main designer of the booklet, *Salvador Sáenz*. He acted as a note-taker during the focus groups, but abstained from providing comments or intruding the dynamics of the conversations. The designer benefited from hearing and observing the comments and body language when reading or referring to the design of the booklet.

The focus groups discussions were facilitated with a guide designed by the author of this dissertation. The discussions were directed toward the *appropriateness* of the words, drawings, and messages and practices recommended, the *effectiveness* of the definitions and information to convey the messages, and the *usefulness* of the recommendations to reduce exposures and address barriers for behavioral changes. The facilitators of the focus groups invited attendees to answer questions and provide feedback about several items in the booklet. Attendees were asked

about the cover page and the messages such as the definitions of concepts, risk messages about exposure, information about the susceptibility of some population groups, the health impacts associated with pesticide exposure, recommendations to prevent pest proliferation, recommendations about safer practices, and the summary. Additionally, attendees to the focus groups provided feedback about the duration of the reading (e.g. short, good, or too long), what would be the most important things to do according to the reading, if other readers would consider the booklet useful, and about the things most easy and difficult to understand by the readers.

Among the major changes to the booklet because of the feedback of the focus groups, the team changed the drawings and the title on the cover and took out the homemade pesticide recipes. Some attendees to the focus groups recommended adding a family and children to the cover of the booklet to make it more attractive (the cover depicted a house, windows and doors closed, and the pests around it). Therefore, the team changed the drawing on the cover and now it includes a family of four surrounded with some pests. The title was also changed from "Here come the pests" to "A little poison…will it kill you?" since the team decided that the previous title says nothing about the risks to pesticide exposures.

Regarding the homemade recipes to control and destroy pests, some women commented that it would be much easier to purchase a product than to prepare one at home, and other women commented that they were not sure if these homemade recipes to control pests were effective. Additionally, some texts were re-phrased, some graphs were relocated and new graphics were integrated to convey the messages more clearly and thoroughly.

3.2.6 Pilot Study: Immediate Knowledge Changes of the Educational Methods

The group talk and the graphic booklet were tested to examine immediate knowledge changes about health and pesticides with volunteers living in the U.S. and Mexican border. The Institutional Review Board of the University of Texas at El Paso approved this small pilot study and the volunteers signed a consent form before participating.

The volunteers of this pilot study were recruited outside of schools, daycare centers, churches, homes, community centers, clinics, and in major stores in the Paso Del Norte region. A convenience sample of 119 women were recruited; 59 women were recruited in the colonias *Luis Olague* (19 women), *16 de Septiembre* (20 women), and *Kilómetro 27* (20 women) in Ciudad Juárez, Chihuahua, México, and 60 women were recruited in the *Segundo Barrio* in El Paso, Texas (20 women), in San Elizario, Texas (20 women), and in Chaparral, New Mexico (20 women) in the U.S.

The community health workers (CHWs) recruited the volunteers, facilitated the educational methods, and conducted pre and post tests. CHWs approached the potential women in these recruitment areas, explaining briefly the purpose of the project and obtaining the consent form before implementation. Women were eligible to participate if they were 18 years of age and older, had children of 11 years of age or younger, were Hispanic, spoke and read Spanish, and never attended a talk or received materials about pesticides from a community center. The volunteers attending the talk received $10 and the volunteers reading the booklet received $5 dollars in compensation for their time. The plan was to recruit 60 women of the areas in México and 60 women of the areas in the U.S. Half of these volunteers were invited to attend a group talk and half of these volunteers were invited to read the booklet. The talks were organized in

community centers, house of the community health worker, or in classrooms. The reading of the booklet by the volunteers was conducted in the site of recruitment, outside the school, daycare center, their own home, clinic, or community center. The pre and posttests were examined for immediate knowledge changes about pesticide issues.

The CHWs were able to recruit 119 volunteers to test the educational methods, 59 volunteers attended the talk and 60 volunteers read the booklet. The two educational methods were implemented in Spanish. The same pre and post questionnaires were applied for the two educational methods. The pre questionnaire included 45 dichotomous answers grouped in 10 sections. The demographic information collected from volunteers was minimal. The pre test asked about the age and the number of school years completed by the volunteer. The post questionnaire included the same 45 dichotomous questions with four additional questions to acknowledge their experience with either educational method (e.g. talk or booklet).

The questions included in both the pre and post tests were: what are the Spanish terms known for pesticide products, the belief that residential pesticides could harm health, the main sections of the label of a pesticide, the main things to do to prevent pest proliferation, the routes of entry of pesticides to the body, the main symptoms appearing shortly after exposure to pesticides, the main diseases associated with long-term exposure to pesticides, the belief if pesticides could harm unborn babies and children, the beliefs if pesticides can be applied in the household when children and pregnant women are present, the form of pesticides that result in less contamination of the family and household items (e.g. liquid and gel instead of spray and fogs), the things to do when applying pesticides (e.g. read the label, wear long sleeve shirts, wash after application, ventilate the home, etc.), the things to do to minimize exposure to pesticides

applied nearby the house (e.g. close windows, wash toys being outside), and the safety measures when using insect repellent with children.

The additional questions included in the post test are intended to examine the perceived usefulness of the talk or booklet by the volunteers. To evaluate the talk, volunteers were asked if they would recommend the talk to other women and to rate on a scale from 1 (very bad) to 2 (very good) the way the talk was facilitated, the quality of the presentation (e.g. pictures, words, colors, etc.), the usefulness of the exercises, the amount of new information, the duration of the talk, and if the talk motivated the volunteer to reduce the risks to pesticides. The post test also requested volunteers to recommend things to improve the talk and to mention those recommendations given during the talk that would be difficult to implement when trying to reduce the risks to pesticides. To evaluate the graphic booklet, volunteers were asked if they would recommend this booklet to other women and to rate on a scale from 1 (very bad) to 2(very good) the recommendations given in the booklet, the quality of the booklet (e.g. size, drawings, words, colors, etc.), the usefulness of the story and drawings to promote learning, the amount of new information learned, the reading length of the booklet, and if the booklet motivated the volunteer to reduce the risks to pesticides. The posttest also requested volunteers to recommend things to improve the booklet and to mention those recommendations given during the talk that would be difficult to implement when trying to reduce the risks to pesticides.

The duration to answer the pre and posttests by the volunteers of both educational methods was 13 minutes and 9 minutes on average respectively. As a result, six talks were facilitated to 59 volunteers with an average duration of 1:35 hours (range from 1:05 to 1:49 hours) and 60 booklets were distributed to 60 volunteers resulting in an average reading time of

20 minutes (range from 6 to 40 minutes). The results of the two demographic questions asked to the 119 volunteers show that the overall mean age is 34.9 years and the average school years completed is 8.6 years. However, significant differences were found when the demographic answers by the volunteers were examined according to the country on which they lived; U.S. volunteers were older and with higher number of school years completed than the volunteers of the Mexican side. Refer to Table 3.6 summarizing the demographic information of volunteers according to the country on which they were recruited.

Table 3.6. Pilot Study: Demographic Information of Volunteers by Country

Item	**Overall**	**U.S.**	**México**
Age *	n=117	n=58	n=59
Average (Standard Deviation)	34.9 (8.95)	36.7 (9.3)	33.2 (8.3)
Range	18-56	18-52	18-56
School years completed**	n=111	n=53	n=58
Average (Standard Deviation)	8.6 (2.5)	9.3 (2.6)	8.0 (2.4)
Range	3-14	4-14	3-14

* Difference between groups is significant at p<.05; ** Difference between groups is significant at p<.001.

When age and education were examined according to the educational methods, no significant difference was found in the age and a moderate difference was found in the years of education between the volunteers from the U.S. and México. Table 3.7 summarizes the results of age and years of educational according to the educational method piloted.

Table 3.7. Pilot Study: Demographic Information of Volunteers by Educational Method

Characteristics of volunteers	**Overall**	**Group Talk**	**Graphic Booklet**
Age	n=117	n=58	n=59
Average	34.9	35.6	34.3
Standard Deviation (range)	8.9 (18-56)	8.9 (18-56)	8.9 (18-52)
Years of school education completed*	n=111	n=56	n=59
Average	8.6	8.1	9.2
Standard Deviation (range)	2.5 (3-14)	2.5 (3-14)	2.5 (5-14)

* The difference between means is significant at p=0.03.

Several concepts were examined with the responses to the tests. First, this small pilot study asked volunteers about the Spanish terms referring to pesticide products. As expected, Hispanic border residents reported knowing varied terms to refer to these products used at home to control/destroy pests. Table 3.8 summarizes the proportion of volunteers knowing the Spanish terms for pesticides according to the country on which they were recruited.

Table 3.8. Pilot Study: Spanish Terms of the word *Pesticides* by Country of Residence

Spanish terms for the word "pesticide"	**Overall**	**U.S.**	**México**
Spanish terms for pesticides†	(n)	(n)	(n)
Pesticida [pesticide]	46.2% (119)	48.3% (60)	44.1% (59)
Plaguicida [pesticide]*	28.6%(119)	36.7% (60)	20.3% (59)
Veneno [poison]	86.4% (118)	88.1% (59)	84.7% (59)
Insecticida [insecticide]	84.9% (119)	88.3% (60)	81.4% (59)

† Volunteers were asked to mark "yes" to the terms they know for the products used in the house for pests; *Difference between countries is significant (p<.05)

The Spanish terms most often used by U.S. and Mexican volunteers to refer to pesticide products were *veneno* [poison] (88.1% and 84.7% respectively) and *insecticida* [insecticide] (88.3% and 81.4% respectively). In contrast, the Spanish term least known by the volunteers is *plaguicida* [pesticide], on which only 36.7% of U.S. and 20.3% of Mexican volunteers responded knowing this term.

The terms known for pesticides by the public have implications for public campaigns to reduce exposures. People may have increased risks of exposure if they do not relate the risks addressed in the campaigns with the products they use at home. Therefore, all the Spanish terms for pesticides were addressed during the talk and in the content of the graphic booklet to guarantee that volunteers relate the information conveyed during these learning opportunities with the products they use in their homes.

As can be seen on Table 3.9, the terms less known by volunteers before attending the talk or reading the booklet were *plaguicida* (28.8% of attendees of the talk 28.3% of the readers of the booklet) and *pesticida* (40.7% of those attending the talk and 51.7% of the readers of the booklet). During the educational interventions, volunteers learned that all these Spanish terms refer to the products used at homes to control pests. After being exposed to either educational method, the great majority of volunteers acknowledge all these Spanish terms as synonymous to pesticides (see Table 3.9).

Table 3.9. Pilot Study: Spanish Terms for the word *Pesticides* Known by Volunteers by Educational Method

Terms known for the products to control pests used in the house	***Group Talk***			***Graphic Booklet***		
	Pre	**Post**	***p* value (paired t-test)**	**Pre**	**Post**	***p* value (paired t-test)**
Pesticida [pesticide]	40.7%	86.4%	.000	51.7%	88.2%	.000
Plaguicida [pesticide]	28.8%	75.9%	.000	28.3%	88.0%	.000
Veneno [poison]	96.6%	96.6%	n/a	76.3%	96.4%	.003
Insecticida [insecticide]	81.4%	91.5%	.109	88.3%	96.1%	n/a

Secondly, the pre and post-tests of this pilot study requested volunteers to answer several questions about pesticides and health to determine the immediate knowledge changes. The knowledge changes were examined with the responses of volunteers grouped in 10 variables. The correct responses were converted into points to compute the composite variable *knowledge level*. The sections computed for the variable *knowledge level* included label content, prevention of pest proliferation, routes of entry of pesticides to the body, symptoms appearing shortly after exposure, diseases associated with long-term exposures, susceptible population groups, forms of pesticides with less level of exposure, safety precautions when applying pesticides, safety precautions with pesticides applied nearby the house, and safety precautions with the application of insect repellents to children. The composite variable was computed with the points of all these

questions and named *knowledge level*. The maximum number of points of the composite variable *knowledge level* was 39 points. The difference between the total scores before and after attending the talk or reading the booklet was analyzed with paired t-tests.

The immediate knowledge changes of volunteers before and after attending the talk or reading the booklet were significant. Participants in the talk had significant knowledge increases between the pre and posttests. As a result of attending the talk, volunteers increased their average total scores from 30.07 points before the talk to 37.65 points after the talk ($p<.001$).

The majority of the concepts measured resulted in significant changes after attending the talk (see Table 3.10). The concepts with no significant changes included "what to do first to prevent pests" (maintain the house clean, dry, and sealed), the beliefs about protecting certain population groups (unborn children, young children), and "what to do after pesticides are applied nearby their homes" (close windows and wash toys being outside).

Similarly, volunteers reading the booklet significantly increased their level of knowledge. Volunteers changed from 30 average points before reading the booklet to 35.6 points after reading the booklet ($p<0.001$). The sections resulting with the less significant changes after reading the graphic booklet were the content of the labels and what to do to prevent pest proliferation. Despite significant changes were observed in the total scores of volunteers exposed to both educational methods, the effect size is higher for the volunteers attending the talk (7.58 average points) than for volunteers reading the booklet (5.58 average points). Thirdly, the posttest of this pilot study included few more questions to examine the satisfaction of the volunteers with the educational method on which they participated. Volunteers were asked to rate some statements with a scale from 1 (very bad) to 4 (very good).

Table 3.10. Pilot Study: Knowledge Scores and Immediate Changes by Educational Method

Concepts measuring knowledge about pesticides and health **(Number of maximum points)**	**Group Talk**			**Graphic Booklet**		
	Pre Mean SD Range	**Post Mean SD Range**	***p* value (paired t-test)**	**Pre Mean SD Range**	**Post Mean SD Range**	***p* value (paired t-test)**
Label content (basic label sections) (5)	4.42 1.00 1-5	4.98 0.13 4-5	.000	4.46 1.09 1-5	4.71 0.77 1-5	.062
What to do first to prevent pest proliferation (clean, dry, seal the home) (1)	0.49 0.50 0-1	0.61 0.49 0-1	.090	0.46 0.50 0-1	0.51 0.50 0-1	.410
Routes of entry of pesticides to the body (inhaled-nose, mouth, absorbed-hands, eyes, skin, ingestion) (6)	4.6 1.52 0-6	6 n/a 6	.000	4.67 1.51 1-6	5.65 0.79 3-6	.000
Short term symptoms after exposure to pesticides (dizziness, headache, stomach ache, vomit, short of breath, asthma attack) (6)	5.10 1.07 2-6	5.97 0.18 5-6	.000	5.02 1.41 1-6	5.83 0.49 3-6	.000
Long term health effects associated with exposure to pesticides (asthma, nervous system, fertility problems, cancer, hormone system) (5)	2.24 1.50 0-5	4.86 0.39 3-5	.000	2.68 1.70 0-5	4.30 1.1541 -5	.000
Preventing exposures of special population groups (unborn babies and children) (3)	2.61 0.69 1-3	2.88 0.46 1-3	.022	2.51 0.85 0-3	2.87 0.43 1-3	.002
Use of pesticide products with less risk of exposure (solid/liquid vs. spray, fogs, etc.) (1)	0.54 0.50 0-1	0.84 0.36 0-1	.001	0.47 0.50 0-1	0.67 0.47 0-1	.009
Safety precautions when applying pesticides (read & follow instructions, wear gloves, long sleeve shirts and pants, wash and ventilate the home after application) (6)	5.34 1.06 2-6	5.97 0.18 5-6	.000	5.48 1.02 1-6	5.91 0.42 3-6	.000
Safety precautions with pesticides applied nearby the home (close windows & wash toys being outside during application) (2)	1.55 0.57 0-2	1.71 0.46 1-2	.163	1.42 0.62 0-2	1.67 0.48 1-2	.008
Safety precautions with repellents applied to children (applied by an adult, avoid face, avoid hands, wash children afterwards) (4)	3.27 0.94 0-4	3.72 0.64 1-4	.001	3.02 1.09 0-4	3.53 0.65 1-4	.000
Total knowledge score(39 points maximum) **Mean** Standard Deviation Range	 **30.07** 5.25 16-39	 **37.65** 1.60 30-39	.000	 **30.00** 5.43 16-39	 **35.59** 2.94 23-39	.000
Mean difference between pre and post tests (Standard Deviation)	**7.58** (5.08)		.000	**5.58** (5.35)		.000

In summary, all volunteers to the group talk would recommend it to other people and rated highly the statements about the facilitator, the quality of the talk (content, exercises, new information), and the helpfulness to motivate people to conduct changes to reduce exposure to pesticides (see Table 3.11). However, volunteers rated slightly lower the duration of the talk.

Table 3.11. Pilot Study: Satisfaction Mean Rates of the Small Group Talk

Statements How would you rate the following...? Scale: 1 (very bad) to 5 (very good)	**Group Talk** **Mean rate (Std. Dev.)**
The way the person facilitated the talk	4.97 (0.18)
The quality of the presentation (pictures, words, colors, etc.)	4.93 (0.25)
The usefulness of the exercises and questions to help you learn the information	4.97 (0.18)
The quantity of information that is new to you	4.95 (0.22)
The duration of the talk	4.76 (0.76)
The talk motivated you to conduct changes to reduce the risks to pesticides	5.0

Similarly, all of the readers of the graphic booklet were satisfied with the booklet (see Table 3.12). The great majority responded that they would recommend this booklet to other people. In general, the volunteers rated highly all the quality, content, and usefulness of the booklet. However, volunteers rated not as good the quantity of the new information provided in the booklet and to the duration time to read the booklet.

Table 3.12. Pilot Study: Satisfaction Mean Rates of the Graphic Booklet

Statements How would you rate the following...? Scale: 1 (very bad) to 5 (very good)	**Graphic Booklet** **Mean rate (SD)**
The way the recommendations are provided in the booklet	4.95 (0.22)
The quality of the booklet (size, drawings, words, colors, etc.)	4.95 (0.22)
The usefulness of the story and the drawings to help you learn the information	4.93 (0.36)
The quantity of information that is new to you	4.85 (0.36)
The duration of reading of the booklet	4.88 (0.33)
The booklet motivated you to conduct changes to reduce the risks to pesticides	4.95 (0.22)

3.3 Community Health Workers

3.3.1 Selection and Level of Involvement

Eleven Community Health Workers (CHWs) were hired for this study to conduct the recruitment, collect information, and facilitate the group talks. CHWs have been included successfully in community-based projects, both during implementation of interventions (Arcury T. , Marin, Snively, Hernandez-Pelletier, & Quandt, 2009; Liebman A. , Juárez, Leyva, & Corona, 2007; Forster-Cox, Mangadu, Jacquez, & Corona, 2007) and during research projects (McConnell R. , et al., 2005; Bass J. , Ortega, Rosales, J. Petersen, & Philen, 2001; Ramos, Baker Davis, He, May, & Ramos, 2008; Levy, Brugge, Peters, Clougherty, & Saddler, 2006; Balcazar, et al., 2009). Additionally, CHWs have been successful in increasing access to services, knowledge, and in the adoption of healthier behaviors of minority women (Andrews, Felton, Wewers, & Heath, 2004).

The CHWs participating in this study were first nominated by the community organization collaborating in this study. The CHWs were finally selected after an interview with the author of this study to recognize their experience in outreach activities, philosophy of community service, and their experience and confidence in following research protocols such as protection of confidentially, recruitment of participants, explaining protocols to potential participants, completing questionnaires, and organizational, communication, and teaching skills. The CHWs were not required to have experience on projects related with environmental health, but rather on outreach and research projects implemented in community-based projects and the willingness to help participants understand the risks imposed by pesticides. Nevertheless the Texas Department of State and Health Services of the State of Texas offers formal training and

certification of CHWs (Texas Department of State Health Services, 2010) and the Office of Border Health of the Department of Health of the New Mexico State (New Mexico Department of Health, 2009); similar trainings and certifications are absent for CHWs in Ciudad Juárez. To avoid bias in skills or competencies between the CHWs of the two countries, such certification or formal trainings were not required in this study. Therefore, all the CHWs participating in this study reported not being certified or trained formally in the U.S. by these agencies.

The CHWs participating in this study were 41 years of age on average (range of 20 to 58 years of age) and had an average of 10.4 school years (range 6 to 18 school years) and 6 years of experience (range 3 to15 years of experience) in field work and community-based education for low-income Hispanic residents. One CHW was appointed as the leader during the field work and the facilitation of the talk. The leading CHW of each area was selected according to the years of experience in community-based outreach and years of education. All CHWs are Hispanic, either with origins on the border or living on the border for numerous years and speak Spanish as their first language to ensure concordance with the population group targeted in this study.

Several measures were implemented in this study to reduce interviewer effects and systematic errors in protocol implementation and data collection, and to ensure fidelity of implementation of the educational methods. The CHWs attended three trainings covering all the study protocol issues, were asked to keep records of their fieldwork activities, and were frequently monitored to assess the correct implementation of the protocol as planned.

In a review of the roles of CHWs, authors found that the length of training sessions for CHWs varied according to the complexity of issues and their roles, ranging from 5 hours to 6 months (O'Brien, Squires, Bixby, & Larson, 2009). The author of this study designed and

facilitated three trainings for the CHWs while considering factors such as the short-term engagement of CHWs in this study (e.g. 4 months) and their experience in outreach and research projects. Additionally, the three trainings were deemed sufficient to achieve homogeneity in the understanding of the concepts and steps of the research protocol, as well as in the instructions to implement the educational methods.

3.3.2 Trainings for Community Health Workers

The community health workers (CHWs) attended two trainings about the research protocol (recruitment, implementation, data collection, and reporting procedures) and one third training on how to conduct the group talk. In the end, these three trainings were duplicated on each side of the border because of the unavailability of some CHWs to cross to either the U.S. or to México (e.g. lack of passport and long-waiting time to cross to either side) or safety issues prevalent in Ciudad Juárez during the period of implementation of this project.

The duration of these three trainings ranged from 5 to 7 hours. Five and six CHWs were hired for the implementation of the study in the U.S. and México respectively. These trainings had varied measures to assess the understanding of procedures and adherence to the concepts and instructions, such as discussions and open questions, role-playing, practicing, assessment of concepts, pre and posttests, and observations during the practices in the field. The goals and information about each of these trainings for CHWs are summarized in Table 3.13.

During *Training I*, CHWs learned about the aims of the project, the research protocol, the formats to report recruitment and activities, how to treat participants, and the form to complete the questionnaire during the household visits. In this training, the CHWs learned the purpose of each question, sections included, probing examples, how to explain participants to rate the

responses, reading speed of questions, skipping, and making notes aside. At the end of the training, CHWs role-played the completion of a questionnaire while the group evaluated the practice.

Table 3.13. Summary of Trainings for the Community Health Workers

Item	**Training I**		**Training II**		**Training III**	
Goals	Ensure adherence to research protocol. Training of CHWs about the project's protocol, recruitment procedures, and how to conduct the household visits. Each CHW was asked to practice the questionnaire with 3 volunteers. These practices were observed by the author of this dissertation and two field coordinators to correct procedures and provide feedback.		Reinforce protocol procedures and provide feedback of the practice of the questionnaire. Re-fresh training of CHWs to provide feedback about their practice to pilot the questionnaire and to ensure that project's protocol is fully understood. The results of the practice were presented during the training to show CHWs how the answers of volunteers are transformed into results (knowledge, practices, and perceptions of volunteers).		Ensure understanding of the key learning objectives and messages and adherence to the instructional steps of the talk. Training of CHWs to increase their knowledge about pesticides and health and how to facilitate the talk. The training included pre and post tests to assess immediate knowledge changes, a role play to practice the talk, and an evaluation session of the practice and the overall talk.	
Sites	Ciudad Juárez (Central Park)	El Paso (UTEP-CERM)	Ciudad Juárez (Central Park)	El Paso (UTEP-CERM)	Ciudad Juárez (Community Center)	El Paso (UTEP-CERM)
Num. of CHWs trained	6	5	6	5	6	5
Duration	8:30-3pm 6:30 hours	9am -4 pm 7 hours	2:00-7 pm 5 hours	9-2 pm 5 hours	2:00-7 pm 5 hours	9am-2 pm 5 hours

Additionally, all 11 CHWs were requested to practice the completion of the questionnaire twice, 4-5 days apart, with three volunteers each. The CHWs were asked to select three volunteers conveniently (e.g. neighbors or friends) to practice the interview. The goals of the practice were to increase familiarity of the CHWs with the question-answer procedures (e.g. multiple choice, how to teach participants to rate answers, how to skip questions, etc.), ensure adherence to the wording of the questions and probing, and to recognize the doubts, misunderstandings, or difficult wordings of the respondents according to the length, terms, and

response procedures of the questions. The author of this dissertation and two field coordinators of this study accompanied each of these CHWs during one practice to observe the completion of the questionnaire. These observations were useful to provide feedback to CHWs during Training II about difficulties or mistakes in following the procedure, filling out the responses, and making the questions correctly to the volunteers. The volunteers of the practice received a UTEP coffee cup in compensation for their time. This practice of the CHWs served also to edit and enhance the instrument. More information about the pilot of the structured questionnaire is included in the section "Preparation of the structured questionnaires" on page 68.

Training II was aimed to reinforce the instructions, provide feedback to the CHWs, present selected results of the responses, and deliver the edited version of the questionnaire. As explained above, the CHWs practiced the completion of the questionnaire twice with three volunteers while the author of this dissertation and two field coordinators observed one practice of all the CHWs. The author reviewed and analyzed the questionnaires completed during the pilot of the instrument. Thus, during this Training II, the facilitator (e.g. author of this dissertation) reinforced the steps and instructions to complete the questionnaire, provided feedback to the CHWs about their practice, and addressed the challenges and questions observed by the CHWs and volunteers when answering the questions. Additionally, during this training II, the author of this study presented the results of the questionnaires completed with volunteers during the practice, including the average duration of the interviews by the CHWs, the trends in missing questions and responses, the ways of using the visual aids with volunteers, percentage of volunteers knowing the ways pesticides enter to the body, and the percentage of volunteers agreeing that pesticides damage health, amongst other results.

The presentation of results of the practice included graphs and tables with statistical information (i.e. averages, proportions, trends). This presentation of the results of the practice was very enlightening to the CHWs. They realized for example the need to fully understand the concepts about pesticides and health, how the questions they asked to the volunteers were transformed into results (e.g. percentage of people thinking that pesticides harm health, percentage of people knowing how pesticides enter to the body, etc.), and how a mistake in marking the answers would hamper the results of the research. Additionally, during Training II, the CHWs had the opportunity to share their experience and challenges when conducting the questionnaire while receiving comments from the other CHWs about the successful ways to address these challenges.

Moreover, the responses to the questionnaires practiced helped the author of this study to rephrase and re-organize the order of the questions and the type of responses. For example, the scale was changed from a 3-point to a 4-point Likert scale. Thus, after this second training, the CHWs received an edited and enhanced version of the questionnaire and a field package with the maps and screening forms to recruit participants, consent forms, random assignment envelopes, and all the forms to record the field activities of the study. *Training I* and *Training II* helped to reduce interviewer effects and systematic errors in data collection and implementation of the protocol as planned.

Training III was also facilitated by the author to instruct CHWs about the key messages and recommendations to help participants reduce pesticide exposures and about the teaching techniques to facilitate the community talk. The learning objectives of this training are based on concepts and recommendations to conduct train-the-trainer adults about environmental health

issues (Agency for Toxic Substances and Disease Registry, 1994; Fink, 2003; Lundgreen R. M., 2004; National Research Council, 2009; Liebman A. , Galván, Juárez, & Sáenz, 2006; Wiggins G. , 1998). This training for CHWs was conducted one week prior to the facilitation of the talks to the participants of experimental group 1. The author facilitated this training with the support of the field coordinator *Claudia Y. Laffont C.*, and was attended by the 11 CHWs and the field coordinator of El Paso areas.

The training was divided into five main exercises. *Exercise 1* explained the goals of this training and logistic issues. *Exercise 2* provided the talk to the CHWs as if they were participants. *Exercise 3* asked participants to summarize the information through brainstorming, asking general questions, and promoting open discussions to corroborate the concepts learned. *Exercise 4* requested participants to role-play the talk in 3-member teams. *Exercise 5* provided feedback to the CHWs role-playing the talk. The feedback was provided by the facilitator and the members of the group observing the role-play. Finally, the CHWs attending *Training III* were asked to provide feedback on the content, activities, instructions, and handouts of the guide of the talk, and about the slides of the power point presentation.

For role-playing, the CHWs received a binder with the guide of the talk. First, following the think-pair-share instructional concept, the CHWs were asked to read the guide individually, then to work in teams of two to three members to exchange comments about the guide, handouts, slides of the presentation, and to clarify concepts and messages, learning objectives, steps to follow and to prepare a presentation of the talk. Secondly, the teams were asked to role-play a talk on which each CHW practiced two or three activities of the talk. Thirdly, the rest of the CHWs were asked to evaluate the role-play and provide constructive feedback to the CHWs

presenting the talk. The feedback of the practice was provided according to a structured form to evaluate the performance of the CHWs during the role-playing.

The structured form to evaluate the performance of the CHWs during the role-play assessed if and how the CHWs addressed the following issues: what are pests and the purpose of pesticides; the ways pesticides enter the body; the length of time when symptoms or diseases may appear (short or long term effects); the health effects appearing shortly or after long time after exposure to pesticides; the characteristics that make children more susceptible to risks; the practices that prevent pest proliferation; the practices that reduce exposure to pesticides, the safety practices when using insect repellents with children; how to reduce exposure to pesticides applied nearby the house; what to do after an accidental exposure to pesticides. The role-players received also feedback on the way they provided the instructions and the summary of the information during the role-play.

During Training III, the CHWs answered pre and post tests to examine the immediate knowledge changes. The tests asked various concepts and facts with dichotomous answers (yes, no) such as what is a pest, what is the purpose of pesticides, how the pesticides enter to the body, what are main sections of the label of a pesticide, the main symptoms appearing shortly after exposure, the main diseases appearing after long term exposures, the characteristics of children that make them more susceptible to harms by exposure to chemicals, what to do in the case of an accidental exposure to pesticides, the practices to prevent pest proliferation, safety practices to reduce exposure to pesticides, safety practices when applying insect repellents to children, and recommendations to reduce exposure to pesticides applied nearby the house.

The answers were computed into a composite variable *Knowledge Level* on which the correct answers were converted into points for a total of 86 points in both the pre and posttests. The mean knowledge scores of the 11 CHWs changed from 79.3 average points (SD 3.8, range from 72 to 81points) in the pre test to 83.8 average points (SD 1.6, range from 81 to 86 points) in the posttest. The difference between the means of the pre and posttest was computed with paired t-tests. The changes in the composite variable of knowledge level were significant between the pre and posttests ($p=0.001$). Finally, after answering the posttest, the correct responses to each question of the test were addressed by the facilitator and discussed by the whole group to ensure all the CHWs understood the background information, concepts, and messages about pesticides and health. Similarly, the learning objectives and the key messages of the talk were repeated and summarized by the facilitator at the end of this training session to ensure the CHWs understand and accomplish these during the facilitation of the talk.

Additionally, at the end of this training the CHWs were asked to provide feedback and recommendations to improve the guide, the presentation, and the handouts of the talk. The feedback was very rich because the CHWs were part of the talk, making easy for them to relate to the doubts and difficulties of potential attendees to the talk. Therefore, some terms were re-worded, activities were re-organized, and the handout forms were edited accordingly. Few days after *Training III*, CHWs received a three ring binder with the guide to facilitate the talk, the CD with the presentation, and the handouts necessary for all the participants to the small group talk. Additionally, the CHWs received the invitations to the talk to distribute to the participants of group 1. The invitations had blank spaces on which the CHWs fill out the date and time of the talk according to the schedule of the talks of each site.

3.4 Recruitment of Participants

3.4.1 Eligibility Criteria

This study selected women to participate for various reasons. Women would be able to respond more accurately and reduce recall bias about the practices of the family regarding the application of pesticides and the household cleaning and pest prevention actions. Additionally, women would be able to report the application of pesticides prior and during pregnancy and breastfeeding period of their children. Moreover, acknowledging the beliefs of women mothers of children about pesticides and health would help develop programs and educational campaigns to reduce exposures to children in the places they live and play.

The criteria to be eligible to participate in this study were ascertained through the *Eligibility Criteria Script and Checklist Form* (Refer to Appendix 4). Before conducting this checklist, the recruiters asked for an adult to answer the questions, more specifically, the interviewer requested if the homemaker or woman head of the household was available. To reduce selection bias, all the interviewers were instructed to read the script included in the form to all the homemaker/woman head of the household potential participants. The script explained briefly the purpose of the visit and the need to ask few questions to see if she would be eligible to participate.

To assess eligibility, the screening form included nine dichotomous questions. Potential participants were asked the following questions:

1) Was any pesticide product used in this house during the summer (2009)?
2) Are you the woman head-of-the household?
3) Are you 18 years of age or older?

4) Do you have at least one child 11 years of age or younger living in this home?

5) Do you consider yourself Hispanic or Latino? (asked only to U.S. participants)

6) Do you speak and read Spanish? (asked only to U.S. participants)

7) Are you pregnant, and if so, are you 24 weeks or less?

8) Have you ever participated in any educational activity about pesticides?

9) Have you ever received any educational material about pesticides?

The potential participant was eligible if she answered "yes" to the first six questions and to the seventh question only if the woman was pregnant, and if the person answered "no" to the 8^{th} and 9^{th} questions. This study considered as safe the limit of 24 weeks of pregnancy for the completion of the study by the pregnant women. The completion of the study was estimated at 4 to 7 weeks, and would require the participant to attend a talk in a community center, clinic, or school, and to accept a second visit to answer questions for over an hour. Such efforts would be difficult or impose a risk to the pregnant women.

If the person was eligible, the interviewer proceeded with the steps to invite and enroll the participant to the study. The steps conducted during the enrollment of participants are described in the section titled "First household visit." When the person answering the door was not eligible, the interviewer explained the reasons for not being eligible by explaining the aim of the study (e.g. examine the effects of educational methods in the use of pesticides by Hispanic, Spanish-speaking women mothers of children of 11 years of age and less). Thus, the interviewer thanked the person for her time and delivered a flyer with the information of the respective partner community organization and the services.

Despite the fact that children did not participate directly in this study, the questionnaire requested information about the children living in the house who were 11 years of age or less. The EPA recommends collecting data according to specific age stages deemed important during exposure to environmental contaminants (2009). The children within the age range selected for this study have characteristics such as undergoing major anatomical/physiological characteristics (i.e. rapid growth, increase proportion of body fat, and immature body functions) and with typical behaviors such as hand-to-mouth behavior, proximity to floor dust and contaminants, long periods of time spent indoors, just before entering to the anatomical, physiological, and behavioral changes occurring during puberty (Environmental Protection Agency, 2009; Firestone, Moya, Cohen-Hubal, Zartarian, & Xue, 2007). The information collected about children include: age and sex, if the child was breastfed and for how long, if pesticides were applied inside the house during pregnancy and during the first 3 years of age of the child, if the child suffers from frequent cough, and if the child has been diagnosed with asthma, allergies (i.e. nose, eyes, throat), skin allergies, and/or diabetes.

3.4.2 Informed Consent and Confidentiality of Information

The researcher of this study, the field coordinators, and the community health workers (e.g. recruiters/interviewers) completed the Human Subject Research & Ethics Training as required by the University of Texas at El Paso’s Institutional Review Board. The author of this dissertation facilitated the IRB Training in Spanish to the field coordinators and the community health workers. Additionally, the researcher completed the NIH Ethics Module. The Institutional Review Board Committee of the University of Texas at El Paso (UTEP) approved this study with

number 123633-1 granted on July 20, 2009. All participants signed the consent form in Spanish before participating in this study.

The 2-page consent form for the participants was designed in an easy-to-read way with simple and short sentences in Spanish. The transcript of this form in English resulted in 8.7 Flesch-Kincaid Grade Level. Two consent forms were available, one for the participants in México and one for the participants in the U.S. The difference between these two consent forms consisted of the names and phone numbers to contact and the amount and method to compensate participants for their time during their participation. In the U.S., the consent form included the name, phone number, and email address of the researcher of this study plus the name and phone number of a person in the Office of Research and Sponsored Projects (ORSP) of the University of Texas at El Paso.

In México, the consent form included the name and contact information of the field coordinator of the study working in one of the partner organizations in Ciudad Juárez, plus the name and phone number of the contact person in the ORSP. It was necessary to provide different phones in the consent form in order to reduce the burden of participants of Ciudad Juárez when making an international call to El Paso, TX and to facilitate the communication of the participant with the responsible of the study and address doubts or concerns about the study. The consent form does not include addresses or phone numbers of the participants.

The participant signed two forms and the interviewer signed the forms adding the date and time of the signature. One consent form with the signatures was delivered to the participant and the other consent form signed was collected for the files of this study.

Additionally, we compensated the participants by giving them $20 dollars in the U.S. and $200 Mexican pesos in México (which is roughly equivalent to $20 in the U.S.) for their time devoted to the study. The interviewers delivered the compensation in two different occasions, half at the end of the first visit, and the other half when completing the study (e.g. after attending the talk). U.S. participants received the incentive in cash, whereas the participants of México received the compensation in coupons redeemable in every major store in Ciudad Juárez. The coupons were redeemed for any product except tobacco and alcohol items. The interviewers in Ciudad Juárez decided to provide the compensation with coupons because of safety precautions when carrying cash in the period of high insecurity in Ciudad Juárez. The interviewers collected the signatures of all the participants after receiving the compensation.

The information collected through structured questionnaires was scanned and transferred to a statistical database. Each participant was assigned a code during the interview. The information from each participant was managed through the code in all reports. To assure confidentiality, the database does not include addresses or names of the participants during the analysis of the database.

3.5 Data Collection

3.5.1 First Household Visit

Once the community health workers (CHWs) ascertained the eligibility of the participant and the potential participant signed the consent form, the interviewers provided an overview of the steps to follow during this first visit. Each CHWs are formally trained and certified CHW had a package with all the 42 questionnaires with the code number pre-assigned on the first page, an envelope with cards numbered according to the experimental group, the visual aids to help the

participant respond the questions, invitations to a group talk, the graphic booklets, and flyers with the information of the community organization.

The CHW followed four main steps during the interview in this first household visit. First, the CHW asked the questions of the first questionnaire to the participants explaining the procedure to answer the questions and showed the visual aids to the participant (refer to sections “structured questionnaires” and “visual aids” for detailed information about the questionnaire and visual aids). Second, once the first questionnaire was completed, the interviewer asked the participant to select a card from an envelope. These cards had the experimental group on them. The CHW registered the experimental group selected by the participant in the top-right corner of the questionnaire (the following section details the use of these cards during the random assignment procedure).

Third, the CHW provided the instructions to complete the educational intervention in the next weeks according to the experimental group chosen by the participant through the card. Fourth, the interviewer provided information about the second household visit and delivered the compensation. The CHW informed the participants of all groups that a second visit would be conducted in the next 4-6 weeks, and asked them the most convenient time and day of the week to visit for the second time. At the end of this first visit, the CHW delivered the compensation to the participants of all experimental groups and collected the signature in a signing sheet to record the receipt of the compensation. The following section details the procedure of random assignment of participants conducted during this first household visit.

3.5.2 Random Allocation of Participants to the Experimental and Control Groups

Each CHW had an envelope with 42 cards, 14 cards titled “Group 1,” 14 cards titled “Group 2” and 14 cards titled “Group 3.” Once the first questionnaire was completed and the CHw clarified all the doubts by the participant, the participant selected a card from the envelope without seeing the cards. The participant was allocated to the experimental group according to the title of the card chosen by the participant. The CWH wrote the number of the experimental group chosen by the participant in every page of the questionnaire.

After the participant selected the group, the CHW invited the participants of “Group 1” to attend a talk in the next one to two weeks by providing an invitation with the potential date of the talk. Similarly, during this first visit, the CHW delivered the graphic booklet to the participants selecting the card “Group 2” and invited them to read it at their most convenient time before the date of the second visit. Lastly, the interviewer did not give any further instruction to the participants selecting the card “Group 3,” except arranging with the participant the best time and potential date to return for a second visit to complete the second questionnaire.

3.5.3 Second Household Visit

The protocol of this study planned that the interviewer would return to the household of the participants of all experimental groups in 4-6 weeks after the first visit to conduct the second questionnaire. Once the second questionnaire was completed, the CHW thanked the participants of Group 1 for their time to complete the participation. For the participants of Groups 2 and 3, the CHW delivered an invitation to the talk planned in the following week or two. This procedure ensured that all participants benefited with the information provided in both the talk and the graphic booklet, independently of the group they were assigned.

3.5.4 Instrument: Two Structured Questionnaires

Participants answered the questions of two structured questionnaires, one during an interview during the first household visit and one during the follow-up visit, 4-6 weeks apart from each other as explained in the previous section. The structured questionnaires were completed with all the participants of the three experimental groups. The interviewers were community health workers (CHWs). The following sections describe how the instrument was validated and the content of the final version of the structured questionnaires.

3.5.4.1 Preparation of the structured questionnaires.

Prior to the completion of the structured questionnaires, the author prepared and piloted a draft instrument. The first design of the questionnaires was piloted by the CHWs with a sample of 33 volunteers selected conveniently. The CHWs invited friends and neighbors to answer the pilot questionnaire (refer to section “Trainings for community health workers” with more information about this practice). The volunteers were residents of both sides of the border and answered the same draft questionnaire 3-7 days apart. This draft of the questionnaire included 71 questions; some questions were dichotomous to examine knowledge and practices of the participants and some other questions on a scale of 1-3 points to rate the perceptions and beliefs of the participants. The volunteers completed the draft questionnaires in1:10 hours in average.

The pilot of the questionnaire accomplished three objectives; to examine the potential random or systematic errors in conducting or answering the questionnaire; to increase the familiarity of the CHWs with the question-answer procedure; and to examine the length of the questionnaire, rating scale, and detect the terms’ clarity, vagueness, or unknown by the

volunteers. Additionally, the pilot of the questionnaire helped determine the adequacy of the instructions, formatting, and sequence of questions.

The feedback from the CHWs and the comments from the volunteers were very helpful in improving the questionnaire; some questions of the questionnaire were rephrased, shortened, and changed with easier terms and other questions were re-arranged to make the order of thinking logical for the respondents and easier to follow by the CHWs. Moreover, the instrument was enhanced with succinct and clear instructions for the CHWs and additional phrases to read out loud to guide the participant throughout the answering process. The modifications to the questionnaires were intended to avoid fatigue and reduce bias and measurement errors by both the interviewer and the interviewee.

During the examination of the responses by the volunteers to the pilot questionnaire, I observed that volunteers tended to rate the extremes of the scale from 1-3, that is, volunteers tended to rate the question as very low (1) or very high (3), or to strongly agree (1) or strongly disagree (3), depending on the scale. I observed that respondents kept rating all the questions similarly, that is, all scales rated as one, two, or three, thus responses had low variation in the 1-3 point scale. Apparently, the 1-3 rating scale was understood by volunteers as a "yes-don't know-no" type of question, and the volunteer keep favoring a certain point in the scale. Therefore, regarding the questions rating the perceptions and beliefs of the participants, I re-designed the questions to assess participants' level of judgment of risks and agreement more accurately with a new scale with even number or response options. Thus, the scale was modified to a 1-4point Likert scale. This even number of points would prevent doubtful respondents choosing a middle point in the scale or to think in the responses as yes or no. A similar 1-4 point rating scale was

used in other studies examining perceptions about pesticides (Vaughan & Dunton, 2007; Arcury, Quandt, & Russell, 2002). Moreover, the analysis of the evaluation of the draft instrument helped to locate the mistakes, omissions, and misunderstandings of the CHWs when conducting the questionnaire.

3.5.4.2 Description of the structured questionnaires.

The final version of the first questionnaire is comprised of 26 pages with 71 questions and with 2 additional pages asking information about the children and the pesticides at home. This first questionnaire was completed in 58 minutes average. The follow-up questionnaire is comprised of 23 pages with 52 questions and was completed in 38 minutes on average. Both questionnaires include a space to record the code of the participant, date, experimental group number, and the starting and ending time. These two questionnaires differ in some respects and contain similar questions to address the changes in knowledge levels and practices or behaviors related with pesticides and health. Refer to Appendix 5 with the first structured questionnaire form and Appendix 6 with the second structured questionnaire form.

Both the first and second questionnaires differ in some respects. The first questionnaire includes questions to acknowledge some characteristics of the participants and general information about pesticide usage. The demographic information requested were age, years of residence in the city and in the house, place of birth, number of adults and children living in the house, income group, type of home ownership, number of rooms in the house. To acknowledge the general practices about pesticides of borderlanders, the questionnaire inquired about who applies pesticides in the house and when and how often they decide to apply pesticides. Additional questions asked if participants use pesticides with a label in a language they do not

understand, if they purchase pesticide products in the other country (e.g. in México or the U.S.), if they use any type of illegal pesticides (e.g. *polvo de avión* –airplane dust, Chinese chalk, and mothballs), and their level of trust on various sources and type of information about pesticides. Finally, the CHWs recorded the address and phone number of the participant to make arrangements for the second visit and the time the questionnaire was completed.

In addition, the first questionnaire includes two additional pages asking information about the children 11 years of age and younger and the pesticide products available during the first visit. The information collected about the children include age, sex, breastfed or not, and if pesticides were applied during pregnancy of the child and if the child has been diagnosed for asthma, allergies (nose, eyes, throat, skin), and diabetes, and if he/she complaints of frequent coughs. The information collected about the pesticide products included the name, method of application (spray, liquid, dust, etc.); the pest intended by the product and the pest for which the product was used by the participant, the registration number, and the regular place to store the pesticides. In contrast, the follow-up questionnaire omits these questions mentioned earlier and adds other general questions such as if participants applied pesticides since the time of the last visit and the reasons given by participants for not applying pesticides.

The two structured questionnaires contain several similar questions in order to compare changes between the first and second visits. These questions were grouped in four main sections. These sections included items to examine participants' knowledge levels, the practices conducted to prevent pest proliferation, the practices used to prevent or avoid exposure to pesticides, and the perceptions and beliefs about the risks of pesticides.

The section exploring the knowledge levels requested participants to answer what do they consider as pests, the purpose of pesticides, how pesticides enter to the body, what are the basic sections of the label of pesticides, some of the symptoms caused by exposure to pesticides, some of the diseases associated with pesticide exposures, and what to do in case of an emergency. The section of the questionnaire examining the practices of the participants to prevent pest proliferation included questions such as if the families get rid of clutter inside and outside the house, install traps & glues, and the frequency of washing dishes, cleaning surfaces and tables, vacuuming carpets and/or mopping floors, covering and storing food properly, taking the trash out and covering it, and ventilating the bathroom and kitchen after using them. Additionally, the first questionnaire included questions about the type and frequency of use of certain pesticide products.

The third section included questions about the basic safety practices conducted by the participants such as if the participants read the label before application of pesticides, follow the instructions of the label, wear gloves, long sleeve shirts, and pants during application of pesticides, apply pesticides when children are not present, cover food, cookware, and toys during application of pesticides, wash hands or take a bath after applying pesticides, ventilate the house after application, and keep the pesticide in the original container.

The last main section of the questionnaires requested participants to rate on a scale from 1 to 4-points various questions about their perceptions and beliefs regarding health and pesticides. Participants rated the likelihood of themselves and their children being harmed by pesticides, the severity of these health harms, the safety of pesticides applied inside and outside the house, the dangerousness of pesticides according to their smell or lack of smell, the

harmfulness of pesticides according to short or long-term exposures, the perceived risks of pesticides, the perceived benefits of preventing exposures, and the difficulty of following the recommendations to reduce exposure to pesticides. Finally, this section included questions to explore the confidence of participants in conducting practices that reduce exposures in the future.

3.5.4.3 Visual aids for some questions of the questionnaires.

During the completion of the first questionnaire, the CHWs utilized visual aids and forms to help participants understand and respond certain questions accurately. The visual aids were forms with the scales, pictures of pesticides, and a list of income groups. The form with the scales showed arrows between 1 and 4 to help participants determine the frequency of use of products and practices according to certain statements, and the scales to rate their level of agreement and perceptions about the easiness, difficulty, likelihood, dangerousness, harmfulness, safety, and confidence of participants according to the statements in these type of questions.

Two pictures with pesticide products were used as visual aid during the completion of the questionnaire. One picture included products considered illegal for domestic use in this study such as *polvo de avión* [airplane dust], mothballs, and Chinese chalk (Environmental Protection Agency, 2010) and another picture with the products that have high indoor air emissions such as sprays, bombs, and fogs (National Pesticide Telecommunications Network, 2001).

The last visual aid was a form with a list of income groups. This form was used to prevent the uneasiness of participant when answering the family income and prevent refusals to answer this question. The CHWs asked the participant to point out the income group on this form on which the income would fall and recorded the income group in the respective question of the questionnaire. Since this is a binational study, two lists with income groups were prepared, one

for the U.S. and one for México, according to the currency and most prevalent incomes of each site.

3.6 Operational Definitions of the Outcome Variables

3.6.1 The Outcome Variables

To examine the effectiveness of the educational methods (the independent variables), the structured questionnaires collected information to measure changes in the knowledge levels and practices (the dependent variables) of the participants that prevent or reduce exposures to residential pesticides after their participation on either educational intervention (e.g. group talk or graphic booklet). Three dependent variables were analyzed as composite variables. To examine the knowledge changes of participants as stated in the research question 1, this study computed a composite variable titled *knowledge level*. To examine the changes in the practices as stated in research question 2, this study computed one composite variable titled *pest prevention*. Similarly, to examine the changes in the practices as stated in research question 3, this study computed one composite variable titled *safety practices*. Each composite variable was computed with several questions and the correct answers to these questions were converted into points. Additionally, to answer research question 4, the structured questionnaires included several statements to examine the perceptions and beliefs of participants according to the constructs of the Health Belief Model.

Several sources were used for the selection of topics to determine the content of the questionnaire such as environmental agencies (U.S. Environmental Protection Agency, 2009; 2005), health related agencies and organizations (AAP Committee on Envioronmental Health, 2003; Centers for Disease Control and Prevention, 2008), and researchers (Adgate, et al., 2000; Berkowitz G. , et al., 2003; Bass J. , Ortega, Rosales, Petersen, & Philen, 2001; Belson, et al.,

2003; Black, Shalat, Freeman, Jimenez, Donnelly, & Calvin, 2005; Rao, 2008; Roddy, O'Rourke, & Mena, 2005; Saller, Reyes, Maldonado, Gibbs, & Byrd, 2007).

Similarly, the statements to examine the beliefs and perceptions of participants about the risks of pesticides were determined according to the results of studies published by other researchers and on the risk prevention recommendations by environmental and health agencies as described in Chapter II and in the section “The educational methods tested in this study” of this chapter. The following sections describe the questions and statements and the operational definitions of the composite variables.

3.6.2 Research Question 1: Knowledge Level

To answer research question 1 (which of the two educational methods tested in this study is more effective in increasing the level of knowledge of participants about residential pesticides and health?), this study computed one composite variable titled *knowledge level.* This composite variable measured the level of knowledge of participants regarding basic information about pests, pesticides, and health.

The questions computed for the composite variable *knowledge level* include the pests known by the participant, the purpose of pesticides, the routes of entry of pesticides into the body, the basic sections of the label of pesticide products, the basic list of symptoms appearing shortly after exposure to pesticides, a basic list of the diseases associated with exposure to pesticides, and what to do in the case of an accidental exposure. The participant received a point if answered “yes” to these questions.

The effectiveness of each educational method (independent variable) was determined in this study as the change in the dependent variable, *knowledge level*, before and after the

participant was exposed to either educational method. The effectiveness was determined as the difference between the average points of the scores of the composite variable *knowledge level* computed before and after the interventions. Table 3.14 lists the questions and the number of points computed for this composite variable.

Table 3.14. Concepts Computed for the Composite Variable *Knowledge Level*

Dependent Variable (composite)	**Questions included in the computation of the dependent variable**	**Num. of points according to the correct responses**
Knowledge Level Level of knowledge of participants about pests, pesticides, and health	Q1: What is pest (list of various pests)	0-8
	Q2: Purpose of pesticides (list of 3 purposes)	0-3
	Q3: Routes of entry of pesticides to the body (list of 5 routes of entry)	0-5
	Q4: Label sections of pesticide products (list of 5 basic sections)	0-5
	Q5: Symptoms appearing shortly after exposure (list of 8 common symptoms)	0-8
	Q6: Diseases associated with exposures to pesticides (list of 7 common diseases)	0-7
	Q7: What to do in an accidental exposure to pesticides	0-1

3.6.3 Research Question 2: Pest Prevention

To answer research question 2 (Which of the two educational methods tested in this study is more effective in the adoption of practices by the participants that prevent pest proliferation without the use of pesticides?), this study computed the composite variable titled pest *prevention*. This composite variable measured the number of practices conducted by participants to prevent pest proliferation without using pesticides. Table 3.15 lists the actions of participants computed for the variable *pest prevention* and the number of points (correct answers) per question.

The variable *pest prevention* was computed with the practices reported by participants such as getting rid of clutter inside frequently, getting rid of clutter outside the house frequently, installing traps and glues frequently, washing dishes, cleaning surfaces, and vacuuming carpets and mopping floors frequently, covering food and store it appropriately frequently, taking the

trash out frequently, keeping the trash outside covered, and ventilating the bathroom and kitchen frequently to reduce humidity and prevent mold.

Table 3.15. Practices of Participants Computed for the Composite Variable *Pest Prevention*

Dependent Variable (composite)	**Questions included in the computation of the dependent variable**	**Num. of points according to the correct responses**
Pest prevention Practices of participants that prevent pest proliferation without using pesticides	Q15a: Get rid of clutter inside the house	0-1
	Q15b: Get rid of clutter outside the house	0-1
	Q15d: Install traps & glues	0-1
	Q16a: Wash dishes frequently	0-1
	Q16b: Clean surfaces frequently	0-1
	Q16c: Vacuum or mop carpets and floors frequently	0-1
	Q16d: Cover and store food frequently	0-1
	Q16e: Take trash out frequently	0-1
	Q16f: Ventilate bathroom after use frequently to reduce humidity	0-1
	Q16g: Ventilate kitchen after use frequently to reduce humidity	0-1
	Q16h: Cover the trash outside frequently	0-1

The practices answered as “yes” by the participants were transformed to points. The effectiveness of each educational method (independent variable) was determined in this study as the difference between the average points of the scores of the composite variable *pest prevention* computed before and after the interventions.

3.6.4 Research Question 3: Safety Practices

To answer research question 3 (Which of the two educational methods tested in this study is more effective in the adoption of safety practices by participants?), this study computed the composite variable *safety practices*. This variable *safety practices* measured the practices of the participants performed before, during, and after application of pesticides in the house that prevent and reduce exposure to pesticides to themselves and their family.

The variable *safety practices* included practices performed by participants such as reading the label of the pesticide and following its instructions before application of pesticides,

wearing long sleeves, pants, and gloves during application of pesticides, application of pesticides when children are not present, covering food, cookware, and toys during application of pesticides, washing or taking a bath after application of pesticides, ventilating the house after application of pesticides, and storing the pesticides in the original container. The participants were assigned a point if they reported performing these practices.

The effectiveness of each educational method (independent variable) was determined in this study as the difference between the average points of the scores of the composite variable *safety practices* computed before and after the interventions. Table 3.16 lists the practices of participants that measure the dependent variable safety *practices*.

Table 3.16. Practices of Participants Computed for the Composite Variable *Safety Practices*

Dependent Variable (composite)	**Questions included in the computation of the dependent variable**	**Num. of points according to the correct responses**
Safety practices Practices of participants that reduce exposures to pesticides when using pesticides	Q20a: Read label before application of pesticides	0-1
	Q20b: Follow instructions of the label	0-1
	Q21a: Wear long sleeves and pants during application	0-1
	Q21b: Wear gloves during application	0-1
	Q21d: Apply pesticides when children are not present	0-1
	Q21e: Cover food and cookware during application	0-1
	Q21f: Cover or store toys during application	0-1
	Q22: Wash or take a bath after application	0-1
	Q23: Ventilate the house/rooms after application	0-1
	Q28: Keep pesticides in original container	0-1

3.6.5 Research Question 4: Perceptions of Participants and the Health Belief Model

To answer the research question 4, which is the examination of the perceptions and beliefs of participants about pesticides and health according to the Health Belief Model (HBM), the ratings of participants were grouped into various categories according to the constructs of the HBM. The statements selected for each question measuring the participants' perceptions of risks

and health are based on studies published by other researchers (Vaughan & Dunton, 2007; Arcury, Quandt, & Russell, 2002; Quandt, Doran, Rao, Hoppin, Snively, & Arcury, 2004; Byrd, VanDerslice, & Peterson, 2001; Martinez, Gratton, Coggin, Rene, & Waller, 2004; Nieuwenshuijsen, Grey, Golding, & Alspac Group, 2005; Rao, Quandt, Doran, Snively, & Arcury, 2007; Saller, Reyes, Maldonado, Gibbs, & Byrd, 2007; Sklansky, Mundt, & Katcher, 2003) and in the beliefs and perceptions observed by the author of this dissertation in previous projects implemented in the Paso del Norte area (Juárez-Carrillo, Liebman, & Corella-Barud, 2009; Liebman, Juárez, Leyva, & Corona, 2007). Moreover, the present study included questions in the structured questionnaire to acknowledge additional perceptions of participants deemed important to guide future studies, interventions, and campaigns addressing the risks of pesticides by Hispanic populations.

Although some publications report using the Health Belief Model (HBM) regarding pesticides (see Chapter II), no scale was located that could be suitable to examine the dimensions of the HBM related with residential pesticide use in border populations. Therefore, this study developed several statements to recognize the perceptions of Hispanics mothers living in the U.S.-Mexico border about health and residential pesticides and were grouped into the constructs of the HBM (Hochbaum, 1958 and Rosenstock, 1966, as cited in Strecher, Champion, and Rosenstock, 1997; Gochman, 1997).

The questions included in this section of the questionnaire examined the perceptions of the participants about health harms, barriers to conduct safer practices, benefits of reducing exposure to pesticides, and the confidence of the participants to adopt practices that prevent and reduce these risks. Each variable measuring the perceptions of participants were examined

independently to acknowledge variations and the salient judgments of the participants about the risks of pesticides.

Additionally, the salient perceptions of participants about pesticides and the health harms were analyzed according to certain factors (e.g. characteristics of the participants).

The factors that could be associated with the perceptions of participants included age, family income, years of school education, number of children, home ownership (e.g. rental, homeowner), number of years living in the city and in the house.

Based on the diagram provided by Champion and Skinner (2008, p. 49), this study examined the correlation between the perceptions of participants about the risks of residential pesticides to health according to the constructs of the Health Belief Model (HBM) and selected factors such as participants' social-demographic characteristics and their scores about knowledge, pest prevention, and safety practices conducted by participants (see Figure 3.3). The responses of participants and the factors predicting such perceptions would help future studies determine a scale and understand the salient perceptions, beliefs, and behaviors that are associated with increased risks of exposure to pesticides used in residential settings. The following sections describe the specific statements and variables examining the perceptions of participants according to the constructs of the HBM.

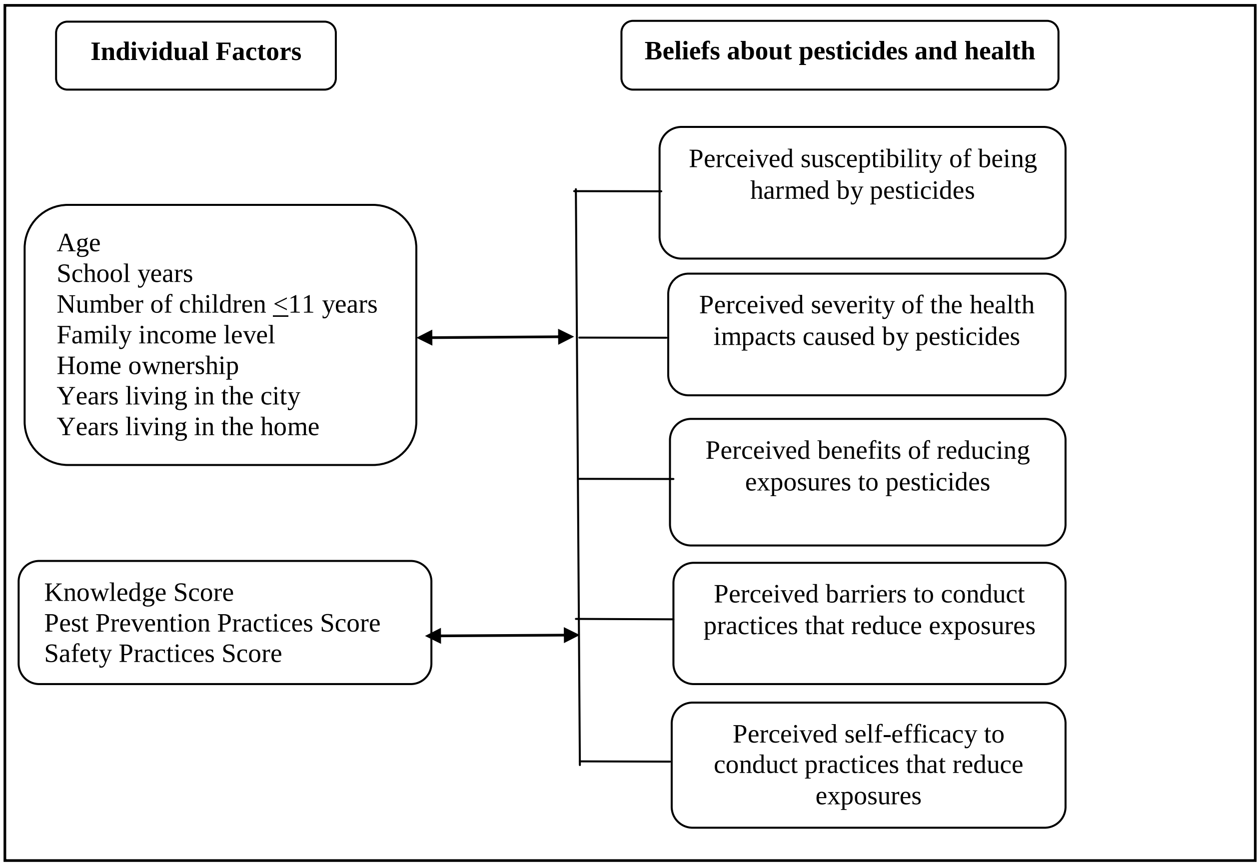

Figure 3.3. Perceptions about Pesticides and Health According to the Health Belief Model.

3.6.5.1 Perceived susceptibility.

The questionnaire included several questions with statements grouped within the construct *perceived susceptibility*. These questions requested participants to rate the likelihood of being harmed in general (*Susceptibility 1*) and of having some particular diseases by exposure to pesticides (*Susceptibility 2*).The statements grouped in *susceptibility 1* were analyzed independently and included three statements. These statements asked participants to rate the likelihood of being harmed, of her children ≤11 years of age being harmed, and her unborn baby (in case she was pregnant) of being harmed. The likelihood of being harmed by exposure to

pesticides was rated by participants with a scale from 1 (not likely) to 4 (very likely). Refer to Table 3.17 with the statements and rating scale grouped in the construct *Susceptibility 1*.

Table 3.17. Perceived Susceptibility to General Health Harms Caused by Pesticides

HBM Constructs	**Statements How likely is that pesticides applied in your house...?**	**Rating scale**
Susceptibility 1: Perceptions of being harmed by pesticides	Q39a: Harm your health	Likelihood of being harmed 1(not likely) to 4(very likely)
	Q39b: Harm the health or your children≤11 years of age	Likelihood of being harmed 1(not likely) to 4(very likely)
	Q39c: Harm the health of your unborn child (in the case you were pregnant)	Likelihood of being harmed 1(not likely) to 4(very likely)

The statements grouped in the construct *susceptibility 2* were analyzed independently to determine the participants' judgment of the likelihood of having a disease or illness associated with exposure to pesticides. The statements about the likelihood asked participants to judge the likelihood of having health problems such as fertility problems, problems of the nervous system, cancer, and allergies (respiratory and skin).

Participants were asked to rate the likelihood of harmfulness according to these statements with a scale from 1 (not likely) to 4 (very likely). Refer to Table 3.18 with the statements and rating scale grouped in the construct *Susceptibility 2*.

Table 3.18. Perceived Susceptibility to Specific Health Harms Caused by Pesticides

HBM Constructs	**Statements How likely is that the pesticides people apply in the house...?**	**Rating scale**
Susceptibility 2: Perceptions of having a disease caused by exposure to pesticides	Q40a: Reduce the ability of men and women to have children	Likelihood of being harmed 1(not likely) to 4(very likely)
	Q40b: Cause problems in the brain or nervous system	Likelihood of being harmed 1(not likely) to 4(very likely)
	Q40c: Cause certain type of cancer	Likelihood of being harmed 1(not likely) to 4(very likely)
	Q40e: Cause allergies (respiratory and skin)	Likelihood of being harmed 1(not likely) to 4(very likely)

3.6.5.2 Perceived severity.

To acknowledge the perceptions of participants about the severity of pesticides, this study examined several statements grouped in four types of perceived severity. These statements were analyzed independently. Participants were asked to rate the perceived severity of the health harms in general (*Severity 1*), the perceived severity of the toxicity of pesticides for children ≤11 years of age according to the type of application *(Severity 2)*, the perceived severity of the toxicity of pesticides for children ≤11 years of age according to the site of application in the house (*Severity 3)*, and the perceived severity of risks of pesticides in general (*Severity 4).*

The perceptions of participants about the severity of the health harms caused by pesticides (*Severity 1)* were examined with statements asking participants to judge the level of easiness or difficulty to treat and/or cure general health harms such as symptoms, diseases, or poisonings. Participants were asked to rate their judgment about the easiness to cure or treat these ailments on a scale from 1 (not easy to cure) to 4 (very easy to cure). Table 3.7 lists the statements grouped in construct *Severity1*.

Table 3.19. Perceived Severity of the Harms Caused by Pesticides

HBM Construct	**Statements How easy you think it is to...?**	**Rating scale**
Severity 1: Perceived severity of the health harms caused by exposure to pesticides	Q41a: Treat the symptoms caused by pesticides	Easiness to treat/cure 1 (not easy) to 4(very easy)
	Q41b: Cure the diseases caused by pesticides	Easiness to treat/cure 1 (not easy) to 4(very easy)
	Q41c: Cure/treat poisonings by pesticides	Easiness to treat/cure 1 (not easy) to 4(very easy)

Participants were requested to judge the easiness to treat or cure health harms in general with three statements grouped within the construct *Severity 2*.

Table 3.20. Perceived Severity of the Harms to Children by Types of Pesticide Application

HBM Construct	Statements How safe are for your children ≤11 years of age...?	Rating scale
Severity 2: Perceived toxicity of pesticides to children according to the type of application	Q42a: The pesticides applied inside your house	Safety of pesticides 1(not safe at all) to 4(very safe)
	Q42b: The pesticides applied outside your house	Safety of pesticides 1(not safe at all) to 4(very safe)
	Q42c: The pesticides applied by the exterminator (hired by you or by the owner of the house)	Safety of pesticides 1(not safe at all) to 4(very safe)

These statements examined the perceived severity of pesticides according to the type of application. Participants were asked to judge the safety of pesticides to their children 11 years of age and younger if pesticides are applied indoors, outdoors, or by an exterminator. These statements were analyzed independently. Participants rated the statements on a scale from 1 (not safe at all) to 4 (very safe).Table 3.20 lists the statements grouped in construct *Severity2.*

The perceptions of participants about the severity of the toxicity of pesticides to children ≤11 years of age according to the site of application in the house (*Severity 3*) were analyzed independently. Participants were provided with statements and were asked to rate the safety of application of pesticides in kitchen cabinets, kitchen floors, rooms of children ≤11 years of age, and in play areas. These statements were rated by participants on a scale from 1 (not safe at all) to 4 (very safe).Table 3.21 lists the statements grouped in construct *Severity 3.*

Table 3.21. Perceived Severity of the Harms to Children by Site of Application

HBM Construct	Statements How safe it is to your children ≤11 years of age...?	Rating scale
Severity3: Perception of toxicity of pesticides according to the site of application	Q43a: To apply pesticides in the kitchen cabinets	Safety according to site 1 (not safe at all) to 4 (very safe)
	Q43b: To apply pesticides in kitchen floors	Safety according to site 1 (not safe at all) to 4 (very safe)
	Q43c: To apply pesticides in children's bedroom	Safety according to site 1 (not safe at all) to 4 (very safe)
	Q43d: To apply pesticides in the places where children play inside the house	Safety according to site 1 (not safe at all) to 4 (very safe)

Lastly, participants were asked to rate their level of agreement with several statements to examine the perceived severity of the risks to pesticides in general (*Severity 4*). Refer to Table 3.22 for the statements grouped in construct *Severity 4*. These statements were analyzed independently. Participants rated how much they agree with statements such as: pesticides do not harm children because pesticides are made to target only pests, little amount of poison does not harm children, pesticides do not reach the unborn babies, and pesticides do not reach breasted babies because pesticides cannot be in the breast milk. The participants rated these statements on a scale from 1 (totally disagree) to 4 (totally agree).

Table 3.22. Perceived Severity of Harms Caused by Pesticides

HBM Construct	**Statements How much do you agree with the following...?**	**Rating scale**
Severity 4: Perception of the general risks of pesticides	Q48a: Pesticides do not harm children because pesticides are made only to target pests	Agreement with statements of risk 1 (totally disagree) to 4 (totally agree)
	Q48b: Little amount of poison does not harm children	Agreement with statements of risk 1 (totally disagree) to 4 (totally agree)
	Q48c: Pesticides do not reach the unborn child of a pregnant woman	Agreement with statements of risk 1 (totally disagree) to 4 (totally agree)
	Q48d: Pesticides do not reach breastfeed children because pesticides cannot be in the breast milk	Agreement with statements of risk 1 (totally disagree) to 4 (totally agree)

3.6.5.3 Perceived benefits.

Participants were asked to respond statements to acknowledge their perceived benefits when using less quantity of pesticides and using them correctly are grouped in the constructs *Benefits 1* and *Benefits 2* respectively. The statements grouped in *Benefits 1*were analyzed independently to examine the participants' level of agreement of the benefits of using less pesticide in the house. Table 3.23 lists the statements grouped within the construct *Benefits 1*. Participants rated statements such as "if you apply less quantity of pesticide in your house, how

much do you agree that…you will not be harmed by pesticides, your unborn baby will not be harmed by pesticides, the baby you are breastfeeding would not be harmed, and your children ≤11 years of age would not be harmed by pesticides." Participants were asked to rate their level of agreement to these statements on a scale from 1 (totally disagree) to 4 (totally agree).

Table 3.23. Perceived Benefits of Using Less Pesticide in the House

HBM Constructs	**Statements** **How much do you agree with the following: If you apply less quantity of pesticides in your house...?**	**Rating scale**
Benefits 1: Perceived benefits by using less quantity of pesticides	Q49a: Your health would not be harmed by pesticides	Agreement with statements of benefits 1 (totally disagree) to 4 (totally agree)
	Q49b: The health of your unborn child would not be harmed (in the case you are pregnant)	Agreement with statements of benefits 1 (totally disagree) to 4 (totally agree)
	Q49c: The health of your breastfeed child would not be harmed	Agreement with statements of benefits 1 (totally disagree) to 4 (totally agree)
	Q49d: Your children ≤11 yrs. of age would not be harmed by pesticides	Agreement with statements of benefits 1 (totally disagree) to 4 (totally agree)

Similarly, the statements grouped in *Benefits 2* were analyzed independently to examine the salient perceptions of participants about the obstacles to conduct the recommendations (see Table 3.24).

Table 3.24. Perceived Benefits of Using Residential Pesticides Correctly

HBM Constructs	**Statements** **How much do you agree with the following: If you apply pesticides correctly...**	**Rating scale**
Benefits 2: Perceived benefits of applying pesticides correctly	Q50a:Your house would be less contaminated by pesticides	Agreement with statements of benefits 1 (totally disagree) to 4 (totally agree)
	Q50b: Your house would be without pests	Agreement with statements of benefits 1 (totally disagree) to 4 (totally agree)
	Q50c: You would save money by purchasing fewer pesticide products	Agreement with statements of benefits 1 (totally disagree) to 4 (totally agree)
	Q50d: Pests would be controlled to the point of not harming the health of your family	Agreement with statements of benefits 1 (totally disagree) to 4 (totally agree)
	Q50e: Pests would be controlled to the point of not bothering your family	Agreement with statements of benefits 1 (totally disagree) to 4 (totally agree)
	Q50f: Pests would be controlled to the point of not damaging your property	Agreement with statements of benefits 1 (totally disagree) to 4 (totally agree)

Participants rated their level of agreement about the benefits of applying pesticides correctly. Table 3.24 illustrates the list the statements grouped in the construct *Benefits 2.* These statements are "If you apply pesticides correctly…your house would be less contaminated with pesticides; your house would be free of pests; you would save money by purchasing less pesticide products; the pests would be controlled to the point of not disturbing your family; and the pests would be controlled to the point of not destroying your property." Participants were asked to rate their level of agreement with these statements on a scale from 1 (totally disagree) to 4 (totally agree).

3.6.5.4 Perceived barriers.

The structured questionnaire included several statements to examine the barriers perceived by participants to conduct preventive and safety practices related with pesticides used at home. These statements are grouped into four constructs titled *Barriers 1, Barriers 2, Barriers 3*, and *Barriers 4*.

The statements grouped in *Barriers 1* were analyzed independently and asked participants to judge how difficult it would be for them to perform practices that prevent pests. proliferation . Table 3.25 details the statements grouped in the construct *Barriers 1*.

These statements requested participants to rate how easy or difficult it would be to wash dishes, clean surfaces, and vacuum carpets or mop floors frequently, take the trash out frequently and keep it covered, ventilate the bathroom and kitchen frequently to prevent mold, and to conduct deep household cleaning to prevent pests. Participants were asked to rate these statements on a scale from 1 (not difficult at all) to 4 (very difficult).

Table 3.25. Perceived Barriers of Participants to Prevent Pest Proliferation

HBM Construct	**Statements** **How difficult would be to you to...**	**Rating scale**
Barriers 1: Perceived barriers of participants to conduct practices that prevent pest proliferation	Q51a: Wash dishes frequently	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q51b: Clean kitchen, tables, surfaces frequently	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q51c: Vacuum/mop frequently	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q51d: Take trash out daily	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q51e: Keep outside trash covered	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q51f: Ventilate frequently the bathroom after shower/bath to reduce humidity and prevent mold	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q51g: Ventilate the kitchen frequently after use to reduce humidity and prevent mold	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q52h: Conduct deep house cleaning periodically	Difficult to perform 1 (not difficult at all) to 4(very difficult)

The statements grouped in the construct *Barriers 2* examine the perceptions of participants about the ease or difficulty to conduct practices that reduce or prevent exposures to pesticides. Table 3.26 details the statements grouped in the construct *Barriers 2*. These statements were analyzed independently and ask participants to rate the level of difficulty to perform certain practices that reduce the need of pesticides.

Participants rated how difficult would be to control pests without using pesticides; use the correct pesticide for the pest intended; read the label before the application of pesticides; follow the instructions of the label when applying pesticides; use methods to destroy pests that do not have pesticides; avoid application of pesticides few months before getting pregnant; avoid application of pesticides during pregnancy; and avoid pesticide application during the breastfeeding period.

Table 3.26. Perceived Barriers of Participants to Reduce Exposure to Pesticides

HBM Constructs	**Statements How difficult would be to you to...?**	**Rating scale**
Barriers 2: Perceived barriers of participants to conduct practices that reduce exposure to pesticides	Q52a: Control pests without using pesticides	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q52b: Use the correct pesticide for the pest intended	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q52c: Read the label before application of pesticide	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q52d: Use only pesticides with registration number	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q52e: Understand the label	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q52f: Follow the instructions on the label	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q52g: Use methods that do not have pesticides to control pests	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q52i: Prevent application of pesticides few months before pregnancy	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q52j: Prevent application of pesticides during pregnancy	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q52k: Prevent application of pesticides during your child’s breastfeeding period	Difficult to perform 1 (not difficult at all) to 4(very difficult)

Participants rated these statements with a score from 1 (not difficult at all) to 4 (very difficult). The statements addressing the barriers of participants to conduct safety practices that reduce the exposures when applying pesticides are grouped in the construct *Barriers 3*. These statements were analyzed independently (see Table 3.27). The statements requested participants to judge the difficulty to perform behaviors such as wearing long sleeves, pants, and gloves during application of pesticides; wash or take a shower after application of pesticides; ventilate the place after application of pesticides; store the pesticide products in places unreachable to children; follow the instructions to apply insect repellents to children; prevent children applying insect repellent by themselves; and to wash or bathe children when the insect repellent is not needed. Participants were asked to judge the perceived difficulty of conducting these practices on a scale from 1 (not difficult at all) to 4 (very difficult).

Table 3.27. Perceived Barriers of Participants to Reduce Exposures to Pesticides During Application of Pesticides

HBM Construct	**Statements How difficult would be to you to...?**	**Rating scale**
Barriers 3: Perceived barriers of participants to conduct practices that reduce exposure when applying pesticides	Q53a: Wear long sleeves and pants during application of pesticides	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q53b: Wear gloves during application of pesticides	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q53d: Wash or take a shower after application of pesticides	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q53e: Ventilate the place after application of pesticides	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q53f: Store pesticides in places where children cannot reach	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q53g: Follow instructions of the label to apply insect repellent to children	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q53h: Prevent that children ≤11 yrs. apply insect repellent by themselves	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q53i: Wash or bathe children when insect repellent is no longer needed	Difficult to perform 1 (not difficult at all) to 4(very difficult)

An additional set of statements request participants to judge the difficulty to perform selected practices related with exposure to pesticides. These statements were examined independently and are grouped into the construct *Barriers 4* (see Table 3.28).

Table 3.28. Perceived Barriers of Participants to Conduct Practices that Reduce Contamination of the House during Application of Pesticides

HBM Construct	**Statements How difficult would be for you to...?**	**Rating scale**
Barriers 4: Perceived barriers of participants to conduct practices that reduce exposure to pesticides	Q54a: Prevent children being present during application of pesticides	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q54b: Reduce the contamination of floors & carpets with pesticides during application	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q54c: Stop using indoor pesticides in the form of spray, coils, vapor, or bomb	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q54d: Prevent the contamination of toys during application of pesticides	Difficult to perform 1 (not difficult at all) to 4(very difficult)
	Q54e: Prevent the contamination of dishes and cookware during application of pesticides	Difficult to perform 1 (not difficult at all) to 4(very difficult)

The statements ask participants to rate the difficulty to avoid children being present during application of pesticides; reduce the contamination of floors and carpets during application of pesticides; stop using pesticides indoors in the form of spray, coils, vapors, or bombs; and to avoid the contamination of toys, dishes, and cookware during the application of pesticides. Participants were asked to rate these statements on a scale from 1 (not difficult at all) to 4 (very difficult).

3.6.5.5 Perceived self-efficacy.

Finally, the questionnaire includes a series of statements to determine the level of confidence (self-efficacy) perceived by participants in performing practices that reduce pests without using pesticides and minimize exposures to pesticides of themselves and their children.

Table 3.29. Perceived Confidence of Participants to Conduct Safer practices that Reduce Exposures to Pesticides

HBM Construct	**Statements In the future, how sure are you that you can...?**	**Rating scale**
Self-efficacy 1: Perceived confidence of participants in conducting practices that reduce exposure to pesticides	Q55a: Apply pesticides when children are not present	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q55b: Prevent application of pesticides few months before pregnancy	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q55c: Prevent application of pesticides during pregnancy	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q55d:Prevent application of pesticides during your baby's breastfeeding period	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q55e: Get rid of pests without using pesticides	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q55f: Conduct deep house cleaning periodically to prevent pests	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q55g: Prevent contamination of toys during application of pesticides	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q55h: Prevent contamination of dishes and cookware during application of pesticides	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q56k: Reduce contamination with pesticides of floors and carpets	Level of confidence to do it 1 (not sure at all) to 4 (very sure)

These statements are grouped into three constructs, *Self-efficacy 1*, *Self-efficacy 2*, and *Self-efficacy 3*. Each statement was analyzed independently.

The questions included in *Self-efficacy1* asked participants to rate their confidence to conduct practices to reduce exposures to pesticides (see Table 3.29). Participants were asked to rate their level of confidence on a scale from 1 (not sure at all) to 4 (very sure). The statements asked participants how sure they were in the future to apply pesticides when children are not present; to avoid pesticide application few months before pregnancy, during pregnancy, and during breastfeeding period; to control pests without using pesticides; to conduct deep household cleaning frequently; to avoid contamination of toys and cookware during application of pesticides; and to reduce contamination of floors and carpets during application of pesticides.

Table 3.30. Perceived Confidence of Participants to Conduct Safer Practices When Applying Pesticides

HBM Construct	**Statements In the future, how sure are you that you can...?**	**Rating scale**
Self-efficacy 2: Perceived confidence of participants to perform actions that reduce exposure to pesticides	Q56a: Use only pesticides with registration number	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q56b: Stop using indoor pesticides in the form of spray, coils, vapor, or bomb	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q56c: Read the label before application	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q56d: Follow instructions of the label	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q56e: Apply the correct pesticide for the pest intended to control/destroy	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q56f: Wear long sleeves and pants during application of pesticides	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q56g: Wear gloves during application of pesticides	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q56i: Ventilate the place after application of pesticides	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q56j: Store pesticides where children cannot reach them	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q56L: Use methods without pesticides to control pests	Level of confidence to do it 1 (not sure at all) to 4 (very sure)

The statements grouped in the construct *Self-efficacy 2* examined the level of confidence of participants to conduct practices to reduce exposures and protect the family (see Table 3.30). Participants rated their confidence of doing these actions on a scale from 1 (not sure at all) to 4 (very sure).

Participants were asked how sure they are to use only pesticides that have a registration number; stop using pesticides indoors in the form of spray, vapor, and fogs; read the label before application and follow the instructions; use the correct pesticide according to the pest intended to control; wear protective clothing such as long sleeves, pants, and gloves during application of pesticides; ventilate the house after application; store pesticides in unreachable places for children; and use methods to control pests without pesticides to control pests.

Table 3.31. Perceived Confidence of Participants in Conducting Safer Practices to Use Insect Repellents Safely on Children

HBM Construct	**Statements** **In the future, how sure are you to...?**	**Rating scale**
Self-efficacy 3: Perceived confidence of participants to perform actions that reduce risks to insect repellents of children ≤ 11 years of age.	Q57a: Read the label before applying insect repellent on children	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q57b: follow instructions of the label of insect repellents for children	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q57c: Prevent children ≤11 yrs. of age applying insect repellent themselves	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q57d: Wash or bath children when insect repellent is no longer needed	Level of confidence to do it 1 (not sure at all) to 4 (very sure)
	Q57e: Store insect repellents where children cannot reach them	Level of confidence to do it 1 (not sure at all) to 4 (very sure)

The statements grouped in the construct *Self-efficacy 3* examine the level of confidence of participants in reducing the risks of insect repellents among children (see Table 3.31). These statements requested participants to rate their level of confidence in reading the label before using insect repellents for children, following the instructions of the product, preventing children

from applying the repellent themselves, washing or bathing children when the repellent is no longer needed, and on storing the insect repellent in unreachable places to children. These statements are analyzed independently. Participants were asked to rate their level of confidence in performing such behaviors on a scale from 1 (not sure at all) to 4 (very sure).

3.6.6 Additional Perceptions of the Safety of Pesticides

Participants answered additional general statements to recognize their perceptions about the safety of pesticides. Participants were asked to rate their level of agreement with these statements on a scale from 1 (totally disagree) to 4 (totally agree) (see Table 3.30).

Table 3.32. Additional Perceptions about the Safety of Pesticide for Children

HBM Construct	**Statements How much do you agree with the following...**	**Rating scale**
Additional Statements: Perceived safety of pesticides	Q38a: The pesticides applied inside the house are safe for the health of children	Agreement with safety of pesticides 1 (totally disagree) to 4 (totally agree)
	Q38b: The pesticides applied outside the house are safe for the health of children	Agreement with safety of pesticides 1 (totally disagree) to 4 (totally agree)
	Q38c: The pesticides applied in agriculture are safe for children	Agreement with safety of pesticides 1 (totally disagree) to 4 (totally agree)
	Q38d: Authorities and Institutions take actions to ensure that pesticides are safe for the health of children	Agreement with safety of pesticides 1 (totally disagree) to 4 (totally agree)

CHAPTER IV

Analysis and Results

4.1 Results of the Implementation of the Study

4.1.1 Recruitment Results

The simple random recruitment process was conducted from September 1 to October 10, 2009 simultaneously in all the six sites selected for the study for 252 participants. Overall, 1,532 households were approached in the blocks selected randomly during varied times of the day and days of the week (including Saturday) to complete the screening checklist to check eligibility and willingness to participate of the residents living in these blocks. The results of the recruitment process are shown in Figure 4.1.

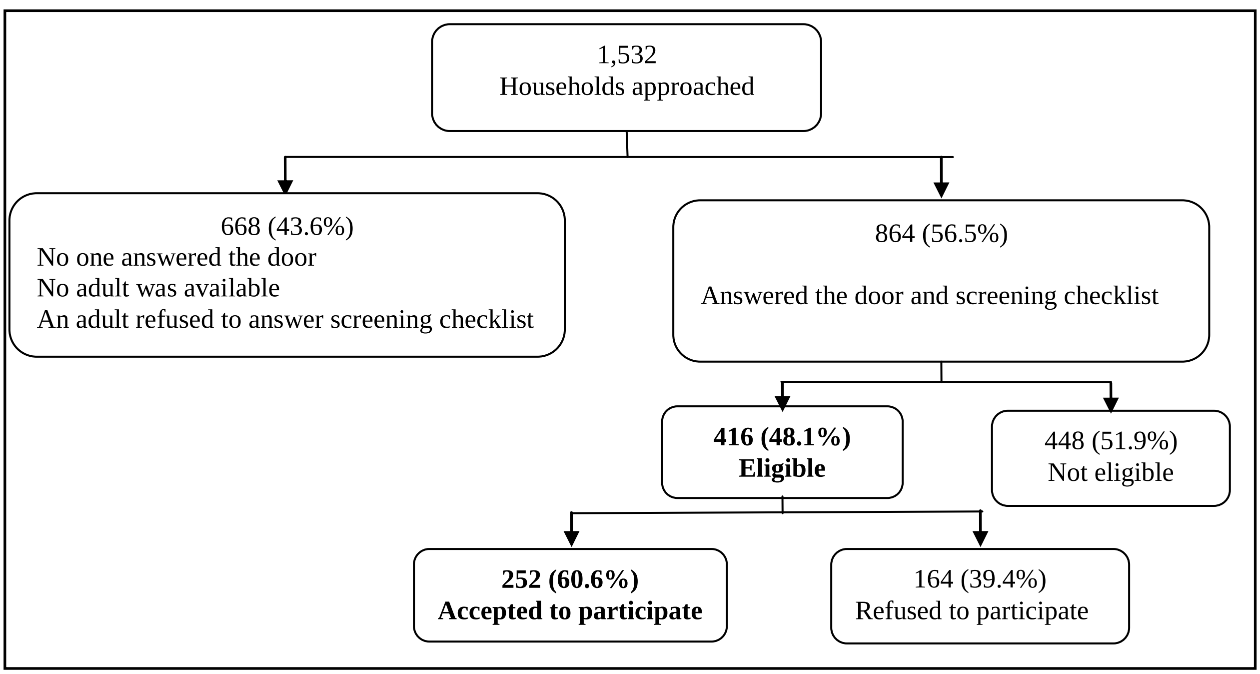

Figure 4.1. Results of the Recruitment Process.

Of the 1,532 households approached, in 668 households (43.6%) no one answered the door, no adult was available at the times of the visit, or the adult answering the door refused to

answer the screening checklist. Thus, 864 households answered the door and an adult answered the screening form to check eligibility, resulting in 416 (48.1%) women eligible to participate. Finally, of the 416 women eligible to participate, 252 women accepted to participate (60.6% participation rate) and 164 women refused to participate (39.4 % refusal rate). In summary, one can conclude that it was necessary to approach over six households to find one household eligible and willing to participate.

The refusal rate varies per site of the study with a range from 10.6% to 59.7%. Thus, some sites required more effort during the recruitment process. The site of *Luis Olague* in Ciudad Juárez required approaching over 7.6 households to recruit 42 participants and resulted with the highest refusal rate of 59.7%, whereas the sites of *Kilómetro 27* in Ciudad Juárez and Sunland Park in New Mexico resulted with the lowest refusal rates, 10.6% and 30% respectively (see Table 4.1).

Table 4.1. Results of the Recruitment Process per Site of the Study

Sites of the Study	Households approached	Households answering screening checklist	Households eligible	Households accepting to participate	Households refusing to participate	Refusal rate per site %
16 de Septiembre	126	89	68	42	26	38.2
Luis Olague	509	318	104	42	62	59.7
Kilómetro 27	123	76	47	42	5	10.6
San Elizario	318	136	62	42	20	32.3
El Paso south-central	116	93	75	42	33	44.0
Sunland Park	340	152	60	42	18	30.0
Total	**1532**	**864**	**416**	**252**	**164**	**39.4**

4.1.2 Allocation of Participants to Experimental and Control Groups

Figure 4.2 describes the algorithm of the results of the implementation of the study. We planned to recruit a total of 252 participants, 84 participants randomly allocated to experimental

group 1, 84 to experimental group 2, and 84 to control group (Refer to section "Study Design" in Chapter III.

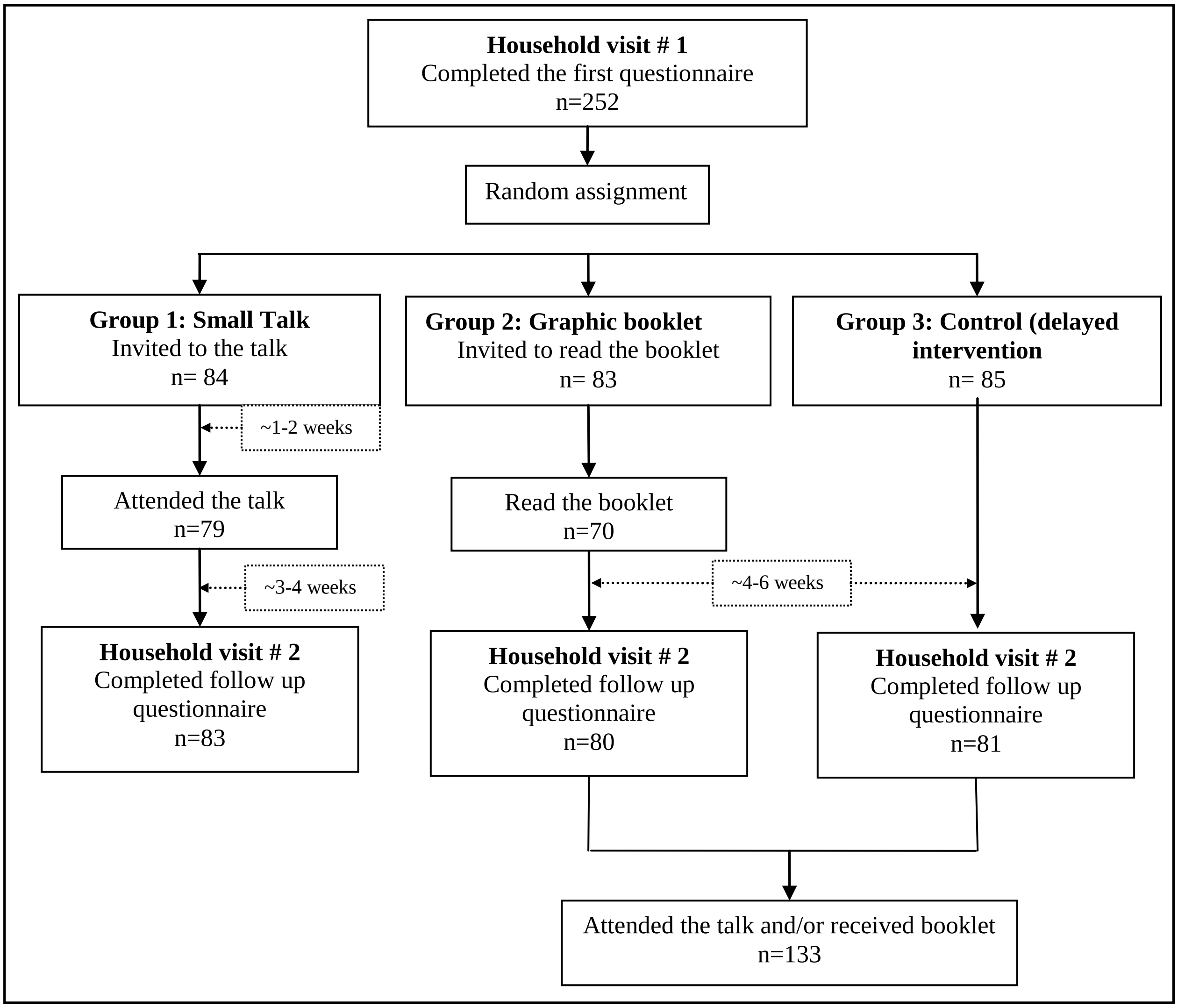

Figure 4.2. Algorithm of the Results of the Implementation of the Study.

However, at the end of the recruitment process 84 participants were allocated to Group 1 (attend the talk), 83 participants were allocated to Group 2 (read the booklet), and 84 participants were allocated to Group 3 (delayed intervention-control group). However, 230 participants of all the experimental groups completed the educational intervention as planned, this is 79 of the 84

participants allocated to group 1 attended the talk, 70 of the 83 participants allocated to group 2 read the graphic booklet, and 81 of the 84 participants allocated to the control group completed the second questionnaire as planned. Diagram 4.2 describes the number of participants allocated in the groups, completing the educational intervention, and completing the follow up questionnaire.

4.1.3 Overall Sample Size

Community health workers (CHWs) conducted household interviews to complete 252 first questionnaires and 244 follow up questionnaires. Eight participants did not complete the participation for varied reasons, two participants refused to complete the follow up questionnaire because of tight schedule and home duties, three participants moved to another residence, and three participants were not located by the CHWs in person or by phone after three or four attempts to locate these participants. The eight participants not completing the study represent 3% drop out rate of the total number of participants recruited. According to the site of the study, the participants not completing the study are three participants from Sunland Park, NM, three from El Paso, and two from the neighborhood *Luis Olague* in Ciudad Juárez.

The demographic characteristics of the participants completing the study and the participants dropping the study were examined for differences with t-tests and chi-square tests (see Table 4.2). The differences between the participants completing and dropping the study were not statistically significant for the majority of the demographic characteristics. The differences between these two groups of participants that were statistically different include characteristics of the participants such as the type of home ownership and the type of house structure. The majority of the participants dropping the study live in an apartment rented.

Table 4.2. Characteristics of Participants Completing or Dropping the Study

Characteristics	Overall participants completing the study	Participants dropping the study	Significance test (p value)
Age (n)	241	8	t=1.294
Mean	33.6	29.3	p=.197
Standard Deviation	9.5	6.5	
Years of education	243	8	t=-.468
Mean	8.4	8.9	p=.640
Standard Deviation	3.1	1.7	
Number of children < 11 years of age	244	8	t=.066 p=.947
Average	2.02	2	
Standard Deviation	1.04	.93	
Years living in the city	243	8	t=1.759
Average	18.5	10.9	p=.08
Standard Deviation	12.1	8.3	
Years living in the house	242	8	t=1.434
Average	8.7	4.4	p=.153
Standard Deviation	8.5	3.9	
Inventory of pesticides	244	8	t=-.107
Average	.96	1.0	p=.914
Standard Deviation	1.07	.93	
Home ownership	242		Chi-square=11.46
Owner	159 (65.7%)	1 (12.5%)	p=.003
Rent	74 (30.6%)	7 (87.5%)	
Lend	9 (3.7%)	-	
People living at home	242	8	t=-1.288
Average	5.1	5.9	P=.199
Standard Deviation	1.67	3.04	
Family income group (Dollars per month)	236	7	Chi-square=2.625 p=.956
< $1,000	45 (19.1%)	2 (28.6%)	
$1,001 to $1,500	52 (22%)	2 (28.6%)	
$1,501 to $2,000	26 (11%)	1 (14.3%)	
$2,001 to $2,500	20 (8/5%)	1 (14.3%)	
$2,501 to $3,000	31 (13.1%)	1 (14.3%)	
3,001 to 3,500	13 (5/5%)	-	
3,501 to 4,000	18 (7.6%)	-	
$4,001 to $5,000	20 (8.5%)	-	
>$5,000	11 (4.6%)	-	
House unit structure (n)	243	8	Chi-sq=12.508
One house unit per lot	103 (42.4%)	2 (25.0%)	p=.052
$\geq$2 house units per lot	63 (25.9%)	-	
Apartment	30 (12.3%)	4 (50.0%)	
Duplex	6 (2/5%)	-	
Mobile	30 (12/3%)	1 (12.5%)	
HUD	11 (4/4%)	1 (12.5%)	

Therefore, the baseline information of the participants not completing the study is dropped from the overall results of the baseline questionnaire to reduce standard errors and all the further results and analysis are presented without the baseline information of the eight participants dropped from the database.

4.1.4 Sample Sizes of Experimental and Control Groups

Of the 252 participants accepting to participate at the beginning of the study, the final dataset for the comparative analysis between experimental and control groups resulted in 230 cases. 22 participants were removed from the study, eight participants did not complete the study (i.e. not answering the second questionnaire) and 14 participants did not comply with the intervention as planned (i.e. attending the talk or reading the booklet). In the end, 79, 70, and 81 participants of experimental groups 1, 2, and 3 respectively are considered for data analysis (see Table 4.3).

Table 4.3. Sample Sizes of Experimental and Control Groups

Condition	Group 1	Group 2	Group 3	Total
Participants randomly allocated to the group	84	83	85	252
Minus: participants not completing the study	1	3	4	8
Participants completing the two questionnaires	83	80	81	244
Minus: participants not attending the talk or not reading booklet	4	10	-	14
Participants per group for comparative analysis	**79**	**70**	**81**	**230**

4.1.5 Implementation of Educational Interventions

The time to answer the first questionnaire was 58 minutes average (range 30 minutes to 1:38 hours) and the second questionnaire in 35 minutes (range 25 to 52 minutes). The average number of days from the first visit to the second visit resulted in 37.8 days for the participants of

group 1, in 30.6 days for the participants of group 2, and in 31.5 days for the participants in the control group.

Eleven community health workers (CHWs) facilitated a total of 12 talks for the 79 participants in group 1, this resulted in 6.7 average attendees per talk (range 6 to 9). One CHW acted as the main facilitator and another CHW assisted the facilitation of the talk. The majority of these talks were organized in community centers (10 out of 12 talks). The rest of the talks were conducted in one school. All the talks were facilitated following the *"Reducing the risks from pesticides used at home: A guide for community health workers to facilitate group talks*" and showed the PowerPoint presentation as planned. The talks were facilitated in 1:42 hours average, with a range from 1:35 to 2:08 hours. The majority of these talks were conducted in the morning (7 out of 12 talks).

Similarly, 83 graphic booklets titled "*Poco veneno…¿no mata? Consejos para prevenir las plagas y los envenenamientos con pesticidas*" [A little bit of poison…Will it kill you? were distributed to the 83 initial participants in Group 2. Of these 83 participants, 70 participants reported reading the booklet at some point between the first and the second household interview.

Additionally, the CHW facilitated 20 talks for the rest of the participants (i.e. participants of group 2 and 3). 133 participants of group 2 and 3 attended the talks after the second questionnaire was completed by these participants. These additional talks were facilitated in 1:42 hours in average. Moreover, the CHWs distributed 250 graphic booklets to all the participants at the end of these talks for participants of group 3 or after completing the second questionnaire with the participants of group 1.

4.2 Data Management

4.2.1 Data Entry and Management

Two people conducted the entry of the data to an electronic database. One person scanned each page of the questionnaires (i.e. the author of this study) and another person transformed the scanned pages into a SPSS database. Dr. Amitava Biswas, Ph. D. Assistant Professor at the College of Health Sciences in the University of Texas at El Paso and member of the dissertation committee transformed the pages scanned to the SPSS database. These two people conducted constant checking of the entries such as missing or incomplete marks in the questionnaires and missing or incorrect codes and number of experimental group, etc. The scanning process and entry revisions occurred from January to September 2010.

The code book was prepared according to each item of the questionnaires. Some items were simple (one question and the answer options) while others included a general and then various statements asking the participant to rate these statements. Simple questions were coded with the number of the question preceded by the letter "Q" (for example Q13). Other questions included a general statement and then multiple questions. For example Q16 was introduced by the interviewer with the initial statement "In the last 4 weeks, how frequently has been done the following in this house? And then the interviewer read a list of eight questions such as "wash dishes," "mop floors or vacuum carpets", etc.

The types of answers were either dichotomous or nominal. The dichotomous questions were coded as (1) for "yes," as (2) for "no," and as (3) for "don't know/don't recall" answers. The answers of the categorical questions included the number as responded by the participant (i.e. income group, age) and the number as rated by the participant with the 4-point Likert scale

from 1 to 4 points. Missing answers were coded as "888." The names of the variables of the follow up questionnaire are the same as that of the first questionnaire but added the letter "p" at the end of the name of the variable to denote such variable corresponds to the "post" questionnaire. The SPSS database was ready for cleaning and preparation in October 2010.

The analysis of the data was conducted with the software SPSS for Windows (SPSS Inc.) version 14.0. The data was reviewed before any analysis. First, the entries were proofread for over 10% of questionnaires (13 questionnaires for each side of the border) in the database against the actual answers in the questionnaires completed. Secondly, the entries of few specific questions were checked because these required special treatment such as skipped or blank, single or select one of multiple choices, or nominal answers. A third step included the print out of the frequencies to proofread invalid entries or unrecognizable entries. These errors were corrected by reviewing the actual responses marked in the questionnaires.

The missing responses were managed in the database as "blank" if the participant did not respond the answer and as "discrete missing value" (i.e. 888) if the response was skipped because it is not applicable. Prior to the conduct of any analysis, all variables were examined to check trends, missing values, wrong entries, outliers through descriptive frequencies and graphs (i.e. histograms & scatter plots) (Tabachnick & Fidell, 2007).

The unit of analysis was the woman answering the questionnaire and thus the database was managed through the code assigned to each of these women participating in the study. The codes range from the number 100 to 351. To ensure confidentiality, names and addresses of participants are not linked to the code during the management and analysis of the data. The addresses of the participants were only utilized in the initial implementation phase to mark the

location of the household in the map of each site of the study to check the distribution of the participants within the 0.5 kilometer radius of the study area.

4.2.2 Monitoring and Quality Assurance of Data Collection Procedures

Several measures were taken to ensure the quality and accuracy of the information. First, all the personnel recruiting participants and monitoring the fieldwork were instructed to contact the author of this study at all times in case of a doubt, concern, or obstacle to implement the study to reduce systematic errors. Each member of the study received a list with the phone numbers of all the people working in the study. Secondly, the field coordinators (one in the U.S. and one in México) met every week with their respective interviewers in the U.S. and in México to collect the questionnaires completed and all the reports of the fieldwork (eligibility checklists, household location, fieldwork record, etc.). During the meeting, the field workers checked the questionnaires for correct code of the participant, correct number of the group on which the participant was allocated, missing responses, or incomplete information (date, time the questionnaire starts and ends, signature of the interviewer, etc.). Thirdly, the field coordinators contacted a participant randomly selected to check the quality of the interview and three to four responses of the participants (i.e. age, number of people living in the house, number of pesticides at the time of the visit, education years, etc.)

Fourthly, the field coordinators met with the author of this dissertation every two weeks to deliver the questionnaires and all the forms recorded by the interviewers. During these meetings, the author and the field coordinators addressed obstacles and questions and reviewed the questionnaires. The completed questionnaires were filed for further review by the author of this dissertation. Finally, the author of this study reviewed all the pages of all the questionnaires

delivered by the field coordinators and prepared a list of mistakes or missing information to check with the interviewers in the field. Additionally, the author of this study contacted over 5% of the participants (six on each side of the border) randomly selected to check the accuracy of the information and potential systematic errors of the interviewers. The answers of the participants checked during this quality assurance phase included few questions related with the outcomes and demographic information, such as two to three questions measuring knowledge, five to six questions measuring the practices of participants, and two to three demographic answers (i.e. age, education years, years living in the city, etc.). The responses of participants about perceptions were not addressed during this check out phase, since the beliefs of participants would have changed from the time of the interview to the checkout phase.

4.2.3 Preparation of Data for Final Analysis

The analysis of variance is considered robust to test differences between experimental groups if the analysis is two-tailed, includes big and relatively equal sample sizes on each group, and has no outliers (Tabachnik & Fidell, 2007). This study is non-directional because the effect of the intervention on the outcome variables is unknown and the differences could be observed in two directions, thus the principle of two-tail test is applied in this study. Despite the sample sizes of the two experimental and the control groups differ slightly as shown in Table 4.3 above, the ratio between the largest and smallest sample size is 1.16. According to Tabachnick & Fidell (2007) the ratio of largest to the smallest sample size should not be greater than 4 to 1. Thus, the final sample sizes of the experimental groups are considered adequate to continue with the comparative analysis.

Lastly, all the demographic variables were analyzed for normality, outliers, and missing responses. The distribution of the variables "age" and "education" showed skewness to the right. Table 4.4 below shows mean age of participants was 33.6 years of age with extreme values from 60 to 69 years of age, and mean 8.4 school years of education completed by participants with extreme values from 15 to 22 school years of education.

Table 4.4. Basic Results of Variables 'AGE' and 'EDUCATION'

Measure	Age	Education (i.e. school years)
Mean (Std. Dev.)	33.6 (9.5)	8.4 (3.1)
Skewness	.786	.492
Range	18-69	1-22
Extreme values	69, 67, 63, 61, 60	22, 17, 16, 16, 15

These two variables were deemed important predictors of the outcomes of educational and health behavior interventions. Thus, the variables 'AGE' and 'EDUCATION' were log transformed for normality. After transformation, the skewness changed to -.010 for the variable 'AGE' and in -1.338 for the variable 'EDUCATION.' All the statistical analysis involving these two variables were conducted with the log transformed variables.

4.2.4 Comparability of Experimental and Control Groups

After the analysis of the general descriptive information of participants and the transformation of the two variables to normalize their distribution, one can conclude that the sample size and the characteristics of the participants measured by experimental and control groups were considered sufficient and homogenous for further comparative analysis.

Several measures were taken into account to reduce systematic bias in the allocation of participants to either group to maintain homogeneity and be able to make comparisons among the participants. First, the sampling areas of this study were checked to determine if the

characteristics of the residents in these areas are similar to the demographic characteristics intended for this study (i.e. low-income neighborhoods, Spanish speakers, Hispanic origin). Secondly, the recruiters followed the systematic recruitment of participants (i.e. approaching all households in randomly selected blocks, 0.5-kilometer radius) in all the sites of the study. The trainings of the community health workers (CHWs) were pivotal to ensure the implementation of the methodology as planned. Thirdly, the CHWs were selected because they share several characteristics with the population intended for this study (Hispanic, Spanish-speakers), culture, and neighborhood that made them cognizant of the population and the areas to approach and recruit participants successfully. Fourthly, the CHWs followed the same randomization procedure (asking participants to select a card from an envelope) in all the six sites that ensured the same likelihood of allocation to either experimental group. The section below details the demographic characteristics of the participants in general and according to experimental group.

4.3 General Results

4.3.1 Characteristics of the Participants

The characteristics of the participants were examined overall and according to the experimental and control groups to check comparability (see Table 4.5). The demographic and socioeconomic characteristics examined included the characteristics of the participants such as age and years or school education, the number of children 11 years of education and less, number of people living in the house, number of years living in the city and in the house), family income, and certain housing characteristics (type of home ownership and structure). Each of these variables was examined for differences between groups with one-way ANOVA or Chi square tests.

Table 4.5. General Characteristics of Participants

Participant and Family characteristics	**Overall**	**Group 1 (Talk)**	**Group 2 (Booklet)**	**Group 3 (Control)**	**Difference between groups**
Age (n) §	241	79	69	79	F=0.830
Average	33.6	33.3	32.8	34.6	p=.437
Standard Deviation	9.46	9.65	9.21	9.61	
Range	18-69	18-69	18-63	18-67	
Years of school education (n)§	243	79	70	80	F=0.590
Average	8.35	8.5	8.6	7.9	p=.555
Standard Deviation	3.13	3.37	3.19	2.91	
Range	1-22	2-17	1-22	1-15	
Number of children of ≤11 years of age per participant (n)	244	79	70	81	F=0.837 p=.434
Average	2.0	2.1	2.1	2.0	
Standard Deviation	1.04	1.01	1.08	1.06	
Range	1-7	1-6	1-5	1-7	
Pesticides were applied during pregnancy	243	79	70	81	Chi-square 8.388
Yes	98 (40.3%)	38 (48.1%)	29 (42%)	25 (30.9%)	p=.078
No	118 (48.7%)	36 (45.6%)	29 (42%)	47 (58%)	
Don't Know	27 (11.1%)	5 (6.3%)	11 (15.9%)	9 (11.1%)	
Pesticides were applied during first 3 years of age of children	244	79	70	81	Chi-square 5.765
Yes	132 (54.1%)	46 (58.2%)	41 (58.6%)	38 (46.9%)	p=.217
No	95 (38.9%)	28 (35.4%)	22 (31.4%)	39 (48.1%)	
Don't Know	17 (7%)	5 (6.4%)	7 (10%)	4 (4.9%)	
Number of years living in the city† (n)	243	79	70	80	F=077 p=.926
Average	18.5	18.2	18.9	18.4	
Standard Deviation	12.11	11.06	12.24	12.64	
Range	1-60	1-47	1-46	1-60	
Number of years living in the house (n)	242	79	70	80	F=0.026 p=.974
Mean	8.7	8.9	8.9	9.2	
Standard Deviation	8.49	8.24	9.26	8.38	
Range	1-40	1-30	1-40	1-35	
Household size [# people] (n)	242	79	70	79	F=0.197
Average	5.08	5.1	5.0	4.9	p=.821
Standard Deviation	1.67	1.66	1.71	1.66	
Range	2-12	2-12	2-10	2-11	

§ Log transformed

Overall, participants result with 33.6 years of age in average, have 8.4 school years of education, have 2 children 11 years of age and younger in average, have a family of 5 in average, and have lived 18.5 years in the city and 8.7 years in the house. Of the 244 participants, 40.3%

and 54.1% reported the application during pregnancy and the first three years of age of any of their children respectively. None of these demographic characteristics differ among the participants of each experimental or control groups.

Similarly, participants answered the group on which the income of the family during the last month would fall (see Table 4.6).

Table 4.6. Family Income

Family Income (in the last month)			**Overall**	**Group 1 (Talk)**	**Group 2 (Booklet)**	**Group 3 (Control)**	**Difference between groups (Chi-square)**
Overall income per family in the last month (n)			236	77	68	78	15.063 p=.520
Group	U.S. (dollars)	México (pesos)					
1	<1,000	<500	45 (19.1%)	16 (20.8%)	8 (11.8%)	16 (20.5%)	
2	1,001 to 1,500	501 to 1,000	52 (22%)	17 (22.1%)	15 (22.1%)	17 (21.8%)	
3	1,501 to 2,000	1,001 to 1,500	26 (11%)	7 (9.1%)	11 (16.2%)	6 (7.7%)	
4	2,001 to 2,500	1,501 to 2,000	20 (8.5%)	11 (14.3%)	3 (4.4%)	6 (7.7%)	
5	2,501 to 3,000	2,001 to 2,500	31 (13.1%)	10 (13%)	9 (13.24)	11 (14.1%)	
6	3,001 to 3,500	2,501 to 3,000	13 (5.5%)	4 (5.2%)	3 (4.5%)	6 (7.7%)	
7	3,501 to 4,000	3, 001 to 3,500	18 (7.6%)	3 (3.9%)	7 (10.3%)	6 (7.7%)	
8	4,001 to 5,000	3,501 to 4,500	20 (8.5%)	4 (5.2%)	9 (13.2%)	7 (9%)	
9	> 5,001	> 4,501	11 (4.7%)	5 (6.3%)	3 (4.4%)	3 (3.8%)	

Overall, 52.1% of the participants reported a monthly income of $2,000 or less (or $1,500 Mexican pesos). The income per family per month reported by participants does not differ significantly between the experimental and control groups (see Table 4.6). The housing characteristics of the participants were also examined overall and for differences between groups (see Table 4.7). Overall, 65.7% of the participants are homeowners and the majority has one house unit per lot (42.4%). The difference between the experimental and control groups regarding the type of home ownership or the house structure were not statistically significant (p=.851 and p=.067 respectively.

Table 4.7. Household Characteristics

Housing characteristics	**Overall**	**Group 1 (Talk)**	**Group 2 (Booklet)**	**Group 3 (Control)**	**Difference between groups (Chi-square)**
Type of Home ownership (n, %)	242	79	70	79	1.360 p=.851
Own	159 (65.7%)	52 (65.8%)	50 (65.8%)	52 (65.8%)	
Rent	74 (30.6%)	24 (30.4%)	17 (24.3%)	25 (31.6%)	
Lend	9 (3.7%)	3 (3.8%)	3 (4.3%)	2 (2.5%)	
House unit structure (n, %))	243	79	70	80	19.988 p=.067
One house unit per lot	103 (42.4%)	36 (46.6%)	39 (55.7%)	26 (32.5%)	
≥2 house units per lot	63 (25.9%)	18 (22.8%)	14 (20%)	27 (33.8%)	
Apartment	30 (12.3%)	7 (8.9%)	9 (12.9%)	8 (10%)	
Duplex	6 (2.5%)	4 (5.1%)	-	2(2.5%)	
Mobile	30 (12.3%)	11 (13.9%)	7 (10%)	11 (13.8%)	
HUD (apartment, house)	11 (4.5%)	3 (3.8%)	1 (1.4%)	6 (7.5%)	

In summary, the strategies employed in this study to recruit and allocate participants were successful in obtaining a homogenous distribution of participants in either experimental or control groups. None of the demographic characteristics examined are statistically different among the three groups. The demographic characteristics of the participants that could influence the outcomes of the study and the perceptions of participants about pesticides and health include age, number of school years of education, income, number of children of 11 years of age and less, type of home ownership, and years living in the house and in the city.

These demographic characteristics were examined to find correlations with the outcomes measured in this study such as knowledge level, pest prevention practices, and safety practices of the participants and with perceptions of participants about pests, pesticides, and health according to the Health Belief Model. The results of this study augment the literature about pesticides and health by providing information on the practices and beliefs about residential pesticides of Hispanic women living in the study sites of the U.S.-México Border.

4.3.2 Information about the Children 11 years of Age and Younger of the Participants

The information in this section is only to describe the characteristics of the children of the participants and is not included in further analysis of the outcomes of this study. Participants were asked to report some information about their children 11 years of age and less. The information collected about the children of the participants were age, sex, application of pesticides few months before pregnancy and during pregnancy, and if the children had been diagnosed with asthma, allergies (nose, eyes, and throat), allergies (skin), frequent cough, and diabetes. The responses were either dichotomous or nominal of the 244 participants who completed the second questionnaire.

Overall, the 244 participating women reported having a total of 495 children of 11 years of age and less, with an average of 2.03 children per participant (see Table 4.8). Children were 70.5 average months (5.9 years of age), slightly more than half of the children were male (51.5%), and the majority were breastfed (74.7%). Of the children who were breastfed, the average duration of the breastfed period was 8.4 months (from 1 to 48 months range). Additionally, the age of children was categorized according to the age stages recommended by the EPA (2008; Firestone et al., 2007).

The majority of the children of the participant were within the age stage of 6 to 11 years of age (54%). According to the responses of the participants, 370 of the 495 (74.7%) children were breastfed for an average of 8.4 months with a median of 6 months. When examined by age groups (data not shown), 114 (31%) were breastfeed for 3 months or less, 103 (28%) for 4 to 6 months, 34 (9.2%) from 7 to 9 months, 62 (16.8%) from 10 to 12 months, 44 (12%) from 13 to 24 months, 10 (2.7%) from 25 to 36 months, and 1 (0.3%) from 37 to 48 months.

Table 4.8. Characteristics of the Children 11 years and Younger of Participants

Characteristics of the Children 11 years of age and younger (of 244 participants)	**Overall**	**Group 1 (Talk)**	**Group 2 (Booklet)**	**Group 3 (Control)**	**Difference between groups**
Number of children	495	174	167	154	F=0.837 p=.434
Sex (n, %)	495	174	174	159	Chi-square
Male	255 (51.5%)	86 (49.4%)	96 (57.5%)	73 (47.4%)	3.73
Female	240 (48.5%)	88 (50.6%)	71 (42.5%)	81 (52.6%)	p=.155
Age of children in months	494	174	167	153	F=1.343
Average	70.5	68.9	68.4	74.8	p=.262
Standard Deviation	38.32	39.68	38.30	74.75	
Range	1-132	1-132	4-132	1-132	
Age groups (EPA age stages)					
<1month	1 (0.2%)	1(0.6%)	-	-	
1 to < 3 months	3 (0.6%)	2 (1.2%)	-	1 (0.7%)	
3 to <6 months	5 (1.0%)	-	3 (1.8%)	2 (1.3%)	
6 to 12 months	17 (3.5%)	5 (2.9%)	6 (3.6%)	6 (3.9%)	
1 to < 2 years	23 (4.7%)	12 (6.9%)	8 (4.8%)	3 (2.0%)	
2 to < 3 years	48 (9.8%)	18 (10.4%)	20 (12%)	10 (6.6%)	
3 to < 6 years	129 (26.2%)	44 (25.4%)	47 (28.1%)	38 (25.0%)	
6 to < 11 years	266 (54.1%)	91 (52.6%)	83 (49.7%)	96 (60.5%)	
Breastfeed children (n)	495	174	167	154	Chi-square
Yes	370 (74.7%)	138 (79.3%)	112 (67.1%)	120 (77.9%)	6.240 p=0.044
Duration of breastfeeding period (months)	368	138	111	119	Chi square 44.98
Average	8.4	8.2	7.3	9.8	p=.203
Standard deviation	7.59	7.27	6.68	8.73	
Range	1-48	1-36	1-36	1-48	
Application of pesticides during pregnancy of the children reported	494	174	166	154	Chi-square 19.968 p=.001
Yes	156 (31.6%)	66 (37.9%)	57 (34.3%)	33 (21.4%)	
No	260 (52.6%)	89 (51.1%)	73 (44%)	98 (63.6%)	
Don’t know	78 (15.8%)	19 (10.9%)	36 (21.7%)	23 (14.9%)	
Application of pesticides during the first 3 years of age of the child	495	174	167	154	Chi-square 5.480
Yes	234 (47.3%)	85 (48.9%)	85 (50.9%)	64 (41.6%)	p=.242
No	221 (44.6%)	75 (43.1%)	66 (39.5%)	80 (51.9%)	
Don’t know	40 (8.1%)	14 (8%)	16 (9.6%)	10 (6.5%)	
Children with at least one health condition (n)	494	173	167	154	Chi-square 11.580
Yes	120 (24.3%)	38 (22%)	42 (25.1%)	40 (26%)	p=.480
Symptoms/diseases reported for children ≤ 11 years of age	120	38	42	40	
Asthma	22 (18.3%)	8 (21.1%)	11 (26.2%)	3 (7.5%)	
Allergies (nose, eyes, throat)	59 (49.2%)	20 (52.6%)	16 (38.1%)	23 (57.5%)	
Allergies (skin)	9 (7.5%)	1 (2.6%)	4 (9.5%)	4 (10%)	
Frequent cough	11 (9.2%)	4 (10.5%)	4 (9.5%)	3 (7.5%)	
Diabetes	1 (0.8%)	1 (2.6%)	-	-	
More than 2 symptoms	18 (15%)	4 (10.5%)	7 (16.7%)	7 (17.5%)	

When the variable of the breastfeeding period was computed without the 11 children who were breastfed for a period beyond 24 months, the average breastfeeding months resulted in 7.6 months (range 1 to 24 months, Standard Deviation 6.11) with a median of 6 months. U.S. and Mexican participants had similar averages on the months of breastfeeding children, 7.6 months (Std. Dev. 5.9) of U.S. and 7.7 months (Std. Dev. 6.25) of Mexican participants.

The exposure to residential pesticides at this age stage (11 years and younger) could be associated with contact with pesticide residues in floors, toys, play areas, and through hand-mouth behaviors. Thus, participants were asked to report if pesticides were applied during the pregnancy and the first three years of age of their children 11 years of age and less.

Overall, pesticides were applied in the house during the pregnancy of 31.6% children and during the first three years of age of 47.2% of children 11 years and younger. The majority of the children (75.7%) of the participant women did not report any of the diseases or symptoms asked during the household interview. Of the children reporting having one health condition (120 children), the majority reported allergies in the nose, eyes, and throat (49.2%); followed by asthma (18.3%).

Additionally, the information about the children 11 years of age and less of the participant women was examined to determine differences according to experimental group on which the participants were allocated. The proportion of children breastfeed and the proportion of children of which mothers reported pesticide application during the pregnancy are significantly different among the three experimental groups. In contrast, no significant difference was found among the two experimental and one control group for children characteristics such as age, sex, duration of breastfeeding period, application of pesticides during the first three years of

age, and on the proportion of children diagnosed with the diseases or symptoms inquired during the household interview.

4.3.3 Patterns of Pesticide Usage

4.3.3.1 Inventory of pesticides.

The community health workers conducting the interviews also collected information about the pesticide products at home during the first house visit. Of the 244 households completing the study, 151 households (61.9%) had at least one pesticide product during the first household visit (from September-October 2009). In total, 234 pesticide products were inventoried in the house of the participants, 1.6 products per household average. The majority reported having two or less pesticide products (88.8%). A single house had nine pesticide products at the time of the first household visit.

Overall, 104 varied pesticide brands were inventoried (see Table 4.9). This study found 234 pesticide products during the first household visit, 159 were located in U.S. households and 75 in Mexican households (67.9% and 32.1% respectively). Of the 234 products found, 27 pesticide products (11.5%) lacked proper labeling or registration number for domestic purposes as mandated by the U.S. or Mexican laws. Of these 27 products with no label or proper labeling, 14 were located in U.S. households (51.9%) and 13 in Mexican households (48.1%).

Of the 75 products found in México, 11 were from the U.S. (14.7%) and of the 159 products found in the U.S. households, 15 products were from México (9.4%). Bass and colleagues (2001) reported that 7% of pesticide products found in the house of participants in a U.S. border city were from México.

Regarding the pesticide brands, this study inventoried 104 varied pesticide brands, 73 different brands in U.S households and 31 different brands in Mexican households (70.2% and 29.8% respectively. In summary, U.S. households had more products than Mexican households (159 versus 75 products) and more varied brands than in Mexican households (73 versus 31 brands).

Table 4.9. Inventory of Pesticide Products in the House of the Participants

Practices about pesticide usage	**Overall**	**Group 1 (Talk)**	**Group 2 (Booklet)**	**Group 3 (Control)**	**Difference between groups**
Households with at least one pesticide product	151 (of 244)	48 (of 79)	39 (of 70	51 (of 81)	F=.180 p=.835
Average	1.55	1.54	1.62	1.49	
Standard Deviation	0.08	0.12	0.22	0.09	
Pesticide products per house:					
1 product	94 (62.3%)	30 (62.5%)	26 (66.7%)	31 (60.8%)	
2 products	40 (26.5%)	13 (27.1%)	8 (20.5%)	15 (29.4%)	
3 products	13 (8.6%)	2 (4.2%)	4 (10.3%)	5 (9.8%)	
4 products	3 (2%)	3 (6.3%)	-	-	
9 products	1 (0.7%)	-	1 (2.6%)	-	

Additionally, 16 households had at least one of the illegal products Chinese chalk (5 households) or *polvo de avión* (i.e. b*olsa mágica*) (11 households) during the first household visit. Four households in the U.S. and one in México had Chinese chalk. Five households in the U.S. and six in México had a bag of *polvo de avión* during the first household visit.

4.3.3.2 General practices of pesticide application.

During the first household visits, participants were asked several questions to examine their practices about pesticide usage. The information in this section examines the practices related with pesticide usage. Table 4.10 shows the general results of the 244 participants

completing the first and second questionnaires and the results of the 230 participants according to the group they were allocated.

Table 4.10. General Practices of Pesticide Application

Practices about pesticide usage	Overall	Group 1 (Talk)	Group 2 (Booklet)	Group 3 (Control)	Difference between groups (Chi square)
When is decided to apply pesticides:	244	78	70	81	1.971 p=.922
To prevent pests inside the house	62 (25.6%)	22 (28.2%)	18 (25.7%)	16 (20%)	
At the first sign of pest problems	116 (47.9%)	35 (44.9%)	34 (48.6%)	43 (53.8%)	
When the pest problem is too big	52 (21.5%)	18 (23.1%)	15 (21.4%)	17 (21.3%)	
When other methods don't work	12 (4.9%)	3 (3.8%)	3 (4.3%)	4 (5%)	
Who applied pesticides during the summer 2009? (Mark all that apply)	244	79	70	81	
The participant	170 (69.7%)	54 (68.3%)	46 (65.7%)	62 (76.5%)	2.365 (p=.307)
Another member of the family	118 (48.4%)	38 (48.1%)	37 (52.9%)	36 (44.4%)	1.066 (p=.587)
An exterminator	20 (8.2%)	4 (5.1%)	4 (5.7%)	10 (12.3%)	3.562 (p=.168)
The owner of the house (responded only by renters)	38 (51.4%) (of 74 renters)	8 (9.4%) (of 25 renters)	10 (45.5%) (of 22 renters)	155 (7.7%) (of 26 renters)	2.292 (p=.318)

The greatest proportion of participants (47.9%) decided to apply pesticides at the first sign of a pest problem. Over 26% of the 244 participants apply pesticides as a preventive or control measure and only 4.9% of the participants apply pesticides only when other measures do not work. The great majority of participants (69.7%) apply the pesticides in the house by themselves or by someone of the family (48.4%). Only 20 of the 244 participants (8.2%) reported hiring an exterminator to apply pesticides in the house.

Of the 230 participants completing the educational intervention – 79, 70, and 81 participants of Groups 1, 2, and 3 respectively; no significant differences were found between the groups about when to decide to apply pesticides and the person applying pesticides (one-way ANOVA). (See Table 4.10).

Additionally, participants reported the frequency of pesticide application according to the season of the year on a scale from 1 (never) to 4 (many times) (see Table 4.11). 26% of the participants applied pesticides many times during the summer and 10.6% of participants applied pesticides during the spring. A great proportion of participants (84.3%) reported never applying pesticides during the winter.

Table 4.11. Frequency of Application of Pesticides by Season of the Year

Frequency of pesticide application by season Frequency (%)	**Scale 1 (never) to 4 (many times)**			
	1	**2**	**3**	**4**
Spring (n= 236)	95 (40.2%)	80 (33.9%)	36 (15.3%)	25 (10.6%)
Summer (n=243)	41 (16.9%)	73 (30%)	66 (27.2%)	63 (25.9%)
Autumn (n=229)	159 (69.4%)	42 (18.3%)	22 (9.6%)	6 (2.6%)
Winter (n=230)	194 (84.3%)	19 (8.3%)	11 (4.8%)	6 (2.6%)

The mean rates about the frequency of application of pesticides by season of the year, overall reported the greater frequency of pesticide application during the summer (2.62 mean rate) and on the spring (1.96 mean rate) than other seasons of the year (Table 4.12). Regarding differences between groups, the frequency of application of pesticides was not statistically significant for any of the seasons of the year.

Table 4.12. Mean Rate of Pesticide Application per Season of the Year by Group

Mean Frequency of Pesticide application by season Mean (Std. Dev.) Scale 1 (never) to 4 (always)	**Overall**	**Group 1 (Talk)** n=79	**Group 2 (Booklet)** n=70	**Group 3 (Control)** n=81	**Difference Between Groups Chi-square**
Spring (n= 236)	1.96 (0.99)	2.03 (.93)	1.9 (1.01)	1.86 (0.99)	5.843 (p=.441)
Summer (n=243)	2.62 (1.05)	2.6 (1.03)	2.7 (1.10)	2.7 (0.98)	4.099 (p=.663)
Autumn (n=229)	1.45 (0.78)	1.6 (0.84)	1.5 (0.77)	1.4 (0.72)	5.242 (p=.513)
Winter (n=230)	1.26 (0.67)	1.3 (0.73)	1.2 (0.66)	1.2 (0.59)	1.537 (p=.957)

Participants were also asked to report about the frequency of application of pesticides on various sites of the house on a scale from 1 (never) to 4 (always). The kitchen and/or dinner rooms and the bathrooms were the places of the house where pesticides were applied more frequently (see Table 4.13). Results showed that pesticides were applied many times in the kitchen by 27% of the participants and in the bathrooms by 24.6% of the participants.

Table 4.13. Frequency of Application of Pesticides per Site of the House

Mean Frequency of Pesticide application in the house Mean (Std. Dev.)	**Scale 1 (never) to 4 (many times)**			
	1	**2**	**3**	**4**
Kitchen and dinner room (n=244).	25 (10.2%)	96 (39.3%)	57 (23.4%)	66 (27%)
Bedrooms (n=243)	65 (26.7%)	90 (37%)	46 (18.9%)	42 (18.9%)
Bathrooms (n=244)	54 (22.1%)	65 (26.6%)	65 (26.6%)	60 (24.6%)
Family room (TV) (n=240)	79 (32.9%)	80 (33.3%)	43 (17.9%)	38 (15.8%)
Other (garage, office, laundry room) (n=234)	140 (59.8%)	41 (17.5%)	24 (10.3%)	29 (12.4%)

The difference between groups regarding the mean frequency of application of pesticides per site of the house was not significant for any of the sites of the house (Table 4.14).

Table 4.14. Mean Rate of Application of Pesticide per Site of the House by Group

Mean Frequency of Pesticide application in the house Mean (Std. Dev.) Scale 1 (never) to 4 (always)	**Overall**	**Group 1 (Talk)** n=79	**Group 2 (Booklet)** n=70	**Group 3 (Control)** n=81	**Difference between groups Chi-square**
Kitchen/dinner room (n=244)	2.67 (0.99)	2.7 (0.88)	2.54 (1.08)	2.7 (1.04)	6.807 (p=.339)
Bedrooms (n=243)	2.27 (1.04)	2.2 (1.03)	2.2 (1.02)	2.5 (1.03)	5.258 (p=.511)
Bathrooms (n=244)	2.54 (1.09)	2.6 (1.11)	2.4 (1.04)	2.6 (1.10)	2.379 (p=.882)
Living/Family room (n=240)	2.17 (1.06)	2.2 (0.99)	2.1 (1.08)	2.2 (1.08)	4.529 (p=.605)
Other rooms (garage, office, laundry room) (n=234)	1.75 (1.07)	1.6 (1.01)	1.7 (1.04)	1.9 (1.12)	4.830 (p=.566)

4.3.3.3 Methods of application of pesticides.

The CHWs showed pictures of varied types of pesticide products to participants to examine the frequency of use of pesticide products according to the method of application (Refer to Appendix 7 with the pictures shown to participants).

Table 4.15 Methods of Application of Pesticides

Frequency Scale 1 (never) to 4 (always)	Overall n=244	Group 1 (Talk) n=79	Group 2 (Booklet) n=70	Group 3 (Control) n=81	Difference between groups Chi-square
Picture 1 (Illegal pesticides) How frequently do you *costalito bronco, bolsa mágica*, unbranded, mothballs, Chinese chalk?					
Mean rate (Std. Dev.)	1.71 (0.09)	1.68 (0.89)	1.59 (0.91)	1.86 (0.02)	11.235 p=.081
Never	137 (56.1%)	44 (55.7%)	45 (64.3%)	38 (46.9%)	
Few times	59 (24.2%)	19 (24.1%)	13 (18.6%)	26 (32.1%)	
Sometimes	29 (11.9%)	14 (16.5%)	8 (11.4%)	7 (8.6%)	
Always	19 (7.8%)	3 (3.8%)	4 (5.7%)	10 (12.3%)	
Picture 2 (indoor air releasers) How frequently do you use sprays, fogs, bombs, coils, etc.?					
Mean rate (Std. Dev.)	2.95 (0.99)	2.94 (0.98)	2.89 (1.00)	2.96 (0.99)	
Never	20 (8.2%)	5 (6.3%)	7 (10%)	7 (8.6%)	2.158 p=.905
Few times	64 (26.2%)	25 (25%)	18 (25.7%)	20 (24.7%)	
Sometimes	67 (27.5%)	(31.6%)	21 (30%)	23 (28.4%)	
Always	93 (38.1%)	30 (38%)	24 (34.3%)	31 (38.3%)	
Picture 3 (liquid/solid pesticide methods) How frequently do you use gel, liquid, powder, granules, etc.?					
Mean rate (Std. Dev.)	2.19 (1.11)	2.32 (1.09)	2.03 (1.12)	2.23 (1.11)	5.820 p=.444
Never	90 (36.9%)	23 (29.1%)	32 (45.7%)	29 (35.8%)	
Few times	57 (23.4%)	23 (29.1%)	14 (20%)	17 (21%)	
Sometimes	57 (23.4%)	18 (22.8%)	14 (20%)	22 (27.2%)	
Always	40 (16.4%)	15 (10%)	10 (14.3%)	13 (16%)	
Picture 4 (mechanical non-pesticide methods) How frequently do you use traps, glue papers, cubes, sticky strips?					
Mean rate (Std. Dev.)	2.18 (1.23)	2.06 (1.24)	2.26 (1.12)	2.26 (1.30)	
Never	107 (43.9%)	39 (49.4%)	25 (35.7%)	36 (44.4%)	10.033 p=.123
Few times	47 (19.3%)	15 (19%)	20 (28.6%)	12 (14.8%)	
Sometimes	30 (12.3%)	6 (7.6%)	12 (17.1%)	9 (11.1%)	
Always	60 (24.6%)	19 (24.1%)	13 (18.6%)	24 (29.6%)	

Picture 1 showed various products considered illegal for domestic use in this study such as *costalito bronco* and *bolsa mágica* (potential *polvo de avión*), Chinese chalk, and mothballs. *Picture 2* showed products that release pesticides to indoor air such as sprays, fogs, bombs, coils, etc. *Picture 3* showed products in the form of liquid, granules, powder, and gel. *Picture 4*

showed pictures that are mostly mechanical and do not have pesticide substances such as mousetraps and cubes, glue papers, and sticky strips. Participants were asked to rate the frequency of use of any of the products shown in the pictures on a scale from 1 (never) to 4 (always) (see Table 4.15). Overall, participants use more frequently the pesticides that release the substances to indoor air (mean rate 2.95).

The pest control methods that are mechanical or have no pesticides on them (picture 4) were used almost as frequent as the liquid/solid pesticides (picture 3) (2.18 and 2.19 mean rates respectively) by the participants. The frequencies of using pesticides according to the method of application shown in pictures 1, 2, 3, and 4 do not differ significantly between the participants in the experimental or control groups.

4.3.3.4 Application of illegal pesticides in residential settings.

Two questions were included in the questionnaire to examine the prevalence of application of *polvo de avión* [airplane dust] inside and outside the house and other products deemed illegal in the U.S. such as Chinese chalk and mothballs (Environmental Protection Agency, 2010). *Polvo de avión* [airplane dust] is the popular name given in México to *methyl parathion*, an agricultural pesticide restricted for certain agricultural crops in the U.S. and for any agricultural purposes in México, sold illegally on the streets in Ciudad Juárez for domestic purposes (Saller, Reyes, Maldonado, Gibbs, & Byrd, 2007). *Methyl parathion* is a substance classified as Toxicity Level I (i.e. the highest toxicity category for acute exposures) (Rubin, Esteban, Hill, & Pearce, 2002).

Participants were asked if *polvo de avión* has been applied inside and outside the house during the previous 4-6 weeks of the time of the first household visit (i.e. summer 2009).

Overall, 21.7% of participants reported applying *polvo de avión* inside the house and 26.7% of participants applying *polvo de avión* outside the house in the last 4-6 weeks (see Table 4.16).

Table 4.16. Prevalence of Application of *Polvo de Avión* (Methyl parathion)

Application of Polvo de Avión (Summer 2009)	**Overall**	**Group 1 (Talk) N=79**	**Group 2 (Booklet) N=70**	**Group 3 (Control) N=81**	**Difference between groups Chi-square**
Applied *polvo de avión* inside the house in the last 4-6 weeks	244				1.960
Yes	53 (21.7%)	16 (20.3%)	16 (22.9%)	18 (22.2%)	p=.743
Applied *polvo de avión* outside the house in the last 4-6 weeks	243				5.814
Yes	65 (26.7%)	24 (30.8%)	14 (20%)	25 (30.9%)	p=.213

Another question requested the participants to rate the frequency of application of any of the pesticide products shown in *Picture 1* by the community health workers (CHWs). *Picture 1* was a double-sided page showing various products deemed as illegal for domestic use such as, *costalito bronco, bolsa mágica* (potential *polvo de avión*) on one side of the page and Chinese chalk and mothballs in the other side of the page. It was suspected that products labeled as *costalito bronco* and *bolsa mágica* are the illegal pesticide known as *polvo de avión* (methyl parathion) because the participants and the CHWs mentioned that these products were *polvo de avión.* These products (*costalito bronco* and *bolsa mágica*) lack adequate label as mandated by the Mexican laws for the pesticides intended for domestic use (i.e. registration number, active ingredients, and full description of the health risks and warnings, etc.).

In an effort to corroborate if these products are *polvo de avión*, the author of this dissertation, the fieldworkers, and the CHWs looked for any similar product labeled as *polvo de avión* in local stores and in the streets in and nearby the sites of the study during the summer 2009. No single product was found labeled as *polvo de avión.* According to all the

inconsistencies found in these Mexican products and the lack of a chemical analysis to determine if these products are in fact methyl parathion, these unlabeled products are grouped in the Picture 1 as 'illegal' only for the purposes of this study.

The scale to rate the frequency of use of any of these pesticides shown in *Picture 1* ranged from 1 (never) to 4 (always). Overall, 43.9% of the total participants applied at least one of the illegal products shown in *Picture 1* from few times to always (see Table 4.17). When examined according to the experimental group, the frequencies of application of any of the products shown in Picture 1 do not differ significantly among the participants of each experimental group.

Table 4.17. Frequency of Application of Illegal Pesticides

How frequently do you apply any of the pesticides in Picture 1?	**Overall n=244**	**Group 1 (Talk)** n=79	**Group 2 (Booklet)** n=70	**Group 3 (Control)** n=81	**Difference between groups Chi-square**
Mean rate (Std. Dev.) Scale 1 (never) to 4 (Always)	1.71 (0.96)	1.68 (0.89)	1.59 (0.91)	1.86 (1.02)	11.235 p=.081
Never	137 (56.1%)	44 (55.7%)	45 (64.3%)	38 (46.9%)	
Few times	59 (24.2%)	19 (24.1%)	13 (18.6%)	26 (32.1%)	
Sometimes	29 (11.9%)	14 (16.5%)	8 (11.4%)	7 (8.6%)	
Always	19 (7.8%)	3 (3.8%)	4 (5.7%)	10 (12.3%)	

4.3.3.5 Practices related to the label of pesticides.

Participants were asked to answer some questions to examine the practices of border residents. Participants were asked if and how frequently they purchase pesticides in the other country and if they purchase pesticides with a label in a language they do not understand. Additionally, participants were asked if they read the label before application and follow the instructions of the label when applying pesticides (see Table 4.18).

As shown in Table 4.18, over 70% of participants never purchase pesticides in the other country; this can be in the U.S. for participants living in México or in México by the participants living in the U.S. In contrast, 36.2% of participants report using pesticide products with a label in a language they do not understand. The difference between groups was not statistically different for the proportions of participants applying pesticides with label in another language or purchasing pesticides in the other country.

Additionally, participants were asked if they use pesticides with a label in a language they do not understand. Over 36% of the 244 participants reported using pesticides with a label in a language not understood. Participants answered questions about reading the label before application of pesticides and following the instructions of the label of pesticides during the last 4-6 weeks. 63.1% of participants reported reading the label before application and over 64% reported following the instructions of the label. In the end, over 36% of the participants could face unintentional exposures to pesticides by not reading the label or following the instructions of the label.

These practices were also examined according to the experimental and control group. As shown in Table 4.18, no statistical differences was found among the participants of the experimental and control groups about the practices related to reading and following the instructions of the label of pesticides.

Table 4.18. Practices of Participants Related to the Label of Pesticides

Label of Pesticide Products	**Overall n=244**	**Group 1 (Talk)** n=79	**Group 2 (Booklet)** n=70	**Group 3 (Control)** n=81	**Difference between groups Chi-square**
How frequently do you purchase pesticides in the other country?					3.415 p=.755
Never	170 (69.7%)	56 (70.9%)	49 (70%)	57 (70.4%)	
Few times	41 (16.8%)	12 (15.2%)	15 (21.4%)	11 (13.6%)	
Sometimes	26 (10.7%)	8 (10.1%)	5 (7.1%)	10 (12.3%)	
Very often	7 (2.9%)	3 (3.8%)	1 (1.4%)	3 (3.7%)	
Do you use pesticides with the label in a language you don't understand (e.g. English, Chinese, etc.)?					4.594 p=.101
Yes	88 (36.2%)	27 (34.2%)	23 (32.9%)	33 (41.3%)	
In the last 4-6 weeks, did you (or family member) read the label before application of pesticides?					3.859 p=.425
Yes	154 (63.1%)	54 (68.4%	44 (62.9%)	49 (60.5%)	
No	86 (35.2%)	23 (29.1%)	24 (34.3%)	32 (39.5%)	
Don't know	4 (1.6%)	2 (2.5%)	2 (2.9%)	-	
In the last 4-6 weeks, did you (or family member) follow the instructions of the label?					3.630 p=.458
Yes	155 (63.5%)	54 (68.4%)	44 (62.9%)	48 (59.3%)	
No	84 (34.4%)	22 (27.8%)	25 (35.7%)	32 (39.5%)	
Don't know	5 (2%)	3 (3.8%)	1 (1.4%)	1 (1.2%)	

4.3.3.6 Notification of application of pesticides.

Participants were asked to report if they are notified before pesticides are applied in and nearby their house (see Table 4.19). Of the 81 participants who rent their house, 63% admitted that the owner notifies them prior to the application of pesticides. The proportion of participants being notified by the owner was similar between groups. In contrast, only 13.1% of the 244 participants have ever been notified prior to the application of pesticides nearby their house or in the neighborhood.

Table 4.19. Notification Prior to the Application of Pesticide

Notification of Pesticide Application	Overall	Group 1 (Talk)	Group 2 (Booklet)	Group 3 (Control)	Difference between groups Chi-square
Does the owner of this house notify you before the application of pesticides? Yes	n=81 51 (63%)	n=25 16 (64%)	n=22 10 (45.5%)	n=26 20 (76.9%)	5.079 p=.079
Have you ever been notified before pesticides are applied nearby your house or in your neighborhood? Yes	n=244 32 (13.1%)	n=79 7 (8.9%)	n=70 10 (14.3%)	n=81 13 (16%)	1.959 p=.375

After the educational interventions, participants renting their house were asked if they asked the owner to notify them before application of pesticides and if they asked the owner to skip the application of pesticides. Of the 69 respondents, 20 participants (29%) asked the owner to notify them before application of pesticides and only three participants (4.3%) asked the owner not to apply pesticides.

4.3.3.7 Pesticide application between the first and second household visit.

The second household visits were conducted from mid October to mid November of year 2009. During this second visit, participants were asked if pesticides were applied in the house since the date of the first household visit. Overall, of the 244 participants completing the first and second questionnaires, 37.7% (92 participants) reported the application of pesticides between the first and second visits.

Of the 230 participants completing the educational interventions of groups 2 and 3 and of the total participants of group 3, 85 participants (37%) reported the application of pesticides and 145 (63%) reported no application during the period between the first and second household visit. Then, the response of applying or not pesticides in the household between the first and

second visits were examined for the total participants completing the participation (n=230) and according to the experimental and control groups.

On one hand, of the 230 participants, 85 participants reported the application of pesticides between the first and second household visits, the lowest proportion of participants were from group 1 (26.6%) and the highest proportion were from group 3 (51.9%) (see Table 4.20). The difference of the proportions of participants that applied pesticides between the first and second household visits between experimental and control groups was significant (Chi-square =12.281, p=.002).

Table 4.20. Application of Pesticides between the First and Second Household Visit

Outcome	**Overall** n=244	**Group 1 (Talk)** n=79	**Group 2 (Booklet)** n=70	**Group 3 (Control)** n=81	**Difference between groups (Chi-square)**
Applied pesticides between the first and second household visits					12.281
Yes	92 (37.7%)	21 (26.6%)	22 (31.4%)	42 (51.9%)	p=.002
No	152 (62.3%)	58 (73.4%)	48 (68.6%)	39 (48.1%)	

On the other hand, of the 145 participants that reported not applying pesticides between the first and second household visits, the majority were from group 1 (39.6%) (see Table 4.21). Moreover, the 145 participants that reported not applying pesticides between the first and second household visits responded a question to acknowledge the reasons of not applying pesticides. The great majority of participants – 99 participants (68.8%), did not apply pesticides because there was no need (i.e. no pests in the house or at least not enough pests to require pesticide application). In contrast, 38 participants (26.4%) decided not to apply pesticides even if there was a pest problem and 7 (4.9%) participants did not apply pesticides for another reasons such as the exterminator didn’t apply pesticides, no money to purchase pesticides, or someone was sick

(see Table 4.21). Of the 38 participants that decided not to apply pesticides, 25 (65.8%) were from group 1. The difference of the reasons of not applying pesticides was significant between groups (Chi-square 22.793, p=.000).

Table 4.21. Participants Not Applying Pesticides between the First and Second Visits

Outcome **(Summer 2009)**	**Overall**	**Group 1 (Talk)**	**Group 2 (Booklet)**	**Group 3 (Control)**	**Difference between groups (Chi-square)**
Participants not applying pesticides between the first and second household visits	n=230 145 (63%)	n=79 58 (39.6%)	n=70 48 (33.3%)	n=81 39 (27.1%)	12.281 p=.002
Reasons of not applying pesticides: Wasn't necessary (no pests) Decided not to apply pesticides For another reasons	n=144 99 (68.8%) 38 (26.4%) 7 (4.9%)	N=57 28 (49.1%) 25 (43.9%) 4 (7%)	N=48 35 (72.9%) 12 (25%) 1 (2.1%)	N=39 36 (92.3%) 1 (2.6%) 2 (5.1%)	22.793 p=.000

4.3.3.8 Characteristics of participants by country of residence in the border.

The basic characteristics of participants were compared according to their place of residence in the U.S.-México border (see Table 4.22). Participants differed in the majority of their characteristics, except on the number of children 11 year of age. Participants of the U.S. are older and with more years of education than participants of Mexico. Participants of Mexico reported a higher family income level than the U.S. participants. However, the income of participants would not be considered comparable because of the economic differences between countries. Participants of both countries resulted in similar average of number of children 11 years of age and younger. In contrast, participants of México were more homeowners and reported more years living in the city and in the house than the participants of the U.S. Regarding the number of pesticide products inventoried during the first household visit, participants of the U.S. reported a higher number of pesticide products than the participants of México.

Table 4.22. Characteristics of Participants by Country of Residence

Characteristic	**U.S.**	**México**	**Significance of the difference**
Age†	n=118	n=123	F=11.224
Mean	35.4	31.9	p=.001
Standard Deviation	8.86	0.72	
Number of School years†	n=119	n=124	F=32.201
Mean	9.7	7.0	p=.000
Standard Deviation	3.41	2.13	
Family Income Group (last month)	n=116	n=120	Chi-square=119.07
Group U.S. (dollars) México (pesos)			p=.000
1 <1,000 <500	45 (38.8%)	-	
2 1,001 to 1,500 501 to 1,000	40 (34.5%)	12 (10%)	
3 1,501 to 2,000 1,001 to 1,500	13 (11.2)	13 (10.8%)	
4 2,001 to 2,500 1,501 to 2,000	8 (6.9%)	12 (10%)	
5 2,501 to 3,000 2,001 to 2,500	5 (4.3%)	26 (21.7%)	
6 3,001 to 3,500 2,501 to 3,000	1 (.9%)	12 (10%)	
7 3,501 to 4,000 3, 001 to 3,500	2 (1.7%)	16 (13.3%)	
8 4,001 to 5,000 3,501 to 4,500	2 (1.7%)	18 (15%)	
9 > 5,001 > 4,501	-	11 (9.2%)	
Number of children 11 years of age and younger	n=120	n=124	F=.986
Mean	2.1	2.0	p=.322
Standard Deviation	1.12	0.95	
Family size	n=118	n=124	F=.510
Average	5.0	5.15	p=.476
Standard Deviation	1.49	1.82	
Range	2-10	2-12	
Type of home ownership	n=119	n=123	Chi-square=45.614
Owner	58 (48.7%)	101 (82.1%)	p=.000
Rent	60 (50.4%)	14 (11.4%)	
Lend	1 (0.8%)	8 (6.5%)	
Number of Years living in the city	n=119	n=124	F=72.606
Mean	12.5	24.2	p=.000
Standard Deviation	9.75	11.44	
Number of years living in the house	n=118	n=124	F=39.385
Mean	5.4	11.8	p=000
Standard Deviation	5.58	9.58	
Inventory of pesticides	n=120	n=124	F=31.374
Mean	1.3	.6	p=.000
Standard Deviation	1.21	0.75	
Range	0-9	0-4	
Purchased pesticides in the other country?	n=120	n=124	Chi-square=9.030
Yes	46 (38.3%)	28 (22.6%)	p=.029
Did you (or family) read the label before application of pesticides?	n=120	n=124	Chi-square=12.095 p=.002
Yes	64 (53.5%)	90 (72.6%)	
Did you (or family) follow the label instructions before application of pesticides?	n=120	n=124	Chi-square=4.791 p=.091
Yes	69 (57.5%)	86 (69.4%)	

†Log transformed

In summary, various characteristics of participants differed according to the country on which they reside on the U.S.-Mexico border. However, the characteristics of participants were homogenous according to the groups on which they were allocated in this study. Thus, the distribution of participants in the two experimental and control groups were deemed comparable for the analysis of the outcomes tested in this study.

4.4 Results of the Study According to the Research Questions

This study examined the effects of two educational interventions related with pesticides and health on three outcomes (dependent variables). The first outcome tested in this study is the level of knowledge of participants about pests, pesticides, and health. This outcome answered research question 1 and the variable was named "knowledge level." The second outcome tested in this study was the number of practices conducted by participants that prevent pest proliferation. This outcome answered research question 2 and the variable was named "pest prevention."

The third outcome tested in this study is the number of practices conducted by participants that reduce exposures before, during, and after the application of pesticides. This outcome answered research question 3 and the variable was named "safety practices." These three outcomes were measured before and after the educational interventions to determine changes. The last research question (Question 4) was intended to understand the perceptions of the participants on this study about pests, pesticides, and health according to the Health Belief Model. The following sections detail the analysis and results conducted with each of these outcomes according to the research questions guiding this study.

4.4.1 Research Question 1: Knowledge Level

The research question 1 aimed to determine the effectiveness of the educational intervention in increasing the knowledge level of participants about pesticides and health. To answer this research question, the dependent variable 'knowledge level' was created as composite variable computed with the number of correct responses of participants to various questions before (i.e. Knowledgepre) and after (i.e. Knowledgepost) the educational interventions. The effectiveness of the interventions was determined with the mean difference of the scores of the participants before and after the educational interventions by group with the variable 'Knowledgedifference.'

The knowledge level was measured through various concepts such as pests and pesticides (i.e. what is a pest and the purpose of pesticides), exposure (i.e. ways pesticides enter the body), information about pesticides (i.e. the basic sections of the label of pesticides), potential health outcomes of exposure to pesticides (i.e. basic symptoms appearing shortly after exposure to pesticides and some diseases associated with exposure to pesticides), and what to do in case of an accidental exposure to pesticides (see Table 4.23). The correct answers or recommendations to these questions were addressed in the educational interventions (i.e. group talk and graphic booklet).

Participants were asked to answer YES or NO to each of these questions in the first and follow up questionnaires. The answers were transformed into points; '0' if the answer was incorrect and '1' if the answer was correct. All the correct answers of each category were computed to create the composite variables 'Knowledgepre' and 'Knowledgepost'f or all the participants to conduct the comparative analysis by the experimental and control groups.

Table 4.23. Concepts Computed for the Outcome Variable *Knowledge Level*

Concepts computed for the composite variable "Knowledge Level"	**Points according to the correct responses**
What is pest (i.e. weeds, cockroaches, mold and fungi, flies and mosquitoes, rats and mice, fleas and ticks, spiders and scorpions, ants and termites)	0-8
Purpose of pesticides (i.e. destroy, repel, and control pests)	0-3
Routes of entry of pesticides to the body (breath through the nose, breath through the mouth, contact with skin and hands, contact with eyes, and ingestion)	0-5
Label sections of pesticide products (i.e. ingredients, health risks, registry number, what to do in case of an accident, instructions to use)	0-5
Symptoms appearing shortly after exposure (i.e. dizziness, headaches, stomach ache, muscle ache, vomiting, sweat, drooling, and short of breath)	0-8
Diseases associated with exposures to pesticides (i.e. asthma attacks, damages to the brain, fertility problems, birth defects, nervousness, endocrine problems, certain types of cancers)	0-7
What to do in an accidental exposure to pesticides (i.e. call poison control center in the U.S. or call a doctor in México)	0-1
Total	**0-37 points**

Overall, the 244 participants exhibit a fair knowledge about pests. Table 4.24 shows that the majority of participants considered various animals as pests. However, less proportion of participants considered as pests the weeds (52.5%) and mold and fungi (72.7%).

Table 4.24. Knowledge of Participants about Pests

Questions about pests	Frequency of "yes" (%) n= 244
Do you know if the following would be a pest?	
Weeds	128 (52.5%)
Cockroaches	240 (98.4%)
Mold and fungi	176 (72.7%)
Flies and mosquitoes	232 (95.5%)
Rats and mice	217 (88.9%)
Ticks and fleas	227 (93.4%)
Spiders and scorpions	197 (80.7%)
Ants and termites	211 (86.5%)

Participants responded a question about the purpose of pesticides. Participants were asked if they thought that pesticides were made to kill pests, keep away pests (repellents), or to control pests. Of the 244 participants, the great majority thought that pesticides were intended to control

pests (84.8%). A less proportion of participants thought that pesticides are intended to kill pests (66.8%) (see Figure 4.3).

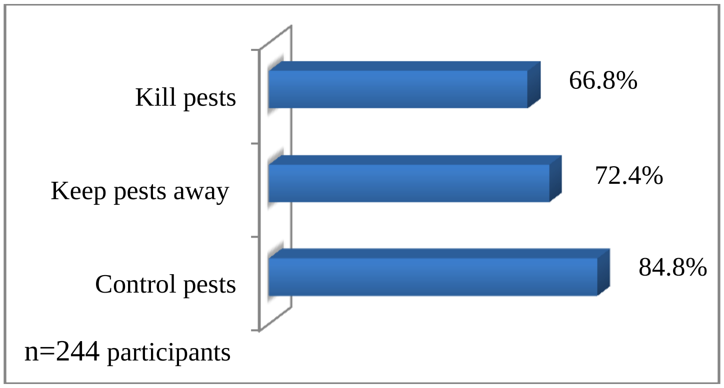

Figure 4.3. Participants Knowing the Purposes of Pesticides.

Participants resulted with a fair knowledge about the ways pesticides enter the body. The great majority was aware that pesticides enter by ingestion (92.6%) and inhaled through the nose (86.1%). A lower proportion of participants knew that pesticides enter the body through absorption by the eyes (63.1%) and by the hands and skin of the body (73.8%) (see Figure 4.4).

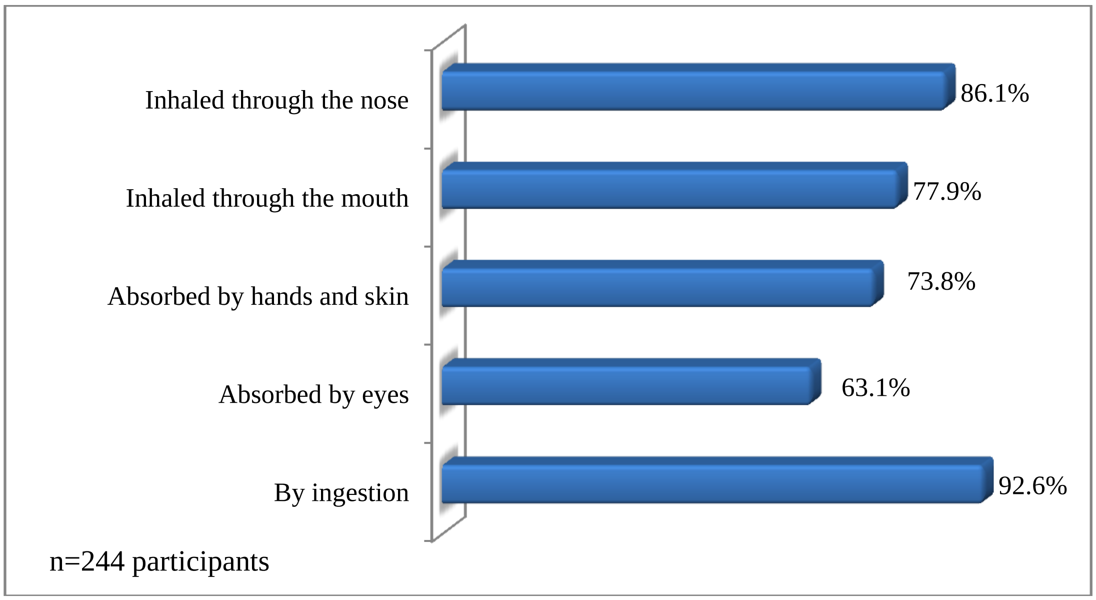

Figure 4.4. Participants Knowing the Ways Pesticides Enter the Body.

Similarly, participants responded if they know about some of the diseases associated with exposure to pesticides. The great majority knew that pesticides could cause asthma attacks (75%). A small proportion of participants knew that pesticides were associated with endocrine (22.5%) and fertility problems (38.9%) and with cancer (59.8%) (see Figure 4.5).

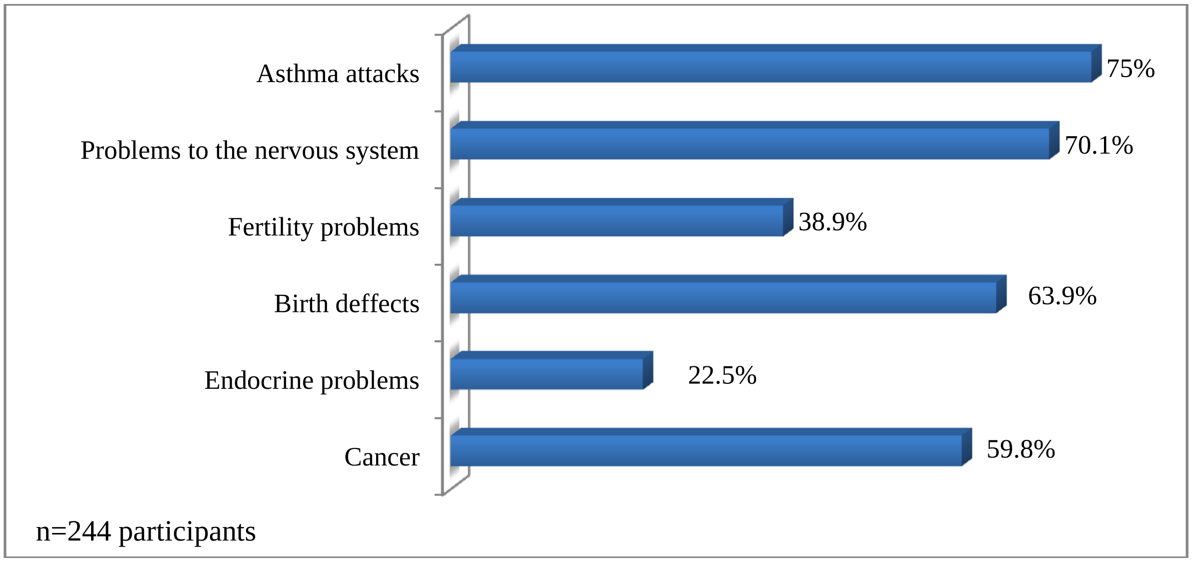

Figure 4.5. Participants Knowing Some Diseases Associated with Exposure to Pesticides.

Additionally, participants responded if they knew some of the common symptoms appearing shortly after exposure to pesticides (see Figure 4.6).

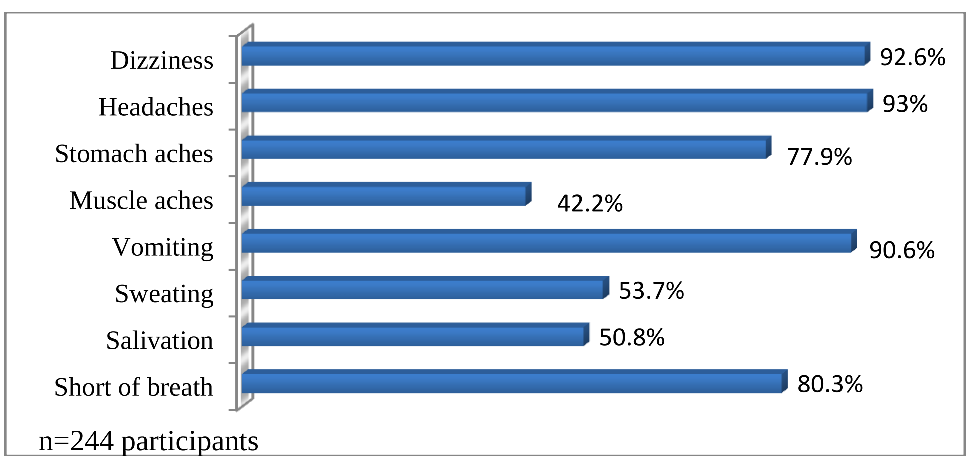

Figure 4.6. Participants Knowing Some Symptoms Associated with Exposure to Pesticides.

The majority of participants knew that headaches (93%), dizziness (92.6%), and vomiting (90.6%) are symptoms appearing shortly after exposure. Fewer participants knew that muscle ache (42.2%), excessive salivation (50.8%), and excessive sweat (53.7%) could appear shortly after exposure to pesticides.

Moreover, as shown on Figure 4.7, a great proportion of participants demonstrated a fair knowledge about the basic sections that should be included in the label of pesticides. Less number of participants (84.8%) knew that the registration number must be included in the label.

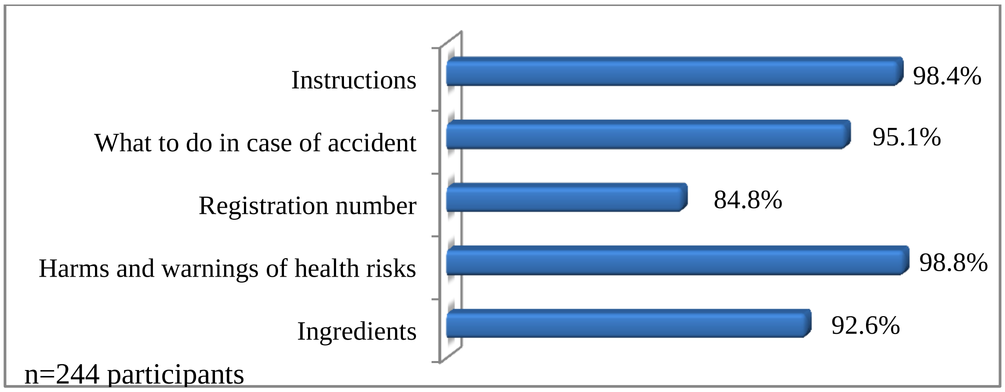

Figure 4.7. Participants Knowing the Basic Sections of the Label of Pesticides.

The responses of participants measuring their knowledge level were examined according to experimental and control groups (see Table 4.25). On average, participants of either group resulted with moderate level of knowledge about pesticides and health prior to the educational interventions. The differences in the knowledge levels according to the group were examined with ANOVA tests for the majority of the categories and with Chi-square for the category of "what to do in the case of an accident (dichotomous)."

Table 4.25. Knowledge Level Scores before Educational Interventions

Concepts of Knowledge Level (points)	**Group 1 (Talk) N=79 Mean (SD) Range**	**Group 2 (Booklet) N=70 Mean (SD) Range**	**Group 3 (Control) N=81 Mean (SD) Range**	**Difference between groups**
Types of pests (8 points)	6.7 (1.15) 4-8	6.6 (1.55) 2-8	6.7 (1.48) 2-8	F=0.097 p=.907
Purpose of pesticides (3 points)	2.2 (0.84) 0-3	2.3 (0.77) 0-3	2.3 (0.84) 0-3	F=0.313 p=.731
Routes of entry to the body (5 points) Range	3.9 (1.25) 0-5	4.1 (1.22) 0-5	4.0 (1.28) 0-5	F=0.328 p=.720
Basic sections of the label of pesticide (5 points)	4.7 (0.64) 2-5	4.8 (0.47) 2-5	4.7 (0.75) 1-5	F=0.931 p=.396
Symptoms observed shortly after exposure (8 points)	5.6 (2.16) 0-8	6.01 (1.99) 0-8	6.1 (1.89) 1-8	F=1.438 p=.240
Diseases or health problems associated with exposure to pesticides (7 points)	3.6 (2.17) 0-7	3.8 (2.09) 0-7	4.0 (2.08) 0-7	F=1.040 p=.355
What to do in case of an accident (1 point)	0.75 (0.44) 0-1	0.67 (0.47) 0-1	0.93 (0.27) 0-1	Chi-square=.493 p=.474
OVERALL average score of Knowledge level BEFORE the intervention	**27.4 (5.26) 14-37**	**28.3 (5.51) 8-37**	**28.5 (5.48) 16-37**	**F=0.983 P=.376**

None of the concepts measuring the knowledge level of participants was statistically different between groups prior to the educational interventions (see Table 4.25).

The same questions measuring the knowledge level were asked to participants during the second household visit – after the educational interventions. The results showed that participants of either group increased their level of knowledge on the majority of the concepts. The differences in the knowledge levels according to the group were examined with ANOVA tests for the majority of the categories and with Chi-square for the category of "what to do in the case of an accident (dichotomous)." The differences between groups were significant for the majority of the concepts, except for the concepts about the purpose of pesticides (p=.126) and the basic sections of the label of pesticide products (p=.126) (see Table 4.26).

Table 4.26. Knowledge Level Scores after the Educational Interventions

Concepts of Knowledge Level (points)	**Group 1 (Talk) N=79 Mean (SD) Range**	**Group 2 (Booklet) N=70 Mean (SD) Range**	**Group 3 (Control) N=81 Mean (SD) Range**	**Difference between groups**
Types of pests (8 points)	7.8 (0.46) 6-8	7.4 (1.07) 3-8	7.1 (1.42) 1-8	F=9.578 p=.000
Purpose of pesticides (3 points)	2.8 (0.37) 2-3	2.7 (0.64) 0-3	2.7 (0.66) 0-3	F=2.092 p=.126
Routes of entry to the body (5 points) Range	4.97 (0.16) 4-5	4.87 (0.45) 2-5	4.26 (1.06) 1-5	F=25.572 p=.000
Basic sections of the label of pesticide (5 points)	4.99 (0.11) 4-5	4.99 (0.12) 4-5	4.94 (0.24) 4-5	F=2.087 p=.126
Symptoms observed shortly after exposure (8 points)	7.94 (0.25) 7-8	7.64 (0.78) 4-8	6.8 (1.57) 2-8	F=25.757 p=.000
Diseases or health problems associated with exposure to pesticides (7 points)	6.82 (0.55) 5-7	6.27 (1.43) 0-7	4.59 (2.36) 0-7	F=39.976 p=.000
What to do in case of an accident (1 point)	0.9 (0.37) 0-1	0.86 (0.35) 0-1	0.75 (0.43) 0-1	Chi-square=6.226 p=.044
OVERALL average score of knowledge levels AFTER the intervention	**n=77 36.23 (1.01) 33 to 37**	**n=70 34.79 (3.11) 23 to 37**	**n=81 31.06 (6.56) 21 to 37**	**F=41.894 p=.000**

To determine the effectiveness of the educational intervention and compare changes between groups, the dependent variable “Knowldegedifference” was computed with the difference between the scores of the variables ‘Knowledgepre’ and ‘Knowledgepost.’ The variable “Knowledgedifference” determined the number of points changed by each participant before and after the educational interventions (see Table 4.27).

The dependent variable ‘Knowledgedifference’ was examined with one-way ANOVA to determine the significance of the changes of the scores of participants according to the experimental and control groups. The level of knowledge of participants in group 1(i.e. group talk) increased 8.9 average points, of participants in group 2 (i.e. graphic booklet) increased 6.5 average points, and of participants in group 3 (i.e. control group) increased 2.4 average points.

The differences of the mean scores of participants before and after the educational intervention were statistically significant between the groups (F=29.6, p<0.001).

Table 4.27. Comparative Analysis of the Outcome Variable *Knowledge Level*

Knowledge Level Scores	**Group 1 (Talk) Average (Std. Dev.) Range**	**Group 2 (Booklet) Average (Std. Dev.) Range**	**Group 3 (Control) Average (Std. Dev.) Range**	**Difference between groups**
Averages PRE intervention	n=79 27.4 (5.26) 14-37	n=70 28.3 (5.51) 8-37	n=81 28.5 (5.48) 16-37	F=0.983 p=.376
Average POST intervention	n=77 36.23 (1.01) 33-37	n=70 34.79 (3.11) 23-37	n=81 31.06 (6.56) 21-37	F=41.894 p=.000
Mean difference between averages before and after the interventions	**n=77** **8.94** **(5.12)** **0 to 22**	**n=70** **6.50** **(5.32)** **-7 to 26**	**n=81** **2.52** **(5.44)** **12 to 17**	**F=29.587** **p=.000**

In conclusion, to answer the research question 1: which of the two educational methods tested in this study is more effective in increasing the level of knowledge of participants about residential pesticides and health?, results showed that the educational intervention of a group talk was more effective in increasing the knowledge scores of participants about pesticides and health than the graphic booklet (see Figure 4.8).

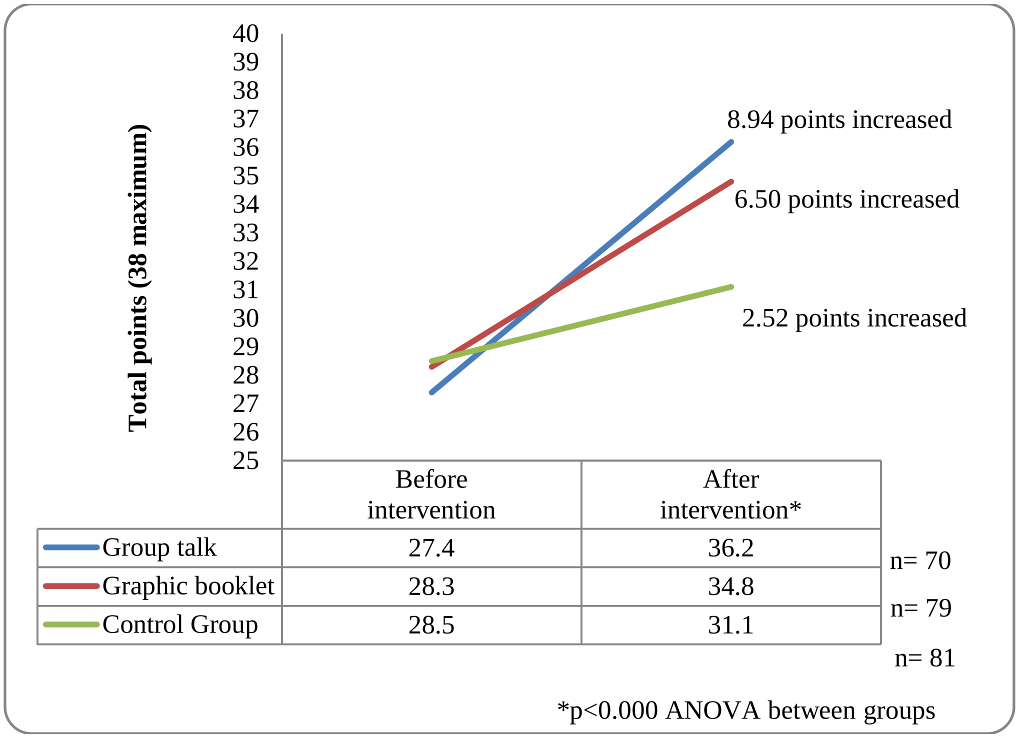

Figure 4.8. Mean Knowledge Scores of Participants about Pesticides and Health.

4.4.2 Research Question 2: Pest Prevention Practices

The research question 2 aimed to determine the effectiveness of the educational intervention in promoting behavioral changes of the participants related with the prevention of pest proliferation. To answer this research question, the outcome variable “Pestprevention” was computed with 11 practices recommended to prevent pest proliferation without using pesticides (see Table 4.28). The outcome variable (dependent variable) ‘Pestprevention’ was computed with the practices conducted before (i.e. Pestpreventionpre) and after (i.e. Pestpreventionpost) the educational interventions. The practices to prevent pest proliferation without application of pesticides were addressed during the educational interventions (i.e. group talk and graphic booklet).

Table 4.28. Practices Computed for the Outcome Variable *Pest prevention*

Practices included in the composite variable "Pest Prevention"	**Points according to the pest prevention practices**
Get rid of clutter inside the house	0-1
Get rid of clutter outside the house	0-1
Install traps & glues	0-1
Wash dishes frequently	0-1
Clean kitchen, tables, surfaces frequently	0-1
Vacuum carpets and/or mop floors frequently	0-1
Cover and store food frequently	0-1
Take trash out frequently	0-1
Ventilate bathroom after use frequently to reduce humidity	0-1
Ventilate kitchen after use frequently to reduce humidity	0-1
Cover the trash outside frequently	0-1
Total	**0-11 points**

During the first household visit, participants reported if they conducted pest prevention practices in the last 4-6 weeks (i.e. summer 2009) such as getting rid of clutter inside and outside the house, install traps and paper glues, and frequently wash dishes, clean surfaces, vacuum carpets, mop floors, cover and store food, take trash out and cover it, and ventilate the room and kitchen after use to reduce humidity to prevent mold. During the second household visit, participants responded the same questions to observe changes before and after the educational interventions. The answers of participants were transformed into points; '0' if the participants do not conduct such pest prevention practice and '1' if participants conduct such recommended practices to prevent pests in the house without using pesticides. The answers of each category were computed to create the composite variable 'Pestpreventionpre' for the score before the intervention and the composite variable 'Pestpreventionpost' for score after the educational interventions.

To determine the effectiveness of the educational intervention and compare changes between groups, the dependent variable "Pestpreventiondifference" was computed with the

difference between the scores of the variables ‘Pestpreventionpre’ and ‘Pestpreventionpost.’ The variable “Pestpreventiondifference” determined the number of points changed by each participant before and after the educational interventions. Then, the dependent variable ‘Pestpreventiondifference’ was examined with one-way ANOVA to determine the significance of the changes of the scores of participants according to the experimental and control groups.

Overall, the majority of participants reported a fair number of practices to prevent pest proliferation without using pesticides (see Figure 4.9).

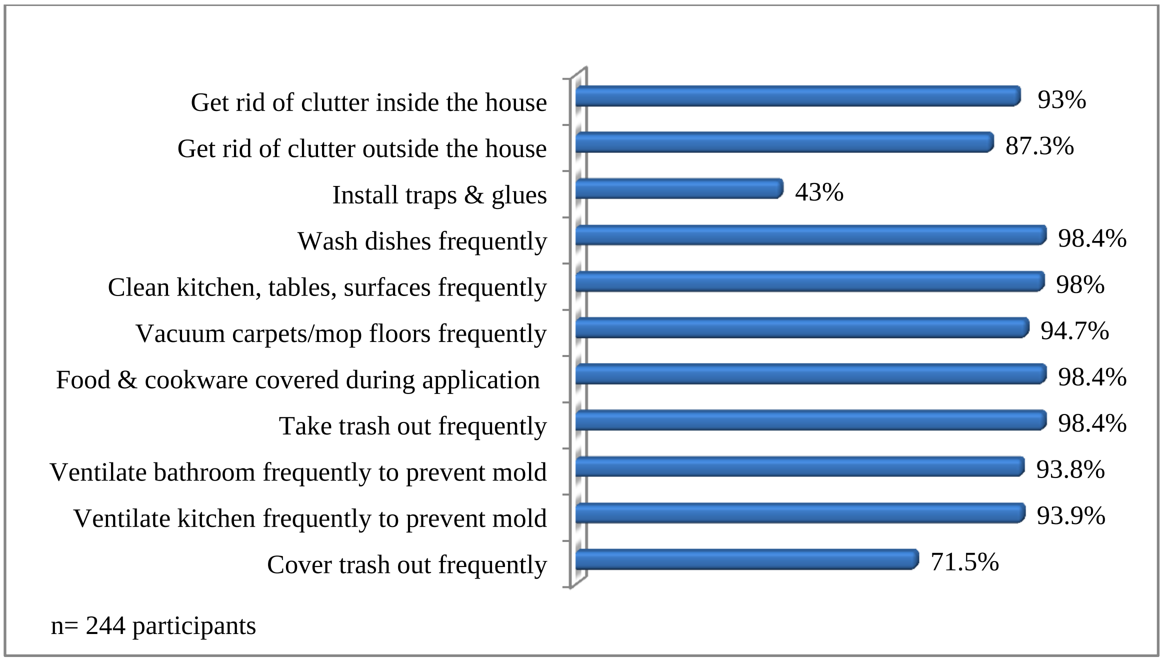

Figure 4.9. Pest Prevention Practices Conducted by Participants.

The pest prevention practices conducted by less number of participants included the installation of traps & glues (43%) and keeping covered the trash outside (71.5%) (see Figure 4.9).

When examined according to groups, the pest prevention practices scores of participants were fairly equal between the groups before any educational intervention (see Table 4.29).

Table 4.29. Pest Prevention Practices Scores before the Educational Interventions

Practices Computed for the Outcome variable "Pest Prevention" before the Intervention (points)	**Group 1 (Talk) N=79 Mean (SD)**	**Group 2 (Booklet) N=70 Mean (SD)**	**Group 3 (Control) N=81 Mean (SD)**	**Difference between groups**
Get rid of clutter inside the house (1 point)	0.92 (0.27)	0.96 (0.20)	0.90 (0.30)	1.722 (p=.423)†
Get rid of clutter outside the house (1 point)	0.89 (0.32)	0.84 (0.37)	0.89 (0.32)	0.884 (p=.643)†
Install traps & glues (1 point)	0.49 (0.50)	0.40 (0.49)	0.40 (0.49)	1.966 (p=.374) †
Wash dishes frequently (1 point)	0.97 (0.16)	1 (-)	0.86 (0.36)	3.856 (p=.145) †
Clean kitchen, tables, surfaces frequently (1 point)	0.97 (0.16)	1 (-)	0.98 (0.16)	1.782 (p=.410)†
Vacuum carpets and/or mop floors frequently (1 point)	0.99 (0.11)	0.91 (0.28)	0.94 (0.24)	4.167 (p=.124) †
Cover and store food frequently (1 point)	0.96 (0.19)	1 (-)	1 (-)	5.772 (p=.056) †
Take trash out frequently (1 point)	1 (-)	0.99 (0.12)	0.99 (0.11)	1.072 (p=.585) †
Ventilate bathroom after use frequently to reduce humidity (1 point)	0.95 (0.22)	0.94 (0.23)	0.93 (0.26)	0.409 (p=.815) †
Ventilate kitchen after use frequently to reduce humidity (1 point)	0.92 (0.27)	0.94 (0.23)	0.95 (0.22)	0.518 (p=.772) †
Cover the trash outside frequently (1 point)	0.68 (0.47)	0.68 (0.47)	0.76 (0.43)	1.620 (p=.445) †
OVERALL average of pest prevention practices BEFORE the intervention Range	**9.76 (1.15) 4 to 11**	**9.69 (1.03) 7 to 11**	**9.73 (1.13) 6 to 11**	**F=0.063§ p=.939**

† Chi-square; § ANOVA

None of the individual pest prevention practices conducted by participants before the educational interventions (Chi-square analysis) or the overall pest prevention score (F=.063, p=.939) differ significantly between the experimental and control groups.

After the educational interventions, the responses of the participants about the pest prevention practices showed that participants adopted a modest number of practices to prevent pests without using pesticides (see Table 4.30). The analysis of the overall results showed that none of the individual practices conducted by participants (Chi-square analysis) or the overall pest prevention score (ANOVA) were statistically different between the experimental and control groups after the educational interventions (F=2.617, p=.075).

Table 4.30. Pest Prevention Practices Scores after the Educational Interventions

Practices Computed for the Outcome "Pest Prevention" after the Intervention (points)	**Group 1 (Talk) N=79 Mean (SD) Range**	**Group 2 (Booklet) N=70 Mean (SD) Range**	**Group 3 (Control) N=81 Mean (SD) Range**	**Difference between groups**
Get rid of clutter inside the house (1 point)	0.90 (0.30)	0.93 (0.26)	0.86 (0.34)	1.677 (p=.436) †
Get rid of clutter outside the house (1 point)	0.86 (0.35)	0.81 (0.39	0.81 (0.39)	0.786 (p=.675) †
Install traps & glues (1 point)	0.47 (0.50)	0.36 (0.483)	0.32 (0.47)	3.953 (p=.139) †
Wash dishes frequently (1 point)	1 (-)	1 (-)	0.98 (0.16)	3.711(p=.156) †
Clean kitchen, tables, surfaces frequently (1 point)	1 (-)	1 (-)	0.98 (0.16)	3.711 (p=.156) †
Vacuum carpets and/or mop floors frequently (1 point)	0.99 (0.11)	0.97 (0.17)	0.98 (0.16)	0.493 (p=.781) †
Cover and store food frequently (1 point)	1 (-)	1 (-)	0.99 (0.11)	1.848 (p=.397) †
Take trash out frequently (1 point)	1 (-)	0.99 (0.12)	1 (-)	2.296 (p=.317) †
Ventilate bathroom after use frequently to reduce humidity (1 point)	0.97 (0.16)	0.97 (0.17)	0.95 (0.22)	0.806 (p=.668) †
Ventilate kitchen after use frequently to reduce humidity (1 point)	1 (-)	0.96 (0.20)	0.99 (0.11)	4.175 (p=.124) †
Cover the trash outside frequently (1 point)	0.81 (0.39)	0.80 (0.40)	0.77 (0.43)	0..530 (p=.767) †
OVERALL average of pest prevention practices AFTER the intervention Range	**10 (0.96) 6 to11**	**9.79 (0.96) 7 to 11**	**9.62 (1.22) 5 to 11**	**$F=2.617^{\S}$ p=.075**

† Chi-square; § ANOVA

The scores before and after the intervention were computed to determine the mean points changed before and after the interventions (see Table 4.31).

Table 4.31. Comparative Analysis of the Outcome Variable *Pest Prevention*

Comparison of Pest Prevention Scores	**Group 1 (Talk) Mean (Std. Dev.) Range**	**Group 2 (Booklet) Mean (Std. Dev.) Range**	**Group 3 (Control) Mean (Std. Dev.) Range**	**Difference between groups ANOVA**
Averages PRE intervention	n=79 9.76 (1.15) 4 to 11	n=70 9.69 (1.03) 7 to 11	n=81 9.73 (1.13) 6 to 11	F=0.063 p=.939
Averages POST intervention	n=79 10 (0.96) 6 to 11	n=70 9.79 (0.96) 7 to 11	n=81 9.62 (1.22) 5 to 11	F=2.617 p=.075
Mean differences between averages before and after the interventions	**n=78 0.231 (1.16) -2 to 6**	**n=68 0.103 (1.02) -2 to 3**	**n-80 -0.100 1.24 -4 to 3**	**F=1.660 p=.193**

Results showed that participants in the experimental groups adopted a modest number of safety practices in comparison with the participants in the control group. Of the 11 pest prevention practices measured before and after the educational interventions, participants in group 1 increased from a mean of 9.76 points (range 4-11 points) to 10 points (range 6 to 11 points), participants in group 2 increased from a mean of 9.69 points (range 7 to 11 points) to 9.79 points (range 7 to 11), and participants in group 3 slightly decreased from 9.73 points (range 6 to 11 points) to 9.62 points (range 5 to 11 points).

Finally, the overall pest prevention practices conducted by participants before and after the educational interventions were compared (ANOVA) to examine the significance of the changes between groups. The mean difference in the overall scores measuring the practices to prevent pest proliferation was not statistically significant between groups (F 1.660, $p=0.193$).

In conclusion, to answer the research question 2: which of the two educational methods tested in this study is more effective in the adoption of practices by the participants that prevent pest proliferation without pesticides?, the results showed that the educational intervention of a group talk was slightly more effective (0.23 mean point increase) than the graphic booklet (0.10 mean point increase) in increasing the practices of participants to prevent pests without application of pesticides (see Figure 4.10). The difference of the mean scores of pest prevention practices between groups was not statistically significant ($F=1.660$, $p=0.193$).

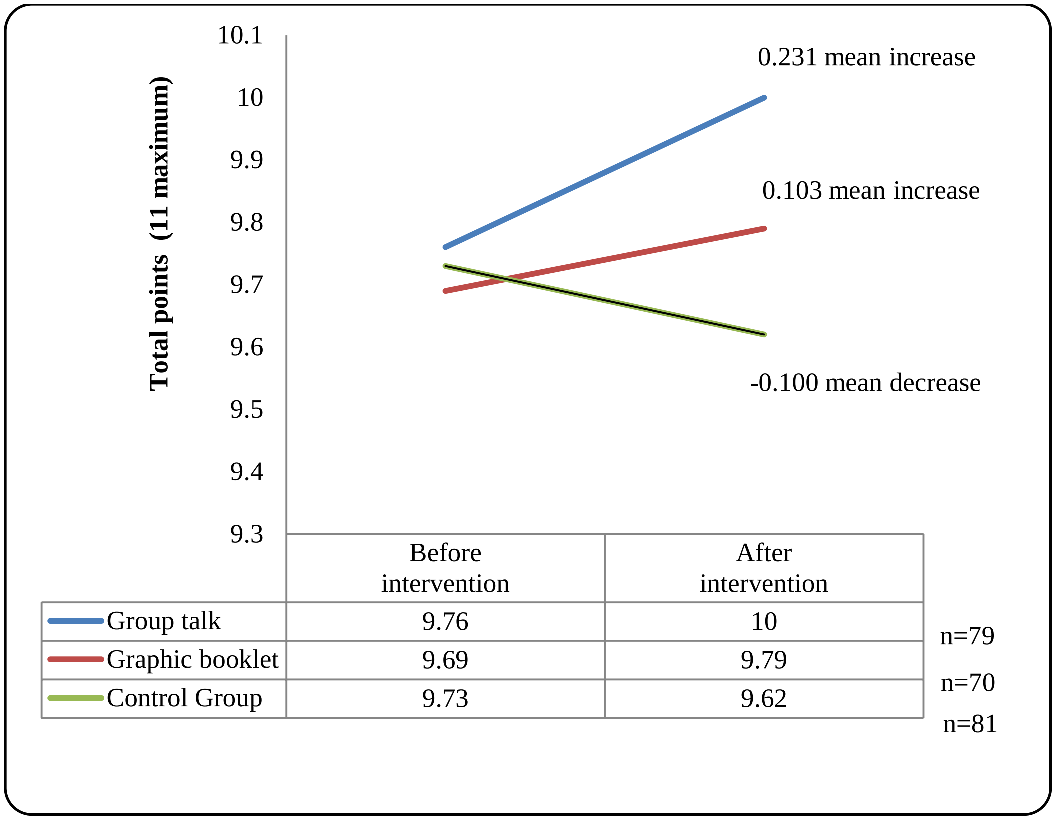

Figure 4.10. Mean Scores of the Pest Prevention Practices Conducted by Participants.

4.4.3 Research Question 3: Safety Practices Related with Pesticide Usage

Research question 3 aimed to determine the effectiveness of the educational intervention in promoting behavioral changes of the participants related with practices that prevent and reduce the exposure to pesticides during the application of pesticides. To answer this research question, the dependent variable ‘Safetypractices’ was computed with number of practices conducted by participants before (i.e. Safetypracticesprepre) and after (i.e. Safetypracticespost) the educational interventions. The variable “Safetypractices” was computed with 10 practices recommended to prevent and reduce exposures to pesticides before, during, and after the application of pesticides (see Table 4.32).

Participants responded if they had conducted these practices during the last 4-6 weeks (i.e. summer 2009). The practices to prevent and reduce exposure to pesticides before, during, and after the application of pesticides were addressed during the educational interventions (i.e. small group talk and graphic booklet).

The safety practices computed included reading the label and following the instructions before the application of pesticides, wearing long sleeve shirts and pants, and gloves during the application of pesticides, application of pesticides only when children are not present, cover food, cookware, and toys during the application of pesticides, and wash or take a bath and ventilate the house after the application of pesticides, and keep the pesticides in the original container (see Table 4.32).

Table 4.32. Practices Computed for the Outcome Variable *Safety Practices*

Practices computed for the composite variable "Safety Practices"	**Points according to practices conducted**
Read label before application of pesticides	0-1
Follow instructions of the label	0-1
Wear long sleeves and pants during application	0-1
Wear gloves during application	0-1
Apply pesticides when children are not present	0-1
Cover food and cookware during application	0-1
Cover or store toys during application	0-1
Wash or take a bath after application	0-1
Ventilate the house/rooms after application	0-1
Keep pesticides in original container	0-1
Total	**0-10 points**

To determine the effectiveness of the educational intervention and compare changes between groups, the dependent variable "Safetypracticesdifference" was computed with the difference between the scores of the variables 'Safetypracticespre' and 'Safetypracticespost.' The variable "Safetypracticesdifference" determined the number of points changed by each participant before and after the educational interventions. Then, the dependent variable

‘Safetypracticesdifference’ was examined with one-way ANOVA to determine the significance of the changes of the scores of participants according to the experimental and control groups.

Overall, 86.9% of the 244 participants reported safety practices such as covering food and cookware during application of pesticides and wash or bath and ventilate the house after application of pesticides. A smaller proportion of participants applied pesticides when children were not present (78.7%), covered or stored toys during the application of pesticides (66%), and read the label before application of pesticides (63.1%) and followed the instructions (63.5%) of the label. However, a smaller proportion of participants reported wearing long sleeves, pants, and gloves and covering toys during the application of pesticides (see Figure 4.11).

The responses of participants were transformed into points; ‘0’ if the participants did not conduct such pest prevention practice and ‘1’ if participants conducted such recommended safety practices. The answers of each category were added to the composite variables ‘Safetypracticespre’ for the practices conducted before and ‘Safetypracticespost’ for the practices conducted after the educational interventions. The results were then examined according to groups to determine the effectiveness of the educational interventions.

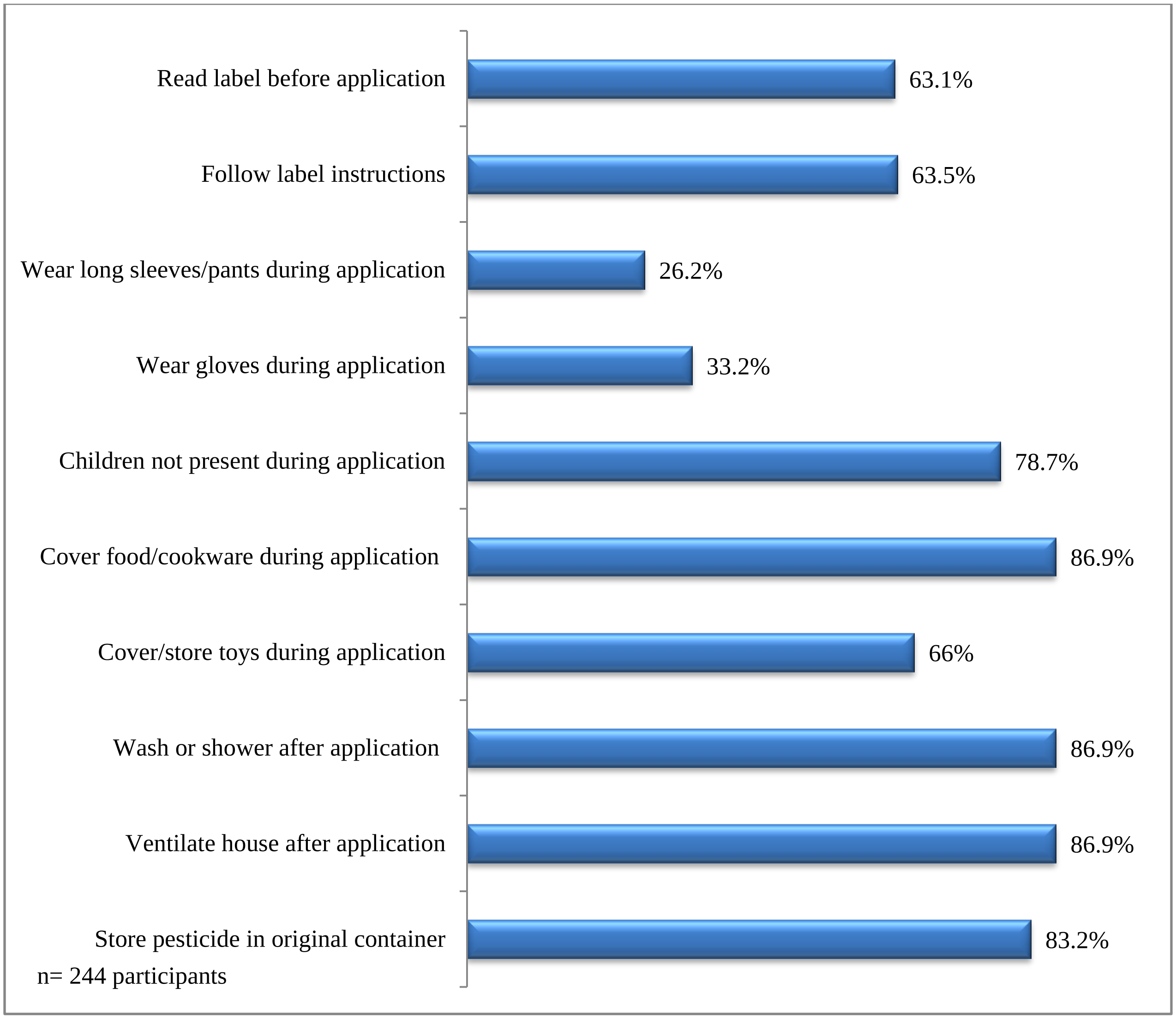

Figure 4.11. Safety Practices Related with Pesticide Usage Conducted by Participants.

Table 4.33 shows that before the educational interventions, participants of either experimental group reported a fair number of practices to reduce exposures before, during, and after the application of pesticides in the house. Of the 10 safety practices measured in this study, participants resulted in 7.4, 6.9, and 6.8 average safety practices of groups 1, 2, and 3 respectively. When examined in detail, the great majority of safety practices conducted by participants did not differ significantly between groups, except for the practice of ventilating the

house after application of pesticides (p=0.039). The mean difference of the scores between groups was not statistically significant between groups (F, 1.499, p=0.226).

Table 4.33. Safety Practices Scores before the Educational Interventions

Practices computed for the outcome “Safety Practices” PRE interventions (points)	**Group 1 (Talk) N=79 Mean (SD)**	**Group 2 (Booklet) N=70 Mean (SD)**	**Group 3 (Control) N=81 Mean (SD)**	**Difference between groups**
Read label before application of pesticides (1 point)	0.70 (0.46)	0.65 (0.48)	0.60 (0.49)	1.617 (p=.446)†
Follow instructions of the label (1 point)	0.71 (0.46)	0.64 (0.48)	0.60 (0.49)	2.145 (p=.342) †
Wear long sleeves and pants during application of pesticides (1 point)	0.28 (0.45)	0.29 (0.46)	0.26 (0.44)	0.112 (p=.946) †
Wear gloves during application of pesticides (1 point)	0.33 (0.47)	0.30 (0.46)	0.40 (0.49)	1.658 (p=.436) †
Apply pesticides when children are not present (1 point)	0.81 (0.39)	0.80 (0.41)	0.78 (0.42)	0.306 (p=.858) †
Cover food and cookware during application of pesticides (1 point)	0.91 (0.29)	0.84 (0.37)	0.86 (0.35)	1.685 (p=.431) †
Cover or store toys during application of pesticides (1 point)	0.76 (0.43)	0.63 (0.49)	0.62 (0.49)	4.293 (p=.117) †
Wash or take a shower after application of pesticides (1 point)	0.89 (0.32)	0.84 (0.37)	0.91 (0.29)	1.725 (p=.422) †
Ventilate the house/rooms after application of pesticides (1 point)	0.92 (0.27)	0.89 (0.32)	0.79 (0.41)	6.514 (p=.039) †
Keep pesticides in original container (1 point)	0.88 (0.33)	0.87 (0.34)	0.87 (0.34)	0.011 (p=.994) †
OVERALL mean pest prevention practices BEFORE the intervention	**N=63 7.35 (1.74) 2 to 10**	**N=63 6.89 (2.16) 3 to 10**	**N=72 6.75 (2.26) 2 to 10**	**F=1.499§ p=.226**

† Chi-square; § ANOVA

The same list of safety practices conducted by participants were computed after the educational intervention. Nonetheless, of the initial 79, 70, and 81 participants of groups 1, 2, and 3 respectively completing the study, the sample sizes were reduced to 21, 22, and 42 respectively because of the number of participants that reported the application of pesticides between the first and second household visits (Refer to Table 4.20). Therefore, the analysis of the safety practices scores was restricted to these participants that applied pesticides at any point between the first and second household visits.

Table 4.34 shows that participants conducted a fair number of safety practices after the educational interventions.

Table 4.34. Safety Practices of Participants after the Educational Interventions

Practices computed for the outcome "Safety Practices" PRE interventions (points)	**Group 1 (Talk) Mean (SD)**	**Group 2 (Booklet) Mean (SD)**	**Group 3 (Control) Mean (SD)**	**Difference between groups**
Read label before application of pesticides (1 point)	n=19 0.95 (0.23)	n=19 0.68 (0.48)	n=35 0.66 (0.48)	5.799 (.055)†
Follow instructions of the label of pesticides (1 point)	n=19 0.95 (0.23)	n=19 0.68 (0.48)	n=35 0.66 (0.48)	5.799 (.055) †
Wear long sleeves and pants during application of pesticides (1 point)	n=19 0.63 (0.49)	n=19 0.67 (0.49)	n=35 0.43 (0.50)	3.555 (.169) †
Wear gloves during application of pesticides (1 point)	n=19 0.79 (0.42)	n=18 0.56 (0.51)	n=35 0.43 (0.50)	6.496 (.039) †
Apply pesticides when children are not present (1 point)	n=21 0.95 (0.22)	n=22 0.77 (0.43)	n=41 0.80 (0.41)	2.964 (.227) †
Cover food and cookware during application of pesticides (1 point)	n=21 1 (-)	n=21 1 (-)	n=41 0.93 (0.26)	3.188 (.203) †
Cover or store toys during application of pesticides (1 point)	N=21 1 (-)	n=21 0.95 (0.22)	n=41 0.85 (0.36)	4.342 (.114) †
Wash or take a shower after application of pesticides (1 point)	n=19 1 (-)	n=18 0.94 (0.24)	n=35 0.94 (0.24)	1.123 (.570) †
Ventilate the house/rooms after application of pesticides (1 point)	n=21 1 (-)	n=22 0.95 (0.21)	n=41 0.90 (0.30)	2.467 (.291) †
Keep pesticides in original container (1 point)	n=20 1 (-)	N=18 1 (-)	n=36 0.94 (0.23)	2.170 (.338) †
OVERALL mean pest prevention practices AFTER the intervention	**n=19 9.3 (1.05) 7 to 10**	**n=18 8.3 (2.43) 2 to 10**	**n=35 7.5 (2.29) 2 to 10**	**4.575§ p=.014**

† Chi-square; § ANOVA

When examined individually, the safety practices that were different between groups included reading and following the instructions of the label (p=.055) and wearing gloves during the application of pesticides (p=.039). Overall, of the 10 safety practices measured in this study after the interventions, participants resulted in 9.3, 8.3 and 7.5 average scores of groups 1, 2, and 3 respectively. The mean difference of safety practices scores between groups was statistically significant (F=4.575, p=.014).

Finally, the total scores of the safety practices conducted by participants before and after the educational interventions were compared (ANOVA) to examine the significance of the changes between groups (see Table 4.35). When comparing the averages before and after the interventions, participants of group 1 increased from 7.35 to 9.26 mean points, participants of group 2 increased from 6.89 to 8.33 mean points, and participants of group 3 from 6.75 to 7.49 mean points. The mean difference in the overall scores measuring the safety practices before and after the interventions was modestly significant between groups ($F=2.724$, $p=0.074$).

Table 4.35. Comparative Analysis of the Outcome Variable *Safety Practices*

Comparison of Safety Practices	**Group 1 (Talk) Average (Std. Dev.) Range**	**Group 2 (Booklet) Average (Std. Dev.) Range**	**Group 3 (Control) Average (Std. Dev.) Range**	**Difference between groups ANOVA**
Averages PRE intervention	n=63 7.35 (1.74) 2-10	n=63 6.89 (2.16) 3-10	n=72 6.75 (2.26) 2-10	F=1.499 p=.226
Averages POST intervention	n=19 9.26 (1.05) 7-10	n=18 8.33 (2.43) 2-10	n=35 7.49 (2.29) 2-10	F=4.575 p=.014
Mean difference between averages before and after the interventions	**n=15** **2.20 (0.20)** **-1 to 6**	**n=17** **1.24 (1.89)** **-2 to 5**	**n=31** **0.81 (1.83)** **-3 to 6**	**F=2.724** **p=.074**

In conclusion, to answer research question 3: which of the two educational methods tested in this study is more effective in the adoption of safety practices related with the application of pesticides by participants?, results showed that the educational intervention of a group talk was slightly more effective (2.20 mean points increase) than the graphic booklet (1.24 mean points increase) in promoting the adoption of safety practices by the participants that prevent and reduce exposure to pesticides before, during, and after the application of pesticides (see Figure 4.12). The difference between groups was modestly significant ($F=2.724$, $p=.074$).

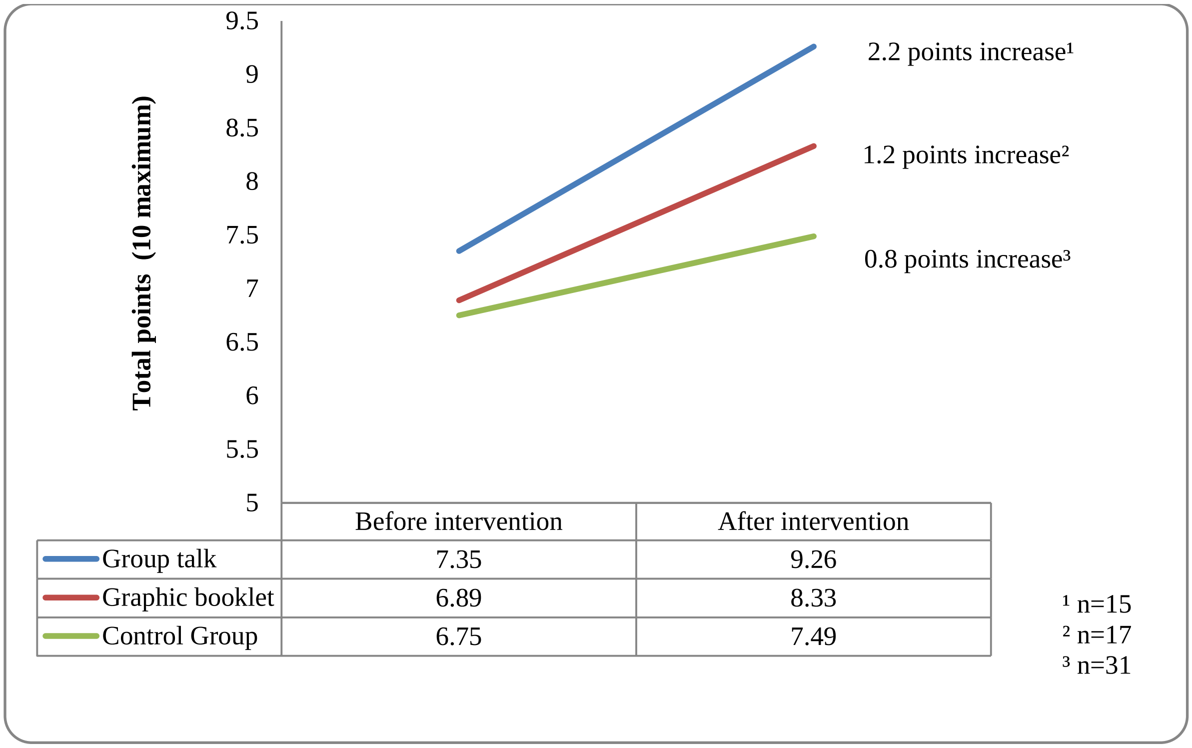

Figure 4.12. Mean Scores of Safety Practices Conducted by Participants.

4.4.4 Correlation among the Outcomes Measured in this Study

The outcomes measured in this study, knowledge level, pest prevention practices, and safety practices scores related with pesticide usage by participants, were examined for correlations between them with the responses of the baseline and the follow-up questionnaires.

Table 4.36 shows the correlation between the scores according to the responses of the baseline questionnaire. The level of knowledge of participants was significantly correlated with the pest prevention (r=.154) and the safety practices (r=.219) conducted by participants. Similarly, the number of pest prevention practices was significantly correlated with the number of safety practices related with pesticide usage conducted by participants (r=.262).

Table 4.36. Correlation between the *Knowledge Level*, *Pest Prevention,* and *Safety Practices* Scores of Baseline Questionnaire

Averages of the outcomes	**Pest prevention practices**	**Safety practices related with application of pesticides**
Knowledge Level	.154* (n=239)	.219** (n=210)
Pest Prevention Practices	-	.262** (n=206)

* Correlation significant at the 0.05 level (two-tailed); ** Correlation significant at the 0.01 level (two-tailed)

In summary, the outcomes examined in this study with the responses of the baseline questionnaire suggest a positive correlation between knowledge level of participants and their actions performed to control pests and to reduce exposures to pesticides. Further analysis would be required to examine the correlation between these outcomes according to the knowledge levels and behaviors performed according to the follow up questionnaire and the educational intervention on which participants were involved. Such analysis is beyond the scope of this study.

Moreover, the knowledge score of participants obtained from the baseline questionnaire was tested as predictor of the pest prevention practices and the safety practices scores of participants (see Table 4.37).

Table 4.37. Regression Analysis of the Knowledge Score and Practices Scores

Predictor: Knowledge level score	**B**	**Std. Error**	**Beta**	**p-value**
Pest Prevention Practices	.033	.014	.154	.017
Safety Practices	.083	.026	.219	.001

The score of knowledge level scores obtained from the baseline questionnaires suggest the impact of knowledge on the behavior of participants about pesticide application. The knowledge score of participants were examined as predictor of the pest prevention and safety practices conducted by participants with linear regression. Table 4.37 shows that the knowledge

of participants about pesticides and health predicts the number of pest prevention (Beta =.154) and safety practices (Beta=.219) conducted by them. In conclusion, the scores of knowledge levels of the 244 participants about pests, pesticides, and health was a significant predictor of the practices conducted by participants to prevent pests and to reduce exposures to pesticides as measured in this study.

4.4.5 Research Question 4: Perceptions about Pesticides and Health According to the Health Belief Model

To answer the research question 4: what are the perceptions of participants about residential pesticides and health according to the constructs of the Health Belief Model?, this study asked participants to rate several statements during the first household visit. The aim of these statements was to examine the perceptions of the participants about pesticides and the potential health risks to people and the barriers and confidence of participants to reduce exposures. The community health workers (CHWs) read each statement and asked participants to rate these statements according to a 4-point Likert Scale.

These perceptions were examined individually and grouped according to the constructs of the Health Belief Model (HBM). The statements were grouped into the following constructs: perceived susceptibility of being harmed by pesticides (i.e. susceptibility 1 and susceptibility 2), perceived severity of the harms of pesticides (i.e. severity 1, severity 2, severity 3, and severity 4), perceived benefits of using less pesticides and using them correctly (i.e. benefits 1 and benefits 2), perceived barriers to conduct pest prevention and safety practices (i.e. barriers1, barriers 2, barriers 3, and barriers 4), and the perceived confidence of the participants to conduct

the practices recommended to prevent pests and reduce exposures (i.e. self-efficacy 1, self-efficacy 2, and self-efficacy 3).

The ratings of the participants measuring their perceptions were analyzed for all the 244 participants and included three types of analysis. First, the responses were examined to obtain mean scores, standard deviations, frequencies and percentages. Secondly, the responses were examined to find correlations between the socio-demographic characteristics of the participants and their perceptions about pesticides and health. The tests included the Pearson's correlation to examine the association between the characteristics of the participants such as age, education (school years), number of children 11 years of age and less, and the number of years living in the city and in the house; the Spearman's rho correlation test to examine the correlation between the variable "income per family" and the ratings of the perceptions; and the Cramer's V correlation test to examine the correlation between the variable "home ownership" and the ratings of the perceptions of the participants. Lastly, the participants' responses about their perceptions were analyzed to find association with knowledge, pest prevention, and safety practices scores (Pearson's correlation) computed with their responses before any educational intervention. Finally, this section includes a summary of the perceptions of participants about pesticides and health that were statistically correlated with the knowledge scores, pest prevention scores, and safety practices scores before the educational interventions.

4.4.5.1 Perceived susceptibility of being harmed by exposure to pesticides.

Participants rated various statements to examine their perceived susceptibility of being harmed by pesticides, including the potential risks for their children and unborn children. The statements measuring the perceptions of susceptibility of participants were grouped in

Susceptibility 1 for general health harms and in the category of *Susceptibility* 2 for more specific health harms.

Susceptibility 1: Perceived Likelihood of General Health Harms

Participant women rated three statements (*Susceptibility 1*) about the likelihood that pesticides applied in the house would harm their health, the health of their children 11 years of age and less, and the health of their unborn child (in the case she was pregnant) on a scale from 1 (not likely) to 4 (very likely) (see Table 4.38). According to the mean scores, participants believed that unborn children are more susceptible of being harmed by the pesticides used at home (mean 3.33) than their children 11 years of age and less (mean 3.08) and the adults (mean 2.98) living in the house. Similarly, the greatest proportion of participants (59.8%) believed that it is very likely that the pesticides they use at home would harm the unborn child.

Table 4.38. Frequencies of the Statements of *Susceptibility 1*

Perceived Susceptibility 1 **How likely is that pesticides applied in your house...?**	**Mean (Standard deviation) n=244**	**Scale n (%)** Scale 1 (not likely) to 4 (very likely)			
		1	**2**	**3**	**4**
Harm your health (and the health of other adults in the house)	2.86 (1.05)	31 (12.7%)	59 (24.2%)	67 (27.5%)	87 (35.7%)
Harm the health or your children 11 years of age and less	3.08 (1.04)	26 (10.7%)	45 (18.4%)	57 (23.4%)	116 (47.5%)
Harm the health of your unborn child (in the case you were pregnant)	3.33 (0.97)	21 (8.6%)	24 (9.8%)	53 (21.7%)	146 (59.8%)

According to the analysis of correlation between the perceived susceptibility of being harm and the characteristics of the participants (see Table 4.39), older mothers tend to rate as very likely that the pesticides used in their homes would harm their own health and the health of other adults living in the house (r=.177).

Similarly, participants at higher income levels believed that it is very likely that pesticides applied in their house would harm the unborn child. In contrast, participants with greater number of children 11 years of age and younger rated as not likely that the pesticides they use at home would harm the unborn child (in the case they were pregnant).

Table 4.39. Correlation between the Statements of *Perceived Susceptibility 1* and Selected Characteristics of Participants

Perceived susceptibility 1 **How likely is that pesticides applied in your house...?** Scale 1 (not likely) to 4 (very likely)	Age†	Education†	Income level (per family per month)[1]	Number of children ≤ 11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in the city	Years living in the house
Harm your health (and the health of other adults in the house)	.180**	-.014	-.010	-.008	.138	.096	0.90
Harm the health or your children 11 years of age and less	.055	-.017	.085	-.070	.096	.103	.077
Harm the health of your unborn child (in the case you were pregnant)	-.058	-.086	.136*	-.143**	.137	.058	-.043

†Log transformed; [1] Spearman's Correlation; [2] Cramer's V; * Correlation is significant at 0.05 level; ** Correlation is significant at 0.01 level.

All the statements about the perceived likelihood of being harmed by the pesticides used at home by participants were significantly correlated with their scores of knowledge level but not with the pest prevention or the safety practices conducted by participants (see Table 4.40).

Table 4.40. Correlation between the Statements of *Perceived Susceptibility 1* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Perceived susceptibility1: **How likely is that pesticides applied in your house...?** Scale 1 (not likely) to 4 (very likely)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
Harm your health (and the health of other adults in the house)	.240**	.043	-.094
Harm the health or your children 11 years of age and less	.201**	.015	-.116
Harm the health of your unborn child (in the case you were pregnant)	.219**	.000	-.019

** Correlation is significant at 0.01 level.

In summary, the participants' perceived susceptibility of being harmed by the pesticides they apply at home increases as participants know more about pesticides and health. In contrast, the perceived susceptibility of participants being harmed or their children being harmed by pesticides were not significantly correlated with their pest prevention or safety practices scores.

Susceptibility 2: Likelihood of Specific Health Harms

Participants rated the likelihood of specific health harms to people caused by exposure to pesticides. The statements were grouped in the construct *susceptibility 2*. Table 4.41 shows that the higher proportions of participants believed that exposure to residential pesticides is very likely to cause allergies (skin and respiratory) (51.2%), problems to the brain and nervous system (29.5%) and certain types of cancer (27.2%). In contrast, only a small proportion of participants (9.5%) believe that exposure to pesticides is very likely to cause fertility problems.

Table 4.41. Frequencies of the Statements of *Perceived Susceptibility 2*

Perceived Susceptibility 2 **How likely is that pesticides people apply in the house...?**	**Mean (Standard deviation) n=244**	**Scale n (%)** Scale 1 (not likely) to 4 (very likely)			
		1	**2**	**3**	**4**
Reduce the ability of men and women to have children	1.89 (1.0)	113 (46.5%)	67 (27.6%)	40 (16.5%)	23 (9.5%)
Cause problems in the brain or nervous system	2.54 (1.15)	57 (23.4)	71 (29.1%)	44 (18%)	72 (29.5%)
Cause certain type of cancer	2.48 (1.14)	62 (25.5%)	68 (28%)	47 (19.3%)	66 (27.2%)
Cause allergies (respiratory or skin)	3.37 (.90)	20 (8.3%)	37 (15.3%)	61 (25.2%)	124 (51.2%)

The ratings of participants about the perceived susceptibility of having certain diseases after exposure to pesticides were examined according to their socio-demographic characteristics (see Table 4.42). The age of the participants was significantly correlated with their perceptions about the likelihood of having fertility problems and certain types of cancer ($p<0.01$). Similarly,

participants at higher income level believed that pesticides are more likely to cause allergies (respiratory and skin) (r=.135). The type of home ownership participants reported was correlated with the perception that pesticides are likely to cause allergies (r=.187). Additionally, the more number of years residing in the city was significantly correlated with participants' perception that exposure to pesticides can cause fertility problems and allergies (r=.219).

Table 4.42. Correlation between the Statements of *Perceived Susceptibility 2* and Selected Characteristics of Participants

Perceived Susceptibility 2 **How likely is that pesticides people apply in the house...?** Scale 1 (not likely) to 4 (very likely)	Age†	Education†	Income level (per family per month)[1]	Number of children ≤11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in the city	Years living in the house
Reduce the ability of men and women to have children	.202**	.013	.015	-.025	.121	.219*	.082
Cause problems in the brain or nervous system	.036	.010	.065	.020	.095	.070	.003
Cause certain type of cancer	.227**	.037	-.029	-.019	.136	.072	.123
Cause allergies (respiratory or skin)	-.043	.069	.135*	-.049	.187**	.159*	.090

†Log transformed; ¹ Spearman's Correlation; ² Cramer's V; * Correlation is significant at 0.05 level; ** Correlation is significant at 0.01 level.

The ratings of participants about their perceptions of the likelihood of having specific diseases were examined to find the correlation with their scores of knowledge level, pest prevention practices, and safety practices when using pesticides (see Table 4.43). Results showed that the perceptions of participants about the likelihood of having fertility problems, brain and nervous system, certain types of cancer and allergies are significantly correlated with the knowledge level scores of participants. In contrast, none of the statements measuring the

perceived susceptibility to specific diseases associated with pesticides were correlated with the pest prevention and safety practices conducted by the participants.

Table 4.43. Correlation between the Statements of *Perceived Susceptibility 2* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Perceived Susceptibility 2 **How likely is that pesticides people apply in the house...?** Scale 1 (not likely) to 4 (very likely)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
Reduce the ability of men and women to have children	.364**	-.090	.008
Cause problems in the brain or nervous system	.416**	-.030	.054
Cause certain type of cancer	.399**	-.038	.041
Cause allergies (respiratory or skin)	.315**	.062	.062

** Correlation is significant at the 0.01 level (two-tailed).

4.4.5.2 Perceived severity of the harms caused by pesticides.

Participants responded several statements to determine their perceptions about the severity of the harms caused by pesticides. The severity of the harms caused by pesticides was measured in two ways, by the perceived easiness to cure the health harms in general, by the safety of the pesticides according to the types and sites of application at home, and the level of agreement with various general statements about pesticides and health harms. The perceptions grouped in *Severity 1* include the easiness to cure symptoms, diseases and poisonings; the perceptions grouped in the category of *Severity 2* examines the safety of pesticides according to the type of application of pesticides such as indoors, outdoors, and by an exterminator; the perceptions grouped in the category of *Severity 3* include the safety of pesticides according to the sites on which pesticides are applied such as in the kitchen and children's bedroom and play areas inside the house; and the perceptions grouped in the category *Severity* 4 examine various general statements about pesticides and health harms.

Severity 1: Difficulty to Treat/Cure General Health Harms

Participants rated how easy it would be to treat or cure health harms caused by exposure to pesticides on a scale from 1 (not easy) to 4 (very easy) (see Table 4.44). The statements on this category distinguished the severity of the harms of pesticides according to the difficulty to cure/treat symptoms, diseases, and poisonings associated with pesticides. Results showed that 62% of participants believed that curing or treating the poisonings was not easy and 48% of participants believed that curing diseases was not easy. A smaller proportion of participants believed that treating the symptoms caused by pesticides is not easy (38% of participants). Apparently, participants believed that poisonings caused by pesticides were more severe (1.68 mean score) than the symptoms (1.99 mean score) or the diseases (1.84 mean score) caused by pesticides.

Table 4.44. Frequencies of the Statements of *Perceived Severity 1*

Perceived Severity 1 **How easy you think it is to...?**	**Mean (Standard deviation) n=244**	**Scale n (%)** Scale 1 (not easy) to 4 (very easy)			
		1	**2**	**3**	**4**
Treat the symptoms caused by pesticides	1.99 (0.97)	92 (37.7%)	86 (35.2%)	42 (17.2%)	24 (9.8%)
Cure the diseases caused by pesticides	1.84 (0.98)	118 (48.4%)	66 (27%)	40 (16.4%)	20 (8.2%)
Cure/treat poisonings by pesticides	1.68 (0.98)	150 (61.5%)	41 (16.8%)	34 (13.9%)	19 (7.8%)

According the their demographic characteristics (see Table 4.45), the perceptions of participants about the severity of pesticides regarding the difficulty to cure the health harms, the participants with higher number of children 11 years of age and less was correlated with the belief that curing the diseases associated with pesticides is not easy (r=0.167).

Table 4.45. Correlation between the Statements of *Perceived Severity 1* and Selected Characteristics of Participants

Perceived severity 1 **How easy it is to...?** Scale 1 (not easy) to 4 (very easy)	Age†	Education†	Income[1] level (per family per month)	Number of children ≤ 11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in the city	Years living in the house
Treat the symptoms caused by pesticides	-.026	.007	-.073	-.118	.172*	-.047	-.039
Cure the diseases caused by pesticides	.022	-.077	-.048	-.167**	.162*	-.023	-.054
Cure/treat poisonings by pesticides	.011	-.092	-.135*	-.077	.121	-.052	-.043

†Log transformed; [1] Spearman's Correlation; [2] Cramer's V; * Correlation is significant at 0.05 level; ** Correlation is significant at 0.01 level.

Similarly, the perceived difficulty of curing/treating poisonings by pesticides was inversely correlated with the income level of the family (r=-.135), this is, participants reporting higher income level perceived that it is not easy to cure poisonings by pesticides. The type of home ownership of participants was correlated with the perceived easiness of treating/curing symptoms (r=.172) and diseases (r=.162) caused by exposure to pesticides.

Additionally, the perceptions of participants about the difficulty to cure/treat the health harms caused by pesticides were examined to find correlations with their scores of knowledge level, pest prevention, and safety practices. Table 4.46 shows that the statistically significant correlations indicated that participants with higher knowledge level believed that curing the diseases caused by pesticides was not easy (r=-0.139). Similarly, participants with higher number of safety practices scores believed that curing or treating poisonings were not easy (r=.141). None of the statements measuring the severity of the harms of pesticides according to the perceived difficulty of curing the health harms were associated with the pest prevention scores.

Table 4.46. Correlation between the Statements of *Perceived Severity 1* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Perceived severity 1 How easy it is to...? Scale 1 (not easy) to 4 (very easy)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
Treat the symptoms caused by pesticides	-.100	.057	-.033
Cure the diseases caused by pesticides	-.139*	-.005	-.043
Cure/treat poisonings by pesticides	-.113	-.069	-.141*

* Correlation is significant at the 0.05 level (two-tailed).

Severity 2: The severity of harms according to the type of pesticide application

The perceptions of participants grouped into the category of Severity 2 measured the safety of pesticides for children 11 years of age and less according to the type of application in the house (see Table 4.47). Participants rated how safe are pesticides applied inside and outside the house, and by an exterminator on a scale from 1 (not safe at all) to 4 (very safe). Participants believed that pesticides applied outdoors (mean score 2.09) were slightly safer than those applied by the exterminator (mean score 2.07) or the pesticides they apply inside the house (mean score 2.02).

Table 4.47. Frequencies of the Statements of *Perceived Severity 2*

Perceived Severity 2 **How safe are for your children 11 years of age and less...?**	**Mean (Standard deviation) n=244**	**Scale n (%)** Scale 1 (not safe at all) to 4 (very safe)			
		1	**2**	**3**	**4**
The pesticides applied inside your house	2.02 (1.04)	99 (40.6)	70 (28.7%)	46 (18.9%)	29 (11.9%)
The pesticides applied outside your house	2.09 (1.05)	102 (42.1%)	68 (28.1%)	41 (16.9%)	31 (12.8%)
The pesticides applied by the exterminator (hired by you or by the owner of the house)	2.07 (1.09)	98 (40.5%)	68 (28.1%)	38 (15.7%)	38 (15.7%)

Regarding the socio-demographic characteristics of the participants, only the income level of participants was correlated with one of the statements of the group of *Perceived Severity 2*. There is an inverse correlation between the income level of the family and the perceptions of

participants that pesticides applied by an exterminator are not safe at all (r=-.132) (see Table 4.48).

Table 4.48. Correlation between the Statements of *Perceived Severity 2* and Selected Characteristics of Participants

Perceived Severity 2 **How safe are for your children 11 years of age and less...?** Scale 1 (not safe at all) to 4 (very safe)	Age†	Education†	Income level (per family per month)[1]	Number of children ≤ 11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in city	Years living in house
The pesticides applied inside your house	-.054	.023	.004	.091	.118	-.055	-.054
The pesticides applied outside your house	.054	-.077	-.124	-.064	.140	-.085	-.032
The pesticides applied by the exterminator (hired by you or by the owner of the house)	.074	.038	-.132*	-.100	.146	-.035	-.070

†Log transformed; [1] Spearman's Correlation; [2] Cramer's V; * Correlation is significant at 0.05 level.

In contrast, some perceptions of participants about the severity of pesticides according to the type of application were correlated with their knowledge level and pest prevention and safety practices conducted by them. Table 4.49 illustrates that the perceived severity of the pesticides applied outside the house was inversely correlated with the level of knowledge of participants about pesticides and health; the lower level of knowledge of participants explains participants' perception that outdoor pesticides are safer. Regarding the practices conducted by participants about pesticide usage, the perceptions of participants that pesticides applied outside the house and applied by an exterminator are safe for children were significantly correlated with the number of pest prevention practices conducted by participants (r=.129 and r=.217). The pest prevention and safety practices conducted by participants were computed with the practices of participants conducted inside the house. The questionnaire did not ask participants about their practices about pesticide application outside the house or by an exterminator. Apparently,

participants conducting more pest prevention practices inside the house perceived as safe the pesticides applied outside the house or applied by an exterminator. On the other hand, participants perceiving that pesticides applied inside the house and by an exterminator as safe conducted more safety practices inside the house. In other words, the higher number of safety practices conducted by participants was significantly correlated with their beliefs that pesticides applied inside the house (r=.171) and by an exterminator (r=.163) are safe.

Table 4.49. Correlation between the Statements of *Perceived Severity 2* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Perceived Severity 2 **How safe are for your children 11 years of age and less...?** Scale 1 (not safe at all) to 4 (very safe)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
The pesticides applied inside your house	-.094	.121	.171*
The pesticides applied outside your house	-.144*	.129*	.120
The pesticides applied by the exterminator (hired by you or by the owner of the house)	-.061	.217**	.163**

* Correlation is significant at the 0.05 level (two-tailed); ** Correlation is significant at the 0.01 level (two-tailed).

Severity 3: The severity of harms according to the sites of pesticide application in the house

Participants rated statements (*Severity 3)* about the safety of pesticides for their children 11 years of age and less according to the sites of application in the house on a scale from 1(not safe at all) to 4 (very safe) (see Table 4.50). The majority of participants rated as not safe at all the application of pesticides in the play areas inside the house (77.9%), in children's bedroom (75.7%), and in the cabinets (63.4%) and floors (60.7%) of the kitchen.

According to the demographic characteristics of participants, only the income level of the family and the type of home ownership were significantly correlated with the perceived safeness of applying pesticides in the kitchen cabinets and floors (see Table 4.51).

Table 4.50. Frequencies of the Statements of *Perceived Severity 3*

Perceived Severity 3 **How safe it is to your children ≤ 11 years of age...?**	**Mean (Standard deviation) n=244**	**Scale n (%)** Scale 1 (not safe at all) to 4 (very safe)			
		1	**2**	**3**	**4**
To apply pesticides in the kitchen cabinets	1.6 (0.91)	154 (63.4%)	48 (19.8%)	26 (10.7%)	15 (6.2%)
To apply pesticides in kitchen floors	1.64 (0.93)	148 (60.7%)	52 (21.3%)	27 (11.1%)	17 (7%)
To apply pesticides in children's bedroom	1.40 (0.93)	184 (75.7%)	30 (12.3%)	20 (8.2%)	9 (3.7%)
To apply pesticides in the places where children play inside the house	1.34 (0.03)	190 (77.9%)	32 (13.1%)	14 (5.7%)	8 (3.3%)

Participants at higher income levels perceived as not safe to apply pesticides in the kitchen cabinets (r=-.159) and participants renting or lending their home felt that applying pesticides in kitchen floors was safe (r=.201).

Table 4.51. Correlation between the Statements of *Perceived Severity* and Selected Characteristics of Participants

Perceived Severity 3 **How safe it is to your children ≤ 11 years of age...?** Scale 1 (not safe at all) to 4 (very safe)	Age†	Education†	Income level[1] (per family per month)	Number of children ≤ 11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in city	Years living in house
To apply pesticides in the kitchen cabinets	-.001	.080	-.159*	-.063	.150	-.040	-.017
To apply pesticides in kitchen floors	-.051	.056	-.095	-.076	.201**	-.092	-.088
To apply pesticides in children's bedroom	.005	.047	-.104	-.109	.085	-.008	-.006
To apply pesticides in the places where children play inside the house	-.011	.106	-.031	-.033	.125	-.014	-.005

†Log transformed; ¹ Spearman's Correlation; ² Cramer's V; * Correlation is significant at 0.05 level; ** Correlation is significant at 0.01 level.

The perceptions of participants about the safety of pesticides according to the site of application in the house were tested for correlation with their scores of knowledge level, pest prevention and safety practices. Certain perceptions about the severity of pesticides for children

according to the site of application were significantly correlated with the levels of knowledge and the pest prevention practices (see Table 4.52).

Table 4.52. Correlation between the Statements of *Perceived Severity 3* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Perceived Severity 3 **How safe it is to your children ≤ 11 years of age...?** Scale 1 (not safe at all) to 4 (very safe)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
To apply pesticides in the kitchen cabinets	-.159*	.134*	.080
To apply pesticides in kitchen floors	-.203**	.037	.058
To apply pesticides in children's bedroom	-.151*	.107	.099
To apply pesticides in the places where children play inside the house	-.159*	.172**	.099

* Correlation is significant at the 0.05 level (two-tailed); ** Correlation is significant at the 0.01 level (two-tailed).

Participants' beliefs about the severity of the harms associated with pesticides were inversely correlated with their level of knowledge; as participants have lower knowledge scores they believe that pesticides applied in the cabinets (r=-.159) and in the floors (r=-.203) of the kitchen and in children's bedroom (r=-.151) and play areas (r=-.159) are safer.

On the other hand, the higher number of pest prevention practices conducted by participants is significantly correlated with the perceived safety of pesticides if applied in the cabinets of the kitchen (r=.134) and in the play areas of children (r=.172). In contrast, none of these perceptions measuring the severity of pesticides were correlated with the safety practices scores about pesticide usage conducted by participants.

Severity 4: Severity of Harms According to General Statements about Pesticides

Participants rated their level of agreement with various statements about the severity of the harms of pesticides (*Severity 4*) on a scale from 1 (totally disagree) to 4 (totally agree) (see Table 4.53).

Table 4.53. Frequencies of the Statements of *Perceived Severity 4*

Perceived Severity 4 **How much do you agree with the following...?**	**Mean (Standard deviation) n=244**	**Scale n (%)** Scale 1 (totally disagree) to 4 (totally agree)			
		1	**2**	**3**	**4**
Pesticides do not harm children because pesticides are intended only for pests	1.59 (0.95)	159 (65.2%)	47 (19.3%)	17 (7%)	21 (8.6%)
Little amount of poison does not harm children	1.45 (0.83)	174 (71.3%)	41 (16.8%)	17 (7%)	12 (4.9%)
Pesticides do not reach the unborn child of a pregnant woman	1.52 (0.92)	172 (70.5%)	36 (14.8%)	18 (7.4%)	18 (7.4%)
Pesticides do not reach breastfeed children because pesticides cannot be in the breast milk	1.56 (0.93)	164 (67.2%)	40 (16.4%)	23 (9.4%)	17 (7%)

Results showed that the majority of participants totally disagreed with statements such as little amount of pesticides do not harm children (71.3%), pesticides do not reach the unborn child of a pregnant woman (70.5%). A smaller proportion of participants totally disagreed with statements such as pesticides do not reach breastfeed babies because pesticides cannot be in the breast milk (67.2%) and pesticides do not harm children because pesticides are made to control pests (65.2%).

According to demographic factors, the level of education of participants was significantly correlated with two statements measuring the severity of pesticides (see Table 4.54). Participants with higher number of school years disagreed with the statement that little amount of poison does not harm children (r=-.186) and that pesticides do not reach the unborn child of a pregnant women (r=-.160). Additionally, the level of income of the family was inversely correlated with the belief that pesticides do not harm children because pesticides are intended only for pests (r=-.162). Participants at higher income levels tend to disagree that pesticides do not harm children because pesticides are intended only for pests.

Table 4.54. Correlation between the Statements of *Perceived Severity 4* and Selected Characteristics of Participants

Perceived Severity 4 **How much do you agree with the following...?** Scale 1 (totally disagree) to 4 (totally agree)	Age†	Education†	Income level (per family per month)[1]	Number of children ≤11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in city	Years living in house
Pesticides do not harm children because pesticides are intended only for pests	.084	-.071	-.162*	-.102	.109	-.036	-.036
Little amount of poison does not harm children	.050	-.186**	.036	-.099	.095	.021	.020
Pesticides do not reach the unborn child of a pregnant woman	.108	-.160*	-.062	-.018	.091	.036	-.007
Pesticides do not reach breastfeed children because pesticides cannot be in the breast milk	-.005	-.070	.044	-.104	.089	.088	.027

†Log transformed; [1] Spearman's Correlation; [2] Cramer's V; * Correlation is significant at 0.05 level; ** Correlation is significant at 0.01 level.

The analysis of correlation between the perceptions grouped in *Severity 4* and the scores of knowledge level, pest prevention, and safety practices showed that the majority of these statements were significantly correlated with the level of knowledge of participants about pesticides and health. As shown in Table 4.55, participants with lower level of knowledge about pesticides and health are more in agreement with statements such as that little amount of poison does not harm children (r=-.130), pesticides do not reach the unborn child of a pregnant woman (r=-.139), and pesticides do not reach breastfeed children because pesticides cannot be in the breast milk (r=-.195). In contrast, the pest prevention and the safety practices conducted by participants were not correlated with the perceptions about the severity of the harms associated with pesticides.

Table 4.55. Correlation between the Statements of *Perceived Severity 4* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Perceived Severity 4 **How much do you agree with the following...?** Scale 1 (totally disagree) to 4 (totally agree)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
Pesticides do not harm children because pesticides are intended only for pests	-.118	-.020	-.017
Little amount of poison does not harm children	-.130*	.077	.023
Pesticides do not reach the unborn child of a pregnant woman	-.139*	.002	.060
Pesticides do not reach breastfeed children because pesticides cannot be in the breast milk	-.195**	.023	-.002

* Correlation is significant at the 0.05 level (two-tailed); ** Correlation is significant at the 0.01 level (two-tailed).

4.4.5.3 Perceived benefits of reducing exposures to residential pesticides.

This study measures the perceptions of participants about the benefits of reducing or preventing the harms associated with pesticides. The perceived benefits are grouped into two categories. *Perceived Benefits 1* includes statements measuring the benefits of preventing health harms by using less pesticide in the house and *Perceived Benefits 2* includes the statements measuring the benefits of preventing health harms by applying correctly the pesticides in the house.

*Benefits 1: Reduced Harms by Applying Less Pesticide in the Hous*e

Participants were asked to rate their level of agreement with several statements about the benefits of applying less amounts of pesticides in the house such as if their own health and the health of their unborn child, their breastfeed child, and their children 11 years of age and younger would not be harmed. Table 4.56 shows that 38.5% and 38.1% of participants somehow agreed (i.e. agree and totally agree) with the statements that if they use less pesticide the health of their children 11 years of age and younger and the health of their unborn child would not be harmed respectively.

Table 4.56. Frequencies of the Statements of *Perceived Benefits 1*

Perceived Benefits 1 **How much do you agree with the following: If you apply less quantity of pesticides in your house...**	**Mean (Standard deviation) n=244**	**Scale n (%)** Scale 1 (totally disagree) to 4 (totally agree)			
		1	**2**	**3**	**4**
Your health would not be harmed by pesticides	2.23 (1.12)	84 (24.4%)	68 (27.9%)	45 (18.4%)	47 (19.3%)
The health of your unborn child would not be harmed (in the case you are pregnant)	2.21 (1.16)	93 (38.1%)	58 (23.8%)	42 (17.2%)	51 (20.9%)
The health of your breastfeed child would not be harmed	2.15 (1.15)	98 (40.2%)	57 (23.4%)	43 (17.6%)	46 (18.9%)
Your children $\leq$11 yrs. of age would not be harmed by pesticides	2.20 (1.19)	98 (40.2%)	52 (21.3%)	40 (16.4%)	54 (22.1%)

Additionally, participants agreed that applying less pesticide would not harm their own health and the health of their breastfeed child, 37.7% and 36.5% of participants respectively.

Table 4.57. Correlation between the Statements of *Perceived Benefits 1* and Selected Characteristics of Participants

Perceived Benefits 1 **How much do you agree with the following: If you apply less quantity of pesticides in your house...?** Scale 1 (totally disagree) to 4 (totally agree)	Age†	Education†	Income[1] level (per family per month)	Number of children $\leq$11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in city	Years living in house
Your health would not be harmed by pesticides	-.072	.006	.011	.002	.172*	.010	-.027
The health of your unborn child would not be harmed (in the case you are pregnant)	.048	.021	.040	-.076	.121	.025	-.048
The health of your breastfeed child would not be harmed	.046	.017	.011	-.062	.125	-.008	-.023
Your children $\leq$11 yrs. of age would not be harmed by pesticides	.045	-.040	.005	-.067	.159*	.039	.004

†Log transformed; [1] Spearman's Correlation; [2] Cramer's V; * Correlation is significant at 0.05 level.

Interestingly, somehow similar proportions of participants totally disagree with the statements that using less pesticide would prevent health harms for their children 11 years of age and younger and breastfed children (40.2% of participants).

Regarding the socio-demographic characteristics of the participants, the great majority of the demographic characteristics of participants were not related with these statements measuring the perceived benefits of using less pesticide (see Table 4.57). Only the type of home ownership of participants was significantly correlated with the beliefs that applying less pesticide would not harm their health (r=.172) and with the statement that applying less pesticide would not harm children 11 years of age and younger (r=.159).

Additionally, the various statements measuring the perceived benefits of participants of applying less pesticide were examined for association with the total scores of participants about their knowledge level, pest prevention practices, and safety practices (see Table 4.58). None of these statements grouped in the category of *Benefits 1* resulted significantly correlated with the level of knowledge about pesticides and health by the participants or with the scores of safety practices conducted by the participants. In contrast, the correlations between the pest prevention scores and the perceptions that applying less pesticide would prevent harms to the unborn child (r=.128), to the breastfed children (r=.184), and to the children 11 years of age and younger (r=.182) were statistically significant. Apparently, participants conduct more pest prevention practices such as house cleaning and pest free methods because they believe that using less pesticide would prevent harms to their children.

Table 4.58. Correlation between the Statements of *Perceived Benefits 1* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Perceived Benefits 1 **How much do you agree with the following: If you apply less quantity of pesticides in your house...?** Scale 1 (totally disagree) to 4 (totally agree)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
Your health would not be harmed by pesticides	-.091	.046	.035
The health of your unborn child would not be harmed (in the case you are pregnant)	-.072	.128*	.019
The health of your breastfeed child would not be harmed	-.120	.184**	-.004
Your children ≤11 yrs. of age would not be harmed by pesticides	-.111	.182**	.023

* Correlation is significant at the 0.05 level (two-tailed); ** Correlation is significant at the 0.01 level (two-tailed)

Benefits 2: Perceived Benefits of Applying Pesticides Correctly

Participants rated their agreement with various statements about the benefits of applying pesticides correctly (see Table 4.59). The majority of participants somehow agreed (i.e. agree and totally agree) that applying pesticides correctly, pests would be controlled to the point of not damaging the property (75%) and would not bother the family (76.3%), and that they would save money by purchasing less pesticide (72.6%). Less proportion of participants somehow agreed (i.e. agree and totally agree) that applying pesticides correctly would result in a house pest free (66.8%) and less contaminated with pesticides (59.7%).

Table 4.59. Frequencies of the Statements of *Perceived Benefits 2*

Perceived Benefits 2 **How much do you agree with the following: If you apply pesticides correctly...**	**Mean (Standard deviation) n=244**	**Scale** **n (%)** Scale 1 (totally disagree) to 4 (totally agree)			
		1	**2**	**3**	**4**
Your house would be less contaminated by pesticides	2.79 (1.14)	45 (18.5%)	53 (21.8%)	52 (21.4%)	93 (38.3%)
Your house would be pest free	2.98 (1.15)	41 (16.8%)	40 (16.4%)	45 (18.4%)	118 (48.4%)
You would save money by purchasing fewer pesticide products	3.10 (1.15)	28 (11.5%)	39 (16%)	57 (23.4%)	120 (49.2%)
Pests would be controlled to the point of not harming the health of your family	3.12 (1.03)	27 (11.1%)	36 (14.8%)	62 (25.5%)	118 (48.6%)
Pests would be controlled to the point of not bothering your family	3.18 (1.03)	26 (10.7%)	32 (13.1%)	57 (23.4%)	129 (52.9%)
Pests would be controlled to the point of not damaging your property	3.14 (1.06)	30 (12.3%)	31 (12.7%)	58 (23.8%)	125 (51.2%)

The demographic characteristics of participants were tested for correlation with the statements measuring the perceptions of participants about the benefits of using pesticides correctly (*Benefits 2*) (see Table 4.60). The level of education of participants was inversely correlated with their level of agreement to various statements.

Table 4.60. Correlation between the Statements of *Perceived Benefits 2* and Selected Characteristics of Participants

Perceived Benefits 2 How much do you agree with the following: If you apply pesticides correctly... Scale 1 (totally disagree) to 4 (totally agree)	Age†	Education†	Income level (per family per month)[1]	Number of children ≤ 11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in city	Years living in house
Your house would be less contaminated by pesticides	-.019	-.136*	.262**	-.103	.066	.096	.041
Your house would be without pests	-.017	-.117	.192**	-.048	.061	.082	.013
You would save money by purchasing fewer pesticide products	-.073	-.114	.193**	.069	.130	.079	-.048
Pests would be controlled to the point of not harming the health of your family	-.056	-.155*	.250**	-.007	.113	.100	.067
Pests would be controlled to the point of not bothering your family	-.023	-.088	.256**	.061	.172*	.100	.125
Pests would be controlled to the point of not damaging your property	-.001	-.127*	.218**	.241**	.168*	.081	.070

†Log transformed; ¹ Spearman's Correlation; ² Cramer's V; * Correlation is significant at 0.05 level; ** Correlation is significant at 0.01 level.

Participants with higher school education tend to disagree that applying pesticides correctly would result in a house less contaminated by pesticides (r=-.136), pests would be controlled to the point of not harming the health of the family (r=-.155) or damage the property (r=-.127). All the statements of the group of *Perceived Benefits 2* about the correct application of

pesticides were significantly correlated with the income level of participants. Participants at higher income level tended to agree with the beliefs that if they apply pesticides correctly, the house would be less contaminated with pesticides (r=.262), the house will be pest free (.192), participants would save money (r=.193), pests would not harm the family (r=.250), pests would not bother the family (.256), and pests would not harm the property (.218). The number of children 11 years of age and younger of participants was significantly correlated with the belief that if pesticides are applied correctly the property would not be damaged (r=.241). Additionally, the type of homeownership of participants was significantly correlated with the perceptions that if pesticides are applied correctly the pests would be controlled to the point of not bothering the family (r=.172) or damage the property (r=.168).

The statements grouped in *Benefits 2* were examined for correlations with knowledge level, pest prevention practices, and safety practices scores of participants (see Table 4.61). Results showed that none of the perceptions of group *Benefits 2* were correlated with the knowledge scores of participants.

Table 4.61. Correlation between the Statements of *Perceived Benefits 2* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Perceived Benefits 2 **How much do you agree with the following: If you apply pesticides correctly...** Scale 1 (totally disagree) to 4 (totally agree)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
Your house would be less contaminated by pesticides	.006	.151*	.220**
Your house would be pest free	-.033	.182**	.147*
You would save money by purchasing fewer pesticide products	.022	.107	.078
Pests would be controlled to the point of not harming the health of your family	-.010	.126	.127
Pests would be controlled to the point of not bothering your family	.017	.122	.122
Pests would be controlled to the point of not damaging your property	.028	.125	.085

* Correlation is significant at the 0.05 level (two-tailed); ** Correlation is significant at the 0.01 level (two-tailed).

In contrast, the statements about the perceived benefits that applying pesticides correctly would result in a house less contaminated and pest free were correlated with the pest prevention practices (r=.151 and r=.182 respectively). Similarly, these same perceptions were significantly correlated with the safety practices scores of participants.

4.4.5.4 Perceived barriers to reduce exposures of pesticides.

Participants rated several statements to acknowledge the obstacles perceived by them in conducting practices that prevent and reduce exposures to residential pesticides. These statements were grouped in categories such as *Perceived Barriers 1, 2, 3* and *4* and rated by participants on a scale from 1 (not difficult at all) to 4 (very difficult). The statements included in the category of *Barriers 1* examined the obstacles of participants to conduct basic house cleaning and humidity prevention in the house. The statements included in the category of *Barriers 2* examined the obstacles of participants to control pests and to conduct practices that prevent exposures to pesticides such as reading and following instructions, using the adequate product, and avoid application of pesticides before and during pregnancy, among other statements.

The statements of the category *Barriers 3* examined the obstacles perceived by participants to reduce exposures during the application of when applying insect repellents on children. Lastly, the statements grouped in the category *Barriers 4* examined the obstacles of participants to conduct practices that reduce exposures to their children, floors, toys, and cookware, among other statements. All these statements about the perceived barriers of participants are described below and include the mean rates and frequencies and the correlation coefficients between these statements and selected demographic characteristics of participants,

and the scores of knowledge levels and practices related with pests and pesticides conducted by participants.

Barriers 1: Obstacles to Conduct Pest Prevention Practices

Participants rated eight statements about the potential obstacles they may confront when conducting house cleaning and pest prevention practices. Table 4.62 shows that the great majority of participants rated as not difficult to conduct house cleaning and pest prevention practices. Participants perceived as not difficult at all to wash dishes (89.8%), clean kitchen and surfaces (88.1%), and vacuum carpets and/or mop floors frequently (85.1%), take the trash out daily (91.8%) and keep it covered (78.3%), ventilate bathrooms (88.5%) and kitchen (90.2%) frequently to reduce humidity and prevent mold, or to conduct deep house cleanings periodically (77%).

Table 4.62. Frequencies of the Statements of *Perceived Barriers 1*

Perceived Barriers 1 **How difficult would be to you to...**	**Mean (Standard deviation) n=244**	**Scale n (%)** Scale 1 (not difficult at all) to 4 (very difficult)			
		1	**2**	**3**	**4**
Wash dishes frequently	1.22 (0.71)	219 (89.8%)	7 (2.9%)	7 (2.9%)	11 (4.5%)
Clean kitchen, tables, surfaces frequently	1.23 (0.70)	215 (88.1%)	13 (5.3%)	5 (2%)	11 (4.5%)
Vacuum/mop frequently	1.26 (0.71)	206 (85.1%)	20 (8.3%)	5 (2%)	11 (4.5%)
Take trash out daily	1.16 (0.61)	224 (91.8%)	9 (3.7%)	2 (0.9%)	9 (3.7%)
Keep outside trash covered	1.40 (0.87)	191 (78.3%)	28 (11.5%)	6 (2.5%)	19 (7.8%)
Ventilate frequently the bathroom during and after shower/bath to reduce humidity and prevent mold	1.21 (0.67)	216 (88.5%)	14 (5.7%)	4 (1.6%)	10 (4.1%)
Ventilate the kitchen frequently during and after use to reduce humidity and prevent mold	1.19 (0.65)	220 (90.2%)	12 (4.9%)	2 (0.8%)	10 (4.1%)
Conduct deep house cleanings periodically	1.41 (0.85)	188 (77%)	29 (11.9%)	11 (4.5%)	16 (6.6%)

According to the demographic characteristics of participants, some of the barriers to conduct pest prevention practices perceived by participants were inversely correlated with their school education and type of home ownership (see Table 4.63). Barriers such as washing the dishes (r=-.137) and cleaning the kitchen, tables and surfaces frequently (r=-.224), and taking the trash out daily (r=-.154) were rated as not difficult by participants with more school years of education. The type of home ownership was correlated with the statement of participants about the difficulty to vacuum carpets and mop floors frequently.

Table 4.63. Correlation between the Statements of *Perceived Barriers 1* and Selected Characteristics of Participants

Perceived Barriers 1 **How difficult would be to you to...** Scale 1 (not difficult at all) to 4 (very difficult)	Age†	Education†	Income[1] level (per family per month)	Number of children ≤ 11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in city	Years living in house
Wash dishes frequently	.003	-.137*	-.043	-.041	.142	.015	-.058
Clean kitchen, tables, surfaces frequently	.077	-.224**	-.036	-.042	.158	.018	-.022
Vacuum/mop frequently	-.062	-.097	-.024	-.044	.166*	-.023	-.080
Take trash out daily	.062	-.154*	-.022	-.084	.136	.020	-.048
Keep outside trash covered	.007	-..070	.049	-.025	.119	.025	.068
Ventilate frequently the bathroom during and after shower/bath to reduce humidity and prevent mold	.015	-.087	-.001	-.043	.088	.004	.011
Ventilate the kitchen frequently during and after use to reduce humidity and prevent mold	.054	-.109	-.065	-.013	.113	-.008	.033
Conduct deep house cleanings periodically	-.050	.011	-.020	-.104	.084	.026	-.103

†Log transformed; ¹ Spearman's Correlation; ² Cramer's V; * Correlation is significant at 0.05 level; ** Correlation is significant at 0.01 level.

Additionally, the statements measuring the obstacles grouped in *Barriers 1* were examined for correlation with scores of knowledge level, pest prevention, and safety practices (see Table 4.64). None of these statements were significantly correlated with the knowledge

level scores or the safety practices conducted by participants. Vacuuming carpets or mopping floors frequently (r=-.147) and keeping the trash covered (r=-.138) were not considered difficult by the participants with higher number of pest prevention practices.

Table 4.64. Correlation between the Statements of *Perceived Barriers 1* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Perceived Barriers 1 **How difficult would be to you to...** Scale 1 (not difficult at all) to 4 (very difficult)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
Wash dishes frequently	-.004	-.027	.060
Clean kitchen, tables, surfaces frequently	.017	-.056	-.026
Vacuum/mop frequently	-.058	-.147*	-.031
Take trash out daily	-.012	.022	.134
Keep outside trash covered	-.121	-.138*	-.045
Ventilate frequently the bathroom during and after shower/bath to reduce humidity and prevent mold	-.116	-.034	-.024
Ventilate the kitchen frequently during and after use to reduce humidity and prevent mold	-.024	-.003	-.050
Conduct deep house cleanings periodically	-.088	-.001	-.108

* Correlation is significant at the 0.05 level (two-tailed).

Barriers 2: Obstacles to Conduct Safety Practices

Participants rated several statements related with the obstacles to conduct practices that prevent and reduce their exposure to pesticides (see Table 4.65). According to the from 1 (not difficult at all) to 4 (very difficult), the practices rated as more difficult to conduct by participants included controlling pests without using pesticides (mean 3.52), using methods without pesticides to control pests (mean 2.48), and using the correct pesticide for the pest intended (mean 2.41).

Table 4.65. Frequencies of the Statements of *Perceived Barriers 2*

Perceived Barriers 2 **How difficult would be to you to...**	**Mean (Standard deviation) n=244**	**Scale n (%)** Scale 1 (not difficult at all) to 4 (very difficult)			
		1	**2**	**3**	**4**
Control pests without applying pesticides	3.52 (0.87)	14 (5.7%)	20 (8.2%)	35 (14.3%)	175 (71.7%)
Use the correct pesticide for the pest intended	2.41 (1.18)	80 (32.9%)	44 (18.1%)	59 (24.3%)	60 (24.7%)
Read the label before application of pesticides	1.45 (.89)	184 (75.4%)	26 (10.7%)	17 (7%)	17 (7%)
Use only pesticides with registration number	1.72 (1.06)	151 (62.1%)	38 (15.6%)	26 (10/7%)	28 (11.5%)
Understand the information of the label	1.53 (0.94)	174 (71.6%)	28 (11.5%)	23 (9.5%)	18 (7.4%)
Follow the instructions on the label	1.39 (0.84)	193 (79.1%)	21 (8.6%)	17 (7%)	13 (5.3%)
Use methods that do not have pesticides to control pests	2.48 (1.27)	83 (34%)	43 (17.6%)	37 (15.2%)	81 (33.2%)
Prevent application of pesticides few months before pregnancy	1.62 (1.05)	169 (69.3%)	27 (11.1%)	19 (7.8%)	29 (11.9%)
Prevent application of pesticides during pregnancy	1.91 (1.16)	135 (55.3%)	39 (16%)	28 (11.5%)	42 (17.2%)
Prevent application of pesticides during your child's breastfeeding period	1.97 (1.18)	129 (52.9%)	38 (15.6%)	33 (13.5%)	44 (18%)

In contrast, the practices rated as not difficult at all by the majority of participants were following the instructions of the label (79.1%), reading the label before application of pesticide (75.4%), understanding the information of the label (71.6%), preventing pesticide application few months before pregnancy (69.2%), applying only pesticides with registration number (62.1%), or preventing application of pesticides during pregnancy (55.3%) and breastfeeding periods (52.9%).

Table 4.66. Correlation between the Statements of *Perceived Barriers* and Selected Characteristics of Participants

Perceived Barriers 2 **How difficult would be to you to...** Scale 1 (not difficult at all) to 4 (very difficult)	Age†	Education†	Income level (per family per month)[1]	Number of children ≤11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in city	Years living in house
Control pests without applying pesticides	-.134*	.022	.098	-.019	.082	-.141*	-.025
Use the correct pesticide for the pest intended	.040	-.055	-.169**	-.015	.103	-.156*	-.027
Read the label before application of pesticides	.100	-.096	-.075	.006	.131	-.064	-.067
Use only pesticides with registration number	.012	-.054	-.059	-.016	.070	.022	.043
Understand the information of the label	.053	-.160*	-.067	-.093	.135	-.022	-.097
Follow the instructions on the label	.039	-.135*	-.045	-.054	.114	-.019	-.071
Use methods that do not have pesticides to control pests	-.019	-.122	.029	-.025	.153	-.036	.057
Prevent application of pesticides few months before pregnancy	.010	-.012	.005	-.138*	.061	-.025	-.043
Prevent application of pesticides during pregnancy	-.027	.012	-.061	-.008	.079	-.103	-.075
Prevent application of pesticides during your child's breastfeeding period	-.053	-.053	-.067	-.110	.134	-.114	-.080

†Log transformed; [1] Spearman's Correlation; [2] Cramer's V; * Correlation is significant at 0.05 level; ** Correlation is significant at 0.01 level.

The socio-demographic characteristics of participants correlated with some of the statements in category *Barriers 2* included age, school years of education, income level, number of children 11 years of age and less, and the number of years living in the city (see Table 4.66).

Younger participants perceived as very difficult to control pests without using pesticides (r=-.134). Participants with fewer years in school rated as very difficult the understanding of the information of the label (r=-.158), following the instructions of the label (r=-.150), and using

methods without pesticides to control pests (r=-.154). Apparently, participants at lower income levels most likely tend to use the same pesticide for various types of pests. Moreover, participants with less number of children 11 years of age and younger find more difficult to prevent the application of pesticides few months before getting pregnant (r=-.138). Participants at higher income levels rated as not difficult to use the correct pesticide for the pest intended (r=-.169). Similarly, participants with less number of years living in the city find more difficult to control pests without using pesticides (r=-.141) and to use the correct pesticide product for the pest intended (r=-.156).

The statements grouped in *Barriers 2* were also examined for correlations with the scores of knowledge level, pest prevention, and safety practices of participants (see Table 4.67). Participants with higher knowledge scores reported less difficulty in controlling pests without pesticides (r=-.147) and using methods without pesticides to control pests (r=-.127).

Table 4.67. Correlation between the Statements of *Perceived Barriers 2* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Perceived Barriers 2 **How difficult would be to you to...** Scale 1 (not difficult at all) to 4 (very difficult)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
Control pests without applying pesticides	-.147*	.103	.036
Use the correct pesticide for the pest intended	-.097	-.034	-.046
Read the label before application of pesticides	.020	.017	-.124
Use only pesticides with registration number	-.053	.111	-.090
Understand the information of the label	.070	.090	-.209**
Follow the instructions on the label	.023	.060	-.094
Use methods that do not have pesticides to control pests	-.127*	.092	-.039
Prevent application of pesticides few months before pregnancy	-.043	.109	-.073
Prevent application of pesticides during pregnancy	-.059	.031	.070
Prevent application of pesticides during your child's breastfeeding period	-.005	.062	.017

* Correlation is significant at the 0.05 level (two-tailed); ** Correlation is significant at the 0.01 level (two-tailed).

Barriers 3: Obstacles to Conduct Safety Practices Related with Pesticides

The scores of pest prevention practices were not significantly correlated with any of the statements grouped in *Barriers 2*. In contrast, participants with higher safety practices scores rated as not difficult to understand the information of the label (r=-.209). One can conclude that knowing more about pest, pesticides and health, and understanding the information of the label would help participants to control pests without pesticides, use methods without pesticides to control pests, and to conduct safety practices when applying pesticides.

Participants rated several statements to examine the perceived difficulty to conduct basic practices recommended to prevent and reduce exposures related with pesticides (see Table 4.68).

Table 4.68. Frequencies of the Statements of *Perceived Barriers 3*

Perceived Barriers 3 **How difficult would be to you to...**	**Mean (Standard deviation) n=244**	**Scale n (%)** Scale 1 (not difficult at all) to 4 (very difficult)			
		1	**2**	**3**	**4**
Wear long sleeves and pants during application of pesticides	1.41 (0.89)	194 (79.8%)	17 (7%)	14 (5.8%)	18 (7.4%)
Wear gloves during application of pesticides	1.26 (0.69)	207 (85.2%)	19 (7.8%)	8 (3.3%)	9 (3.7%)
Wash or take a shower after application of pesticides	1.10 (0.45)	228 (93.8%)	8 (3.3%)	4 (1.6%)	3 (1.2%)
Ventilate the place after application of pesticides	1.09 (0.42)	231 (95.1%)	6 (2.5%)	3 (1.2%)	3 (1.2%)
Store pesticides in places where children cannot reach	1.12 (0.52)	227 (93.4%)	8 (3.3%)	2 (0.8%)	6 (2.5%)
Follow instructions of the label to apply insect repellent to children	1.19 (0.62)	216 (88.9%)	15 (6.2%)	4 (1.6%)	8 (3.3%)
Prevent that children $\leq$11 yrs. apply insect repellent by themselves	1.38 (0.84)	191 (78.9%)	27 (11.2%)	8 (3.3%)	16 (6.6%)
Wash or bathe children when insect repellent is no longer needed	1.21 (0.67)	215 (88.5%)	14 (5.8%)	4 (1.6%)	10 (4.1%)

The great majority of participants rated as not difficult at all to conduct safety practices such as ventilating the place after application of pesticides (95.1%), wash after applying pesticides (93.8%), store pesticides in places unreachable to children (93.4%), and follow label instructions before applying insect repellents on children (88.9%). Less number of participants

rated not difficult to prevent children applying insect repellent by themselves (78.9%), wear long sleeves and pants (79.8%), and gloves during application of pesticides (85.2%).

According to the socio-demographic factors, participants at higher income levels rated as not difficult to store pesticides on places unreachable for children (r=-.163). The type of home ownership was significantly correlated with two statements of category *Barriers 3* (see Table 4.69), such as the difficulty of preventing children applying insect repellent by themselves (r=.163) and washing children when the insect repellent is no longer needed (r=.169).

Table 4.69. Correlation Coefficients between the Statements of *Perceived Barriers 3* and Selected Characteristics of Participants

Perceived Barriers 3 **How difficult would be to you to...** Scale 1 (not difficult at all) to 4 (very difficult)	Age†	Education†	Income level (per family per month)[1]	Number of children ≤11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in city	Years living in house
Wear long sleeves and pants during application of pesticides	-.004	-.004	-.019	.075	.060	-.040	-.105
Wear gloves during application of pesticides	-.005	.011	.006	-.007	.078	-.006	-.051
Wash or take a shower after application of pesticides	-.039	.095	0.112	-.040	.103	-.069	-.106
Ventilate the place after application of pesticides	.034	.026	-.056	-.013	.082	.020	-.048
Store pesticides in places where children cannot reach	.088	-.030	-.163*	-.111	.099	-.005	.012
Follow instructions of the label to apply insect repellent to children	-.085	.019	-.009	.000	.137	-.051	-.102
Prevent that children ≤11 yrs. apply insect repellent by themselves	-.072	-.036	-.027	.027	.163*	-.033	-.055
Wash or bathe children when insect repellent is no longer needed	-.077	.075	.016	.089	.169*	-.032	-.093

†Log transformed; [1] Spearman's Correlation; [2] Cramer's V; * Correlation is significant at 0.05 level.

The perceptions grouped in *Barriers 3* were examined for correlations with the scores of knowledge level, pest prevention and safety practices of participants (see Table 4.70).

Table 4.70. Correlation between the Statements of *Perceived Barriers 3* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Perceived Barriers 3 **How difficult would be to you to...** Scale 1 (not difficult at all) to 4 (very difficult)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
Wear long sleeves and pants during application of pesticides	.009	.015	-.189**
Wear gloves during application of pesticides	-.027	.061	-.183**
Wash or take a shower after application of pesticides	.095	.080	.007
Ventilate the place after application of pesticides	.081	.075	-.019
Store pesticides in places where children cannot reach	.033	.078	.061
Follow instructions of the label to apply insect repellent to children	.075	.026	-.087
Prevent that children ≤11 yrs. apply insect repellent by themselves	.002	-.011	.105
Wash or bathe children when insect repellent is no longer needed	.022	.024	.061

** Correlation is significant at the 0.01 level (two-tailed).

None of the statements about the difficulty of conducting safety practices of the group *Barriers 3* were significantly correlated with the knowledge scores or with the pest prevention scores. In contrast, participants with higher scores of safety practices perceived as not difficult at all to wear long sleeves and pants (r=-.189) and gloves (r=-.183) during the application of pesticides.

Barriers 4: Barriers to Conduct Safety Practices

Participants rated additional statements to acknowledge their perceptions of the obstacles to conduct certain practices recommended to reduce exposure to pesticides (see Table 4.71). The statements of the category *Barriers 4* show that the majority of participants rated as not difficult at all to prevent the contamination of dishes and cookware (81.1%) and toys (74.1%) during the

application of pesticides. Fewer participants rated as not difficult at all to stop using pesticides in the form of spray, vapors or bombs (55.6%), reduce the contamination of floors and carpets (64%), and prevent children being present during the application of pesticides (67.5%).

Table 4.71. Frequencies of the Statements of *Perceived Barriers 4*

Perceived Barriers 4 **How difficult would be to you to...**	**Mean (Standard deviation) n=244**	**Scale n (%)** Scale 1 (not difficult at all) to 4 (very difficult)			
		1	**2**	**3**	**4**
Prevent children being present during application of pesticides	1.62 (1.02)	164 (67.5%)	35 (14.4%)	17 (7%)	27 (11.1%)
Reduce the contamination of floors & carpets with pesticides during the application	1.62 (0.96)	155 (64%)	42 (17.4%)	26 (10.7%)	19 (7.9%)
Stop using pesticides in the form of spray, coils, fogs, bombs, etc.	1.92 (1.17)	135 (55.6%)	34 (14%)	32 (13.2%)	42 (17.3%)
Prevent the contamination of toys during application of pesticides	1.48 (0.92)	180 (74.1%)	29 (11.9%)	15 (6.2%)	19 (7.8%)
Prevent the contamination of dishes and cookware during application of pesticides	1.34 (0.79)	197 (81.1%)	23 (9.5%)	10 (4.1%)	13 (5.3%)

Additionally, the socio-demographic characteristics of participants were examined for correlations with the statements of category *Barriers 4 (*see Table 4.72). Results showed that older participants found easier to stop using pesticides in the method of spray, fogs, and bombs than younger participants did (r=-.195) and more educated participants to stop contamination of floors and carpets (r=-.141). Additionally, the type of home ownership was statistically correlated with the level of difficulty of participants to prevent children being present during application of pesticides (r=.210) and prevent the contamination of dishes and cookware during application of pesticides (r=.162).

Table 4.72. Correlation between the Statements of *Perceived Barriers 4* and Selected Characteristics of Participants

Perceived Barriers 4 **How difficult would be to you to...** Scale 1 (not difficult at all) to 4 (very difficult)	Age†	Education†	Income level (per family per month)[1]	Number of children ≤11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in city	Years living in house
Prevent children being present during application of pesticides	-.030	-.101	-.073	-.024	.210**	.026	.006
Reduce the contamination of floors & carpets with pesticides during application	-.006	-.141*	-.070	.027	.103	-.032	-.065
Stop using pesticides in the form of spray, smoke, vapors, or bombs	-.195**	.002	.093	.086	.131	-.069	-.113
Prevent the contamination of toys during application of pesticides	-.068	-.071	-.055	.011	.119	-.039	.077
Prevent the contamination of dishes and cookware during application of pesticides	-.053	.007	-.067	-.029	.162*	.005	-.075

†Log transformed; [1] Spearman's Correlation; [2] Cramer's V; * Correlation is significant at 0.05 level; ** Correlation is significant at 0.01 level.

Apparently, participants living in a home rented or lended rated as more difficult to reduce these types of contamination in the house.

Table 4.73. Correlation between the Statements of *Perceived Barriers 4* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Perceived Barriers 4 **How difficult would be to you to...** Scale 1 (not difficult at all) to 4 (very difficult)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
Prevent children being present during application of pesticides	.009	-.023	-.011
Reduce the contamination of floors & carpets with pesticides during application	-.019	.018	-.011
Stop using indoor pesticides in the form of spray, coils, vapors, or bombs	.087	.036	.031
Prevent the contamination of toys during application of pesticides	-.036	.003	-.085
Prevent the contamination of dishes and cookware during application of pesticides	-.055	.002	-.041

The perceptions of the category *Barriers 4* were examined for correlation with the scores of knowledge level, pest prevention, and safety practices of participants (see Table 4.73).

None of the statements measuring the level of difficulty to conduct safety practices that prevent and reduce exposure to pesticides during the application as grouped in the category *Barriers 4* were statistically correlated with the knowledge level, pest prevention, or safety practices scores of participants.

4.4.5.5 Perceived self-Efficacy to reduce exposures to pesticides

Participants responded to several statements to examine their level of confidence in conducting the pest prevention and safety practices that reduce exposures to pesticides recommended in this study. Participants rated their level of confidence of each statement on a scale from 1 (not sure at all) to 4 (very sure). These statements were grouped into the categories *Self-Efficacy 1, 2, and 3*. The results about the perceptions of self-efficacy of participants in conducting the exposure reduction practices include the mean and frequencies according to the scale 1 to 4 and with the analysis of correlation between these perceptions and the demographic characteristics, the pest prevention scores, and safety practices scores of participants.

Self-Efficacy 1: Confidence of Participants in Reducing Exposures to Pesticides

On a scale from 1 (not sure at all) to 4 (very sure at all) participants rated how confident they felt to conduct practices that reduce exposures to residential pesticides (see Table 4.74).

Table 4.74. Frequencies of the Statements of *Perceived Self-Efficacy 1*

Perceived Self-Efficacy 1 **In the future, how sure are you that you can...?**	**Mean (Standard deviation) n=244**	**Scale n (%)** Scale 1 (not sure at all) to 4 (very sure)			
		1	**2**	**3**	**4**
Apply pesticides when children are not present	3.53 (0.87)	12 (4.9%)	25 (10.3%)	29 (10.3%)	177 (72.8%)
Prevent application of pesticides few months before getting pregnant	3.19 (1.11)	33 (13.6%)	31 (12.8%)	35 (14.4%)	144 (59.3%)
Prevent application of pesticides during pregnancy	3.17 (1.13)	35 (14.4%)	32 (13.2%)	32 (13.1%)	144 (59.3%)
Prevent application of pesticides during breastfeeding period	3.10 (1.17)	40 (16.5%)	35 (14.5%)	27 (11.2%)	140 (57.9%)
Get rid of pests without application of pesticides	2.00 (1.20)	129 (53.1%)	32 (13.2%)	36 (14.8%)	36 (14.8%)
Conduct deep house cleaning periodically to prevent pests	3.60 (0.82)	14 (5.8%)	10 (4.1%)	34 (14%)	184 (76%)
Prevent contamination of toys during application of pesticides	3.51 (0.89)	18 (7.4%)	12 (4.9%)	40 (16.5%)	173 (71.2%)
Prevent contamination of dishes and cookware during application	3.58 (0.89)	18 (7.4%)	13 (5.3%)	23 (9.5%)	189 (77.8%)
Reduce contamination with pesticides of floors and carpets	3.52 (0.80)	8 (3.3%)	24 (9.9%)	44 (18.1%)	167 (68.7%)

Results showed that the majority of participants were very sure to conduct practices such as preventing contamination of dishes and cookware during application of pesticides (77.8%), conducting deep house cleaning periodically (76%), and applying pesticides when children are not present (72.8%). Fewer participants felt sure of getting rid of pesticides without using pesticides (14.8%) and preventing the application of pesticides before and during pregnancy (59.3%).

The demographic characteristics of participants were examined for correlation with the statements grouped in *Self-Efficacy 1* (see Table 4.75). The analysis showed that these perceptions were significantly correlated with characteristics such as age, income level, and type of home ownership. Older participants felt more confident applying pesticides when children are

not present (r=.138) and preventing the application of pesticides few months before (r=.130) and during pregnancy (r=.140).

Table 4.75. Correlation between the Statements of *Perceived Self-Efficacy 1* and Selected Characteristics of Participants

Perceived Self-Efficacy 1 **In the future, how sure are you that you can...?** Scale 1 (not sure at all) to 4 (very sure)	Age†	Education†	Income level (per family per month)[1]	Number of children ≤ 11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in city	Years living in house
Apply pesticides when children are not present	.138*	.000	.107	-.026	.176*	.124	.068
Prevent application of pesticides few months before pregnancy	.130*	.002	.059	.040	.115	.028	.118
Prevent application of pesticides during pregnancy	.140*	.033	.057	-.031	.087	.040	.073
Prevent application of pesticides during breastfeeding period	.046	.013	.056	-.073	.098	.041	.052
Get rid of pests without application of pesticides	.109	-.022	.030	.023	.116	.106	.072
Conduct deep house cleaning periodically to prevent pests	-.003	.065	.115	.055	.106	-.038	.011
Prevent contamination of toys during application of pesticides	.000	.100	.067	.091	.076	-.049	-.097
Prevent contamination of dishes and cookware during application of pesticides	.028	.104	.113	-.013	.111	-.005	-.033
Reduce contamination with pesticides of floors and carpets	.093	-.026	.139*	.106	.077	.037	-.005

†Log transformed; ¹ Spearman's Correlation; ² Cramer's V; * Correlation is significant at 0.05 level.

Similarly, participants with higher income level felt more confident of conducting deep house cleanings periodically (r=.139). The type of home ownership was significantly correlated with the level of confidence of participants to apply pesticides when children are not present (r=.176).

The statements grouped in the category *Self-efficacy 1* were examined for correlations with the scores of knowledge level, pest prevention, and safety practices of participants (see Table 4.76). Results showed that the higher knowledge level score of participants was significantly correlated with the confidence of participants to get rid of pests without using pesticides (r=.208).

Table 4.76. Correlation between the Statements of *Perceived Self-Efficacy 1* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Perceived Self-Efficacy 1 **In the future, how sure are you that you can...?** Scale 1 (not sure at all) to 4 (very sure)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
Apply pesticides when children are not present	.073	.105	.107
Prevent application of pesticides few months before pregnancy	.068	.048	.164*
Prevent application of pesticides during pregnancy	.046	-.004	.062
Prevent application of pesticides during breastfeeding period	.038	.080	.095
Get rid of pests without application of pesticides	.208**	.036	.033
Conduct deep house cleaning periodically to prevent pests	.038	.014	.057
Prevent contamination of toys during application of pesticides	.086	.014	.065
Prevent contamination of dishes and cookware during application of pesticides	.063	.051	.089
Reduce contamination with pesticides of floors and carpets	.079	.174**	.127

* Correlation is significant at the 0.05 level (two-tailed); ** Correlation is significant at the 0.01 level (two-tailed).

The higher number of pest prevention practices was also significantly correlated with the level of confidence of participants to reduce the contamination of floors and carpets during the application of pesticides (r=.174). Similarly, the higher number of safety practices conducted by participants was significantly correlated with the level of confidence of participants to prevent the application of pesticides before pregnancy (r=.164).

Self-Efficacy 2: Confidence of Participants in Conducting Safety Practices

Participants rated their level of confidence in conducting additional safety practices grouped in the category of *Self-Efficacy 2* related with pesticide usage on a scale from 1 (not sure at all) to 4 (very sure) (see Table 4.77).

Table 4.77. Frequencies of the Statements of *Perceived Self-Efficacy 2*

Perceived Self-Efficacy 2 **In the future, how sure are you that you can...?**	**Mean (Standard deviation) N=242-243**	**Scale n (%)** Scale 1 (not sure at all) to 4 (very sure)			
		1	**2**	**3**	**4**
Use only pesticides with registration number	3.00 (1.14)	37 (15.3%)	46 (19%)	38 (15.7%)	121 (50%)
Stop using indoor pesticides in the form of spray, coils, fogs, or bombs	2.73 (1.20)	57 (23.5%)	46 (18.9%)	46 (18.9%)	94 (38.7%)
Read the label before application	3.64 (0.75)	9 (3.7%)	13 (5.3%)	34 (14%)	187 (77%)
Follow instructions of the label	3.69 (0.73)	9 (3.7%)	11 (4.5%)	27 (11.2%)	195 (80.6%)
Apply the correct pesticide for the pest intended to control/destroy	3.33 (0.98)	23 (9.5%)	20 (8.3%)	53 (21.9%)	146 (60.3%)
Wear long sleeves and pants during application of pesticides	3.44 (0.96)	22 (9.1%)	16 (6.6%)	38 (15.6%)	167 (68.7%)
Wear gloves during application of pesticides	3.58 (0.81)	11 (4.5%)	16 (6.6%)	37 (15.2%)	179 (73.7%)
Ventilate the place after application of pesticides	3.79 (0.58)	5 (2.1%)	5 (2.1%)	25 (10.3%)	207 (85.5%)
Store pesticides where children cannot reach them	3.83 (0.58)	7 (2.9%)	3 (1.2%)	15 (6.2%)	218 (89.7%)
Use methods without pesticides to control pests	2.63 (1.27)	72 (29.6%)	41 (16.9%)	36 (14.8%)	94 (38.7%)

Results showed that a high number of participants felt confident to store pesticides in unreachable sites to children (89.7%), ventilate the house after application of pesticides (85.5%), follow the instructions of the label (80.6%), read the label of pesticides before application of pesticides (77%), and wear gloves (73.7%) and long sleeves and pants during application of pesticides (68.7%). In contrast, 29.6% of participants felt not confident to use methods without pesticides to control pests and 23.5% of stop using spray, fogs, coils, or bombs.

The demographic factors were examined for correlations with the level of confidence of participants to conduct safety practices grouped in *Self-Efficacy 2* (see Table 4.78). Results showed that older participants felt more confident of wearing gloves during the application of pesticides (r=.147), more educated women felt more confident of reading the label before application of pesticides (r=.132), and women on higher income levels felt more confident of applying the correct pesticide for the pest intended (r=.196) and storing pesticides unreachable for children (r=.142).

Table 4.78. Correlation between the Statements of *Perceived Self-Efficacy 2* and Selected Characteristics of Participants

Perceived Self-Efficacy 2 **In the future, how sure are you that you can...?** Scale 1 (not sure at all) to 4 (very sure)	Age†	Education†	Income level (per family per month)[1]	Number of children ≤ 11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in city	Years living in house
Use only pesticides with registration number	.038	.099	-.061	.021	.174*	-.025	-.083
Stop using indoor pesticides in the form of spray, coils, fogs, or bomb	.079	.092	.018	.041	.100	.073	-.004
Read the label before application	-.100	.132*	.122	.084	.087	.027	.010
Follow instructions of the label	-.024	.110	.107	.125	.082	.047	.091
Apply the correct pesticide for the pest intended to control/destroy	.025	-.008	.196**	.015	.129	.056	.091
Wear long sleeves and pants during application of pesticides	.065	-.022	.097	-.038	.107	.049	.127*
Wear gloves during application of pesticides	.147*	-.026	.125	-.024	.078	.042	.111
Ventilate the place after application of pesticides	.126	-.021	.086	.007	.107	.022	.041
Store pesticides where children cannot reach them	-.036	.007	.142*	.094	.098	.010	-.050
Use methods without pesticides to control pests	.102	.008	-.042	.022	.077	-.007	-.021

†Log transformed; [1] Spearman's Correlation; [2] Cramer's V; * Correlation is significant at 0.05 level; ** Correlation is significant at 0.01 level.

The type of home ownership was significantly correlated with the level of confidence of participants in applying only pesticides with registration number (r=.174).

The level of confidence of conducting the safety practices grouped in the category of *Self-Efficacy 2* were examined for correlations with the scores of knowledge levels, pest prevention, and safety practices of participants (see Table 4.79). None of the statements of the category *Self-efficacy 2* were significantly correlated with the knowledge level scores of participants. In contrast, the number of pest prevention practices conducted by participants were significantly correlated with the perceived confidence of participants to use the correct pesticide for the pest intended (r=.135) and to ventilate the house after application of pesticides (r=.130).

Table 4.79. Correlation between the Statements of *Perceived Self-Efficacy 2* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Perceived Self-Efficacy 2 **In the future, how sure are you that you can...?** Scale 1 (not sure at all) to 4 (very sure)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
Use only pesticides with registration number	.004	-.002	.045
Stop using indoor pesticides in the form of spray, coils, fogs, or bombs	.026	-.010	-.072
Read the label before application	-.091	-.003	.221**
Follow instructions of the label	-.007	.047	.238**
Apply the correct pesticide for the pest intended to control/destroy	.081	.135*	.228**
Wear long sleeves and pants during application of pesticides	.049	.099	.276**
Wear gloves during application of pesticides	.073	.070	.283**
Ventilate the place after application of pesticides	.059	.130*	.133
Store pesticides where children cannot reach them	-.008	.022	-.039
Use methods without pesticides to control pests	.065	-.015	.081

* Correlation is significant at the 0.05 level (two-tailed); ** Correlation is significant at the 0.01 level (two-tailed).

Similarly, the higher number of safety practices conducted by participants was significantly correlated with the levels of confidence of participants to read the label before application of pesticides (r=.221), follow the instructions of the label (r=.238), apply the correct

pesticide for the pest intended (r=.228), wear long sleeves and pants (r=.276) and gloves (r=.283) during the application of pesticides.

Self-Efficacy 3: Level of Confidence of Participants about Insect Repellents

Participants were asked to rate their level of confidence in reducing the risks of insect repellents with children 11 years of age and younger. The statements grouped in *Self-Efficacy 3* were rated by participants on a scale from 1 (not sure at all) to 4 (very sure) (see Table 4.80). Results showed that the majority of participants feel confident of conducting prevention practices when using insect repellents with children. A smaller proportion of participants felt very sure of preventing children 11 years of age and less of applying insect repellent by themselves (76%).

Table 4.80. Frequencies of the Statements of *Perceived Self-Efficacy 3*

Perceived Self-Efficacy 3 **In the future, how sure are you that you can...?**	**Mean (Standard deviation) N=242-243**	**Scale n (%)** Scale 1 (not sure at all) to 4 (very sure)			
		1	**2**	**3**	**4**
Read the label before applying insect repellent to children	3.66 (0.73)	7 (2.9%)	16 (6.6%)	30 (12.3%)	190 (78.2%)
Follow instructions of the label when applying insect repellents to children	3.73 (0.66)	7 (2.9%)	7 (2.9%)	31 (12.8%)	197 (81.4%)
Prevent children $\leq$11 yrs. of age applying insect repellent themselves	3.57 (0.87)	16 (6.6%)	14 (5.8%)	28 (11.6%)	184 (76%)
Wash or bath children when insect repellent is no longer needed	3.72 (0.68)	8 (3.3%)	7 (2.9%)	29 (12%)	198 (81.8%)
Store insect repellents where children cannot reach them	3.83 (0.55)	6 (2.5%)	2 (0.8%)	19 (7.9%)	215 (88.8%)

The perceived level of confidence of participants in conducing safety practices such as reading the label of insect repellents before application on children and following the instructions of the insect repellent were correlated with the number years of education of participants (see Table 4.81). As expected, results showed that participants with more years of school education felt more confident in reading the label of insect repellents before applying these on children

(r=.197) and following the instructions of the label before application of insect repellent on children (r=.137).

Table 4.81. Correlation between the Statements of *Perceived Self-Efficacy 3* and Selected Characteristics of Participants

Perceived Self-Efficacy 3 **In the future, how sure are you that you can...?** Scale 1 (not sure at all) to 4 (very sure)	Age†	Education†	Income level (per family per month)[1]	Number of children ≤11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in city	Years living in house
Read the label before applying insect repellent to children	-.029	.197**	.128	-.007	.100	.015	-.005
Follow instructions of the label when applying insect repellents to children	-.014	.137*	.059	-.028	.107	-.043	-.018
Prevent children ≤11 yrs. of age applying insect repellent themselves	.020	.106	.103	-.036	.124	.007	.006
Wash or bath children when insect repellent is no longer needed	..041	.046	.011	-.010	.095	-.051	-.011
Store insect repellents where children cannot reach them	.061	-.008	.019	-.051	.141	.029	-.014

†Log transformed; ¹ Spearman's Correlation; ² Cramer's V; * Correlation is significant at 0.05 level; ** Correlation is significant at 0.01 level.

Additionally, the perceived confidence of participants regarding the application of insect repellents on children was examined for correlation with the scores of knowledge level, pest prevention, and safety practices of participants (Table 4.82). Results showed that none of the perceptions of confidence on conducting practices regarding insect repellents on children were significantly correlated with the knowledge level scores or the pest prevention practices conducted by participants. In contrast, the perceived confidence of participants in reading the label before applying insect repellent on children and following the instructions of the label of

insect repellents were significantly correlated with the number of safety practices conducted by participants (r=.141 and r=.138 respectively).

Table 4.82. Correlation between the Statements of *Perceived Self-Efficacy 3* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Perceived Self-Efficacy 3 **In the future, how sure are you that you can...?** Scale 1 (not sure at all) to 4 (very sure)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
Read the label before applying insect repellent to children	.047	-.016	.141*
Follow instructions of the label when applying insect repellents to children	.016	-.010	.138*
Prevent children ≤11 yrs. of age applying insect repellent themselves	.055	.084	.039
Wash or bath children when insect repellent is no longer needed	.025	.009	-.049
Store insect repellents where children cannot reach them	.003	.028	-.038

* Correlation is significant at the 0.05 level (two-tailed).

4.4.6 General Perceptions about Pesticides

Besides the perceptions measured according to the constructs of the Health Belief Model, participants rated additional statements about the safety of pesticides for children 11 years of age and younger (see Table 4.83).

Table 4.83. Frequencies of the Statements of *Additional Perceptions* of the Safety of Pesticides for Children

Additional **How much do you agree with the following...**	**Mean (Standard deviation) N=244**	**Scale n (%)** Scale 1 (totally disagree) to 4 (totally agree)			
		1	**2**	**3**	**4**
The pesticides applied inside the homes are safe for the health of children	1.83 (1.070)	131 (53.7)	55 (22.5)	26 (10.7)	32 (13.1)
The pesticides applied outside the homes are safe for the health of children	1.81 (1.033)	130 (53.3)	57 (23.4)	30 (12.3)	27 (11.1)
The pesticides applied in agriculture are safe for the health of children	1.73 (1.007)	143 (58.6)	48 (19.7)	30 (12.3)	23 (9.4)
Authorities and institutions take actions to ensure that pesticides are safe for the health of children	2.49 (1.188)	71 (29.1)	53 (21.7)	50 (20.5)	70 (28.7)

Results showed that over half of participants totally disagree that pesticides applied in agriculture (58.6%), inside the house (53.7%), and outside the house (58.6%) are safe for children. When participants were asked to rate their agreement with the statement that authorities and institutions take actions to ensure that pesticides are safe for children, 29.1% of participants totally disagreed with the statement and 28.7% agreed with the statement. These results suggest that over half of the participants disagree at some level that authorities take actions to ensure the safety of pesticides.

These general statements were also examined for correlations with the socio-demographic characteristics of participants (see Table 4.84). Results showed that none of the characteristics of the participants were significantly correlated with these additional statements about the safety of pesticides for children.

Table 4.84. Correlation between the Statements of *Additional Perceptions* of the Safety of Pesticides and Selected Characteristics of Participants

Additional Perceptions **How much do you agree with the following...** Scale 1 (totally disagree) to 4 (totally agree)	Age†	Education†	Income level (per family per month)[1]	Number of children ≤ 11 years of age	Home ownership[2] 1=own 2=rent 3=lend	Years living in city	Years living in house
The pesticides applied inside the house are safe for the health of children	-.046	.042	.027	-.044	.119	-.049	-.011
The pesticides applied outside the house are safe for the health of children	.027	-.021	-.066	-.095	.149	-.074	-.038
The pesticides applied in agriculture are safe for the health of children	-.004	.033	-.049	-.060	.151	-.015	-.011
Authorities and institutions take actions to ensure that pesticides are safe for the health of children	.075	-.028	-.108	-.030	.124	.078	.056

†Log transformed; ¹ Spearman's Correlation; ² Cramer's V.

Additionally, these general statements about the safety of pesticides were examined for correlation with the scores of knowledge level, pest prevention, and safety practices of participants (see Table 4.85). Results showed that participants with higher knowledge scores disagree with the statements that pesticides applied inside (r=-.184) and outside the house (r=-.137) are safe for children.

Table 4.85. Correlation between the Statements of *Additional Perceptions* and the Knowledge Level, Pest Prevention, and Safety Practices Scores

Additional Perceptions **How much do you agree with the following...** Scale 1 (totally disagree) to 4 (totally agree)	Knowledge Level	Pest prevention practices	Safety practices related with pesticide application
The pesticides applied inside the house are safe for the health of children	-.184**	.078	.146*
The pesticides applied outside the house are safe for the health of children	-.137*	.085	.078
The pesticides applied in agriculture are safe for the health of children	-.123	.123	.175*
Authorities and institutions take actions to ensure that pesticides are safe for the health of children	-.077	.123	.159*

* Correlation is significant at the 0.05 level (two-tailed)

In contrast, participants conducting higher number of safety practices agreed with the statements that pesticides applied inside the house (r=.146) and in agriculture are safe for children (r=.175), and that authorities take actions to ensure that pesticides are safe for children (r=.159).

4.4.7 Perceptions Correlated with the Composite Scores of Participants

This section summarizes the perceptions of participants that resulted statistically correlated (chi square tests) with the outcomes measured in this study such as the composite scores knowledge level, pest prevention practices, and the safety practices conducted by participants.

4.4.7.1 Perceptions correlated with the knowledge level scores.

Table 4.86 shows a summary of the perceptions of participants about health and pesticides according to the Health Belief Model statistically correlated with the knowledge scores of participants. Overall, participants with higher knowledge level scores felt more susceptible to being harmed by pesticides. All the seven statements measuring the perceived susceptibility of being harmed of the participants were significantly correlated with their knowledge scores.

Participants with higher knowledge scores felt susceptible for themselves and their children being harmed by pesticides. Similarly, participants with higher knowledge scores perceived very likely that pesticides would cause specific health problems such as fertility and brain and nervous system problems, cancer, and allergies. Regarding the severity of the harms caused by pesticides, nine out of the 14 statements measuring the perceived severity of the harms of pesticides were correlated with the knowledge scores.

Participants with higher knowledge level scores considered it not to be easy to cure the diseases caused by pesticides and as not safe for children 11 years of age and younger the pesticides applied outside the house or the pesticides applied in kitchen cabinets and floors, in children’s bedroom, and in play areas inside the house. Moreover, participants with higher knowledge level scores disagreed with statements such as a little amount of poison does not harm children and with statements that pesticides do not reach the unborn child or breastfed children.

Table 4.86. Significant Correlations between Perceptions and *Knowledge Level* Scores

Statements	Coefficient
Perceived Susceptibility1	
How likely is that pesticides applied in your house...?	
Scale 1 (not likely) to 4 (very likely)	
Harm your health (and the health of other adults in the house)	.240**
Harm the health or your children 11 years of age and less	.201**
Harm the health of your unborn child (in the case you were pregnant)	.219**
Perceived Susceptibility 2	
How likely is that pesticides people apply in the house...?	
Scale 1 (not likely) to 4 (very likely)	
Reduce the ability of men and women to have children	.364**
Cause problems in the brain or nervous system	.416**
Cause certain type of cancer	.399**
Cause allergies (respiratory or skin)	.315**
Perceived Severity 1	
How easy it is to...?	
Scale 1 (not easy) to 4 (very easy)	
Cure the diseases caused by pesticides	-.139*
Perceived Severity 2	
How safe are for your children 11 years of age and less...?	
Scale 1 (not safe at all) to 4 (very safe)	
The pesticides applied outside your house	-.144*
Perceived Severity 3	
How safe it is to your children $\leq$ 11 years of age...?	
Scale 1 (not safe at all) to 4 (very safe)	
To apply pesticides in the kitchen cabinets	-.159*
To apply pesticides in kitchen floors	-.203**
To apply pesticides in children's bedroom	-.151*
To apply pesticides in the places where children play inside the house	-.159*
Perceived Severity 4	
How much do you agree with the following...?	
Scale 1 (totally disagree) to 4 (totally agree)	
Little amount of poison does not harm children	-.130*
Pesticides do not reach the unborn child of a pregnant woman	-.139*
Pesticides do not reach breastfeed children because pesticides cannot be in the breast milk	-.195**
Perceived Barriers 2	
How difficult would be to you to...	
Scale 1 (not difficult at all) to 4 (very difficult)	
Control pests without application of pesticides	-.147*
Use methods that do not have pesticides to control pests	-.127*
Perceived Self-Efficacy 1	
In the future, how sure are you that you can...?	
Scale 1 (not sure at all) to 4 (very sure)	
Get rid of pests without application of pesticides	.208**
Additional Perceptions	
How much do you agree with the following...	
Scale 1 (totally disagree) to 4 (totally agree)	
The pesticides applied inside the house are safe for the health of children	-.184**
The pesticides applied outside the house are safe for the health of children	-.137*

* Correlation is significant at 0.05 level; ** Correlation is significant at 0.01 level.

Of the 10 statements measuring the perceived benefits of applying less pesticides and applying pesticides correctly, none of these statements were significantly correlated with the level of knowledge of participants. Of the 31 statements measuring the barriers to conduct pest prevention and safety practices related with application of pesticides, only two statements were statistically correlated with the knowledge scores of participants. Participants with higher knowledge level scores deemed not difficult at all to control pests without the application of pesticides and to use methods that do not have pesticides to control pests. Regarding the levels of confidence of participants to conduct practices that reduce exposure to pesticides, only one of the 24 statements was significantly correlated with the knowledge scores of participants. The participants with higher knowledge level scores felt confident of getting rid of pests without application of pesticides. Finally, of the four additional statements measuring the safety of pesticides, participants with higher knowledge scores perceived as not safe for children 11 years of age and younger the pesticides people apply inside and outside the house.

4.3.7.2 Perceptions correlated with the pest prevention scores.

Table 4.87 shows the perceptions of participants about pesticides and health according to the Health Belief Model that resulted statistically correlated with their pest prevention scores. Of the seven perceptions measuring the perceptions of susceptibility of being harmed by pesticides of the participants, none was significantly correlated with the number of pest prevention practices conducted by participants.

Regarding the 14 statements measuring the perceived severity of participants of the harms caused by pesticides, four were correlated with the pest prevention scores. Participants with higher number of pest prevention practices rated as very safe the pesticides applied outside

the house, by an exterminator, and in the kitchen cabinets and on the places where children play inside the house. Of the 10 statements measuring the benefits of applying less pesticide and applying pesticides correctly, five were significantly correlated with the number of pest prevention practices. Participants conducting more pest prevention practices agreed that applying less pesticide would not harm the unborn child, breastfeed children, and children 11 years of age. Similarly, participants conducting more pest prevention practices agreed that applying pesticides correctly would result in a house less contaminated by pesticides and in a house without pests.

Regarding the 31 statements measuring the obstacles of participants to conduct safety practices before, during, and after the application of pesticides, only two statements were correlated with the number of pest prevention practices conducted by participants.

Participants conducting more pest prevention practices rated as not difficult to vacuum carpets, mop floors, and keeping the trash out covered. Of the 24 statements measuring the confidence of participants in conducting safety practices, three statements were correlated with the pest prevention practices conducted by participants. Participants conducting more pest prevention practices felt very confident in reducing the contamination of floors and carpets with pesticides, and in using the correct pesticide for the pest intended and in ventilating the place after the application of pesticides. Finally, none of the four additional statements measuring the perceived safety of pesticides were correlated with the number of pest prevention practices conducted by participants.

Table 4.87. Significant Correlations between Perceptions and *Pest Prevention* Scores

Statements	Correlation Coefficient
Perceived Severity 2 **How safe are for your children 11 years of age and less...?** Scale 1 (not safe at all) to 4 (very safe)	
The pesticides applied outside your house	.129*
The pesticides applied by the exterminator (hired by you or by the owner of the house)	.217**
Perceived Severity 3 **How safe it is to your children ≤ 11 years of age...?** Scale 1 (not safe at all) to 4 (very safe)	
To apply pesticides in the kitchen cabinets	134*
To apply pesticides in the places where children play inside the house	.172**
Perceived Benefits 1 **If you apply less quantity of pesticides in your house...?** Scale 1 (totally disagree) to 4 (totally agree)	
The health of your unborn child would not be harmed (in the case you are pregnant)	.128*
The health of your breastfeed child would not be harmed	.184**
Your children ≤11 yrs. of age would not be harmed by pesticides	.182**
Perceived Benefits 2 **If you use pesticides correctly...** Scale 1 (totally disagree) to 4 (totally agree)	
Your house would be less contaminated by pesticides	.151*
Your house would be pest free	.182**
Perceived Barriers 1 **How difficult would be to you to...** Scale 1 (not difficult at all) to 4 (very difficult)	
Vacuum/mop frequently	-.147*
Keep outside trash covered	-.138*
Perceived Self-Efficacy 1 **In the future, how sure are you that you can...?** Scale 1 (not sure at all) to 4 (very sure)	
Reduce contamination with pesticides of floors and carpets	.174**
Perceived Self-Efficacy 2 **In the future, how sure are you that you can...?** Scale 1 (not sure at all) to 4 (very sure)	
Use the correct pesticide for the pest intended to control/destroy	.135*
Ventilate the place after application of pesticides	.130*

* Correlation is significant at 0.05 level; ** Correlation is significant at 0.01 level.

4.4.7.3 Perceptions correlated with the safety practices scores.

Table 4.88 illustrates the perceptions of participants about health and pesticides according to the Health Belief Model that were statistically correlated with their safety practices scores. Of

the seven statements measuring the perceived susceptibility of being harmed by pesticides, none was statistically correlated with the number of safety practices conducted by participants.

Of the 14 statements measuring the severity of the harms caused by pesticides, only three were correlated with the safety practices. Participants conducting more safety practices perceived not easy to cure or treat the poisonings with pesticides and considered safe the pesticides applied inside the house and applied by an exterminator.

Regarding the 10 statements measuring the benefits of applying less pesticide and applying pesticides correctly, two statements were statistically correlated with the number of safety practices conducted by participants. Participants with higher score of safety practices agreed with the statements that applying pesticides correctly the house would be less contaminated by pesticides and the house would be pest free.

Of the 31 statements measuring the barriers of participants to reduce exposures to pesticides, only three statements were statistically correlated with the number of safety practices conducted by participants. Participants with higher safety practices scores rated not difficult at all to understand the information of the label and wear long sleeves, pants and gloves during the application of pesticides.

Of the 24 statements measuring the confidence of participants to conduct practices that reduce exposure to pesticides, six statements were statistically correlated with the number of safety practices conducted by participants. Participants conducting more safety practices felt more confident of preventing the application of pesticides before pregnancy, reading and following the instructions of the label of pesticides, applying the correct pesticide for the pest intended, and of wearing long sleeves, pants, and gloves during the application of pesticides.

Table 4.88. Significant Correlations between the Perceptions of Participants According to the Health Belief Model and *Safety Practices* Scores

Statements	**Safety Practices Correlation Coefficients**
Perceived severity 1	
How easy it is to...? Scale 1 (not easy) to 4 (very easy)	
Cure/treat poisonings by pesticides	-.141*
Perceived Severity 2	
How safe are for your children 11 years of age and less...? Scale 1 (not safe at all) to 4 (very safe)	
The pesticides applied inside your house	.171*
The pesticides applied by the exterminator (hired by you or by the owner of the house)	.163**
Perceived Benefits 2	
If you apply pesticides correctly... Scale 1 (totally disagree) to 4 (totally agree)	
Your house would be less contaminated by pesticides	.220**
Your house would be pest free	.147*
Perceived Barriers 2	
How difficult would be to you to... Scale 1 (not difficult at all) to 4 (very difficult)	
Understand the information of the label	-.209**
Perceived Barriers 3	
How difficult would be to you to... Scale 1 (not difficult at all) to 4 (very difficult)	
Wear long sleeves and pants during application of pesticides	-.189**
Wear gloves during application of pesticides	-.183**
Perceived Self-Efficacy 1	
In the future, how sure are you that you can...? Scale 1 (not sure at all) to 4 (very sure)	
Prevent application of pesticides few months before pregnancy	.164*
Perceived Self-Efficacy 2	
In the future, how sure are you that you can...? Scale 1 (not sure at all) to 4 (very sure)	
Read the label before application	.221**
Follow instructions of the label	.238**
Use the correct pesticide for the pest intended to control/destroy	.228**
Wear long sleeves and pants during application of pesticides	.276**
Wear gloves during application of pesticides	.283**

* Correlation is significant at 0.05 level; ** Correlation is significant at 0.01 level.

4.4.8 Perceptions about Pesticides and Health on the U.S.-México Border

Additional analysis was conducted of the perceptions about pesticides and health according to the constructs of the Health Belief Model by the place of residence of participants in

the U.S.-México border. Of the 244 participants, 120 were from the U.S. and 124 from México. Chi square analyses were conducted for all the perception measured in this study to observe significant differences between these two groups of participants. Appendix 8 includes the tables with the results of the chi square values and their significance (p value) of all the perceptions examined in this study. The perceptions of participants found statistically significant according to place of residence are described below.

4.4.8.1 Perceived susceptibility according to country of residence.

None of the perceptions about the susceptibility of being harmed by pesticides were statistically different between the U.S. and Mexican participants. Perceptions measuring the perceived likelihood of participants that the pesticides applied in the house would harm the health of participants, their children and their unborn children (*Susceptibility 1*), and the perceptions of the category of *Susceptibility 2* such as the perceived likelihood of participants that the pesticides people apply would reduce the ability of men and women to have children, cause brain and nervous system problems, cancer, and allergies were not different between the U.S. and Mexican participants.

4.4.8.2 Perceived severity according to country of residence.

Regarding the perceptions of participants about the severity of the harms of pesticides for children 11 years of age and younger of categories *Severity 1*, *2*, and *3*, only one statement resulted significantly different between the participants of the U.S. and México. More participants of México (50.8%) than of the U.S. (30%) rated as not safe at all for their children the pesticides applied by exterminators (hired by them or by the owner of the house) (p=.003).

The rest of the statements measuring the perceived severity of the harms of pesticides that were not different between the U.S. and Mexican participants included the perceived difficulty to treat symptoms, diseases or poisonings caused by pesticides (*Severity 1*), the safety of pesticides for children if these are applied inside or outside the house (*Severity 2*), and the safety of pesticides according to the site of application in the house such as in the kitchen cabinets and floors, children bedrooms and in play areas of the house (*Severity 3*).

U.S. and Mexican participants reported similar level of disagreement with the statements of category *Severity 4*. Participants of either side of the border disagreed with statements such as pesticides do not harm children because pesticides are intended for pests, little amount of poison does not harm children, pesticides do not reach unborn child, and pesticides do not reach breastfeed children because pesticides cannot be in the breast milk. Additionally, U.S. and Mexican participants reported similar perceptions about the safety of pesticides according to various types of application (*Additional Perceptions*). U.S. and Mexican participants tend to disagree with statements such as pesticides applied inside and outside the house were safe for children, pesticides applied in agriculture were safe for children, and that authorities and institutions take actions to ensure that pesticides were safe for children. None of these additional perceptions about the safety of pesticides were statistically different between the participants of the U.S. and México.

4.4.8.3 Perceived benefits of participants according to country of residence.

None of the statements measuring the perceived benefits of applying less pesticide (*Benefits 1)* was statistically different between the U.S. and Mexican participants. These statements measured the perceived benefits of applying less pesticide such as would not harm the

health of participants, of their unborn child (in the case she was pregnant), or the health of their children 11 years of age and younger. In contrast, all the statements measuring the perceived benefits of applying pesticides correctly (*Benefits 2*) were statistically different between the U.S. and Mexican participants (see Table 4.89).

Table 4.89. Perceived Benefits of Applying Pesticides Correctly that Differ Between U.S. and Mexican Participants

Statements about the perceived benefits of participants **How much do you agree with the following: If you apply pesticides correctly...** Scale 1 (totally disagree) to 4 (totally agree)	Significance of the difference Chi square (p-value)
Your house would be less contaminated by pesticides	13.629 (.003)
Your house would be without pests	16.477 (.001)
You would save money by purchasing less pesticide products	13.686 (.003)
Pests would be controlled to the point of not harming the health of your family	19.301 (.000)
Pests would be controlled to the point of not bothering your family	17.787 (.000)
Pests would be controlled to the point of not damaging your property	15.716 (.001)

Mexican and U.S. participants resulted with statistically significant differences about the perceived benefits of applying pesticides correctly. A greater proportion of participants of México (47.2%) than of the U.S. (29.2%) totally agree with the statement that applying pesticides correctly would result in a home with less contamination with pesticides. More participants in Mexico (58.1%) than in the U.S. (38.3%) totally agreed that applying pesticides correctly would result in a house without pests. More participants in México (60.5%) than in the U.S. (37.5%) totally agreed that applying pesticides correctly would save them money because they would need less pesticide. More participants in México (59.7%) than in the U.S. (37%) totally agreed that by applying pesticides correctly pests would be controlled to the point of not harming their family. Finally, more participants in México (62.9%) than in the U.S. (42.5%) totally agreed that correctly applying pesticides would control pests to the point of not bothering

their family and more participants in México (58.9%) than in the U.S. (43.3%) totally agreed that applying pesticides correctly pests would be controlled to the point of not damaging the property.

4.4.8.4 Perceived barriers of participants according to country of residence.

Interestingly, U.S. and Mexican participants resulted with statistically significant differences on their perceived barriers to conduct practices that reduce exposures to residential pesticides. Table 4.90 illustrates the perceived barriers of the categories *Barriers 1, 2, 3,* and *4* that were significantly different among the U.S. and Mexican participants.

Of the perceived barriers to conduct pest prevention practices (*Barriers 1*), more participants in México (91.9%) than in the U.S. (85.8%) rated as not difficult at all to conduct deep house cleaning periodically (p=.039). The other statements of the category *Barriers 1* about the perceived difficulty to conduct pest prevention practices such as wash dishes, clean the kitchen, tables and surfaces, vacuum carpets and mop floors, and take the trash out frequently, keep the trash outside covered and frequently ventilate bathroom and kitchen to reduce humidity and prevent mold were not statistically different between the U.S. and Mexican participants.

Table 4.90. Perceived Barriers to Reduce Exposure to Pesticides that Differ between U.S. and Mexican Participants

Statements about the perceived barriers of participants **How difficult would be to you to...** Scale 1 (not difficult at all) to 4 (very difficult)	Significance of the difference Chi square (p-value)
Conduct deep house cleanings periodically	8.351 (.039)
Control pests without using pesticides	10.229 (.017)
Read the label before the application of pesticides	11.738 (.008)
Understand the information of the label	10.262 (.016)
Follow the instructions on the label	13.495 (.004)
Use methods that do not have pesticides to control pests	17.638 (.001)
Wear gloves during application of pesticides	9.759 (.021)
Wash or take a shower after application of pesticides	7.093 (.069)
Store pesticides in places where children cannot reach	10.893 (.012)
Prevent children being present during application of pesticides	11.612 (.009)
Stop using indoor pesticides in the form of spray, coils, vapors, or bombs	6.692 (.082)

Of the category *Barriers 2,* more participants of México (75%) than of the U.S. (68.3%) considered it very difficult to get rid of pests without using pesticides. In contrast, more participants of México (83.9%) than of the U.S. (66.7%) perceived as not difficult at all to read the label of the pesticide before every time of application. Similarly, more participants of México (78%) than of the U.S. (65%) perceived as not difficult at all to understand the label of pesticides and 83.9% of participants of México and 74.2% of the U.S. perceived as not difficult at all to follow the instructions of the label. Moreover, more participants in México (43.5%) than in the U.S. (22.5%) perceived as very difficult to use methods without pesticides to control pests. The perceived barriers to conduct safety practices related to the application of pesticides of category *Barriers 2* that were not statistically significant between the U.S. and Mexican participants included the difficulty to apply the correct pesticide for the pest intended, to apply only pesticides with registration number, and to prevent the application of pesticides before and during pregnancy and breastfeeding period.

Of the category *Barriers 3*, more participants in México (88.7%) than in the U.S. (81.5%) rated as not difficult at all wearing gloves during application of pesticides (p=.021). A marginal statistical significance (p=.069) was observed between the perceptions of the U.S. and Mexican participants about washing or taking a shower after application of pesticides, on which 97.6% participants of México and 89.9% participants of the U.S. rated as not difficult at all to wash or take a shower after application of pesticides. Similarly, more participants in México (97.6%) than in the U.S. (89.1%) considered not difficult at all storing pesticides in unreachable sites for children (p=.012). In contrast, U.S. and Mexican rated similarly the difficulty to conduct other practices of category *Barriers 3.* Participants of either side of the border rated as not difficult

wearing long sleeves and pants during application of pesticides, ventilating the place after application of pesticides, following instructions of the label to apply insect repellent on children, preventing children applying insect repellent by themselves and washing or bathing children when insect repellent is no longer needed.

Regarding the barriers to conduct practices to reduce exposures to residential pesticides (*Barriers 4*), Table 4.90 illustrates that more participants in México (71% of 124) than in the U.S. (63.9% of 119) considered it not difficult to prevent children being at home during the application of pesticides. More participants in México (32.3% of 124) than in the U.S. (28.6% of 119) considered it difficult stop using pesticides in the form of spray, bombs, coils, fogs, etc. The difference between these two groups was not statistically significant (p=.082).

The rest of the statements measuring the level of difficulty to conduct the practices of the category *Barriers 4* that were not statistically different between the U.S. and Mexican participants included the perceived difficulty to reduce the contamination of floors and carpets, toys, and dishes and cookware during the application of pesticides.

4.4.8.5 Perceived self-efficacy of participants according to country of residence.

Regarding the perceived confidence of participants, Table 4.91enlists the statements measuring the perceived self-efficacy of participants to conduct pest prevention and safety practices that reduce exposure to pesticides according to the categories of *Self-Efficacy 1, 2, and 3* that resulted statistically different between the U.S. and Mexican participants.

Table 4.91. Perceived Self-Efficacy to Reduce Exposures that Differ between U.S. and Mexican Participants

Statements about the perceived self-efficacy of participants **In the future, how sure are you that you can...?** Scale 1 (not sure at all) to 4 (very sure)	Significance of the difference Chi square (p-value)
Get rid of pests without using pesticides	8.287 (.040)
Stop using indoor pesticides in the form of spray, coils, vapor, or bomb	7.468 (.058)
Follow instructions of the label	7.528 (.057)
Wear long sleeves and pants during application of pesticides	9.307 (.025)
Wear gloves during application of pesticides	13.242 (.004)
Use methods without pesticides to control pests	7.623 (.054)

Regarding the perceived confidence of participants in conducting practices that reduce exposures to residential pesticides (*Self-efficacy 1*), more participants of México (57.3%) than of the U.S, (48.7%) were not sure at all to control pests without using pesticides. Regarding the perceived confidence of participants to conduct the practices according to the category *Self-efficacy 2*, more participants of Mexico (42.7%) than of the U.S. (34.5%) were confident to stop applying pesticides in the form of spray, coils, fogs, bombs, etc. Similarly, more Mexican (87.1%) than U.S. (73.7%) participants felt confident to follow the instructions of the label. Similarly, more participants of México (74.2%) than of the U.S. (63%) felt confident to wear long sleeves and pants during the application of pesticides and to wear gloves during the application of pesticides (79% and 68.1% respectively). More participants of the U.S. (41.2%) than of México (36.3%) felt very sure to use methods without pesticides to control pests.

In contrast, participants of both countries reported similar levels of confidence (*Self-Efficacy 1*) in applying pesticides when children are not present, prevent the application before and during pregnancy and breastfeeding period, in conducting deep house cleaning periodically, and prevent the contamination of toys, floors, and carpets during the application of pesticides. Similarly, of the perceptions measuring the level of confidence of participants about reducing

risks of exposure to pesticides (*Self-Efficacy 2*), participants of both countries reported similar levels of confidence in applying only pesticides with registration number, reading the label before application of pesticides, use the correct pesticide for the pest intended, ventilate the place after application of pesticides and storing pesticides in unreachable places for children. Of the perceptions about the level of confidence in reducing risks when applying insect repellent on children (*Self-Efficacy 3*), no statistical difference resulted between U.S. and Mexican participants about their level of confidence to conduct practices such as reading the label before application of insect repellents, following the instructions, prevent children applying the insect repellent by themselves, washing or bathing children when insect repellent is no longer needed, and on storing the insect repellent in places unreachable for children.

CHAPTER V

Conclusions and Recommendations

5.1 Implementation of the Study

This study aimed to examine the effects of two educational methods in promoting the prevention and reduction of exposure to residential pesticides. The educational interventions measured in this study were a small group talk and a graphic booklet. These two methods aimed to help Hispanic, Spanish speaking mothers living in the Paso Del Norte region on the U.S.-México border to prevent and reduce exposures to residential pesticides of the entire family, but mostly for children. To that end, this study employed a randomized control trial design to test the effectiveness of these educational methods in affecting three outcomes: the knowledge level of participants about health and pesticides, the number of practices to prevent pest proliferation, and the number of practices that reduce exposures to residential pesticides. The effectiveness of these methods in affecting the outcomes was measured with the changes in the scores of these outcomes.

Both educational methods included the same background information, risk messages, recommendations, Spanish language level, and targeted for women mothers of children 11 years of age and younger living in low-income neighborhoods on either side of the U.S.-México border. In contrast, these two methods differed in the method to convey the information and messages. The small group talk titled *"Reducing the risks from pesticides used at home: A guide for community health workers to facilitate group talks"* (Refer to Appendix 1) was designed by the author specifically for this study and was conducted in community centers in or very close to the neighborhood of the participants. The small group talk included active learning activities,

opportunities to discuss and reflect the information, reinforced with visual aid such as a power point presentation, and facilitated by a community health worker resident of the same area as of the participants. The graphic booklet *"Poco veneno…¿no mata? Consejos para prevenir las plagas y los envenenamientos con pesticidas" [A little bit of poison…Will it kill you?* (Galván, Juárez-Carrillo, Liebman, Sáenz, Sáenz, & Corella-Barud, 2008) (Refer to Appendix 2) consisted of a printed colorful graphic material, with cartoon-type characters and drawings, easy-to-read and follows texts in balloons, including highlighted boxes summarizing the messages and recommendations, and delivered in the house of the participants. These two methods were informed by the Health Belief Model, Adult Learning Theory, and Risk Communication Principles.

The study was organized in partnership with five community organizations including *AYUDA, Inc*. in San Elizario, Texas and *Boys and Girls Clubs of El Paso*, in El Paso, Texas in the U.S. side; and *AQUA 21, A.C., Gente a Favor de Gente, A.C.*, and *Salud y Desarrollo Comunitario de Ciudad Juárez, A.C.* (SADEC) in the Mexican side. The study was implemented by eleven community health workers (CHWs), who recruited the participants, conducted two household questionnaires during first and second household visits, and facilitated the educational interventions. The study was approved by the Institutional Review Board Committee of the University of Texas at El Paso and was carried out from September 1 to November 14, 2009. The CHWs explained the consent form and all participants signed it before their participation. The participants received a compensation of $20 dollars (or $200 Mexican pesos).

The study was implemented in six sites, three on each side of the U.S.-México border. The sites included the blocks within a ~.5 kilometer radius of community centers or house of

community health workers. In the U.S., the sites included the blocks around the community center of Boys and Girls Clubs of El Paso in south-central El Paso, Texas (i.e. Segundo Barrio), the community center of AYUDA, Inc. located in the semi-rural area east-south of San Elizario, Texas, and the neighborhoods around the house of a community health worker in Sunland Park, New Mexico. In México, the sites included the blocks around the community center of Don Bosco in the *Colonia 16 de Septiembre*, the Kolping Community Center in the *Colonia Luis Olague*, and the house of a community health worker of SADEC in *Colonia Kilómetro 27*.

The community health workers (CHWs) followed a simple random recruitment process approaching 1,532 households to check eligibility and willingness to participate. Of the 416 women eligible to participate, 252 accepted to participate (60.6% participation rate), completed one first questionnaire and were randomly allocated to three groups. Finally, 244 women completed the second household questionnaire, and of these, 230 women completed the educational interventions, 79 women attended the small group talk (Group 1), 70 women read the graphic booklet (Group 2), and 81 women were allocated in the control group (Group 3). Participants answered two questionnaires, one during the first household visit and the other 4-6 weeks later during the second household visit. The first questionnaires took an average of 58 minutes and the second questionnaire 37 minutes to complete.

The recruitment process was carefully planned to maintain internal validity within the study sites. Although this study selected the sites conveniently, the recruitment process within the selected sites followed the simple random selection procedure (Environmental Protection Agency, 2002) to maintain an equal likelihood of eligible people to participate. Overall, the recruitment process conducted by the CHWs was successful, with a participation rate of 60.6%

(or refusal rate of 39.4%). Previous studies have shown the success of CHWs in recruiting and retaining participants in community-based participatory research (Parker, et al., 2008) (Balcazar, et al., 2010).

Regarding the implementation of the educational interventions, 12 talks were conducted with the 79 participants of Group 1, resulting in 6.7 average participants per talk. The talks were facilitated from 1:35 to 2:08 hours, with an average duration of 1:42 hours. 85 graphic booklets were distributed to the participants of Group2. In a small pilot study conducted with 119 volunteers living in the U.S.-México border, the booklet resulted in 20 minutes average to read. After the completion of the second questionnaire, the rest of the participants were invited to attend the small group talk and received the graphic booklet. The data collected was entered into a database with a code for each participant and analyzed with SPSS Version 14.0 for Windows (SPSS, Inc.).

5.2 Characteristics of Participants

The participants in this study were women, Spanish speakers, mothers of children 11 years of age and younger, and living in low income neighborhoods in the Paso Del Norte region of the U.S.-México border. Women were eligible if they reported application of pesticides in their house any time during the summer 2009.

Of the 244 participants, women had an average of 33.6 years of age and 8.4 school years of education, with 2 children 11 years of age and less, and living in the U.S.-México border for 18.5 years and in the house where the interviews were conducted for 8.7 years. An average of 5 people living in the house of the participants was a higher estimate than the average household size of 3.05 estimated for El Paso County (US Census, 2000) and of 4.4 people per house

estimated in the *Municipio* of Ciudad Juárez (INEGI). The majority of the participants reported being a homeowner (65.7%) and living in one house per lot (42.6%). Over 26% lived in a house located in the same lot with another house unit, 12% lived in an apartment, 12% in a mobile home, and 4.5% of participants lived in units of the House and Urban Development (HUD) of the United States. 52% of participants reported a family income during the last month of $2,000 dollars and less, or the equivalent income level of $1,500 Mexican pesos and less. Some characteristics differed according the country of residence. More participants in México were homeowners (82.1% of 123) than the participants in the U.S. (48.7% of 119), more participants in México (24.2% of 124) had more years living in the city than U.S. participants (12.5% of 119) and living in the house (11.8% of 124) than U.S. participants (5.4% of 118). These differences between participants according to country of residence were statistically significant ($p<.01$).

Of the 495 total children 11 years of age and less reported by participants, children resulted with an average of 5.9 years of age (70.5 months), slightly more children were male (51.5%) and over 75% of these children were breastfed during 8.4 average months.

Exposure to pesticides during pregnancy and early childhood can result in potential harms to the health of children (Sanborn, Cole, Kerr, Vakil, Sanin, & Bassil, 2004; Rao, 2008). In this study, 40.3% and 54.1% of participants reported the application of pesticides during pregnancy and the first three years of age of their children respectively. Previous studies reported that 50.5% of Hispanic women (Berkowitz, et al., 2003) and 85% of African and Dominican women (Whyatt, et al., 2002) living in New York applied pesticides during pregnancy.

Although the application of pesticides during pregnancy reported by the participants in this study is lower than the proportions reported by other studies; the risks to children could be

augmented because 54.1% of participants reported the application of pesticides during the first three years of age of their children, the application of illegal pesticides (43.9% of participants), the application of pesticides with a label in a language not understood by the participants (36.2% of participants), and the modest number of safety practices to prevent and reduce exposures to pesticides, of which the median was 7 out of the 10 basic safety practices measured in this study (see Table 4.33 in Chapter IV). Before any educational intervention, Mexican participants reported more safety practices (mean 7.3, 1.9 Std. Dev.) than U.S. participants (mean 6.6, 2.2 Std. Dev.).

5.3 General Practices of Residential Pesticide Usage

Participants answered questions about their practices about pesticide usage during the first and second household visits and were requested to show the pesticide products available during the first household visit. Of 244 participants, the great majority reported the application of residential pesticides during the summer 2009 by themselves (91.8%) rather than hiring a professional exterminator (8.2%). More U.S. than Mexican participants hired an exterminator (12.5% and 4% respectively) during the summer 2009. Similarly, another study conducted with a cohort of 29 families living in a *colonia* in the U.S.-México border reported that all participants applied pesticides by themselves rather than hiring an exterminator (Shalat, et al., 2003). In contrast, another study reported that 55% of Hispanic and 44.1% non-Hispanic white participants reported the application of pesticides by a professional in the last 6 months in the U.S. (Table 16-31 by Tsang and Klepeis, 1996 as cited by U.S. Environmental Protection Agency, 1997). On the one hand, self-application of pesticides in the house could increase the risks of exposures if consumers are unaware of the risks and of the safety measures as one would expect from a

professional applicator. On the other hand, participants would have less risks of exposure because they apply pesticides on a needing basis rather than applying pesticides periodically as exterminators do.

Regarding the decision of when apply pesticides in the house, another study reported that 35.8% of participants decided to apply pesticides indoors at the first sign of a problem and 28.3% when the problem was too big (Nieuwenhuijsen, Grey, Golding, & Group, 2005) A similar trend about when participants decide to apply pesticides was found in this study. 47.9% participants decided to apply pesticides at the first sign of a pest problem and 21.5% when the pest problem was too big. These results suggest that participants may apply higher amounts of pesticide to destroy pests promptly and thus increase the one-time exposure to high doses of pesticides.

On the other hand, 25.6% of the participants of this study reported that they decide to apply pesticides to prevent pests and only 4.9% decided to apply pesticides when other methods do not work. These results suggest that Hispanic border women apply pesticides to destroy rather than to prevent pest proliferation, and thus, participants are applying less pesticide and less frequently. However, participants are rarely utilizing pesticide-free methods – such as traps and glues, and household cleaning, as the first attempt to destroy pests.

Of the 244 participants, 151 (61.9%) had at least one pesticide product at the time of the first household visit. The 1.6 average pesticide products per household (234 pesticide products in 151 households) inventoried in this study is similar to the 1.4 average pesticide products (148 products in 107 households) reported by residents of a border town in Arizona on the U.S.-Mexico border (Bass et al, 2001). A higher average of pesticide products was reported by residents of Minnesota in the U.S. with an average of 6 pesticide products per household (Adgate

et al, 2000). The majority (89%) had two or one pesticide products at the time of the first household visit. Apparently, border residents purchase and apply pesticide products on an as needed basis (i.e. at the time of the first sign of a pest problem), thus fewer products were stored in their homes.

This study found 234 pesticide products during the first household visit, 159 were located in U.S. households and 75 in Mexican households (67.9% and 32.1% respectively). Of the 234 products found, 27 pesticide products (11.5%) lacked proper labeling or registration number for domestic purposes as mandated by the U.S. or Mexican laws. Of these 27 products with no label or proper labeling, 14 were located in U.S. households (51.9%) and 13 in Mexican households (48.1%).

Of the 75 products found in México, 11 were from the U.S. (14.7%) and of the 159 products found in the U.S. households, 15 products were from México (9.4%). Bass and colleagues (2001) reported that 7% of pesticide products found in the house of participants in a U.S. border city were from México. Regarding the pesticide brands, this study inventoried 104 varied pesticide brands, 73 different brands in U.S households and 31 different brands in Mexican households (70.2% and 29.8% respectively. In summary, U.S. households had more products than Mexican households (159 versus 75 products) and more varied brands than in Mexican households (73 versus 31 brands).

The great majority (91.8%) reported the use of pesticides in the form of a spray, bombs, fogs, etc. (indoor air releasers). Davis and Ahmed (1998) reported that residues of pesticides were detected in toys and hand surfaces of children up to two weeks after a single sprayed application by professional applicators.

Previous studies have shown that from 7% to 9 % of U.S.-México border residents apply *polvo de avión* (Saller J. , Reyes, Maldonado, Gibbs, & Byrd, 2007, 2006). *Polvo de avión* is the popular name given in México to methyl parathion, an agricultural pesticide restricted for certain agricultural crops in the U.S. and used for general agricultural purposes in México, that is sold illegally on the streets in Ciudad Juárez for domestic purposes (Saller, Reyes, Maldonado, Gibbs, & Byrd, 2007). According to the Environmental Protection Agency (2007), *methyl parathion* is an insecticide/acaricide registered for agricultural purposes in 1954 and recognized as harmful to humans causing cholinesterase inhibition and peripheral neuropathology; therefore, methyl parathion is a pesticide of restricted use by certified applicators in non-residential uses and only in non-human consumption crops (Environmental Protection Agency, 2006). Methyl parathion is a substance classified as Toxicity Level I (i.e. the highest toxicity category for acute exposures) (Rubin, Esteban, Hill, & Pearce, 2002). In this study, 21.7% of the participants reported the application of *polvo de avión* inside the house and 26.7% outside the house during the summer 2009.

However, products with such name on the label were not located in the streets or local stores of the neighborhoods in Ciudad Juárez. The products sold in the streets found for this study were labeled as *costalito bronco, bolsa mágica,* and other products without a name on the label. No chemical analysis was conducted with these products to determine if these were in fact methyl parathion. Nevertheless, these products were recognized as polvo *de avión* by some neighbors and vendors. Thus, these products were deemed as *polvo de avión* and thus illegal products for purposes of this study.

These products were included in a picture along with other products considered illegal for domestic purposes in the U.S. such as Chinese chalk and mothballs (Environmental Protection Agency, 2010). When the picture was shown to participants, 43.9% of the participants of this study reported the use of any of the products of the picture. Bass and colleagues (2001) reported that an illegal pesticide such as the Chinese chalk was inventoried in seven of the 107 households of their study in Douglas, Arizona in the U.S.-México border (Bass, Ortega, Rosales, Petersen, & Philen, 2001). However, the proportion of participants reporting the application of *polvo de avión* inside and outside the house and the frequency of application of any of the products shown in a picture deemed illegal should be taken with reservations for the reasons explained above.

Nonetheless, the constraints to acknowledge the prevalence of illegal pesticide use with the responses of the participants may not preclude risk assessors and communicators to recognize the availability of products in the U.S.-México border without proper labeling and the proportion of participants employing such unknown, unlabeled, unregistered, and illegal products, either inside or outside their house.

The majority of the participants reported the application of pesticides many times during the summer (83.1%) and spring (59.8%), whereas 84% of participants reported never applying pesticides during the winter season. Similarly to other studies, the application of pesticides according to the site of the house, participants applied pesticides more frequently in the floors of the kitchen and dinner rooms (27%) followed by the bathrooms and the bedrooms (18.9%) (Freeman, et al., 2004; Bass, Ortega, Rosales, J. Petersen, & Philen, 2001). According to these patterns, special emphasis should be placed on the risk reduction campaigns to take extra

precautions in preventing the contamination of food, cookware, floors, and surfaces during the application of pesticides.

Additional risks would be faced by border residents because of the feasibility of purchasing pesticide products in a language not understood by the consumer. In this study, 36.2% of the participants admitted using pesticides with a label in a language not understood by them. When asked about their practices related with the label, 63.1% of the participants admitted reading the label before application of pesticides and 63.5% reported following the instructions of the label. When asked if they purchase pesticides in the other country, 38.3% of 120 U.S. participants and 22.6% of the 124 Mexican participants reported the purchase of pesticides in the other country. This could be interpreted as either U.S. residents purchase the pesticide products in México because prefer reading the labels in Spanish or because these products would be cheaper. The label of pesticide products is considered the primary source of information about the health risks of pesticides (Abt Associates Inc., 1999).

In a study of the label of pesticides, users of indoor pesticides (n=889) were asked about what would be the most important information in the label for them. 80% reported that the most important information would be the directions on how to use it, 69% respondents reported that the most important information would be about what the product does. Only 49% respondents considered as the most important information in the label would be the health effects, 45% of respondents considered as most important what to do in case of an emergency, and 42% respondents considered that the most important information would be where not to use the product (42%) (Abt Associates Inc., 1999). As can be seen, the general public participants do not consider important to read the ingredient statement on the label.

A great proportion of participants of this study responded following the instructions of the label. However, according to the tendencies presented above, the results suggest that participants follow the instructions on how to use the product but not on how to conduct safety practices or reduce exposures for women and children.

Moreover, besides relying on the information included in the packaging of the product, a greater proportion of consumers of indoor pesticides reported getting the information from newspaper and magazines (55.8%) and the store (53%) than from sources in the university (11.8%) or the internet/web (5.8%) (Abt Associates Inc., 1999). The information sought by consumer may be focusing on the instructions on how to use it rather than on the potential health risk and the adequate procedures to reduce exposures.

A significant difference was found between U.S. and Mexican participants who read the label before the application of pesticides. 53.5% of the 120 U.S. participants and 72.6% of the 124 Mexican participants reported reading the label before application of pesticides ($p<.01$). Although this study did not question participants about the reasons for not reading the label before application of pesticides, a potential explanation of the reduced proportion of U.S. participants reading the label as compared to the Mexican participants, could be the difficulties of U.S. participants to read information in a language not fully understood by them (i.e. English).

The perceptions of participants about conducting certain safety practices related with pesticide application were also examined for correlation with their practices. Reading the label was perceived as not difficult at all by 75.5% of the 244 participants. However, when examined according to the place of residence, 83.9% of Mexican participants and 66.7% U.S. participants rated as not difficult at all reading the label before the application of pesticides, the difference in

the perceived barrier of reading the label before the application of pesticide was statistically significant between these groups (p<.001). Similarly, when participants were asked about their level of confidence in reading the label, 82.3% Mexican and 71.4% U.S. participants were very sure to read the label before the application of pesticides, however, the difference between groups was not significant.

In the U.S.-México border, the educational methods and risk messages of the public campaigns should include recommendations to apply pesticides that have the adequate labels (i.e. as mandated by the laws in the U.S. and in México) and to read the label every time before application of pesticides.

Because pesticide application is more frequent during the summer and spring seasons, the campaigns about pest prevention and safety practices related with residential pesticides could be launched in late winter and early spring to increase the awareness of the risks of pesticides before these are actually applied and to provide recommendations about the safety measures. These campaigns would benefit more if they include additional cues to help the public recall risk messages during the seasons with higher frequency of pesticide application (i.e. graphic booklets, magnets, calendars, etc.).

5.4 Conclusions of the Study

This study was guided by four research questions. The following sections summarize the results according to each of these research questions that guided the study.

5.4.1 Research Question 1: which of the two educational methods tested in this study is more effective in increasing the level of knowledge of participants about residential pesticides and health?

The outcome “Knowledge Level” was computed with various concept about pests, pesticides, and health. The knowledge level of participants was measured with their answers before and after the educational interventions about what is a pest, what is the purpose of pesticides, the ways pesticides enter the body, the basic sections that must be included in the label of pesticides, some of the symptoms appearing shortly after exposure to pesticides, some of the diseases associated with exposure to pesticides, and what is the first to do in the case of accidental contact with pesticides. These concepts were addressed during the small group talk and in the graphic booklet. The responses of participants were transformed into points for a total of 37 points that determined the knowledge level score.

Overall, the 244 participants had a fair knowledge about the concepts measured in the outcome knowledge level. A salient result is the beliefs of the participants about the purposes of pesticides. Residential pesticides may help the public to control pests to a certain point or to eliminate the pest population completely. Before any educational intervention, more participants (84.8%) believed that pesticides are made to control than to other purposes such as that pesticides are made to keep pests away (72.4%) or to kill pests (66.8%). Apparently, participants believe that residential pesticides are more effective to control pests to certain point rather than eliminate all the pests in the house. The differential perception between controlling and killing pests may incite participants to disregard the risk messages about the levels of toxicity of pesticides, because they would consider pesticides less toxic when are used to control pests than more toxic when are made to kill pests. The educational interventions of this study addressed that pesticides help to control, kill, or keep pests away (repel). Consequently, of the 244

participants, the proportion of participants considering that pesticides are made to control pests increased to 95.1%, to keep pests away increased to 94.7%, and to kill pests increased to 84.4%.

When participants were asked about how pesticides enter the body, the smaller proportion of participants recognized that pesticides enter the body by absorption through the eyes (63.1%) and absorbed through the hands and skin of the body (73.8%) in contrast to the great proportion of participants recognizing that pesticides enter the body by ingestion (92.6%). These results may suggest the broad awareness of poisonings with pesticides by ingestion and the disbelief that pesticides are absorbed through the skin.

The diseases associated with exposure to pesticides that were recognized by a smaller number of participants included the endocrine problems (22.5%), fertility problems (38.9%), and cancer (59.8%). A fair number of participants recognized that pesticides could cause asthma attacks (75%). Similarly, fewer participants recognized some of the symptoms appearing shortly after exposure to pesticides such as muscle aches (42.2%), salivation (50.8%) or sweating (53.7%). In contrast, more participants recognized that dizziness (92.6%), headaches (93%), and vomiting (90.6%) could appear shortly after exposure to pesticides. Regarding the basic sections of the label of pesticides, participants reported a fair knowledge of the five sections asked in this study, such as the harms and warnings of the health risks (98.8%), instructions (98.4%), and what to do in case of an accidental exposure (95.1%). Of all the sections of the label asked on the questionnaire, fewer participants knew that the registration number (84.8%) should be included on the label of pesticides.

According to the experimental and control groups, of the 37 total points measuring the knowledge level of participants about pesticides and health, participants of group 1 increased

from 27.4 to 36.2 points, of group 2 from 28.3 to 34.8 points, and of group 3 (control) from 28.5 to 31.1 points. The changes in knowledge scores of participants were statistically significant between groups ($p<.001$). The slight changes observed on the participants of group 3 (control) could be explained as a testing effect, that is, the effect of being exposed to the questionnaire conducted during the first household visit. In conclusion, the small group talk was more effective than the graphic booklet in increasing the knowledge level of participants about pesticides and health. These results suggest that the characteristics of the group talk such as opportunities to discuss and reflect about the information being presented and the information presented orally and visually had a profound effect on the learning process of participants.

It must be noted that participants were eligible to participate if they did not participate in educational sessions or receive materials about pesticides and health. These requirements to participate were pivotal to control potential confounders that could influence the knowledge scores of participants.

5.4.2 Research Question 2: which of the two educational methods tested in this study is more effective in the adoption of practices by the participants that prevent pest proliferation without the use of pesticides?

The outcome of pest prevention was computed with the practices conducted by participants that prevent and control pest proliferation. The pest prevention score of participants was measured with the practices they conducted before and after the educational interventions. The practices recommended to prevent pests were getting rid of clutter inside and outside the house, installation of traps and glues, washing dishes, cleaning the kitchen, tables, and all surfaces frequently, vacuuming carpets and mopping floors frequently, covering and storing food

frequently, taking the trash out daily and keeping it covered, and ventilating the bathroom and kitchen during and after use to reduce humidity and prevent mold. These practices were recommended during the group talk and addressed in the graphic booklet. The responses of participants were transformed to points for a total of 11 points that determined the pest prevention score.

Overall, the 244 participants reported conducting a fair number of pest prevention practices before any educational intervention. The great majority of participants conducted frequent house cleaning and other practices that prevent pest proliferation. However, fewer participants reported installing traps and glues to control pests (43%) and keeping the trash can outside covered (71.5%).

According to the experimental and control groups, of the 11 total points measuring the outcome of pest prevention practices, participants of group 1 increased from 9.8 to 10 points, of group 2 from 9.7 to 9.8 points, and the participants of group 3 (control) decreased from 9.7 to 9.6 points. The changes in the pest prevention scores was not statistically significant between groups ($p=.193$). Therefore, it can be concluded that the educational methods tested in this study were modestly effective in increasing the number of pest prevention practices measured in this study on which the small group talk was modestly more effective (0.23 mean point change) than the graphic booklet (0.1 mean point change) in promoting the adoption of pest prevention practices by participants. The small changes of the practices conducted by participants before and after the educational interventions can be explained by the great number of practices conducted by participants before any intervention and/or by the type of pest prevention practices measured in this study.

Future educational campaigns should reinforce these practices but include additional practices to prevent pest proliferation without or with less-toxic pesticides. Integrated Pest Management (IPM) is an environmental sustainable strategy to "address the overuse or misuse of pesticides in agriculture. It involves the use of cultural, biological, and chemical techniques to control pest populations (Marquez Cuyno, 1999, p. 3). The IPM strategy has been adapted to urban settings. The IPM strategy is based on the identification and monitoring of pests (i.e. type, location, number) and the conditions that promote growth and harboring (poor sanitation, clutter, cracks, temperature, humidity, etc.), use of non-chemical methods (i.e. sticky traps, pheromone traps, glues, mouse traps, vacuuming, sanitation and housekeeping, etc.) (Maryland Department of Agriculture, 1999). Similarly, the IPM strategy has been adapted to residential interventions successfully. Williams and colleagues (2006) conducted strategies such as deep professional cleaning and sealing pest entry points combined with the application of low-toxicity pesticides in the households of pregnant women in New York in the U.S. The implementation resulted in significant decrease of cockroach infestation and a reduction in the levels of pesticide metabolites in blood samples (Williams, et al., 2006).

As noted above, participants reported a fair number of pest prevention practices. These practices could be enhanced with IPM strategies to increase the effectiveness to control pests and prevent the use of pesticides in residential settings. The IPM strategies could be disseminated in public campaigns as a basic domestic measure that can be conducted systematically and regularly by residents.

5.4.3 Research Question 3: which of the two educational methods tested in this Study is more effective in the adoption of safety practices related with the application of pesticides by participants?

The outcome of safety practices was computed with the practices conducted by participants before, during, and after the application of pesticides in the house that reduce exposures to pesticides. The safety practices score was measured with the practices conducted by participants before and after the educational interventions. The safety practices to reduce exposures to pesticides measured in this study included read the label before application of pesticides, follow the instructions of the label, wear long sleeves, pants, and gloves during application of pesticides, apply pesticides when children are not present, cover food and cookware, cover or store toys during application of pesticides, wash or take a shower after application of pesticides, ventilate the house/rooms after application of pesticides, and keep pesticides in original container. These safety practices were addressed during the small group talk and in the graphic booklet. The responses of participants were transformed into points for a total of 10 points to that determined the safety practices score.

Overall, the 244 participants conducted a fair number of safety practices such as washing or taking a shower after application of pesticides (86.9%), ventilating the house after application of pesticides (86.9%), covering food and cookware during the application of pesticides (86.9%), and keeping pesticides in original container (83.2%). In contrast, less number of participants reported wearing long sleeves/pants (26.2%) and gloves (33.2%) during the application of pesticides. Similarly, 63.1% and 63.5% of the participants reported reading the label before application of pesticides and following the instructions of the label respectively.

According to the experimental and control groups, of the 10 total points measuring the outcome of safety practices, participants of group 1 increased from 7.4 to 9.3 points, of group 2 from 6.9 to 8.3 points, and of group 3 from 6.8 to 7.5 points. The changes in the number of safety practices conducted by participants was modestly significant between groups ($p=.074$). Therefore, it can be concluded that the small group talk was more effective (2.2 mean points change) than the graphic booklet (1.2 mean point change) in promoting the adoption of safety practices related with pesticide usage. The slight changes observed on the participants of group 3 (control) could be explained as a testing effect, that is, the effect of being exposed to the questionnaire conducted during the first household visit.

The responses of participants about reading the label before application of pesticides and following the instructions of the label were examined for correlation (Chi square). Results showed a strong correlation between reading the label and following the instructions of the label either before or after the educational interventions ($p=<0.001$). Similarly, reading the label before application of pesticides was strongly correlated with the number of safety practices scores of the participants either before or after the educational interventions ($p<0.000$).

The label of pesticide products is considered the primary source of information about the health risks of pesticides (Abt Associates Inc., 1999). As shown in this study, reading the label is a significant predictor of the safety practices that reduce exposures to pesticides. Thus, reading the label should be a practice strongly recommended in public campaigns. However, the label must be in a language understood by border residents and complete because this study found a strong correlation between the obstacle of understanding the information of the label and the number of safety practices conducted during the application of pesticides ($r=-.405$, $p=.000$).

Moreover, results of this study showed that 36.2% of the 244 participants reported using pesticides with a label in a language not understood by them and 43.9% of participants reported the application of illegal pesticides as shown in one picture that included products with a label with incomplete information.

Furthermore, when the proportion of participants that reported reading the label was examined according to the place of residence in the border, 53.5% of the 120 U.S. participants and 72.6% of the 124 Mexican participants reported reading the label before application of pesticides ($p<.01$). Despite this study did not questioned participants about the reasons of not reading the label before application of pesticides, a potential explanation of the reduced proportion of U.S. participants reading the label as compared to the Mexican participants, could be the difficulties of U.S. participants to read information in a language not fully understood by them (i.e. English). The perceptions of participants about conducting certain safety practices related with pesticide application were also examined for correlation with their practices. Reading the label was perceived not difficult at all by 75.5% of the participants. However, when examined according to the place of residence, 83.9% of Mexican participants and 66.7% U.S. participants rated as not difficult at all to read the label before the application of pesticides, the difference in the perceived barrier of reading the label before the application of pesticide was statistically significant between these groups ($p<.001$). Similarly, when participants were asked about their level of confidence in reading the label, 82.3% Mexican and 71.4% U.S. participants were very sure to read the label before the application of pesticides, however, the difference between groups was not significant.

Moreover, as explained in Chapter II of this document (Section “Lost in Translation”), there are two Spanish terms to refer to translate the English term *pesticides*, these are *pesticida* and *plaguicida*. However, a small pilot study with volunteers on the U.S.-México border (Refer to Chapter III, Section “Pilot Study”) demonstrated that over 87% and 85% of the 119 volunteers recognized the pesticide products they used at home as *veneno* [poison] and *insecticida* [insecticide] respectively, and of the Spanish synonymous of pesticides, 46% of the volunteers recognized the term *pesticida* and only 29% the term *plaguicida*.

The terms included on the label are most important because of the strong correlation between reading the label and following the instructions of the label and between reading the label and conducting safety practices that reduce exposures to pesticides found in this study. The varied Spanish terms of pesticidal products in the border plus the prevalence of purchasing products in a language not understood by Hispanic women would significantly preclude consumers learning about the warnings and health risks included on the label, and thus, reduce their adherence to the safety recommendations to reduce exposures. Employing adequate terms and the language preferred by the consumer would potentially increase the number of safety precautions conducted by participants when applying pesticides in their house. At least in the areas with high prevalence of Hispanic and foreign born Hispanic populations, such on the U.S.-México border, the circumstances explained above merit that the label of all pesticide products should be provided in Spanish and address the generic Spanish terms of pesticides. The results of this study strongly support the recommendation to include the information of the label in Spanish as well as in English.

In conclusion, as shown on Figure 5.1, this study reports a relationship between the knowledge of participants about pesticides and health and the practices they conduct to reduce exposure to residential pesticides. Because knowledge scores were statistically correlated with the practices conducted by participants and the pest prevention and safety practices were statistically correlated as well, one may infer that awareness of the risks of pesticides would predict the performance of participants to prevent pests and to adopt safety practices that reduce exposures. The results of this study concur with the view that people that lack information and education about the effects of chemicals may ignore or neglect the practices to prevent or reduce these effects (World Health Organization, 2004).

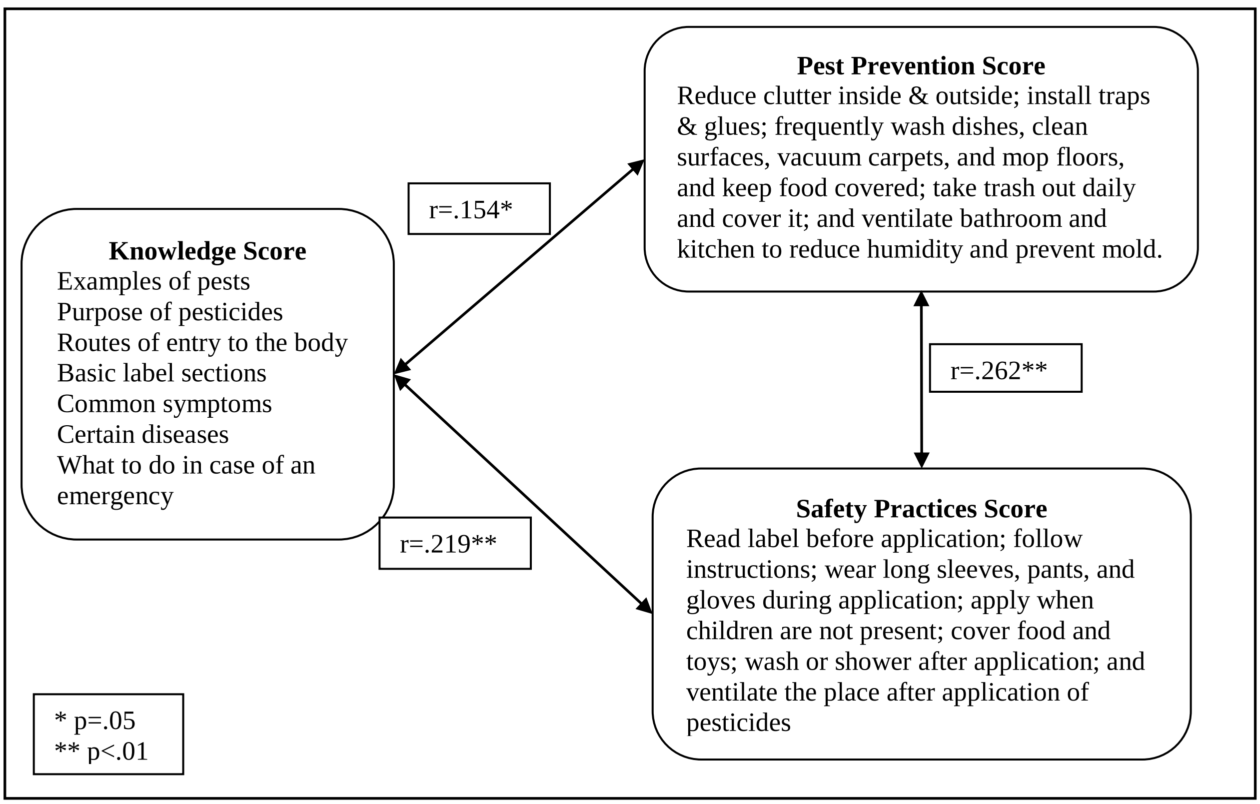

Figure 5.1. Correlation between Knowledge, Pest Prevention, and Safety Practices Scores Reported by Participants Prior to the Educational Interventions.

The effect of the community health workers (CHWs) on the results of the educational interventions should not be overlooked. Besides the group talk was carefully designed according to Adult Learning Theory and informed by the concepts of the Health Belief Model and the risk communication principles, these talks were facilitated by CHWs who live in the same neighborhoods and resemble the characteristics of participants. The effectiveness of CHWs in increasing knowledge levels, access to health services, and promoting behavioral changes had been reported by various community-based interventions (Andrews, Felton, Wewers, & Heath, 2004; Swider, 2002; Nuno, Garcia, Zuckerman, & Zuckerman, 2008). In contrast, other studies reported ambivalent results of the impact of the education provided by community health workers on reducing environmental exposures (Wu & Takaro, 2007; Arcury T. , Marin, Snively, Hernandez-Pelletier, & Quandt, 2009).

5.4.4 Research Question 4: what are the perceptions of participants about residential pesticides and health according to the constructs of the Health Belief Model?

According to the constructs of the Health Belief Model, this study asked participants to rate several statements to acknowledge their perceived susceptibility of being harmed by the pesticides applied in their house (i.e. *perceived susceptibility*), the severity of the harms caused by residential pesticides (i.e. *perceived severity*), the benefits of using less pesticide and applied correctly (i.e. *perceived benefits*), the barriers to conduct the practices recommended to reduce exposures to the pesticides applied in their house (i.e. *perceived barriers*), and their level of confidence to conduct such recommendations (i.e. *perceived self-confidence*). All statements were rated by the participants on a 4-point Likert scale.

5.4.4.1 Perceived Susceptibility

Participants rated seven statements to acknowledge their perceptions about the susceptibility of being harmed by pesticides in general and of having specific diseases as a result of exposure to pesticides. Of the 244 participants, the majority perceived that unborn children are more likely to be harmed by the pesticides applied in the house than the children 11 years of age and younger or themselves. Similarly, when asked about some specific diseases caused by exposure to pesticides, the higher proportions of participants believed that exposure to residential pesticides is very likely to cause allergies (skin and respiratory) (51.2%), problems to the brain and nervous system (29.5%) and certain types of cancer (27.2%). In contrast, less number of participants believed that exposure to pesticides is very likely to cause fertility problems to men and women (9.5%), cancer (27.2%), or problems to the brain and nervous system (29.5%). All the seven statements measuring the perceived susceptibility of being harmed by pesticides were significantly correlated with the knowledge level scores of participants, but not with the pest prevention or safety practices conducted by participants. Apparently, the level of knowledge about pesticides and health influences the perceived susceptibility of being harmed by pesticides. However, the perceived susceptibility of being harmed was not reflected on the number of practices that reduce exposures to residential pesticides.

5.4.4.2 Perceived Severity

Participants rated 14 statements regarding their perceptions about the difficulty to cure health harms caused by pesticides, the safety of the pesticides applied by themselves inside or outside the house and by an exterminator, the safety of the pesticides for children according to site of application in the house, and about the level of agreement of participants about general

statements of pesticides and the health harms. Overall, the majority of participants (61.5%) believed that treating poisonings was not easy at all, compared to the 48.4% and 37.7% of participants rating as not easy at all to treat the diseases or the symptoms caused by pesticides respectively. Similar proportions of participants believed that pesticides applied inside, outside or by an exterminator are not safe for children (40.6%, 42.1%, and 40.5% respectively). When asked about the safety of pesticides for their children according to the site of application, 77.9% rated as not safe at all the pesticides applied in the children's play areas, 75.7% the application of pesticides in children's bedroom, 60.7% the application of pesticides in kitchen cabinets, and 63.4% the application of pesticides in kitchen floors.

Additionally, 71.3% totally disagreed with the statement that "a little amount of poison does not harm children," 70.5% with the statement that "pesticides do not reach the unborn child of a pregnant woman," 67.2% with the statement that "pesticides do not reach breastfeed children because pesticides cannot be in the breast milk," and 65.2% with the statement that "pesticides do not harm children because pesticides are intended only for pests." Of concern is that over a third of the participants apparently think that pesticides applied in their house are safe for their children and unborn child.

These 14 statements about the severity of the harms caused by pesticides were tested for correlation with the knowledge level, pest prevention, and safety practices scores of the participants. Nine statements of the perceived severity of pesticides of participants were statistically correlated with the knowledge level scores of participants. These perceptions included that pesticides applied outside the house are not safe for children, pesticides applied in kitchen cabinets and floors and in the children's bedroom and play areas, and the disagreement

with statements such as “little amount of poison does not harm children,” “pesticides do not reach the unborn child,” and that “pesticides do not reach breastfeed children because pesticides cannot be in the breast milk.”

The perceptions about the severity of pesticides statistically correlated with the pest prevention scores of participants included that the pesticides applied outside the house and by an exterminator and that the pesticides applied in the children’s play areas and in the kitchen cabinets are not safe at all for children were significantly correlated with the pest prevention practices conducted by participants. Finally, beliefs of participants such as the difficulty to cure poisonings and that the pesticides applied inside the house and by an exterminator are not safe for children were significantly correlated with the safety practices conducted by participants.

These results suggest that the perceived severity of the harms caused by pesticides is strongly correlated with the level of knowledge participants have about pesticides and health and with the number of practices conducted by participants to reduce exposure with pesticides.

5.4.4.3 Perceived Benefits

Participants rated 10 statements to acknowledge their perceptions about the benefits of using less pesticide and applying pesticides correctly. The salient benefits perceived by the majority of the participants included that if they use less pesticide the health of their children 11 years of age would not be harmed (22.1%) and the health of the unborn child would not be harmed (20.9%). The salient benefits of applying pesticides correctly perceived by the majority of the participants included that pests would be controlled to the point of not bothering the family (52.9%) and of not damaging the property (51.2%), that they would save money for purchasing less pesticide (49.2%) and that pests would be controlled to the point of not harming the health of

the family (48.6%). 38.2% participants totally agreed that applying pesticides correctly would result in a house less contaminated by pesticides and 48.4% participants agreed that applying pesticides correctly would result in a house free of pests.

These perceptions of participants about the benefits of using less pesticides and applying pesticides correctly were tested for correlation with the knowledge level, pest prevention, and safety practices scores. None of these perceptions were statistically correlated with the knowledge level scores. In contrast, five statements were statistically correlated with the pest prevention scores. Participants conducting higher number of pest prevention practices agreed with the statement that if they apply less pesticides the health of the unborn child and of children 11 years of age and breastfeeding children would not be harmed. On the other hand, participants with higher number of pest prevention practices agreed with the statement that if pesticides are applied correctly the house would be less contaminated and pest free.

Of the 10 statements about the benefits of using less pesticide and applying it correctly, only two statements were significantly correlated with the number of safety practices conducted by participants. Participants with higher safety practices scores agree with the statements that applying pesticides correctly would result in a house less contaminated and pest free. The results of this study suggest that the majority of participants believe on the benefits of using less pesticide and of using them correctly.

5.4.4.4 Perceived Barriers

Participants rated 31 statements to understand their perceived barriers in conducting practices that reduce exposures to pesticides. The salient barriers perceived by the majority of the participants were that participants perceived it as very difficult to control pests without applying

pesticides (71.7%), use methods that do not have pesticides to control pests (33.2%), use the correct pesticide for the pest intended (24.7%), and stop using pesticides in the form of spray, fogs, bombs, etc. (17.3%).

In contrast with the cultural beliefs of farmworkers of the need to cool down before washing hands or showering to prevent health harms (Quandt, Arcury, Austin, & Cabrera, 2001), 93.8% of the 244 participants of this study rated as not difficult at all to wash or take a shower after the application of pesticides. This belief was not statistically correlated with age, education, income level, type of house ownership or structure, or with the knowledge level and the pest prevention or safety practices conducted by the participants. This result may suggest that certain cultural beliefs of Hispanic populations may differ by the setting (i.e. rural versus urban), type of use of the pesticide (i.e. agricultural versus residential), or context (i.e. occupational versus domestic).

The statements measuring the perceived barriers to reduce exposures to pesticides were tested for correlations with the knowledge level, pest prevention, and safety practices scores. Only two out of the 31 statements of the perceived barriers were statistically correlated with the level of knowledge of participants. Participants with higher knowledge scores found not difficult at all to control pests without application of pesticides and to use methods that do not have pesticides to control pests. Similarly, two out of the 31 statements measuring barriers were statistically correlated with the pest prevention and safety practices scores of participants. Participants conducting more pest prevention practices rated as not difficult at all to vacuum carpets and mop floors frequently and on keeping covered the trashcan outside. In contrast, participants conducting more safety practices rated as not difficult at all to understand the

information of the label and wearing long sleeves, pants and gloves during the application of pesticides.

5.4.4.5 Perceived Self-Efficacy

Participants rated 24 statements to acknowledge their level of confidence in conducting practices that reduce exposures to pesticides. The salient practices on which the majority of the participants felt confident of performing included storing pesticides in unreachable places for children (89.7%), ventilating the place after application of pesticides (85.5%), following the instructions of the label (80.6%), storing insect repellents in unreachable places to children (88.8%), washing children when insect repellent is no longer needed (81.8%), following the instructions of the label of insect repellents (81.4%) and reading the label of insect repellent before application on children (78.2%), and preventing children applying insect repellent by themselves (76%). Similarly, the majority of participants felt confident of preventing the contamination of dishes and cookware during the application of pesticides (77.8%), reading the label before application of pesticides (77%), conducting deep house cleaning periodically (76%), wearing gloves during application of pesticides (73.7%), applying pesticides when children are not present (72.8%), preventing the contamination of toys during the application of pesticides (71.2%), reducing the contamination of floors and carpets with pesticides (68.7%), and wearing long sleeves and pants during the application of pesticides (68.7%).

The perceptions of self-efficacy of participants to conduct practices that reduce exposures to pesticides were examined for correlations with the knowledge level, pest prevention, and safety practices. Of the 24 statements measuring the self-efficacy of participants to reduce exposures, only one statement was correlated with their knowledge scores. Participants with

higher knowledge scores felt very confident of getting rid of pests without application of pesticides. On the other hand, three statements were statistically correlated with the pest prevention practices. Participants conducting more pest preventing practices felt confident of reducing the contamination of floors and carpets with pesticides, using the correct pesticide for the pest intended, and ventilating the place after application of pesticides. Similarly, three out of the 24 statements measuring the self-confidence of participants were statistically correlated with the number of safety practices conducted by participants. Participants with higher number of safety practices felt very confident to prevent application of pesticides few months before pregnancy, read the label before application of pesticides, follow the instructions of the label, use the correct pesticide for the pest intended, and wear long sleeves, pants, and gloves during the application of pesticides.

5.4.4.6 Additional perceptions

Participants rated four additional perceptions about the safety of pesticides in general. The majority of the participants totally disagreed that pesticides applied in agriculture are safe for children (58.6%), applied inside the house are safe for children (53.7%), applied outside the house are safe for children (53.3%). Moreover, 29% participants totally disagreed and 28.7% totally agreed that authorities and institutions take actions to ensure that pesticides are safe for children.

The additional statements about the safety of pesticides for children were tested for correlation with the knowledge level, pest prevention, and safety practices scores. Only one statement was correlated with the knowledge scores. Participants with higher knowledge scores totally disagreed with the statements that pesticides applied inside or outside the house are safe

for children. None of the additional statements were correlated with the pest prevention or safety practices scores conducted by participants.

In conclusion, 90 statements were presented to participants to understand their perceptions about pesticides and health and grouped according to the constructs of the Health Belief Model plus four additional statements of the safety of pesticides to children. Of these 90 statements, 21 were significantly correlated with the knowledge of participants about pesticides and health, 14 were correlated with the pest prevention practices conducted by participants, and 16 statements were correlated with the pest prevention practices.

5.5 Limitations

In research studies with experimental design, the measures to maintain the internal validity are preferred over external validity (Campbell & Stanley, 1963, p. 5; as cited in Shadish, Cook & Campbell, p. 97). The level of internal validity focuses on detecting differences between groups in contrast with external validity that focuses on the results applicable to all the population (i.e. generalization). Randomized control trials focus on maintaining homogeneity between the participants by allocating participants randomly and controlling potential sources of discrepancy among participants. The strategies conducted in this study were successful to maintain homogeneity between groups despite the fact that participants were recruited from six sites in two distinct countries. Participants were residents of areas with similar neighborhood and socio-economic characteristics and the recruitment and implementation of the educational interventions were conducted concurrently for all groups and by community health workers (CHWs) with similar characteristics and experience. This study found that the family size in the U.S.-Mexico border is similar in either size of the border and greater than in the U.S. In contrast

to the U.S. that reports an average of 2.74 persons per household (U.S. Census, 2000), this study found an average of 5.0 and 5.15 persons per household in U.S. and Mexican border sites.

As a result, this study provides an understanding of the behaviors and perceptions of participants about exposures to residential pesticides that can be extrapolated to other Hispanic, Spanish-speaking women with similar characteristics.

However, the results of this study could extrapolated to other Hispanic populations in the U.S. or in México with some considerations. As mentioned earlier, the results of this study may apply best for border residents given the culture and unique environment prevalent in the U.S.-Mexico areas, including easy access to purchase pesticides and other toxic substances in either country. It is noteworthy that this study was conducted during a highly insecure period in Ciudad Juárez, which may have precluded some families from participating or for interviewers to cover all the blocks planned in the initial recruitment design.

The results of this study rely on self- reported practices, knowledge, and perceptions, which could had been influenced by recall bias and in over or under reporting practices as per actual behavior by participants. In addition, although the interviewers attended two trainings that included a practice of an interview, the interviewers may have faced challenges to explain the questions, the rating scores, and to help participants reduce recall bias about pesticide application and household cleaning practices.

Participants found the rating scale somewhat difficult. This can be explained by the participants' low-to-moderate education level and lack of experience with such type of questions. To solve this, the interviewers provided examples on how to answer a scale-based question before asking the actual question of the questionnaire. We addressed the difficulties of

participants in understanding and scoring the scale-based questions by showing them a form with the scoring points linked by an arrow to aid participants in responding this type of questions and to reduce measurement errors. All these issues (recall bias, phrasing of questions, scoring a scale) were observed during the pilot of the questionnaire and were addressed accordingly. The structured questionnaire was reviewed and evaluated by the interviewers and piloted with a convenience sample of 33 volunteers for language and sense of the questions. Several versions were prepared until both the interviewers and the committee members agreed that questions were clear and simple and conveyed the message intended by the question.

For practical purposes the community health workers (CHWs) in this study acted as interviewers and some of them as facilitators of the small group talks. All the CHWs attended three trainings designed and facilitated by the author of this study about study implementation, conducting the questionnaire, and facilitating the talk. The potential lack of objectivity by the CHW was addressed during these trainings by emphasizing to maintain the protocol in asking and marking the questions as answered by the participants and to conduct the talk as instructed in the guide.

Although the efficacy of the two educational methods (i.e. group talk and graphic booklet) were significant in changing the knowledge level of participants, some caution must be taken for the absolute points changes because of the instrument effect (as can be observed in the changes of the participants in the control group). Moreover, other researchers have reported concerns about the validity of the information collected because of the potential effects of the community health workers when implementing participatory action research with participants living in low-income or semi-urbanized areas (May, et al., 2003).

As shown in this study, several perceptions of the participants were strongly correlated with their knowledge about pesticides and health. However, it has been recognized that people perceive the risks differently (Garvin, 2001) and thus, the educational interventions would benefit by considering the variations on the perceptions of risks and benefits of using less pesticide and applying pesticides correctly, and on taking actions to reduce exposures to pesticides in residential settings.

Because the public perceive and evaluate environmental risks differently from experts and decision-makers (Garvin, 2001), the risk communication strategies should help not only to reduce risks, but to reduce the risk perception divide between experts and the public (Leiss, 2004). The risk messages included in the educational interventions tested in this study suggest an increase of the perceived levels of risk enough for participants to modify their practices.

However, the perceptions of participants about the risks of pesticides could be considered in future efforts to promote and educate the public about the serious and long term effects of pesticides in their children beyond the short term physical symptoms and poisonings.

The application of a theory such as the Health Belief Model by this study in the design of the educational methods and in the understanding of the perceptions of participants (Parker, Baldwin, Israel, & Salinas, 2004) was effective to provide a baseline for future interventions to reduce exposures to residential pesticides at the public health level. Additionally, the results of this study could help health care professionals in the understanding of the potential risks of exposure of their patients to residential pesticides. Moreover, health care providers would be and the compliance with preventive practices by acknowledging the perceptions of Hispanic, Spanish speaking mothers about the risks for themselves and their children.

This study did not collect environmental samples such as dust, soil, indoor air or biological samples (i.e. urine, blood) to examine the association between practices and beliefs, and the potential risks about residential pesticide usage. However, other studies found a strong correlation between environmental sampling and the practices about pesticide usage reported by the participants (Thompson, Harrison, Fenske, Robertson, & Hern, 2005; Colt, et al., 2004). Similarly, on a review about the predictors of pesticide exposures for farmworkers, 10 out of 25 studies about behaviors related with pesticides provided a strong association between certain behaviors of residential pesticide usage and detectable levels of pesticides in the house or in people (Quandt, Hernandez-Valero, Grzymwacz, Hovey, Gonzales, & Arcury, 2006). Other authors argue that the efficacy of questionnaires in the determination of environmental risks is limited, but can complement the monitoring of environmental exposures and explain past and salient exposures (Bradman & Whyatt, 2005).

In summary, the results of this study illustrate that participants living in the U.S.-México border perform some protective practices about residential pesticides. Participants tend to apply pesticides in their homes on an as needed basis that reduces exposures by application of pesticides periodically. Over 60% of participants read the label before application of pesticides and followed the instructions of the label. Furthermore, reading and following the instructions of the label were statistically correlated. The majority of participants apply pesticides when children are not present and conduct basic pest prevention practices frequently (i.e. house cleaning). Between the first and second household visits (4-6 weeks apart), participants did not need to apply pesticides because there were no pests, 26% of participants decided not to apply pesticides

even when these were needed, and the great majority had up to two pesticide products in their homes.

In contrast, participants showed some risk practices such as the great majority are self-applicators, use air releaser forms of pesticides (i.e. spray, fogs, etc.). A small number of participants reported using non-chemical products as the first attempt to control pests. Over half of the participants applied pesticides during pregnancy and the first three years of age of their children. Apparently, 21.7% apply *polvo de avión* (possible Methyl parathion) inside their house and 44% apply at least one of the illegal products asked in this study (i.e. Chinese chalk, *polvo de avión*, *costalito bronco*, *bolsa mágica*, mothballs). During the first household visit, some participants had pesticides considered illegal in this study and some pesticide products without proper labeling or registration number. Moreover, 36.2% participants reported using a product with a label in a language they do not understand, 37% participants were not notified by the owner of the house before the application of pesticides, and 86.9% were not notified of the pesticides applied nearby their house.

5.6 Recommendations

According to the slight changes about the pest prevention and safety practices reported by participants after the interventions, the main recommendation for future educational interventions is to include various pest prevention practices additional to the practices recommended in this study. Such practices to prevent pest proliferation can be adapted from the Integrated Pest Management Program into community-based educational interventions aiming to reduce exposure at residential settings. Moreover, an additional recommendation would be to expand these educational interventions to specific settings where children are, such as daycare

centers, schools, and to the play areas nearby agricultural settings. Reaching out to these specific settings would follow some of the goals set by the Healthy People 2020 Program (HP) in the U.S. (Department of Health and Human Services, 2011). This program defined various objectives within the environmental health category about exposures to pesticides. Among these, the HP 2020 aims to increase the number of schools adopting safer pesticide application practices such as spot treatment and bait pest control, increase the number of schools marking the areas treated with pesticides and informing students and staff prior to pesticide application. Additionally, the HP 2020 included the objectives to reduce the serum levels of organochlorine pesticides of children 12 years and older and non-persistent pesticides of children older than 6 years of age, to reduce acute chemical poisonings, and to increase the number of states monitoring pesticide poisonings.

Quandt, Hernandez-Valero, Grzymwacz, Hovey, Gonzalez, and Arcury (2006) compiled a comprehensive list of studies with occupational, household, and behavioral predictors of pesticide exposures of farmworkers. The results of this study and future studies may help expand such list of predictors with information about the exposures for farmworkers and their families living in the U.S.-Mexico border region. Additionally, the results of this study would help create a similar list with the predictors of pesticide exposure of the public living in urban and semi-urban settings.

Since a lower proportion of participants identified weeds and fungi as pests, the label of pesticides used for these typed of pests should address that these products are in fact pesticides, future educational interventions should address these types of pests more specifically to increase public awareness about the risks of the products used for these types of pests.

The significant changes in knowledge level of participants about pesticides and health can be attributed to the framework that guided the educational methods tested. However, other studies have reported similar significant changes about knowledge about pesticides. Sklansky et al. (2003) evaluated the changes in knowledge and attitudes of participants after being exposed to a pamphlet regarding children and pesticides. Participants were randomized to intervention and control groups and answered a baseline and follow up assessments – 11 to 25 days apart. Participants increased the number of correct responses about the risks of pesticides from 8.8 to 11.9 mean score and participants in the control group increased from 8.4 to 8.8 mean score (Sklansky, Mundt, & Katcher, 2003), a 35.2% and 4.8% increase respectively. On this study, participants attending the small group talk increased their knowledge score from 27.4 to 36.4 points and the participants reading the booklet increased from 28.3 to 34.8 points, a 32.8% and 22.9% increase respectively.

The American Cancer Society (ACS) has pioneered the development of education programs and materials about several health issues. In collaboration with a panel of experts, the ACS published the National Health Education Standards for school health education (American Cancer Society, 2011). This study recommends continuing to examine the practices and the perceptions of the public about residential pesticides and health and ultimately developing similar educational programs and materials as those defined for school health education, but to adapt these to informal settings directed to adult populations.

The Council on Scientific Affairs of the American Medical Association (AMA) recommended strategies to reduce the risks of pesticides. Among others, the AMA recommends to increase collaboration between the AMA and medical professionals and agencies to develop

informational materials for physicians, workers, and the public; implement improved educational programs for pesticide applicators and the public, support research to develop effective and less toxic chemical pesticides and non-chemical products (Council on Scientific Affairs-American Medical Association, 1997). Additionally, the AMA encourages physicians to educate themselves on diagnostic, therapeutic, and on how to inquire about pesticide exposure during patient visits. Therefore, following with these recommendations by the AMA, this study recommends disseminating the results of this study and to implement programs to increase awareness and educate health care professionals located in the U.S.-México border, mostly to those providing health services to Hispanic populations, about the risks of pesticides for adults and children used in residential and children's environments.

Moreover, given that a greater proportion of adults trusting the information from doctors and the Internet (National Cancer Institute, 2007); materials such as pamphlets, brochures, flyers and other materials could be distributed in health care settings and/or uploaded to the Internet to increase the awareness about the risks of pesticides. Such materials should be carefully designed and prevent funding from private sources to avoid bias about the potential risks of pesticides in residential settings. Universities, independent researchers, and government agencies should take an increased role in the design and distribution of that type of materials in private clinics and doctors' office, besides distributing these in state and federal clinics.

As commented in Chapter II, the National Library of Medicine conducts surveys to acknowledge the health literacy skills of the U.S. populations (National Library of Medicine, 2010). Among other results, non-native English speakers and Hispanic adults resulted with lower literacy levels than other racial/ethnic groups. To my knowledge, the levels of literacy about

environmental issues related with health of adult populations have not been examined. Acknowledging these levels according to the population characteristics would be of great help for the design and implementation of environmental health promotion interventions. It would be very useful to conduct a similar effort as the National Assessment of Adult Literacy to acknowledge the health literacy levels of U.S. adult population (For more information see Kutner, Greenber, Jin, & Paulsen, 2006) to determine the environmental health literacy levels of adult populations.

Regarding environmental exposures, *environmental health disparity* is defined as the "racial/ethnic and socioeconomic inequities in illness and exposures that are at least partially mediated by factors associated with the physical, social, and built environments" (Payne-Sturges & Gee, 2006) (p. 155). A large proportion of Hispanic/Latino populations live and work in areas with heightened risk of exposures (Quintero-Somaini, Quirindongo, Arevalo, Sashof, Olson, & Solomon, 2004). According to the U.S. National Center for Health Statistics, by 2000 the Hispanic and African-American population groups comprised the highest percentage of persons living at or below 200% of the poverty level, being children of these groups with the highest proportion of persons being poor (National Center for Health Statistics, 2007).

However, Hispanic/Latino cultures are diverse; thus, culture-specific approaches in research studies (The Latino Coalition, 2006) and in educational interventions must be emphasized for the major Hispanic descent groups such as Mexican, Puerto Rican, Cuban, Dominicans, Salvadorans, and Colombians. Additionally, there is a need to understand inter-cultural differences within the Hispanic/Latino category to design and implement effective programs and policies for Latino immigrants (Joint Center for Political and Economic Studies-

Policy Link, 2004) and for the understanding of health-seeking behaviors (Larkey, Hecht, Miller, & Alatorre, 2001).

Regarding the Spanish terms for pesticides, the omission of the overarching terms *pesticida* and *plaguicida* in Spanish on the label of pesticides could be an additional barrier and increased risk for the children of Spanish-speaking consumers in the U.S., but mostly in the U.S.-Mexico border, to relate the risk messages of the public campaigns with the commercial products they use. Border populations face particular barriers to access information and understand the risks of pesticides because of two languages and continual exchange of products and behaviors common in the U.S.-Mexico border. Moreover, English-speaking populations would benefit as well if the overarching term *pesticide* were included in the label of pesticide products for the public. This would ease relating the risk messages by experts and researchers with the products consumers use in their homes. Thus, an important recommendation to increase awareness and reduce risks related with residential pesticides is to include the information in English and Spanish in all labels as required by the laws and the overarching terms *pesticide* in English and the Spanish terms *pesticida* and *plaguicida* at the front of the label of pesticides directed to the public. The front of the label should state "*This product is a pesticide*" and "*Este product es un pesticida-plaguicida*"

Additionally, this report recommends continue studying general practices and perceptions about practices regarding residential pesticides with a representative sample of all populations, but mostly with populations living in buildings, apartments, and public housing. In this study, 37% of 81 participants renting a house were not asked permission by the owner before application of pesticides. After the educational interventions, of the 69 respondents renting their

home, 95.7% did not ask the owner to skip the application of pesticides and 53.6% did not ask the owner to notify them before application of pesticides. This study did not ask the reasons of participants for not asking such petitions to the owner. However, renters should have the option to stop the application of pesticides if there is no obvious need (i.e. pest proliferation) in their house or apartment and to receive a notification before the application of pesticides to take the precautions to reduce exposures. Renters can reduce the exposures to pesticides of their children by preventing the contamination of food, cookware, and toys among others during the application of pesticides, as well as to ventilate the site and clean floors and vacuum carpets after the application of pesticides. Additionally, families should be aware of the public areas treated with pesticides such as play areas, halls, sidewalks, backyards, parks, etc. to prevent their children playing in such areas for few days after the application.

A comprehensive study about the knowledge and practices of families living in apartments and public housing and the understanding of the policies implemented by administrators would help define policies to increase awareness and reduce exposures by both owners and families. Examples of policies are to notify renters at least three days before application of pesticides; provide authority to renters to reject the application of pesticides, especially to families with young children, pregnant women and those families with someone ill or with allergies or asthma problems; and to notify families about the areas treated with pesticides. The educational methods tested in this study would be effective measures adopted by administrators to inform families about the pest prevention practices and safety measures to reduce exposures to pesticides. Additionally, administrators can benefit by and reduce exposures

to the families by implementing the Integrated Pest Management Program in public housing and apartment areas.

The median breastfeeding period of all participants was 6 months. U.S. and Mexican participants reported a similar average months they breastfed their children, 7.6 months of U.S. women and 7.7 months of Mexican women. Important messages could be disseminated in the region for Hispanic women during prenatal and healthy baby visits to the pediatrician to alert mothers of preventing the application of pesticides during the breastfeeding period.

This study provided an overview of the practices and beliefs about residential pesticide usage of border residents and the effectiveness of two community-based educational methods to augment awareness and reduce exposures for such a unique population group. Most importantly, the results of this study could serve to implement public programs and design materials to reduce the risks of exposure to pesticides applied in children's environments. Their increased biological and physical susceptibilities and their vulnerability to social factors such as poverty, lack of health insurance, exposure to environmental pollution, and language and cultural barriers place them in a higher risk for lasting and incapacitating health consequences. The need to increase parents' awareness and the society as a whole to reduce exposures to pesticides in the places where children live, play, and learn demand our prompt attention. As poetically described by Gabriel a Mistral, "Many things we need can wait. The child cannot. Now is the time his bones are being formed, his blood is being formed, his mind is being developed. To him we cannot say tomorrow, his name is today" (as cited by National Academy of Sciences, 2004, p. 1).

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APPENDICES

Reduciendo los riesgos de los pesticidas usados en el hogar

Guía para trabajadores comunitarios de la salud para dar pláticas en la comunidad

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Esta guía es para ayudar a los trabajadores comunitarios de la salud a dar pláticas a personas que viven en la frontera México-Estados Unidos. Aquí se incluye la información necesaria para entender los riesgos, las instrucciones paso-por-paso, los materiales que se usarán, y una presentación lista para proyectarse. El propósito de la plática es ayudar a la gente a entender los riesgos de los pesticidas usados en el hogar (ó plaguicidas) y motivar a las personas a tomar precauciones para disminuir esos riesgos.

This guide helps community health workers to facilitate group talks with people living in the U.S.-México border. The goal is to help people take actions to reduce the risks from the pesticides used at home. This guide is available in English.

INFORMACIÓN NECESARIA

¿Qué son los pesticidas?

Los pesticidas (también se les dice plaguicidas ó venenos) son substancias o mezclas hechas para destruir, alejar, o controlar las plagas. Las plagas son cualquier animal, planta, moho, o insecto que daña la salud y el ambiente.

Los pesticidas son usados para producir alimentos y evitar su descomposición, para evitar enfermedades y para proteger las casas y jardines. También se usan para deshacerse de los mosquitos e insectos que transmiten enfermedades. Los pesticidas se usan en la agricultura, la comunidad y en los hogares.

Los pesticidas del hogar

Los pesticidas se usan en el hogar para matar, alejar o controlar plagas. Las plagas (también llamadas pestes) son por ejemplo las cucarachas, mosquitos, moscas, moho, pulgas, garrapatas, y plantas e insectos que dañan las plantas. Los pesticidas son usados por muchas personas. Sin embargo, usarlos en forma inadecuada y usarlos en forma excesiva puede aumentar los riesgos de dañar la salud de las personas y al ambiente.

¿Los pesticidas pueden afectar la salud de las personas?

Los pesticidas pueden dañar la salud de las personas. Los niños pueden sufrir más daños que los adultos. Los pesticidas entran al cuerpo en varias formas: a través de la piel y los ojos (al absorberlos), por la boca (al tragar) o a través del aire (al respirar por la nariz y boca).

Los efectos a la salud causados por los pesticidas pueden verse al poco tiempo o muchos años después del contacto con los pesticidas. Algunos malestares que se pueden ver al poco tiempo después del contacto con pesticidas son dolor de cabeza, mareos, dolor de estómago, vómito, mucho sudor, falta de aire, moqueo, mucha saliva y dolores musculares. Los pesticidas también pueden provocar ataques de asma y problemas respiratorios.

Algunos daños a la salud que pueden resultar algún tiempo después del contacto con los pesticidas son: problemas para tener hijos, defectos de nacimiento, asma, problemas del sistema nervioso y hormonal y algunos tipos de cánceres.

OBJETIVOS DE LA PLÁTICA

Al terminar la plática, los participantes podrán:

- Identificar las formas de exponerse a los pesticidas del hogar.
- Reconocer los efectos a la salud que ocurren a corto y largo plazo causados por pesticidas.
- Enlistar las acciones para reducir las plagas en el hogar.
- Describir las acciones para reducir el contacto con pesticidas antes, durante y después de usar pesticidas.

IDEAS CLAVE

- Las plagas se pueden evitar con limpieza frecuente, evitando la humedad y sellando la casa para evitar que entren las plagas.
- Los pesticidas son sustancias o mezclas usadas para destruir, alejar, o controlar las plagas. Los insecticidas, raticidas, fungicidas y repelentes son pesticidas.
- Los pesticidas pueden causar daños a salud. Los niños pueden tener mayores daños a su salud aún antes de nacer.
- Los daños a la salud pueden verse al poco tiempo o mucho tiempo después del contacto con pesticidas.
- Se puede reducir el contacto de las personas con los pesticidas al usar protección y aplicarlos correctamente.
- Se puede evitar contaminar objetos y sitios del hogar usando los pesticidas correctamente, usando menos pesticida, y usando pesticidas que no contaminen el aire adentro del hogar.

Las personas que trabajan con pesticidas, por ejemplo los trabajadores del campo y los fumigadores, tienen que tener mayores medidas para protegerse ellos y a sus familias.

¿Por qué afecta más a los niños?
Los niños pueden sufrir mayores daños a su salud porque:

✓ En comparación con los adultos, los niños comen, respiran y toman más líquidos de acuerdo a su peso y talla. Esto puede aumentar la cantidad de contaminantes que entran a su cuerpo.
✓ los niños hacen cosas que aumenta el contacto con los pesticidas como meter cosas y manos en la boca muy seguido.
✓ Sus órganos están en desarrollo.

¿Qué se puede hacer para reducir el contacto con los pesticidas?

La gente puede hacer algunas cosas para reducir el contacto con los pesticidas como por ejemplo evitar que haya plagas y deshacerse de las plagas sin usar pesticidas. En el caso de que se tenga que usar pesticidas, las personas pueden hacer cosas para protegerse ellos y a sus niños y niñas. Estos son los pasos recomendados:

1) Evitar que haya plagas en el hogar

Las plagas se pueden evitar con tres acciones básicas: limpiar, secar y sellar la casa. Se recomienda limpiar seguido atrás y debajo de muebles y refrigerador, mantener la cocina limpia, lavar seguido los trastes y tapar bien la comida. También se recomienda sacar la basura diariamente, mantener tapada la basura y los recipientes con agua que están afuera y evitar amontonar cosas (tilichero). Para reducir la humedad se recomienda ventilar el baño después de bañarse, ventilar la cocina durante y después de cocinar y tapar las goteras. Para evitar que entren las plagas al hogar se recomienda sellar los agujeros y grietas, así como instalar esprines en las ventanas y puertas.

2) Deshacerse de las plagas sin pesticidas

Para deshacerse de las plagas sin usar pesticidas se recomienda colocar trampas para ratones y papeles engomados para insectos en los rincones y sitios donde andan las plagas. Utilizar productos que no contengan pesticidas. También se recomienda usar matamoscas y cajas que atrapan cucarachas.

Usando pesticidas en forma segura

Los pesticidas están en toda la casa aunque no se vean. Los pesticidas pueden contaminar el aire adentro del hogar, juguetes, comida, agua, muebles, ropa, etc. Los pesticidas son peligrosos al respirarlos aunque no huelan a nada. Las

ACCIONES PARA REDUCIR EL CONTACTO CON PESTICIDAS

- Evitar que se generen las plagas haciendo limpiezas frecuentes, mantener la casa sin humedad, y sellar las grietas y agujeros en el hogar para evitar que entren.
- Usar productos que no contengan pesticidas como primera acción para deshacerse de las plagas, por ejemplo las trampas y el papel engomado.
- Si se decide usar pesticidas, comprar productos en formas que no contaminan el aire adentro del hogar, por ejemplo en forma de gel, líquidos, o sólidos.
- Comprar productos con etiqueta completa y que sea exacto para la plaga que desea destruir.
- Evitar el contacto de las personas con los pesticidas al aplicarlos. No aplicar cuando están los niños y mujeres embarazadas. Usar guantes, manga larga y tapa-bocas (mascarilla).
- Evitar contaminar comida, juguetes, trastes, mesas, muebles y ropa.
- Lavarse con jabón y ventilar la casa después de aplicar los pesticidas. Guardar los pesticidas lejos de los niños y en recipientes originales.
- Buscar ayuda médica inmediata en caso de sospecha de envenenamiento y llevar el producto o la etiqueta.

En Ciudad Juárez buscar ayuda médica.

En los Estados Unidos llamar al Centro de Control de Envenenamientos al 1-800-222-1222. Es gratis y disponible las 24 horas todo el año y también en español.

personas pueden reducir los riesgos de los pesticidas haciendo las siguientes acciones antes, durante y después de usar pesticidas.

1) Lo que hay que hacer antes de usar pesticidas

- ✓ Comprar los productos en forma de gel, líquida o sólida en lugar de espray o gases
- ✓ Usar el pesticida exacto para la plaga que se desea destruir o controlar
- ✓ Comprar los pesticidas que tengan etiqueta con toda la información
- ✓ Evitar usar pesticidas que no se sabe que son porque pueden ser peligrosos, como el *polvo de avión* (nombre común usado por la gente en la frontera de México-Estados Unidos para el plaguicida agrícola usado en México llamado Paratión Metílico).
- ✓ Con número de registro. El registro en los Estados Unidos debe empezar así "EPA Reg. #..." En México, el número de registro debe empezar así "RSCO-DOM-…"
- ✓ Verificar que la etiqueta incluya al menos 5 partes: los ingredientes, las advertencias sobre los riesgos a la salud, las indicaciones de primeros auxilios, la forma de usarse y el número de registro.

2) Lo que hay que hacer durante la aplicación de pesticidas

- ✓ Leer la etiqueta antes de usarlos y seguir las instrucciones
- ✓ Usar guantes, manga larga, pantalones y tapa-bocas (mascarilla) al usar los pesticidas
- ✓ Evitar usar mucho pesticida o más cantidad de lo necesario
- ✓ Aplicar los pesticidas cuando los niños y las mujeres embarazadas no estén presentes
- ✓ Aplicar los pesticidas solo en los sitios donde andan las plagas, como rincones y lugares oscuros
- ✓ Evitar contaminar el aire, comida, trastes, juguetes, agua, mesa, muebles, ropa, etc.
- ✓ No deje que los niños toquen los pesticidas o los respiren

3) Lo que hay que hacer después de aplicar los pesticidas

- ✓ Lavarse o bañarse después de usar los pesticidas
- ✓ Ventilar la casa abriendo ventanas y puertas y prendiendo los ventiladores
- ✓ Taparlos bien y guardarlos donde no los alcancen los niños
- ✓ Evitar vaciar pesticidas en otros recipientes diferentes al original
- ✓ Tirar los recipientes vacíos y no usar esos recipientes otra vez

¿Los repelentes de insectos pueden dañar la salud de las personas?

Los repelentes son venenos que sirven para alejar mosquitos. Los repelentes que se usan en las personas pueden afectar la salud si no se usan correctamente, especialmente pueden dañar la salud de los niños. Para evitar los daños a la salud de los niños, se recomiendan las siguientes acciones:

- ✓ Evitar que los niños se apliquen el repelente ellos mismos
- ✓ El adulto tiene que aplicar el repelente en sus manos y luego en el cuerpo de los niños
- ✓ Aplicar el repelente solamente en la piel descubierta (donde no hay ropa)
- ✓ Evitar usarlos debajo de la ropa
- ✓ No usarlos en heridas, cortadas, ojos ni boca
- ✓ Evitar poner el repelente en las manos de los niños pues se las pueden meter a la boca
- ✓ Aplicar el repelente en lugares abiertos para evitar respirarlos
- ✓ Lavar con jabón las partes untadas cuando ya no se necesite el repelente

Los pesticidas usados cerca de su casa o en el barrio

En caso de que se usen pesticidas cerca de su casa se recomienda:

- ✓ Meter la ropa del tendero
- ✓ Cerrar ventanas
- ✓ Evitar prender el aire acondicionado durante la aplicación de pesticidas cerca de su hogar
- ✓ Tapar y lavar los juguetes que estén afuera
- ✓ Poner tapetes en las puertas para limpiarse los zapatos antes de entrar al hogar

¿Qué hacer en caso de envenenamiento con pesticidas?

En caso de sospechar de daños a la salud o envenenamiento causado por pesticidas se recomienda buscar ayuda médica inmediata y traer el pesticida o la etiqueta con el doctor. Hacer lo que sigue dependiendo de la ciudad donde vive:

En los Estados Unidos:
Llamar al Centro de Control de Envenenamientos al 1-800-222-1222. La llamada es gratuita, están disponibles las 24 horas todo el año y hablan español.

En Ciudad Juárez:
Llevar a la persona al doctor inmediatamente junto con el recipiente o la etiqueta del pesticida.

¿Cómo dar una plática acerca de los pesticidas y la salud?

Enseguida encontrará las instrucciones y los pasos para dar una plática. Esta plática ayuda a las personas a reducir el contacto con los pesticidas usados en el hogar. La plática está dividida en varias actividades y se acompaña con una presentación. Cada actividad indica el propósito, lo que dura, los materiales y las páginas de la presentación, y los pasos a seguir. Recorte cada actividad en forma de tarjeta. Las palabras en color le dicen lo que usted hará. Haga copias de las formas que usarán los participantes.

Antes de empezar la plática lea toda la información y las instrucciones y practique. La presentación esta anexa en un CD lista para proyectarse. Cada página de la presentación está numerada. Cada actividad le indica el número de página de la presentación que mostrará.

Haga la plática interactiva pidiendo a los participantes que se sienten en semi-círculo de manera que puedan verse e intercambiar opiniones. Usted cambie su posición dos o tres veces durante la plática. Pida voluntarios para leer si los participantes pueden y quieren leerla. Invite a los participantes dar opiniones y trabajar en equipo. Escuche sus respuestas y comentarios por 1 ó 2 minutos. Enfoque los comentarios de los participantes hacia el tema de cada actividad. Pida respeto a las opiniones de los demás. Agradezca la participación de los asistentes y al final promueva una reflexión sobre sus experiencias y sus retos para hacer las recomendaciones.

INSTRUCCIONES

PARA DAR LA PLÁTICA

Actividad # 1

Propósito: Conocer a los demás participantes
Tiempo: 10 minutos
Materiales: Nada

1) **Explique** que el siguiente ejercicio es para crear un ambiente agradable para aprender. **Forme** parejas. **Pida** que escojan a alguien para entrevistar.

2) **Pídales** que entrevisten a su pareja haciendo las siguientes 3 preguntas. **Dígales** que tienen **2 minutos** para entrevistarse:

    a) Nombre y edades sus hijos
    b) ¿Qué espera aprender en esta plática?

3) **Pida** a cada participante que presente a su pareja. **Empiece** por presentarse usted o a su colaboradora. **Diga** que tienen **1 minuto** para dar la información que le platicó su pareja durante la entrevista. **Agradezca** a las participantes que ayuden a conocerse

4) **Mencione** que durante esta plática se harán algunas actividades en equipo con su pareja para que sigan en el mismo lugar.

Actividad # 2

Propósito: Explicar el propósito de esta plática
Tiempo: 3 minutos
Materiales: Página 1 de la presentación

1) **Muestre** la **página 1** de la presentación. **Lea** los propósitos de esta plática**. Explique** que..

    "La intención de esta plática es ayudar a los participantes a aprender sobre las formas de reducir su exposición y la de sus hijos a los pesticidas. Aprender por ejemplo como evitar daños a la salud, cómo mantener a las plagas alejadas in usar pesticidas, y cómo usarlos con seguridad si deciden usar pesticidas."

2) **Aclare** que solo estos temas serán tratados durante la plática en caso de que no coincidan con las expectativas mencionadas durante las presentaciones.

3) **Mencione** que para asegurar que se entiende la información, es muy importante que todos los participantes:
    a) Hagan preguntas
    b) Den sus comentarios
    c) Respeten la opinión de los demás
    d) Compartan solo las ideas que están relacionadas con el tema de la actividad

Actividad # 3

Propósito: Definir lo que son los pesticidas
Tiempo: 5 minutos
Materiales: Hojas para escribir, lápices o plumas, página 2 de la presentación

1) **Pida** que comenten en equipo y decidan como contestar las preguntas. **Distribuya** 2 hojas a cada equipo. **Pida** que escriban en una hoja las respuestas a la siguiente pregunta:

    ¿Qué son pesticidas? ó ¿Cuáles son los nombres que le dice la gente a los pesticidas?

2) **Pida** que hagan una lista respondiendo a la siguiente pregunta:

    ¿Para qué se usan en el hogar?

3) **Pida** a un equipo que lea sus respuestas o **lea** usted las respuestas. **Muestre** la **página 2**. **Lea** la información. **Aclare** a las participantes que llamaremos **"pesticidas**" a todos los **venenos** usados en el hogar para cualquier propósito como se lee en la página (es decir, para destruir, alejar, y controlar animales, plantas, moho y hongos, insectos, o cualquier otra plaga).

Actividad # 4

Propósito: Localizar las formas en que los pesticidas entran al cuerpo
Tiempo: 4 minutos
Materiales: Forma "Formas por donde entran los pesticidas al cuerpo" y página 3 de la presentación

1) **Entregue** una hoja con el dibujo del cuerpo a cada persona de los equipos. **Haga** la siguiente pregunta y **escuche** sus respuestas:

    ¿Por dónde pueden entrar los pesticidas al cuerpo?

2) **Pida** que marquen o dibujen flechas en todas las partes del cuerpo por donde creen que pueden entrar los pesticidas al cuerpo. **Pida** que decidan en equipo las formas en que entran los pesticidas al cuerpo. **Diga** que tienen **1 minuto**.

3) **Pida** a dos equipos que muestren y platiquen lo que decidieron. **Muestre** la **página 3** y **señale** las flechas y las formas por donde entran los pesticidas al cuerpo.

4) **Mencione** otra vez las formas de entrada al cuerpo que no mencionaron las participantes.

Actividad # 5

Propósito: Enlistar los daños a la salud causados por los pesticidas
Tiempo: 10 minutos
Materiales: Páginas 4, 5, 6 y 7 de la presentación

1) **Haga** la siguiente pregunta y **escuche** sus respuestas:

   ¿Creen que el contacto con los pesticidas puede causar daños a la salud?

2) **Mencione** que algunos daños a la salud pueden verse al poco tiempo después del contacto con pesticidas y que otros daños se pueden ver hasta mucho tiempo después.

3) **Muestre** la **página 4**. **Lea** la lista de malestares. **Pregunte** a los participantes y **escuche** sus respuestas:

   ¿Cuántos de estos malestares ya sabían?

4) **Haga** la siguiente pregunta y **escuche** sus respuestas:

   ¿Cuáles son los daños que ocurren mucho tiempo después del contacto con los pesticidas?

5) **Muestre** la **página 5**. **Lea** la lista de daños a la salud. Pida voluntarios para leer uno o dos daños a la salud. **Lea** la lista otra vez.

Actividad # 5 … continuación

6) **Pregunte** a las participantes y **escuche** sus respuestas:

   ¿Creen que los niños pueden sufrir mayor daño a su salud por contacto con los pesticidas que los adultos? ¿Por qué?

7) **Muestre** la **página 6**. **Lea** la información.

8) **Pregunte** a las participantes y **escuche** sus respuestas:

   ¿Los pesticidas pueden dañar al bebé de mujeres embarazadas si ellas tienen contacto con los pesticidas?

9) **Muestre** la **página 7**. **Mencione** que los pesticidas pueden llegar al bebé de las mujeres embarazadas y afectar su salud y desarrollo durante el embarazo.

10) **Haga** la siguiente pregunta y **escuche** sus respuestas:

    ¿Ustedes podrían hacer algo para proteger a sus niños de los pesticidas?

11) **Mencione** que esta plática les dirá las acciones para reducir el contacto con los pesticidas.

Actividad # 6

Propósito: Enlistar las acciones para evitar las plagas sin usar pesticidas
Tiempo: 15 minutos
Materiales: Forma "Limpiar, Secar y Sellar" y páginas 8, 9, 10 y 11 de la presentación

1) **Muestre** la **página 8** y **diga** que **lo primero** que se aconseja para reducir los riesgos de los pesticidas es EVITAR LAS PLAGAS, a través de "limpiar" "secar" y "sellar."

2) **Pida** que trabajen en equipo. **Entregue** la hoja con tres columnas. **Pida** que platiquen en su equipo y digan 3 acciones que se pueden hacer en la casa para evitar las plagas de acuerdo al título de cada columna. **Diga** que tienen **2 minutos** para terminar.

3) **Pida** a un equipo que diga **2 acciones** escogidas por su equipo para la columna "limpiar." **Pida** a los otros equipos que agreguen ideas en "limpiar." Repita el ejercicio con las otras columnas ("secar" y "sellar"). **Agradezca** a los presentadores.

4) **Muestre** las **páginas 9 y 10**. **Lea** la lista de acciones en cada columna y **diga** que esos son los pasos básicos para prevenir plagas. **Haga** la siguiente pregunta y **escuche** sus respuestas:

   ¿Y si hay alguna plaga, qué se puede hacer para deshacerse de la plaga sin usar pesticidas?

5) **Muestre** la **página 11**. **Diga** que la **segunda cosa** que hay que hacer es deshacerse de las plagas sin usar pesticidas. **Lea** los consejos de la **página 11**.

Actividad # 7

Propósito: Enlistar las acciones para reducir los riesgos al usar pesticidas
Tiempo: 10 minutos
Materiales: Forma "Acciones para reducir el contacto con pesticidas" (y respuestas), páginas 12, 13, 14, y 15 de la presentación

1) **Muestre** la **página 12**. **Lea** la información. **Diga** que hay acciones que hacer "antes" "durante" y "después" de aplicar pesticidas. **Entregue** una forma a cada participante.

2) **Pida** que se ayuden en equipo. **Diga** que unan con flechas las acciones de la izquierda con los pasos en la columna de la derecha ("antes" "durante" o "después"). **Diga** que tienen **3 minutos** para unir con flechas las acciones con los pasos.

3) **Pida** que a un equipo que lea las acciones unidas con flechas al "antes." **Muestre** la **página 13**. **Lea** la información. **Pida** que a otro equipo que lea las acciones unidas con flechas al "durante." **Muestre** la **página 14**. **Lea** la información. **Pida** que a un equipo que lea las acciones unidas al "después." **Muestre** la **página 15. Lea** la información.

4) **Entregue** la hoja de respuestas. **Diga** que las respuestas pueden variar. **Explique que lo importante es evitar** el contacto con los pesticidas.

Actividad # 8

Propósito: Mencionar las partes básicas de la etiqueta de los pesticidas
Tiempo: 15 minutos
Materiales: Pesticidas (3 productos, incluya algún producto con poca o sin información en la etiqueta y en Inglés o Chino), páginas 16, 17, 18, 19, 20, 21 de la presentación

1) **Muestre** la **página 16**. **Haga** la siguiente pregunta y **escuche** sus respuestas**:**

   ¿Cuáles son las partes básicas que debe tener la etiqueta de los pesticidas?

2) **Muestre** la **página 17**. **Lea** la información.

3) **Distribuya** un pesticida a cada equipo. **Pida** que encuentren y cuenten las partes básicas de la etiqueta como dice la **página 17**. **Diga** que tienen **2 minutos**.

4) **Pida** a cada equipo que diga cuántas y cuáles partes encontraron en la etiqueta. Al terminar**, haga** la siguiente pregunta y **escuche** sus respuestas:

   Para proteger la salud de sus hijos, ¿Cuál producto escogerían, el que tiene toda la información, el que tiene poca información, o el que está en un idioma que no entienden?

Actividad # 8 …continuación

5) **Mencione** que el producto con etiqueta con todas las partes básicas de información puede ayudar a las personas a usarlo correctamente y a evitar riesgos.

6) **Muestre** la **página 18**. **Lea** la información. **Mencione** que los pesticidas en forma de gel, líquida o sólida no contaminan el aire adentro del hogar y la familia tiene menos riesgo de respirarlos.

7) **Muestre** la **página 19**. **Diga** que algunos pesticidas no tienen información completa y las personas no saben lo que están usando ni cómo usarlo. Esos pesticidas con etiqueta incompleta o sin etiqueta pueden ser peligrosos, como por ejemplo el "*polvo de avión*."

8) **Muestre la pagina 20. Diga** que aunque no tengan olor los pesticidas contaminan el aire, juguetes, comida, agua, muebles, ropa, etc. y puede ser peligroso respirarlos

9) **Pregunte** a los participantes y **escuche** sus respuestas:
   ¿Qué se recomienda hacer en caso de envenenamiento con pesticidas?

10) **Muestre** la **página 21. Lea** lo que hay que hacer de acuerdo al país donde viven.

Actividad # 9

Propósito: Enlistar las acciones para usar repelentes con los niños en forma segura
Tiempo: 5 minutos
Materiales: Forma "Usando repelentes en los niños", páginas 22, 23, 24 de la presentación

1) **Muestre** la **página 22**. **Lea** el título. **Haga** la siguiente pregunta y **escuche** sus respuestas:

   ¿Recuerdan por qué los niños son más vulnerables que los adultos a los daños de los pesticidas?

2) **Muestre** la **página 23**. **Lea** la información. **Pida** voluntarios para leer. **Pida** a las participantes que traten de aprender las recomendaciones en la página 23. **Diga** que tienen **2 minutos** para aprenderlas.

3) **Muestre** la **página 24**. **Lea** la información. **Forme** dos equipos para hacer una competencia. **Diga** que solo una persona puede hablar por equipo y los demás pueden aconsejarle. **Dígales** que tienen **1 minuto** para contestar.

4) **Pida** a un equipo que mencione las recomendaciones que recuerden. **Cuente** el número de recomendaciones mencionadas. **Verifique** que sean correctas (ver página 23). Al terminar, **pida** al otro equipo que repita el ejercicio. **Nombre** ganador al equipo que haya mencionado el mayor número de recomendaciones.

Actividad # 10

Propósito: Enlistar los pasos para evitar el contacto con los pesticidas usados cerca del hogar
Tiempo: 4 minutos
Materiales: Página 25 de la presentación

1) **Pregunte** a las participantes y **escuche** sus respuestas:

   ¿Qué se podría hacer para evitar que su familia tenga contacto con los pesticidas aplicados en su barrio o cerca de su casa?

2) **Muestre** la **página 25**. **Lea** la información. **Pida** a los equipos que comenten si se han aplicado pesticidas en sus barrios y si pudieran seguir las acciones recomendadas para protegerse ellos mismos y a su familia. **Diga** que tienen **2 minutos** para intercambiar comentarios.

3) **Pida** a los equipos que compartan lo que se discutió en su grupo. **Fomente** la discusión entre los equipos durante **2 minutos**.

Actividad # 11

Propósito: Resumir la información aprendida
Tiempo: 10 minutos
Materiales: Forma "Resumen de ideas aprendidas" y páginas 26, 27, 28, 29, 30, y 31 de la presentación

1) **Pida** que trabajen en equipo. **Entregue** la forma "resumen de ideas" a cada persona. **Diga** que platiquen con su equipo y se ayuden a contestar las preguntas de la forma.

2) **Muestre** la **página 26**.**Pida** que marquen lo siguiente en la segunda columna de acuerdo a lo que saben de cada pregunta o idea. **Dígales** que tienen **6-8 minutos**:

   (✓) si está segura de la respuesta
   (?) si tiene alguna duda sobre la respuesta correcta
   (x) si no sabe que contestar o necesita aprender más

3) **Al terminar, muestre** las siguientes **páginas una por una, 27, 28, 29, 30, 31** y lea alguna pregunta de la primera columna y luego la respuesta en la segunda columna. Si fuera posible, **pida** voluntarios para leer de la página de la presentación la respuesta correcta a cualquier pregunta que marcaron con (x) ó con (?).

4) Al final, **distribuya** las formas con las preguntas y las respuestas.

Actividad # 12

Propósito: Reflexionar sobre lo que se aprendió hoy
Tiempo: 5 minutos
Materiales: Páginas 32 y 33 de la presentación

1) **Promueva** que los participantes platiquen para reflexionar sobre la información aprendida. **Muestre** la **página 32. Explique** que las siguientes preguntas les ayudarán a reflexionar sobre los temas aprendidos hoy:

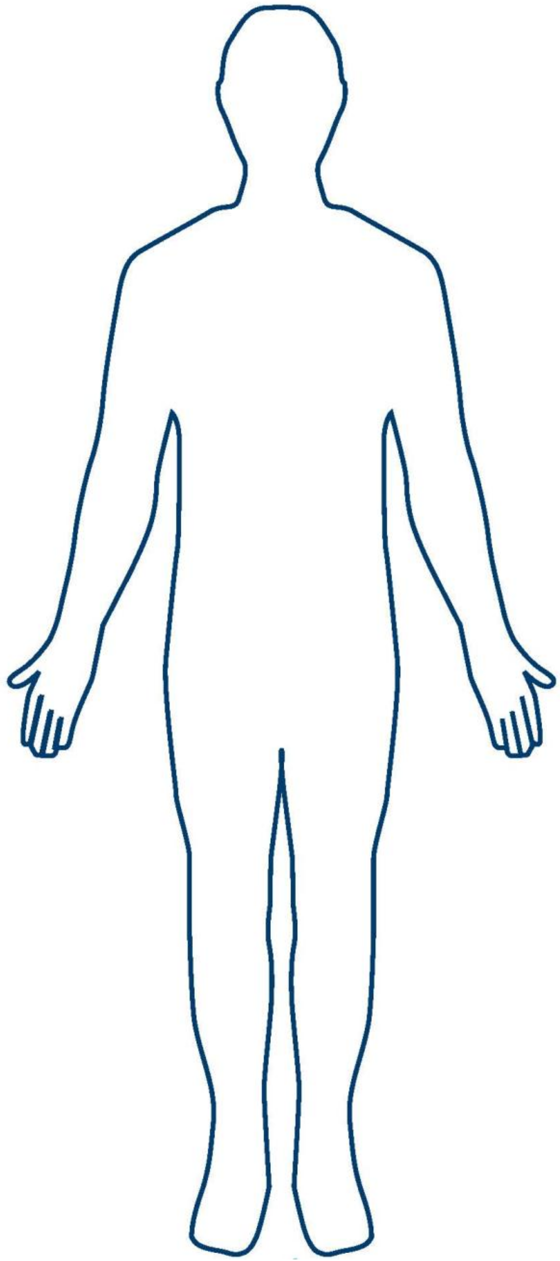
   a) Antes de esta plática, ¿Habían pensado en los riesgos a su salud causados por los pesticidas que usan?
   b) ¿Cuáles obstáculos tendrían ustedes para hacer los consejos que se dijeron en esta plática?
   c) ¿Cuáles son los temas de esta plática que más les impactaron?
   d) ¿Cuál será lo primero que harán para reducir la exposición a los pesticidas?

2) **Muestre la página 33**. **Agradezca** a los participantes por haber venido a la plática y **dígales** que hicieron muy buen trabajo durante la plática.

MATERIALES
PARA DISTRIBUIR A LOS PARTICIPANTES

LAS FORMAS EN QUE LOS PESTICIDAS ENTRAN AL CUERPO

Marque con flechas las partes del cuerpo por donde pueden entrar los pesticidas.



LIMPIAR, SECAR Y SELLAR

Para cada acción en cada columna escriba lo que usted piensa que se puede hacer para evitar las plagas en su hogar.

LIMPIAR	SECAR	SELLAR

ACCIONES PARA REDUCIR EL CONTACTO CON PESTICIDAS

¿Cuándo cree que se deben hacer estos pasos? Dibuje una flecha para unir cada paso de la izquierda con el tiempo en que se deben hacer, ya sea “antes” “durante” o “después” de usar pesticidas.

Guardar los pesticidas lejos del alcance de los niños al terminar de aplicarlos	
Seguir las instrucciones de la etiqueta	**<u>ANTES</u>** **DE USAR PESTICIDA**
Revisar que el pesticida tiene número de registro	
Evitar vaciar los pesticidas en recipientes que no son originales después de terminar de usarlos	
Usar guantes, manga larga, pantalones y tapabocas	
Evitar contaminar comida y trastes con pesticida	
Lavarse o bañarse	**<u>DURANTE</u>** **LA APLICACIÓN DE PESTICIDA**
Ventilar la casa	
Evitar que estén presentes los niños y las mujeres embarazadas	
Comprar el pesticida exacto para la plaga que intenta destruir o controlar	
Leer la etiqueta	
Comprar pesticidas en forma líquida o sólida	**<u>DESPUÉS</u>** **DE APLICAR PESTICIDA**
Aplicar los pesticidas en rincones y lugares oscuros	
Tirar los recipientes vacíos de pesticida y no usarlos otra vez	

ACCIONES PARA REDUCIR EL CONTACTO CON PESTICIDAS
(respuestas)

Guardar los pesticidas lejos del alcance de los niños al terminar de aplicarlos

Seguir las instrucciones de la etiqueta

Revisar que el pesticida tiene número de registro

Evitar vaciar los pesticidas en recipientes que no son originales después de terminar de usarlos

Usar guantes, manga larga, pantalones y tapabocas

Evitar contaminar comida y trastes con pesticida

Lavarse o bañarse

Ventilar la casa

Evitar que estén presentes los niños y las mujeres embarazadas

Comprar el pesticida exacto para la plaga que intenta destruir o controlar

Leer la etiqueta

Comprar pesticidas en forma líquida o sólida

Aplicar los pesticidas en rincones y lugares oscuros

Tirar los recipientes vacíos de pesticida y no usarlos otra vez

<u>ANTES</u>
DE USAR
PESTICIDA

<u>DURANTE</u>
LA APLICACIÓN
DE PESTICIDA

<u>DESPUÉS</u>
DE APLICAR
PESTICIDA

¿USTED SABE?

Lea cada pregunta y piense detenidamente en la respuesta. Escriba lo siguiente en la columna de la derecha de acuerdo a lo que usted aprendió:

si está segura de la respuesta escriba: ✓

si tiene dudas sobre la respuesta escriba: **?**

si no sabe que contestar escriba: **x**

PREGUNTA	Símbolo
¿Qué son los pesticidas?	
¿Cuáles son las 5 formas en que los pesticidas entran al cuerpo?	
¿Por qué los niños sufren más daños a su salud por los pesticidas ?	
¿Cuáles son los 5 malestares o síntomas que pueden aparecer poco tiempo después del contacto con pesticidas?	
¿Cuáles son 4 enfermedades que pueden aparecer algún tiempo después del contacto con pesticidas?	
¿Cuáles son las 3 acciones principales para evitar las plagas en el hogar?	
¿Cuáles son los 2 métodos para deshacerse de las plagas sin usar pesticidas?	
¿Cómo escogerá usted un pesticida?	
¿Cuáles son las 3 acciones para protegerse usted durante la aplicación de pesticidas?	
¿Cómo puede proteger usted a su familia durante la aplicación de pesticidas?	
¿Cuáles son las 4 cosas que hay que hacer después de aplicar los pesticidas?	
¿Cuáles son las 4 acciones para usar correctamente los repelentes en los niños?	
¿Qué puede hacer si se aplican pesticidas en el barrio o cerca de su casa?	
¿Qué debe hacer si sospecha que alguien tiene un envenenamiento con pesticidas?	

RESUMEN, página 1

Qué son pesticidas	Son plaguicidas, venenos, substancias, insecticidas Sirven para matar, controlar y alejar las plagas
Los pesticidas entran al cuerpo en varias formas	Absorber: ojos y piel Respirar: nariz y boca Tragar: boca
Los niños son más susceptibles que los adultos	Están en desarrollo Hacen cosas que aumenta el contacto (manos a la boca, gatear, jugar en el piso) Comparados con los adultos, los niños comen, beben y respiran mas de acuerdo a su peso y talla
Los malestares que pueden verse al poco tiempo del contacto con pesticidas	Dolor de cabeza, mareos, dolor de estómago, vómito, mucho sudor, falta de aire, moqueo, mucha saliva, dolores musculares, ataques de asma
Las enfermedades que se ven algún tiempo después	Problemas para tener hijos Problemas en el sistema nervioso y hormonal Algunos tipos de cáncer

RESUMEN, página 2

Las tres acciones para evitar las plagas	Limpiar, Secar, y Sellar
Los métodos sin pesticidas	Papeles engomados Trampas Matamoscas Cajas-trampa
Cómo escoger un pesticida	En forma de gel, líquida o sólida El exacto para la plaga exacta No escoger *polvo de avión* Con etiqueta que tiene 5 partes básicas de información (ingredientes, peligros de salud, instrucciones, número de registro, información de emergencias)
Qué hacer durante la aplicación	Leer y seguir las instrucciones Usar guantes, manga larga, pantalones, tapabocas Usar solo lo necesario No aplicar cuando están los niños y mujeres embarazadas Aplicar solo en los sitios donde andan las plagas No contaminar el aire, comida, trastes, agua, juguetes, mesa, muebles, ropa, etc. No deje que lo toquen ni respiren los niños

Qué hacer después de la aplicación	Lavarse o bañarse después de la aplicación Ventilar la casa Taparlos bien Guardar los pesticidas donde no los alcancen los niños No vaciarlos a otros recipientes Tirar los recipientes vacíos y no usarlos otra vez
Cómo usar los repelentes con los niños	Evitar que los niños se lo apliquen solos El adulto lo pone en sus manos y luego lo unta en los niños Usar solo en la piel descubierta (donde no hay ropa) No usar debajo de la ropa No usar en cortadas ni heridas No usar en los ojos, boca ni manos Aplicarlo en sitios ventilados Lavar con jabón o bañar al no necesitarlo
Cómo protegerse de los pesticidas aplicados cerca de su casa o en el barrio	Meter la ropa del tendedero Cerrar ventanas Evitar prender el aire Tapar y lavar juguetes que están afuera Poner tapetes en las puertas para limpiarse los zapatos antes de entrar
Qué hacer en caso de sospechar de un envenenamiento	En México: Buscar ayuda médica y llevar el producto o la etiqueta En los Estados Unidos: Buscar ayuda médica y llamar al Centro de Control de Envenenamientos al 1-800-222-1222 La llamada gratis, todo el año, las 24 horas y en Español Tener la información del producto o la etiqueta

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Y
RECURSOS

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Sitios recomendados para mayor información:

U.S. Environmental Protection Agency: Pesticides Program: http://www.epa.gov/pesticides/
Hesperian Foundation: A community guide to environmental health:
http://www.hesperian.org/publications_download_EHB.php
University of Kansas: The Tool Box: http://ctb.ku.edu/en/
Migrant Clinician Network: Resource Library: http://www.migrantclinician.org/resources_intro.html

Preparado por:
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(915) 747-6649; (915) 747-5145 fax
www.cerm.utep.edu

Migrant Clinicians Network (MCN)
(512) 327-2017
www.migrantclinician.org

PÁGINAS DE LA PRESENTACIÓN (PowerPoint)

Reduciendo los riesgos de los pesticidas del hogar

University of Texas at El Paso

(Universidad de Texas en El Paso)

Diciembre, 2009

Usted aprenderá hoy…

1. Cuáles son las formas de exponerse a los pesticidas que se usan en el hogar
2. Cuáles son los daños a la salud a corto y a largo plazo
3. Cómo evitar las plagas sin usar pesticidas
4. Qué hacer para reducir los riesgos al usar pesticidas

1

Los pesticidas son …venenos o plaguicidas

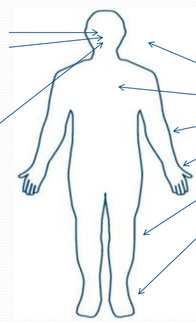
- Que se usan para:
  - Matar plagas
  - Alejar (repeler) plagas
  - Controlar las plagas
- Las plagas son cualquier **animal**, **planta**, **insecto**, **hongos** y **moho** que dañan la salud de las personas y el ambiente.

2

Los pesticidas entran al cuerpo al …

Respirar: por nariz y boca

Tragar: por la boca



Absorber: por toda la piel y ojos

3

Poco tiempo después del contacto con pesticidas puede ocurrir esto…

- Dolor de cabeza
- Mareos
- Dolor de estómago
- Vómito
- Mucho sudor
- Falta de aire
- Moqueo
- Mucha saliva
- Dolores musculares
- Ataques de asma

4

Algún tiempo después del contacto con los pesticidas puede ocurrir esto…

- Cáncer
- Defectos de nacimiento y problemas para tener hijos
- Problemas del sistema nervioso y hormonales
- Asma

5

¿Por qué los niños pueden tener mayor riesgo?

- Su cuerpo está en desarrollo.
- Su forma natural de ser : gatear, manos-boca, tocar todo, etc.
- Comparados con los adultos, los niños comen, respiran y beben más de acuerdo a su peso y talla. Esto puede aumentar la cantidad de contaminantes en su cuerpo.

6

El bebé puede sufrir daños durante el embarazo

7

Lo primero que hay que hacer es… ¡evitar las plagas!

8

Limpiar

- Limpiar seguido
- Limpiezas profundas debajo y atrás de…
  - Refrigerador
  - Muebles
  - Estufa
- Lavar trastes y cocina seguido
- Trapee o aspire al menos una vez a la semana
- Tapar bien la comida
- Sacar la basura a diario
- Tapar la basura de afuera

9

Secar

- Usar abanicos o abrir ventanas para mantener sin humedad la cocina y el baño
- Tapar goteras y evitar la humedad

Sellar

- Poner esprín en ventanas y puertas y mantenerlos en buenas condiciones
- Tapar grietas
- Tapar agujeros

10

Lo segundo que hay que hacer es: deshacerse de las plagas sin pesticidas, usando…

- Papeles engomados
- Trampas
- Matamoscas
- Cajitas de trampa

11

Y lo tercero que hay que hacer es: protegerse usted y su familia…

Antes

Durante

Y después de usar pesticidas

12

Antes de usar pesticidas …

- Compre pesticidas en forma de gel, líquida o sólida
- Compre el pesticida exacto par a la plaga que desea controlar
- Compre un producto que tenga etiqueta con las **5 partes** básicas de información
- No usar pesticidas que no sabe que son o peligrosos, como el **polvo de avión**

13

Durante la aplicación de pesticidas…

- Leer y seguir las instrucciones
- Usar guantes, manga larga, pantalones
- Usar solo la cantidad necesaria
- No aplicar cuando están los niños y mujeres embarazadas
- Aplicar solo en sitios donde andan las plagas
- No contaminar el aire, comida, trastes, agua, juguetes, mesa, muebles, ropa, etc.
- No deje que lo toquen ni respiren los niños

14

Después de la aplicación de pesticidas…

- Lavarse o bañarse después de usar los pesticidas
- Ventilar la casa abriendo ventanas y prendiendo ventiladores
- Cerrar bien los recipientes de pesticidas
- No vaciarlos a otros recipientes
- Guardarlos donde no los alcancen los niños
- Tirar los recipientes vacíos y no usarlos otra vez

15

¿Cuáles son las partes básicas de una etiqueta?

16

Las partes básicas de la etiqueta son:

- Los ingredientes
- Las advertencias sobre los riesgos a la salud
- Las indicaciones de primeros auxilios
- Las instrucciones de uso
- El número de registro empieza así:
  - EPA Reg… (si es de E.U.)
  - RSCO-DOM … (si es de México)

17

Evite contaminar el aire de su hogar, use pesticidas … en forma de gel, líquida o sólida

18

NO USAR…

19

Aunque no tengan olor, los pesticidas pueden contaminar …

- El aire interior
- Comida
- Trastes
- Agua
- Juguetes
- Mesas
- Muebles
- Ropa

20

¿Sospecha de un envenenamiento?

Si vive en…

En México

1) Buscar ayuda médica inmediata

2) llevar el producto o la etiqueta

En los Estados Unidos

1) Buscar ayuda médica y llamar al:
Centro de Control de Envenenamientos
1-800-222-1222

2) Gratis, las 24 horas, todo el año y en Español

3) Tener la información del producto

21

Los repelentes de insectos y los niños

22

Aplicar el repelente en forma segura

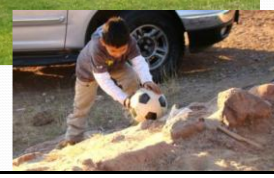
- Evitar que los niños se lo apliquen solos
- Un adulto poner el repelente en sus manos y luego en los niños
- Usar solo en la piel descubierta (sin ropa)
- No usarlos debajo de la ropa
- No usarlos en cortadas ni heridas
- No usarlos en los ojos, boca ni manos de los niños
- Aplicar el repelente en lugares ventilados
- Lavar con jabón las partes tratadas cuando ya no se necesita el repelente

23

¿Cuáles son los consejos para usar el repelente de insectos en forma segura?

24

Qué hacer cuando se usan pesticidas cerca de su casa:



- Meter la ropa del tendedero
- Cerrar las ventanas
- Evitar prender el aire
- Tapar y lavar los juguetes que están afuera
- Poner tapetes en las puertas para limpiarse los zapatos antes de entrar

25

Marcar lo que sigue: si usted …

- Está segura de la respuesta ✓
- Tiene algunas dudas de la respuesta ?
- No sabe que contestar ✕

26

Lo que aprendió hoy…

Qué son pesticidas	Plaguicidas, venenos, substancias, insecticidas Sirven para matar, controlar y alejar plagas
Los pesticidas entran al cuerpo en varias formas	Absorber: ojos y piel Respirar: nariz y boca Tragar: boca
Los niños son más susceptibles que los adultos	Están en desarrollo Hacen cosas que aumenta el contacto (manos a la boca, gatear, jugar en el piso) Comparados con los adultos, los niños comen, beben y respiran mas de acuerdo a su peso y talla
Los malestares que pueden verse al poco tiempo del contacto con pesticidas	Dolor de cabeza, mareos, dolor de estómago, vómito, mucho sudor, falta de aire, moqueo, mucha saliva, dolores musculares, ataques de asma

27

Lo que aprendió hoy…

Las enfermedades que se ven algún tiempo después	Problemas de fertilidad problemas hormonales problemas de los nervios Algunos tipos de cáncer
Las tres acciones para evitar plagas	Limpiar, Secar, y Sellar
Los métodos sin pesticidas	Papeles engomados Trampas Matamoscas Cajas-trampa
Cómo escoger un pesticida	En forma de gel, líquida o sólida El exacto para la plaga exacta No escoger *polvo de avión* Con etiqueta con 5 partes básicas (ingredientes, peligros de salud, instrucciones, registro, información de emergencias)

28

Lo que aprendió hoy…

Qué hacer durante la aplicación	Leer y seguir las instrucciones Usar guantes, manga larga, pantalones, tapabocas Usar solo lo necesario No aplicar con niños y mujeres embarazadas Aplicar solo en sitios donde andan las plagas No contaminar el aire, comida, trastes, agua, juguetes, mesa, muebles, ropa, etc. No deje que lo toquen ni respiren los niños
Qué hacer después de la aplicación	Lavarse o bañarse después de la aplicación Ventilar la casa Taparlos bien Guardar donde no los alcancen los niños No vaciarlos a otros recipientes Tirar los recipientes vacíos y no usarlos otra vez

29

Lo que aprendió hoy…

Cómo usar los repelentes con los niños	Evitar que los niños se lo apliquen solos Poner en manos de adulto y luego en niños Usar solo en la piel descubierta No usar debajo de la ropa No usar en cortadas ni heridas No usar en los ojos, boca ni manos de los niños Aplicarlo en lugares ventilados Lavar con jabón o bañar al no necesitarlo
Cómo protegerse durante la aplicación de pesticidas en el barrio	Meter la ropa del tendedero Cerrar ventanas Evitar prender el aire Tapar y lavar juguetes que están afuera Poner tapetes en las puertas para limpiarse los zapatos antes de entrar

30

¿Qué hacer en caso de sospechar un envenenamiento?

En México:

- Buscar ayuda médica y llevar el producto o la etiqueta

En Estados Unidos:

- Buscar ayuda médica y llamar al
  Centro de Control de Envenenamientos al
  1-800-222-1222
- Llamada es gratis, todo el año, las 24 horas y en Español
- Tener la información del producto o etiqueta

31

ALGO PARA REFLEXIONAR:

Antes de esta plática, ¿Había pensado antes en los daños a la salud causados por los pesticidas que usa?

¿Cuáles problemas tendría usted para hacer lo que se recomienda?

¿Cuál tema le impactó más?

32

¡Muchas gracias!

University of Texas at El Paso's Center for Environmental Resource Management
www.cerm.utep.edu
Patricia M. Juárez-Carrillo, (915) 747-6649, pjuarez@utep.edu
Fondos: Comisión de Cooperación Ecológica Fronteriza-Border Environmental Cooperation Commission, Contrato # TAA08-042

Reconocimientos

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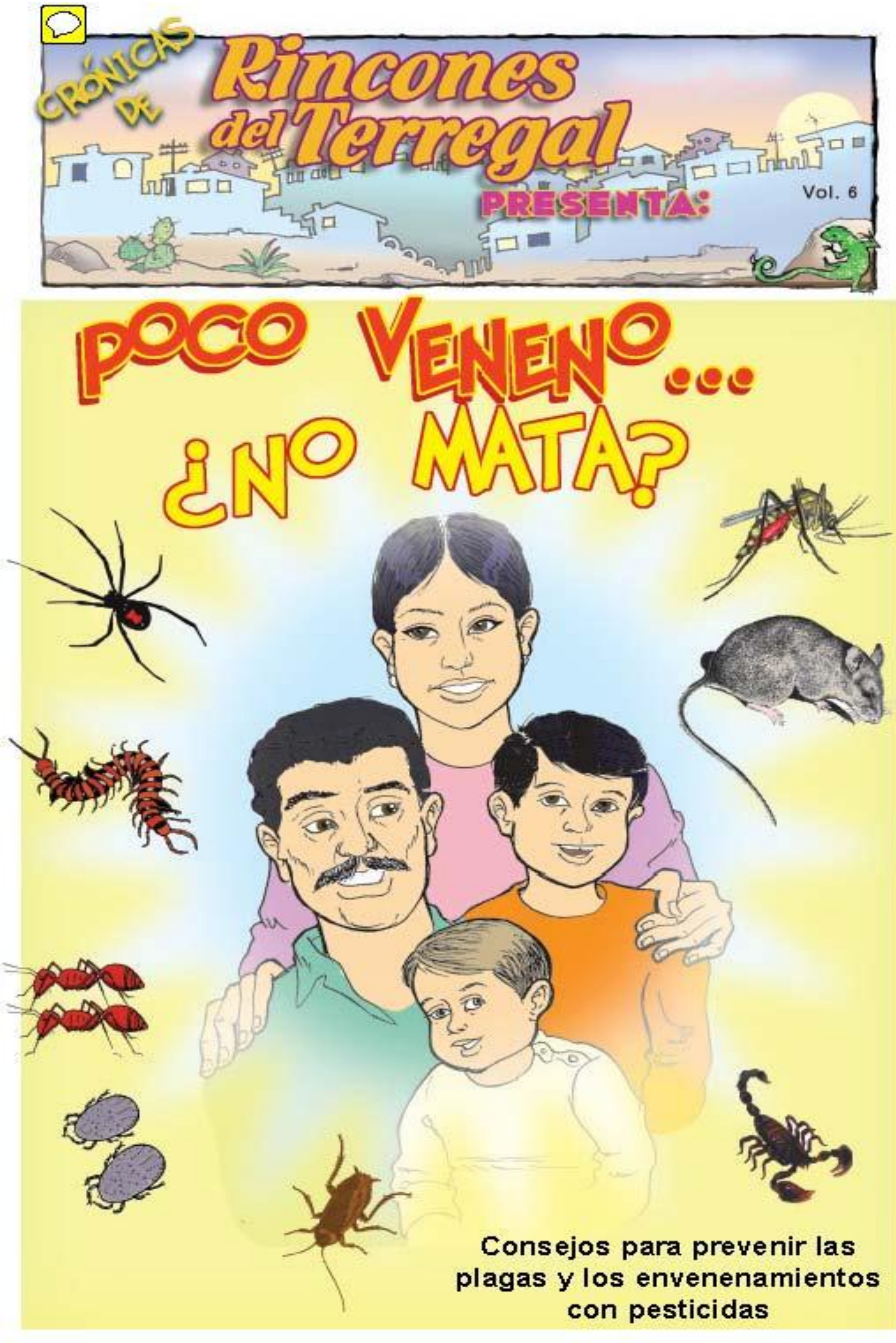
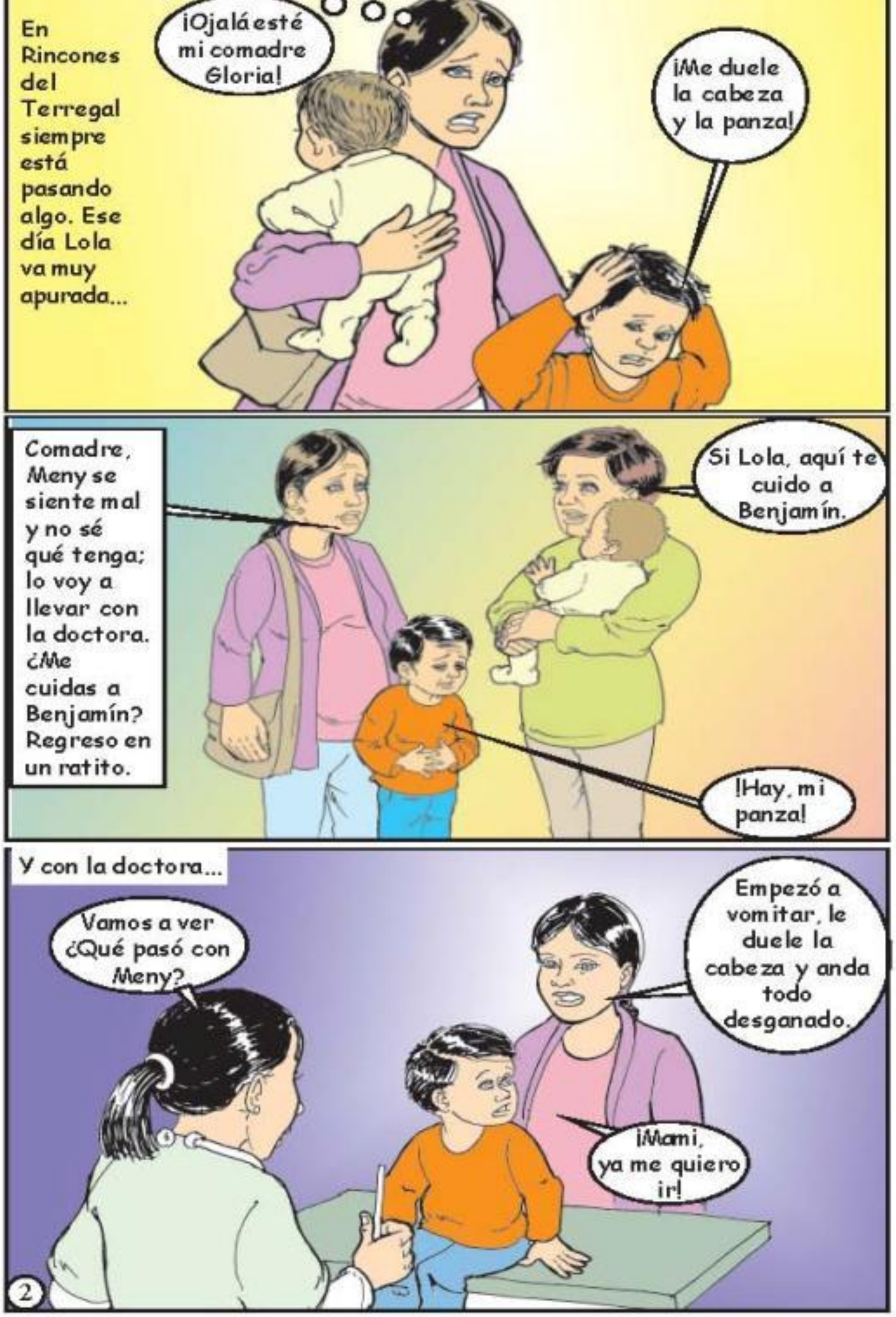
Appendix 2: Graphic Booklet "Poco veneno...¿no mata? (Spanish)




En Rincones del Terregal siempre está pasando algo. Ese día Lola va muy apurada...
¡Ojalá esté mi comadre Gloria!
¡Me duele la cabeza y la panza!
Comadre, Meny se siente mal y no sé qué tenga; lo voy a llevar con la doctora. ¿Me cuidas a Benjamín? Regreso en un ratito.
Si Lola, aquí te cuido a Benjamín.
!Hay, mi panza!
Y con la doctora...
Vamos a ver ¿Qué pasó con Meny?
Empezó a vomitar, le duele la cabeza y anda todo desganado.
¡Mami, ya me quiero ir!
2


Yo aquí me quedo con Meny, Lola, tu ve a recoger a Benjamín con la comadre
Vamos a hacerle unas pruebas para tratar de saber que tiene.
Está bien José, regreso pronto.
De vuelta en casa...
¿Cómo está todo Lola? ¿Qué les dijo la doctora?
Meny se quedó en la clínica. Yo vine por Benjamín y...
...voy a llevarle a Meny unos juguetes para que se anime.
Buena idea comadre, llévale... ¡¿QUÉ ES ESTO?!
MATA
3


¡Ah, el veneno se cayó!
¡Seguro que esto tiene que ver con el malestar de Meny! Rápido Lola llévale el frasco o la etiqueta a la doctora.
Bueno, te dejo al niño otra vez, ¡ya me voy!
Doctora, me encontré este veneno tirado cerca de donde andaba jugando Meny.
Qué bueno que lo trajo, así podemos saber cómo curarlo.
Luego de un rato...
Listo, ya se pueden llevar a Meny, aquí tienen la receta y las instrucciones.
Muchas gracias doctora.
¡Al fin ya nos vamos a la casa!
4


• Los venenos son pesticidas o plaguicidas que se usan para matar, alejar y controlar las plagas.
• Plaga es cualquier animal, planta, o insecto que daña la salud y el ambiente.
• Las plagas son por ejemplo cucarachas, moscas, mosquitos, moho, arañas, pulgas, garrapatas y plantas e insectos que dañan las plantas.
MATA INSECTOS
RECUERDE, Pesticida y plaguicida son lo mismo. En este libro usaremos la palabra "VENENO" para hablar de los químicos usados en el hogar para matar, controlar y mantener alejadas a las plagas (también llamadas pestes).
RECUERDE
Los venenos entran a nuestro cuerpo por:
NARIZ
BOCA
PIEL
OJOS
INSECTICIDA
Y los niños tienen más riesgo. Además de estar en desarrollo, ellos comen, respiran y toman más líquidos en comparación con su peso y estatura que la de un adulto. Además, hacen muchas cosas con las manos y la boca. Así es como los venenos que quizá estén en la comida, en los juguetes o en el suelo se absorben por la piel o entran por la boca.
5

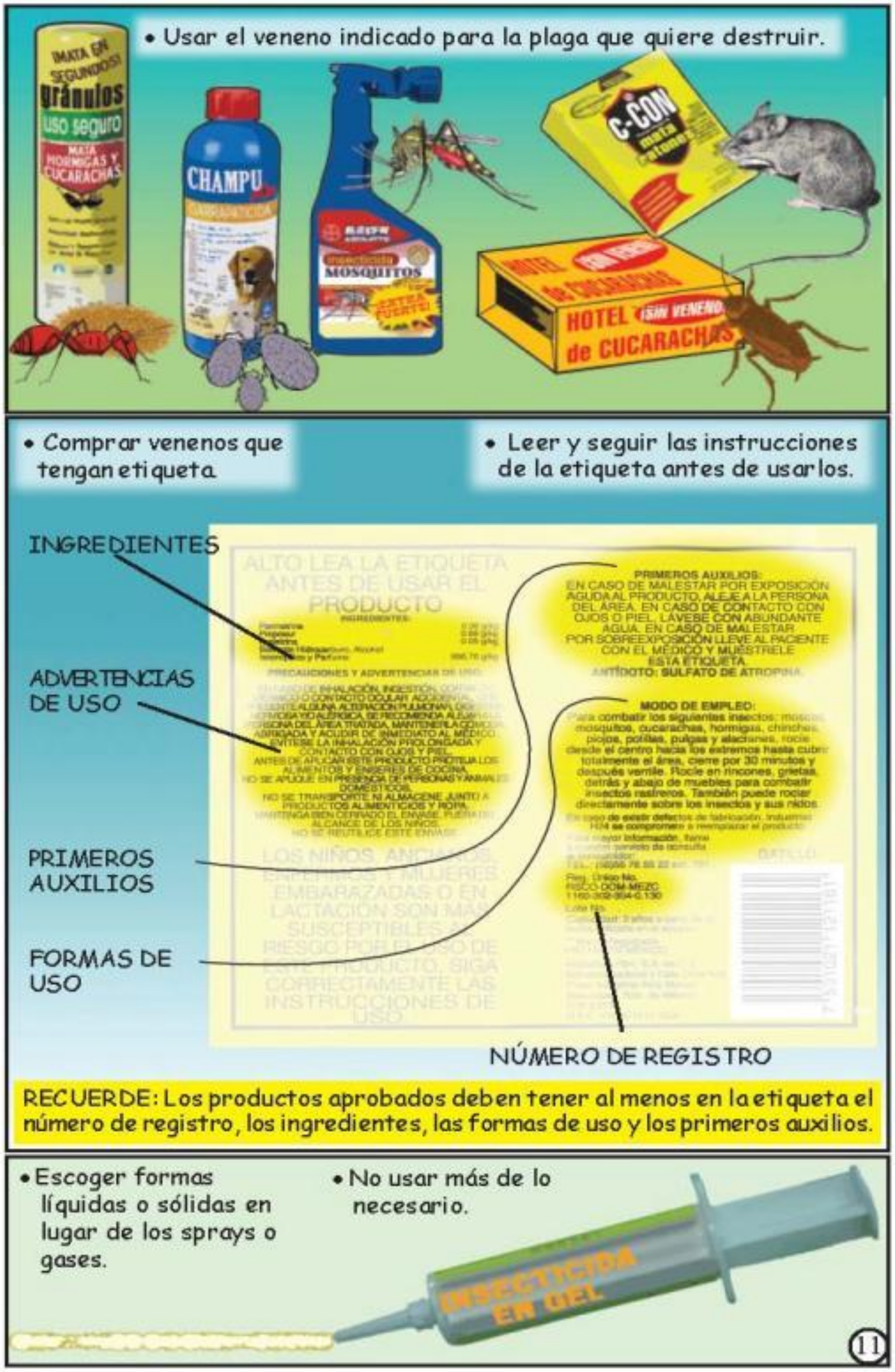
Además los venenos pueden dañar a los bebés que se están formando durante el embarazo y causar defectos de nacimiento.
CHAMPU
MOSQUITOS
Mata Avispa Abeja
También pueden dar problemas de salud a los bebés cuando crezcan.
¿Recuerdan lo que le pasó a Meny? Esos síntomas pueden sentirse pronto, pero también se pueden ver después de unas horas o algunos días después del contacto con el veneno.
RECUERDE
Los venenos entran al cuerpo y dañan de inmediato. Los síntomas pueden ser:
• Dolor de cabeza
• Mareos
• Dolor de estómago
• Vómito
• Mucho sudor
• Falta de aire
• Moqueo
• Mucha saliva
• Dolores musculares
Otras veces los daños a la salud no se ven sino hasta años después. Estos daños a la salud pueden ser cáncer, daño cerebral o problemas para embarazarse.
Año 5
Año 4
Año 3
Año 2
Año 1
RECUERDE
Los venenos pueden dañar la salud poco a poco y en el futuro causar enfermedades como:
• Cáncer
• Esterilidad
• Problemas hormonales y de los nervios
• Asma
6


En mi trabajo tengo que usar guantes y mascarilla al aplicar venenos o usar productos de limpieza.
Exactamente compadre, eso es lo que debemos hacer para protegernos de los venenos.
Pues no queremos otro susto ni tener enfermedades pero ¿qué hacemos si por aquí hay muchas cucarachas?
Pues hay que evitar que las plagas entren a la casa porque así no tenemos que usar venenos.
Para eso hay que...
Limpiar
Secar
Sellar
7


Limpiar
Limpie atrás y debajo de los muebles y refrigeradores para que no haya escondites ni comida para las plagas.
Trapee los pisos o use la aspiradora al menos una vez a la semana.
Recoja seguido la cocina, lave pronto los trastes sucios y cierre bien los recipientes que contienen comida.
Tape los recipientes que tienen agua para evitar que salgan mosquitos. Mantenga limpios los recipientes de agua de sus mascotas.
Tire lo que no sirve y evite juntar muebles y aparatos viejos, llantas usadas, tiliches, etc. Esto evitará escondites y criaderos de cucarachas, mosquitos y ratones.
Saque la basura todos los días y tápela.
CONTRA LOS HONGOS Y EL MOHO
Mezcle un cuarto de litro de cloro, 1 litro de agua y 3 cucharadas de jabón; rocíe el moho y limpie con una esponja.
1/4 LITRO CLORO
1 LITRO AGUA
DETERGENTE
8


Secar
Evite la humedad. Mantenga seco y limpio donde puedan crecen hongos y moho, como el baño o la cocina, el refrigerador, alrededor del aire acondicionado, etc.
Repare goteras.
Ventile bien la casa, especialmente el baño y la cocina.
Sellar
Ponga mosquiteros en las puertas y ventanas y evite que se rompan. Tape todas las grietas y huecos con mezcla, yeso, silicón, o plásticos.
Si después de todo esto las plagas siguen ahí, entonces siga estos consejos: Use formas para matar las plagas que no contienen venenos, por ejemplo trampas, matamoscas, papeles engomados, cajas para atrapar cucarachas y ratones, etc.
"SIN VER"
trampas de goma
9

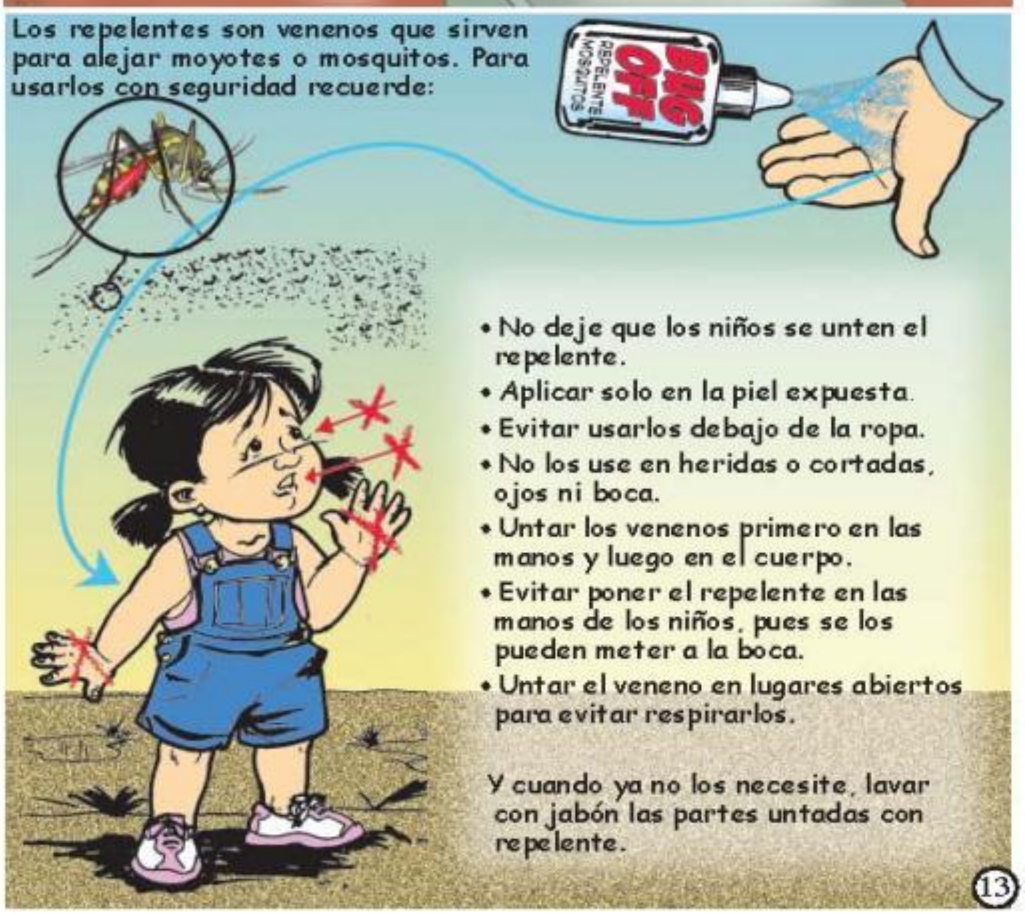

Use guantes al poner las trampas y para deshacerse de los animales atrapados.
Envuélvalos en bolsas y tírelos en el basurero.
¡Qué buenos consejos comadre! Así evitamos tener plagas y usamos menos venenos que le pueden hacer daño a toda la familia.
Así es, recuerde:
• Usar estos remedios lejos de los niños y mascotas.
• Usar guantes y mascarilla al preparar y colocar las trampas y lavarse las manos después de hacerlo.
• Colocar las trampas en los rincones y sitios donde andan las plagas.
Pero comadre, ¡Hay unas plagas muy tercas! Las cucarachas, ratones y moyotes son difíciles de controlar.
Pues cuando ya intentaron todo y las plagas siguen molestando, entonces habrá que usar venenos.
Y cuando compre venenos recuerde...
10



• Usar el veneno indicado para la plaga que quiere destruir.
¡MATA EN SEGUNDOS!
gránulos
uso seguro
MATA HORMIGAS Y CUCARACHAS
CHAMPU
MOSQUITOS
C-CON
HOTEL ¡SIN VENENO! de CUCARACHAS
• Comprar venenos que tengan etiqueta
• Leer y seguir las instrucciones de la etiqueta antes de usarlos.
INGREDIENTES
ADVERTENCIAS DE USO
PRIMEROS AUXILIOS
FORMAS DE USO
ALTO LEA LA ETIQUETA ANTES DE USAR EL PRODUCTO
PRIMEROS AUXILIOS:
MODO DE EMPLEO:
NÚMERO DE REGISTRO
RECUERDE: Los productos aprobados deben tener al menos en la etiqueta el número de registro, los ingredientes, las formas de uso y los primeros auxilios.
• Escoger formas líquidas o sólidas en lugar de los sprays o gases.
• No usar más de lo necesario.
INSECTICIDA EN GEL
11


Ya ven que hay algunos venenos que ni se sabe que son, pero pueden ser muy peligrosos, por ejemplo el polvo de avión.
POLVO DE AVIÓN
• Poner los venenos solamente en los sitios donde andan las plagas, por lo regular en los rincones y lugares oscuros.
• Usar guantes, mascarilla y pantalones y ropa de manga larga. Lavarse bien o bañarse después de poner los venenos.
• Evitar contaminar trastes, comida, juguetes, mesa, ropa, etc.
PAN
• Taparlos bien y guardarlos en donde no los alcancen los niños.
• Evitar poner los venenos en otros recipientes.
• Poner los venenos cuando los niños o las mujeres embarazadas no estan en casa.
• Tirar los recipientes de los venenos, no usarlos otra vez.
12


Aunque no se ven, los venenos se quedan adentro en todos lados y pueden contaminar el aire, juguetes, comida, agua, muebles, ropa, etc. Y aunque no tengan olor, los venenos pueden ser peligrosos al respirarlos.
• Ventile la casa después de usarlos.
• Evite que los niños los toquen o respiren.


Los repelentes son venenos que sirven para alejar moyotes o mosquitos. Para usarlos con seguridad recuerde:
BUG OFF
REPELENTE MOSQUITOS
• No deje que los niños se unten el repelente.
• Aplicar solo en la piel expuesta.
• Evitar usarlos debajo de la ropa.
• No los use en heridas o cortadas, ojos ni boca.
• Untar los venenos primero en las manos y luego en el cuerpo.
• Evitar poner el repelente en las manos de los niños, pues se los pueden meter a la boca.
• Untar el veneno en lugares abiertos para evitar respirarlos.
Y cuando ya no los necesite, lavar con jabón las partes untadas con repelente.
13


Lo que le pasó a Meny es muy buen ejemplo de los daños causados por los venenos. También hay que hacer lo siguiente cuando haya una fumigación cerca de la casa:
Meter la ropa del tendedero.
Cerrar las ventanas y evitar prender el aire acondicionado.
Tapar y lavar los juguetes que se quedaron afuera y pudieron haberse contaminado con el veneno.
Poner tapetes afuera y limpiarse los zapatos antes de entrar.
14

1. Los plaguicidas o pesticidas son venenos que entran al cuerpo por la nariz, la boca, la piel y los ojos.

2. Los daños a la salud causados por los venenos pueden verse inmediatamente, en unas horas o semanas, o varios años después de usarlos:
   - Los niños y mujeres embarazadas pueden sufrir más daños.
   - Los daños a la salud pueden verse inmediatamente (por ejemplo dolor de cabeza o de estómago, mareos, vómito y hasta la muerte) o hasta años después (por ejemplo asma, problemas para tener hijos, problemas hormonales, cáncer).

3. Para deshacerse de las plagas PRIMERO se recomienda:
   - Mantener limpia, seca y sellada la casa.
   - Mantener limpio y sin tiliches afuera de la casa.
   - Usar formas y métodos naturales.

4. Si decide usar venenos ENTONCES:
   - Use el veneno indicado para cada plaga.
   - Compre venenos que tengan etiqueta y lea y siga las instrucciones de la etiqueta.
   - Espere a que las personas, especialmente los niños, estén afuera de la casa para aplicarlos.
   - Tape la comida, los trastes, agua y juguetes antes de aplicarlos.
   - Cubra su cuerpo con pantalón, manga larga, guantes y mascarilla.
   - Lave todo lo que pudo haber sido salpicado con veneno antes de volver a utilizarlo (comida, trastes, juguetes).
   - Guárdelos bien tapados y en lugares donde los niños no puedan verlos ni tocarlos.
   - Evite vaciarlos a otros recipientes y no use otra vez los recipientes que tenían veneno.
   - Use repelentes solamente en la piel expuesta a los moyotes o mosquitos. No los ponga en los ojos, boca ni manos de los niños.
   - Lave con agua y jabón al dejar de estar en contacto con los moyotes o mosquitos.

5. **Si sospecha de un envenenamiento...**

   En México: Lleve al enfermo al doctor inmediatamente junto con el recipiente o la etiqueta del veneno.

   En los Estados Unidos: Llame al Centro de Control de Envenenamientos las 24 horas del día durante todo el año. La llamada es gratis y hablan Español. Ahí le dirán qué hacer.
   El número es 1-800-222-1222.

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Este material fue elaborado por
Migrant Clinicians Network
y el Centro para la Administración de Recursos Ambientales
de la Universidad de Texas en El Paso

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Contenido (en orden alfabético)
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Salvador Sáenz con Verónica Corella-Barud

Con el apoyo económico de
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Mayor información en:

MCN (512) 327-2017
www.migrantclinician.org

CERM (915) 747-6649
www.cerm.utep.edu

Paso del Norte Health Foundation

Appendix 3: Form to Evaluate the Small Group Talk Guide by Experts

Reviewer's name _________________________________ Date ____________

I appreciate in advance your evaluation of this curriculum. Please refer to the summary below and the information attached to help you rating the curriculum.

The curriculum includes a step-by-step guide for pesticide educational talks accompanied by power point slides. The curriculum links active learning with lecturing and hands-on, participatory activities. This curriculum is part of a pesticide train-the-trainer effort for use by Spanish speaking *promotoras de salud* (lay health advisors) with an education level ranging from 6^{th} to 10^{th} grade. After receiving training, the *promotoras* will use the curriculum to facilitate group talks in their community (community center, library, homes) for low-income residents. The group talks is oriented to Spanish speaking mothers of children 11 years old and younger and with an education level ranging from 6^{th} to 9^{th} grade. Participants to the talks are residents in the Paso del Norte area on both sides of the US-Mexico border. The curriculum is designed according to the guidelines for adult education and health education (see list of references at the end of this document).

The content of the curriculum is based on the information provided in the comic book, *Poco Veneno...¿No Mata?* (2008), that aims to educate parents about ways to reduce exposure to residential pesticides (see the attached comic book). The curriculum and comic book address 1) the short and long term adverse health outcomes associated with pesticides, 2) routes of exposure, 3) children's susceptibility, 4) ways to control pests, 5) safe practices recommended before, during, and after a pesticide application, 6) ways to minimize exposures when pesticides are used nearby the home, and 7) tips for safely using insect repellents with children.

This curriculum is part of a larger dissertation study to measure the changes in level of knowledge and safe practices reported by participants, and compare the results between those attending the group talk or reading a comic with those not receiving either method of education (refer to attached abstract).

Please use the attached form to evaluate the curriculum. The form includes six dimensions pertinent to adult education and health promotion. For each dimension, please rate the relevancy of activities using a scale from 1 to 4 with 1 being not relevant and 4 being very relevant. Scores by all reviewers will be analyzed with a *Content Validity Index* (Waltz, Strickland & Lenz, 1991). The reviewers will be acknowledged in the dissertation and publications.

Section	Not relevant 1	Somehow relevant 2	Quite relevant 3	Very relevant 4
I. Structure and organization				
The structure and organization of the curriculum have a logical order to promote learning and interest, have clear instructions, and delineates the learning objectives. The structure and organization are easy for the *promotoras* to understand and use and helps the *promotoras* facilitate learning and interest of those participating in the group talks. The curriculum creates rapport, presents the context, sets objectives, and indicates the materials required, timing, and steps for each task or activity. The power point presentation contains succinct text and simple illustrations that are culturally appropriate, calls attention to key points, includes adequate colors and contrasts, and helps motivate the participant to learn. Comments:				
II. **Background information for the facilitator**				
Background information is relevant to support the implementation of the talk by the *promotora*. The information is sufficient, concise, provided in short sentences, and follows a logical order to assist the *promotoras* facilitating the talk. The background information is the same as the comic book. Comments:				
III. Teaching techniques for adult learning				
The activities incorporate life experiences, link the participants' existing knowledge with the new information, promote interaction and discussion among participants and between facilitator and participants, motivate participants to learn, are succinct, provide opportunities to experience the lessons learned (hands-on), and provide feedback. Comments:				

Section	Not relevant 1	Somehow relevant 2	Quite relevant 3	Very relevant 4
IV. **Cultural & Linguistic Appropriateness**				
Activities are relevant to the culture, practices, and linguistic characteristics of the participants (Hispanic, Spanish speaking, mothers, residents of U.S.-Mexico border region, wording, examples, etc.). Comments:				
V. Active Learning				
The talk provides new information, hands-on activities and finds applications pertinent to participants' life. Activities provide opportunities for participants to interact and discuss and to find, clarify, and summarize the information. Comments:				
VI. Self-efficacy				
Activities increase participants' confidence to conduct the recommendations provided during the talk and to find application of the lessons learned. Lecture and activities are partitioned in small tasks, provide opportunities to repeat the information or task, and reinforce the lessons learned. Comments:				

Additional comments and suggestions (please use back or insert a page)

References (curriculum and evaluation scale)

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Appendix 4: Recruitment Script and Eligibility Checklist Form (Spanish)

Gracias por venir a la puerta. Mi nombre es ____ y trabajo para ____. Estamos invitando a las amas de casa que viven en esta manzana a participar en un estudio sobre los venenos que usan para matar plagas en su hogar. No todas los que viven aquí pueden participar. Le podría hacer algunas preguntas para saber si usted podría participar? De acuerdo a sus respuestas, usted será invitada a participar. Las preguntas son:

1. Se han aplicado venenos para plagas durante el verano?	**Si**	No
2. Es usted la ama de casa o madre de familia de este hogar?	**Si**	No
3. Tiene usted 18 años o más?	**Si**	No
4. Tiene al menos un hijo(a) de 11 años o menos que vive aquí en esta casa?	**Si**	No
5. Usted se considera Hispana/Latina?	**Si**	No
6. Usted habla y lee en Español?	**Si**	No
7. Si está embarazada, tiene menos de 24 semanas (6meses)?	**Si**	No
8. Ha participado en alguna actividad educativa sobre pesticidas Plaguicidas/pesticidas organizada por ____(organización) o promotoras?	Si	**No**
9. Ha recibido algún material sobre plaguicidas/venenos Distribuido por __(organización) o promotoras?	Si	**No**

Muchas gracias por sus respuestas. De acuerdo a esto usted…

a) **(Si se marcan TODAS las respuestas en negras):** Puede participar en este estudio. Ahora le explicare sobre el estudio para ayudara a decidir participar.

b) **(Si no se marca alguna pregunta en negro):** Veo que no puede participar en este momento. Le agradecemos mucho su tiempo. Aquí le dejo un folleto de ____(organización) que le puede beneficiar en el futuro. Por favor llame o visítenos cuando quiera.

Domicilio: ____

Llenado por: __________________________ Fecha: _________

Appendix 5: First Structured Questionnaire (Spanish)

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #__________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

Fecha __________________(Mes, día, año) **Hora de inicio: _________________**

Gracias por aceptar participar. Le haré preguntas muy variadas. Por ejemplo acerca de lo que sabe, lo que hace, y lo que piensa y algunas preguntas de su familia y su hogar.

Algunas veces es difícil contestar solamente "si" o "no", por lo que algunas respuestas van desde el número 1 al número 5. Escoja el número que más se parece a su forma de pensar y de hacer las cosas. Conteste lo más parecido a lo que realmente pasa en su casa. **Nosotros no juzgaremos si hace o piensa bien o mal. Solamente queremos aprender lo que hacen y piensan todas las participantes**.

Por favor, piense detenidamente antes de escoger su respuesta. Cuando digo la palabra **"pesticidas"** me refiero a cualquier producto llamado **plaguicidas**, **insecticidas**, **veneno**, o substancias usados para los bichos, cucarachas, insectos, ratas, ratones, moscos, y cualquier otra plaga en las casas.

1. Usted sabe si lo siguiente es plaga:

	Si	No	No sabe
Mala hierba	○	○	○
Cucarachas	○	○	○
Hongos y moho	○	○	○
Moscas y mosquitos	○	○	○
Ratas y ratones	○	○	○
Pulgas y garrapatas	○	○	○
Arañas y alacranes	○	○	○
Hormigas y termitas	○	○	○

Lugar

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○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

2. Usted cree que los pesticidas (plaguicidas o venenos) están hechos para…

	Si	No	No sabe
Para destruir plagas	○	○	○
Para alejar plagas	○	○	○
Para controlar plagas	○	○	○

3. ¿Cómo cree que entran los pesticidas al cuerpo?

	Si	No	No Sabe
Al respirarlos por la nariz	○	○	○
Al respirarlos por la boca	○	○	○
Al contacto con las manos y piel	○	○	○
Al contacto con los ojos	○	○	○
Al tragarlos	○	○	○

4. ¿Usted sabe si se debe incluir la siguiente información en la etiqueta del pesticida?

	Si	No	No sabe
Los ingredientes en el producto	○	○	○
Los peligros y advertencias sobre los riesgos a la salud	○	○	○
El número de registro del producto	○	○	○
Qué hacer en caso de un accidente	○	○	○
Las instrucciones de uso del pesticida	○	○	○

Lugar

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○	○	○	○	○	○

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1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

5. ¿Usted sabe si los siguientes malestares pueden ocurrir después del contacto con los pesticidas?

Mareos	○
Dolores de cabeza	○
Dolor de estómago	○
Dolores musculares	○
Vómito	○
Sudoración	○
Saliva abundante	○
Falta de aliento	○

6. ¿Usted sabe si las siguientes enfermedades pueden ocurrir por contacto con los pesticidas?

Ataques de asma	○
Daños al cerebro	○
Problemas de fertilidad	○
Defectos de nacimiento	○
Nerviosismo	○
Problemas de las hormonas	○
Ciertos tipos de cancer	○

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○	○	○	○	○	○

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1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

7. ¿Qué es lo **primero que debe hacerse** cuando una persona se siente mal y se sospecha del contacto con pesticidas? [**leer todas y marcar solo una]**

Dar algún remedio (agua, leche, otra cosa)	○
Dar alguna medicina para sentirse mejor	○
Seguir las instrucciones de la etiqueta	○
Buscar ayuda médica o llamar al centro de envenenamientos	○

8. ¿Usted **conoce a alguien** que se siente mal o se haya enfermado por los pesticidas?

Usted	○
Su esposo	○
Sus hijos	○
Otra persona que conoce	○

9. ¿Alguien de su familia que vive en esta casa ha **sido atendido por un médico** por sentirse mal o haberse intoxicado con los pesticidas?

Si	No
○	○

10. ¿Alguien en su familia que vive en esta casa ha **sido hospitalizado** por sentirse mal o haberse intoxicado con los pesticidas?

Si	No
○	○

Lugar

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○	○	○	○	○	○

Cuestionario #

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Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

11. ¿Quién aplicó pesticidas adentro de la casa durante el tiempo de calor que acaba de pasar (el verano)?

	Si	No
Usted	○	○
Su esposo o alguien más de su familia	○	○
Ustedes contrataron un fumigador	○	○
El dueño contrató un fumigador (o él mismo aplicó los pesticidas)	○	○

12. Si el dueño de su casa manda a alguien a aplicar pesticidas (o el mismo aplica), ¿le pide permiso antes de aplicarlos?

Si	No	No renta esta casa
○	○	○

13. ¿Cuándo es que **deciden usar pesticidas adentro de su casa**? **Escoja** la situación que más se parece a su decisión **[Leer todas y marcar solo una**]

	Si	No
Para evitar que las plagas entren o crezcan adentro de la casa	○	○
A la primera señal de un problema de plagas	○	○
Cuando el problema de plagas es muy grande	○	○
Cuando otros métodos parecen no funcionar	○	○

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○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #_________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

14. Qué tantas veces aplica pesticidas **adentro del hogar durante …**

	Muy pocas veces ◄······► Muchas veces			
	1	2	3	4
La primavera	○	○	○	○
El verano	○	○	○	○
El otoño	○	○	○	○
El invierno	○	○	○	○

15. Durante el verano, ¿se ha hecho lo siguiente en esta casa?

	Si	No
Se deshizo de cosas que no quiere (tiliches) que estaban **adentro**	○	○
Se deshizo de cosas que no quiere (tiliches) que estaban **afuera**	○	○
Instaló mosquiteros en ventanas o puertas	○	○
Puso trampas o papeles engomados adentro de la casa para deshacerse de alguna plaga	○	○

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○	○	○	○	○	○

Cuestionario #

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Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

16. En las **últimas 4 semanas**, ¿qué tan seguido se ha hecho en esta casa lo siguiente?

	Nada seguido ◄·······► 1	2	3	Muy seguido 4
Lavar los platos y trastes de la cocina	○	○	○	○
Limpiar las superficies de la cocina y mesas	○	○	○	○
Trapear los pisos y/o aspirar la alfombra	○	○	○	○
Tapar la comida y/o mantenerla guardada en el refrigerador	○	○	○	○
Sacar la basura	○	○	○	○
Ventilar el baño después de bañarse (abrir ventana o prender extractor)	○	○	○	○
Ventilar la cocina (al cocinar y después de cocinar)	○	○	○	○
Tapar la basura de afuera	○	○	○	○

17. En las **últimas 4-6 semanas**, ¿en esta casa se ha aplicado *polvo de avión*…

	Si	No	No Sabe
Adentro de la casa	○	○	○
Afuera de la casa	○	○	○

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○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #__________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

18. ¿Qué tan seguido usa **algún tipo de estos productos** en la foto [**mostrar cada foto y los productos de cada foto. Marcar lo que corresponda]**

	Nunca ◄······► 1	2	3	Siempre 4
Foto 1	○	○	○	○
Foto 2	○	○	○	○
Foto 3	○	○	○	○
Foto 4	○	○	○	○

19. Cuando aplica pesticidas en la casa, ¿qué **tan seguido lo aplica en** los siguientes cuartos?

	Nunca ◄······► 1	2	3	Siempre 4
Cocina y comedor	○	○	○	○
Cuartos de dormir	○	○	○	○
Baños	○	○	○	○
Sala, cuarto familiar o de TV	○	○	○	○
Otros cuartos (garaje, oficina, lavandería)	○	○	○	○

20. En las últimas **4-6 semanas** al aplicar pesticidas adentro de la casa usted o alguien en su familia…

	Si	No	No Sabe
¿Leyó la etiqueta antes de aplicarlo?	○	○	○
¿Siguió todas las instrucciones de la etiqueta?	○	○	○

Lugar

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○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #__________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

21. En las **últimas 4-6 semanas durante** la aplicación de los pesticidas adentro de la casa…

	Si	No	No Sabe
¿Usted (o alguien en su familia) usó manga larga y pantalones al aplicarlos	○	○	○
¿Usted (o alguien en su familia) usó guantes al aplicarlos?	○	○	○
¿Usted (o alguien en su familia) usó tapabocas (mascarilla) al aplicarlos?	○	○	○
¿Los niños estaban en la casa durante la aplicación?	○	○	○
¿La comida y los trastes de la cocina estaban tapados?	○	○	○
¿Los juguetes estaban tapados o guardados durante la aplicación?	○	○	○

22. Durante las últimas 4-6 semanas, Si **usted o alguien más de su familia** aplicó pesticidas, se lavó o bañó después de haber aplicado los pesticidas?

Si	No	Ni ella ni su familia aplicó pesticidas
○	○	○

23. Durante las últimas 4-6 semanas, se ventiló la casa después de haber aplicado los pesticidas?

Si	No
○	○

24. ¿Usted sabe si se han aplicado pesticidas cerca de su casa o en su barrio?

Si	No
○	○

Lugar

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○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #__________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

25. ¿Alguna vez le han avisado en su casa de que se van a aplicar pesticidas en su barrio o cerca de su casa?

Si	No
○	○

26. ¿Cuál sería su forma preferida para enterarse de que se van a aplicar pesticidas en su barrio o cerca de su casa (por ejemplo periódico, televisión, una carta entregada en su casa, radio, etc.)?

27. Cuando los pesticidas se aplican en el barrio o cerca de la casa, usted cree que la gente **debería hacer lo siguiente**…

	Si	No
Cerrar las ventanas	○	○
Tapar los juguetes que estén afuera	○	○
Lavar los juguetes que estaban afuera durante la aplicación de pesticidas en el barrio	○	○
Apagar el aire acondicionado	○	○
Poner tapetes en la entrada para limpiar los zapatos antes de entrar	○	○

28. Durante las **últimas 4-6 semanas,** ¿se ha vaciado un pesticida en otro recipiente diferente al original?

Si	No	No Sabe
○	○	○

29. ¿Qué tan seguido compra pesticidas en?**…[preguntar en los Estados Unidos si vive en México]…[preguntar en México si vive en los Estados Unidos]**

Nunca ◄········► Muy seguido

1	2	3	4
○	○	○	○

Lugar

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○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #__________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

30. ¿Qué tan seguido usa pesticidas con instrucciones en otro idioma que usted no entiende? (Inglés, Chino, otro idioma?)

Nunca ◄·····························► Muy seguido

1	2	3	4
○	○	○	○

31. Durante **las últimas 4-6 semanas, ¿qué usó usted y su familia** para mantener alejados los moyotes o mosquitos?

Algo que se unta en las personas, por ejemplo líquidos, crema, o toallitas	○
Espray que se pone **en** las personas	○
Algo que se pone **alrededor** de las personas, por ejemplo espray, radiolitos, velas, etc.	○

32. Durante las **últimas 4-6 semanas**, ¿sus hijos de 11 años o menos de edad usaron repelente en su cuerpo para alejar moyotes, zancudos, o moscos?

SI ○ NO ○ **[Pase a la pregunta # 37]**

33. Durante las **últimas 4-6 semanas**, ¿Qué tan seguido **usted (u otro adulto) le pone** el repelente a sus hijos de 11 años y menos de edad?

Nunca ◄·····························► Muy seguido

1	2	3	4
○	○	○	○

34. Durante las **últimas 4-6 semanas**, ¿Qué tan seguido **ellos mismos se pusieron el repelente** (sus hijos de 11 años y menos de edad)

Nunca ◄·····························► Muy seguido

1	2	3	4
○	○	○	○

Lugar

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○	○	○	○	○	○

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●	○

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Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

35. ¿Qué tan seguido se aplica el repelente …

	Nunca ◄ 1	2	3	► Muy seguido 4
A los niños en **sitios de la casa abiertos o ventilados**	○	○	○	○
En los brazos y piernas de los niños	○	○	○	○
En la cara de los niños	○	○	○	○
Alrededor de los ojos de los niños	○	○	○	○
En la boca o alrededor de la boca de los niños	○	○	○	○
En las manos de los niños	○	○	○	○
En el cuerpo debajo de la ropa de los niños	○	○	○	○
En la ropa de los niños	○	○	○	○

36. ¿**Qué tan seguido los niños se lavan** las partes untadas con repelente **o se bañan** al no necesitar el repelente?

Nunca ◄ 1	2	3	► Muy seguido 4
○	○	○	○

LEER A LA PARTICIPANTE:

Las siguientes preguntas son acerca **de lo que piensa** de los pesticidas**.** Por favor **ESPERE Y PIENSE detenidamente antes de escoger** el número que más se parece a lo que usted cree.

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○	○	○	○	○	○

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●	○

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Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

37. ¿Qué **tanto cree** en la información acerca de los pesticidas que dan…

	No cree nada 1	2	3	Cree mucho 4
L**os comerciales** de televisión anunciando el producto o también comerciales en el internet	○	○	○	○
Sus familiares, amigos, o conocidos	○	○	○	○
En las pláticas en agencias o instituciones (por ejemplo en la universidad, escuela, televisión, agencias de gobierno, clínicas)	○	○	○	○
En las pláticas en su comunidad (por ejemplo en centros comunitarios, iglesias, biblioteca, casas de líderes comunitarios)	○	○	○	○
P**or escrito** a través de reportes de expertos en publicaciones científicas, revistas, periódico	○	○	○	○
Por escrito a través de folletos, libritos cómicos, posters, etc.	○	○	○	○
P**or escrito** a través de anuncios del producto en el periódico, revistas, posters, etc.	○	○	○	○

38. ¿Qué tan de acuerdo está con lo que voy a leer:

	Nada de acuerdo 1	2	3	Muy de acuerdo 4
Los pesticidas que se usan **adentro del hogar** son seguros para la salud de los niños	○	○	○	○
Los pesticidas que se usan **afuera del hogar** son seguros para la salud de los niños	○	○	○	○
Los pesticidas que se usan **en la agricultura** son seguros para la salud de los niños	○	○	○	○
Las autoridades y las instituciones cuidan que los pesticidas sean seguros para la salud de los niños	○	○	○	○

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○	○	○	○	○	○

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1	2
●	○

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Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

39. ¿Qué **tan probable** es que los pesticidas que aplican **en su casa** …

	Nada probable 1	2	3	Muy probable 4
Dañen **su salud** o la **de las personas mayores de edad** que viven aquí	○	○	○	○
Dañen la **salud de sus hijos** que tengan **11 años o menos** de edad	○	○	○	○
Dañen la **salud de su bebé** en caso de que estuviera **embarazada**	○	○	○	○
Dañen la salud de su bebé en caso de que estuviera **amamantando**	○	○	○	○

40. Los pesticidas que **la gente usa** en la casa ¿qué **tan probable es que** …

	Nada probable 1	2	3	Muy probable 4
Disminuyan la capacidad de hombres y mujeres de tener hijos	○	○	○	○
Causen problemas en el cerebro y el sistema nervioso	○	○	○	○
Causen algún tipo de cáncer	○	○	○	○
Causen problemas respiratorios y de los pulmones	○	○	○	○
Causen alergias respiratorias y en la piel	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #__________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

41. ¿Qué **tan fácil cree** que es …

	Nada fácil 1	2	3	Muy fácil 4
T**ratar los malestares** causados por los pesticidas	○	○	○	○
C**urar las enfermedades** causadas por los pesticidas	○	○	○	○
C**urar los envenenamientos** causados por los pesticidas	○	○	○	○

42. Qué tan seguros son para sus **hijos de 11 años y menos** de edad los pesticidas que …

	Nada seguros 1	2	3	Muy seguros 4
Que ustedes aplican **adentro** su casa	○	○	○	○
Que ustedes aplican **afuera** de su casa	○	○	○	○
Que **aplican los fumigadores** en caso de ser contratados por usted o por alguien mas	○	○	○	○

43. Que **tan seguro** es para **sus hijos de 11 años y menos** de edad …

	Nada seguros 1	2	3	Muy seguros 4
Aplicar pesticidas en los **gabinetes** de la cocina	○	○	○	○
Aplicar pesticidas en el **piso** de la cocina	○	○	○	○
Aplicar pesticidas en el **cuarto** de los niños	○	○	○	○
Aplicar pesticidas en los lugares **donde juegan** los niños adentro de la casa	○	○	○	○
Guardar los pesticidas **en sitios bajos** (abajo del zinc, en cajones abajo de la cocina, baño o lavandería, etc.)	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #__________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

44. De acuerdo al olor de los pesticidas, ¿qué tan seguros son los pesticidas si …

	Nada seguros 1	2	3	Muy seguros 4
Huelen bien	○	○	○	○
No huelen a nada	○	○	○	○
Huelen mal	○	○	○	○

45. ¿Qué **tan peligrosos** son para sus **hijos de 11 años y menos de edad los pesticidas**…

	Nada peligroso 1	2	3	Muy peligroso 4
Que ustedes aplican **adentro** su casa	○	○	○	○
Que ustedes aplican **afuera** de su casa	○	○	○	○
Que **aplican los fumigadores** en caso de ser contratados por usted o por alguien mas	○	○	○	○
Aplicar pesticidas en los **gabinetes** de la cocina	○	○	○	○
Aplicar pesticidas en el **piso** de la cocina	○	○	○	○
Aplicar pesticidas en el **cuarto** de los niños	○	○	○	○
Aplicar pesticidas en los lugares **donde juegan** los niños adentro de la casa	○	○	○	○
Guardar los pesticidas en sitios bajos (abajo del zinc, en cajones abajo de la cocina, baño o lavandería, etc.)	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #__________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

46. Si hay contacto con **cantidades pequeñas** de pesticidas **durante algunas semanas**, ¿**cuánto daño causaría a la salud** de…

	Nada de daño 1	2	3	Mucho daño 4
Usted	○	○	○	○
Los que viven aquí y que son adultos o adolescentes	○	○	○	○
Su bebé en caso de que estuviera embarazada	○	○	○	○
Su bebé en caso de que esté amamantando	○	○	○	○
Sus hijos menores de 11 años	○	○	○	○

47. Si hay contacto con **cantidades pequeñas** de pesticidas **durante muchas semanas, meses o años, ¿cuánto daño causaría a la salud** de…

	Nada de daño 1	2	3	Mucho daño 4
Usted	○	○	○	○
Los que viven aquí y que son adultos o adolescentes	○	○	○	○
Su bebé en caso de que estuviera embarazada	○	○	○	○
Su bebé en caso de que esté amamantando	○	○	○	○
Sus hijos menores de 11 años	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #___________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

48. Qué tan de acuerdo está con lo que voy a leer:

	Nada de acuerdo 1	2	3	Muy de acuerdo 4
Los pesticidas no hacen daño a los niños porque los pesticidas son hechos para las plagas solamente	○	○	○	○
Poco veneno no le hace daño a los niños	○	○	○	○
El pesticida no le llega al bebé adentro de una mujer embarazada	○	○	○	○
El pesticida no le llega al bebe que toma pecho, porque el pesticida no puede estar en la leche de pecho	○	○	○	○

49. Qué tan de acuerdo está con lo que voy a decir: **si ustedes usan menos** pesticida en su casa…

	Nada de acuerdo 1	2	3	Muy de acuerdo 4
Usted no tendría daños a su salud causados por los pesticidas	○	○	○	○
Su bebé no tendría daños a su salud en caso de estar embarazada	○	○	○	○
Su bebé que toma pecho no tendría daños a su salud	○	○	○	○
Sus hijos de 11 años y menos de edad no tendrían daños a su salud causados por los pesticidas	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #__________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

50. Qué tan de acuerdo está con lo voy a decir: si **ustedes usan correctamente los pesticidas…**

	Nada de acuerdo 1	2	3	Muy de acuerdo 4
Su casa estaría sin contaminación con pesticidas	○	○	○	○
Su casa estaría sin plagas	○	○	○	○
Ahorraría dinero al no necesitar mucho pesticida	○	○	○	○
Las plagas estarían controladas de manera que **no dañan la salud** de su familia	○	○	○	○
Las plagas estarían controladas de manera que **no molestan** a su familia	○	○	○	○
Las plagas estarían controladas de manera que **no destruyan su casa**	○	○	○	○

51. Qué **tan difícil sería** para usted:

	Nada difícil 1	2	3	Muy difícil 4
Lavar los platos y trastes muy seguido	○	○	○	○
Limpiar la cocina y las superficies y mesas seguido	○	○	○	○
Trapear los pisos y/o aspirar la alfombra seguido	○	○	○	○
Instalar y/o mantener en buen estado esprines en ventanas y puertas	○	○	○	○
Sacar la basura a diario	○	○	○	○
Mantener la basura de afuera tapada	○	○	○	○
Ventilar el baño después de bañarse (ventana o extractor)	○	○	○	○
Ventilar la cocina durante y después de cocinar	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #__________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

52. ¿Qué **tan difícil sería** para usted?

	Nada difícil 1	2	3	Muy difícil 4
Deshacerse de las plagas sin usar pesticidas	○	○	○	○
Usar el pesticida exacto para la plaga que desea controlar	○	○	○	○
Leer la etiqueta del pesticida antes de cada aplicación	○	○	○	○
Usar solamente pesticidas que tienen número de registro	○	○	○	○
Entender la información de la etiqueta	○	○	○	○
Seguir las instrucciones de la etiqueta	○	○	○	○
Usar métodos que **no tienen pesticida** para controlar las plagas	○	○	○	○
Hacer limpieza profunda de la casa periódicamente para evitar las plagas	○	○	○	○
Evitar que se apliquen pesticidas unos meses antes de que se embarace	○	○	○	○
Evitar que se apliquen pesticidas durante el embarazo	○	○	○	○
Evitar que se apliquen pesticidas durante el tiempo que amamanta a su bebé	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #__________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

53. ¿**Qué tan difícil sería** para usted…

	Nada difícil 1	2	3	Muy difícil 4
Usar manga larga y pantalones durante la aplicación de pesticidas	○	○	○	○
Usar guantes durante la aplicación de pesticidas	○	○	○	○
Usar tapabocas (mascarilla) durante la aplicación de pesticidas	○	○	○	○
Lavarse o bañarse después de aplicar pesticidas	○	○	○	○
Ventilar la casa después de aplicar pesticidas	○	○	○	○
Guardar los pesticidas en lugares donde los niños no los alcancen	○	○	○	○
Seguir las instrucciones para usar los repelentes en los niños	○	○	○	○
Evitar que los niños menores de 11 años se unten el repelente solos	○	○	○	○
Lavar o bañar los niños al no necesitar los repelentes	○	○	○	○

54. ¿Qué **tan difícil sería** para usted …

	Nada difícil 1	2	3	Muy difícil 4
Evitar que sus hijos estén durante la aplicación de los pesticidas	○	○	○	○
Reducir la contaminación con pesticidas en pisos y alfombras	○	○	○	○
Dejar de usar pesticidas en forma de espray, humo, vapores, o bombas	○	○	○	○
Evitar contaminar los juguetes durante la aplicación	○	○	○	○
Evitar contaminar platos, vasos y trastes durante la aplicación	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #__________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

55. En el futuro, **qué tan segura** está **de poder**…

	Nada segura de que pueda 1	2	3	Muy segura de que pueda 4
Aplicar pesticidas cuando no están los niños	○	○	○	○
Evitar que se apliquen pesticidas en su casa unos meses antes de que se embarace	○	○	○	○
Evitar que se apliquen pesticidas en su casa durante su embarazo	○	○	○	○
Evitar que se apliquen pesticidas en su casa durante el tiempo que da pecho a su bebé	○	○	○	○
Deshacerse de las plagas sin usar pesticidas	○	○	○	○
Hacer limpiezas profundas de la casa periódicamente para evitar las plagas	○	○	○	○
Evitar que se contaminen los juguetes durante la aplicación de pesticidas	○	○	○	○
Evitar contaminar los platos , vasos y trastes durante la aplicación de pesticidas	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #_________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

56. En el futuro, qué **tan segura está de poder** …

	Nada segura de de que pueda 1	2	3	Muy segura de que pueda 4
Usar solo pesticidas que tienen número de registro	○	○	○	○
Dejar de usar pesticidas en forma de espray, humo, vapores, o bombas	○	○	○	○
Leer la etiqueta antes aplicar algún pesticida	○	○	○	○
Seguir las instrucciones para usar los pesticidas en la casa	○	○	○	○
Usar el pesticida exacto para la plaga que desea controlar	○	○	○	○
Usar manga larga y pantalones al aplicar pesticidas	○	○	○	○
Usar guantes al aplicar pesticidas	○	○	○	○
Usar tapabocas (mascarilla) al aplicar pesticidas	○	○	○	○
Ventilar la casa después de haber aplicado pesticidas	○	○	○	○
Guardar los pesticidas en lugares donde los niños no los alcancen	○	○	○	○
Reducir la contaminación con pesticidas de pisos y/o alfombras	○	○	○	○
Usar métodos que no tienen pesticidas para controlar las plagas	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #__________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

57. En el futuro, qué **tan segura está de poder**:

	Nada segura de que pueda 1	2	3	Muy segura de que pueda 4
Leer la etiqueta antes de usar repelente en los niños	○	○	○	○
Seguir las instrucciones para usar los repelentes en los niños	○	○	○	○
Evitar que los niños de 11 años y menos se pongan repelente solos	○	○	○	○
Lavar o bañar a los niños al no necesitar el repelente	○	○	○	○
Guardar los repelentes en lugares inaccesibles para los niños	○	○	○	○

58. Cuántos años completos de escuela terminó usted _______

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

59. ¿Cuántos años tiene usted? ________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

60. Cuántos años ha vivido en esta ciudad? _________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #__________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

61. Cuantos años ha vivido en esta casa? ___________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

62. Donde nació usted? ____(ciudad, estado, país)

63. Está embarazada?

Si ○ No ○ (**Pase a la pregunta #65**)

64. ¿Cuántos meses _________ tiene de embarazo?

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○

O cuántas semanas ____________ tiene de embarazo

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

65. ¿Planea embarazarse en el siguiente año?

Si ○ No ○ No sabe ○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
●	○

Código #__________________

Grupo:

1	2	3
○	○	○

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

66. ¿Cuántas personas viven en esta casa que son mayores de edad?

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○

67. ¿Cuántas personas viven en esta casa que son menores de edad?

1	2	3	4	5	6	7	8	9
○	○	○	○	○	○	○	○	○

68. Esta casa en la que vive es…

Rentada	Propia	Prestada
○	○	○

69. Cuántos cuartos tiene su casa? (incluir cada cuarto que está separado: cocina, baño, comedor, sala, cuartos para dormir, lavandería, cuarto de televisión, oficina, etc.)

1	2	3	4	5	6	7	8	9
○	○	○	○	○	○	○	○	○

70. ¿Cuál sería el ingreso total por mes sumando todos los que trabajan en esta casa? Por favor señale en esta tarjeta en dónde quedaría el ingreso mensual de toda la casa

1	2	3	4	5	6	7	8	9
○	○	○	○	○	○	○	○	○

71. Esta es una casa:

única en un solo lote	Dos o más casas en un solo lote	Departamento	Casa Duplex	Casa móvil (traila)	Departamento de gobierno	Casa de gobierno
○	○	○	○	○	○	○

Sitio: _____________ Fecha __________________(mes, día, año) Código ________________

Podría dar la siguiente información de sus hijos que tienen 11 años y menos de edad

Edad	Niño o Niña	¿Le dio pecho? Si No	¿Cuánto tiempo le dio pecho?	¿Se aplicaron pesticidas adentro de su casa cuando estaba embarazada de este hijo o hija? Si No No sabe	¿Se aplicaron pesticidas adentro de su casa cuando este hijo estaba recién nacido y hasta 3 años de edad? Si No No sabe	Ha sido diagnosticado con lo siguiente o tiene seguido los siguientes malestares: Asma Alergias (nariz, ojos, garganta) Alergia (piel) Tos frecuente Diabetes

Ahora podría mostrarme los productos pesticidas que tiene en la casa, por ejemplo esprays, papeles engomados, vapores, polvos, radiolitos, líquidos, etc. Haremos una lista que hay en las casas de todas las participantes.

___ No hay productos al momento de la visita

Calle ______________________ Núm. ________ Teléfono: ____________________

Todo el cuestionario llenado por ________________ Revisado por _______________

NOTAS Y COMENTARIOS:

Nombre (marca)	Presentación del pesticida Bote espray, líquido espray bomba, vapor, líquido, gránulos, polvo, gel, crema, cebos, papeles adheribles, radiolitos, etc.	Plaga que dice o está dibujado en el pesticida	¿Para qué plaga lo usó la última vez?	Núm. de registro como sigue: EPA Reg. RSCO-DOM… Anotar si no tiene este tipo de registro	Donde lo guarda: en qué cuarto y en que parte del cuarto

Gracias por la información. Ahora escoja una tarjeta para ver lo que haremos enseguida.

Hora que termina la entrevista: _______

Appendix 6: Second Structured Questionnaire (Spanish)

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #__________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

Fecha __________________(Mes, día, año) **Hora de inicio: ________________**

Gracias por recibirnos otra vez en su casa. La mayoría de las preguntas que le haré se refieren a lo que ha hecho **desde la fecha en que la visitamos la primera vez. Esto fue hace 4 a 6 semanas**. También le haremos preguntas sobre lo que piensa hacer en el futuro.

Así como en nuestra primera visita, le haremos preguntas para contestar desde el número 1 al número 5. Escoja el número que más se parece a su forma de pensar y de hacer las cosas. **Por favor, piense detenidamente antes de escoger su respuesta**.

Cuando digo la palabra **"pesticidas"** me refiero a cualquier producto llamado **plaguicidas**, **insecticidas**, **veneno**, o substancias usados para los bichos, cucarachas, insectos, ratas, ratones, moscos, y cualquier otra plaga en las casas.

72. Usted sabe si lo siguiente es plaga:

	Si	No	No sabe
Mala hierba	○	○	○
Cucarachas	○	○	○
Hongos y moho	○	○	○
Moscas y mosquitos	○	○	○
Ratas y ratones	○	○	○
Pulgas y garrapatas	○	○	○
Arañas y alacranes	○	○	○
Hormigas y termitas	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis O.)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

1	2
○	●

Cuestionario #

Código #___________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

73. Usted cree que los pesticidas (plaguicidas o venenos) están hechos para…

	Si	No	No sabe
Para destruir plagas	○	○	○
Para alejar plagas	○	○	○
Para controlar plagas	○	○	○

74. ¿Cómo cree que entran los pesticidas al cuerpo?

	Si	No	No Sabe
Al respirarlos por la nariz	○	○	○
Al respirarlos por la boca	○	○	○
Al contacto con las manos y piel	○	○	○
Al contacto con los ojos	○	○	○
Al tragarlos	○	○	○

75. ¿Usted sabe si se debe incluir la siguiente información en la etiqueta del pesticida?

	Si	No	No sabe
Los ingredientes en el producto	○	○	○
Los peligros y advertencias sobre los riesgos a la salud	○	○	○
El número de registro del producto	○	○	○
Qué hacer en caso de un accidente	○	○	○
Las instrucciones de uso del pesticida	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #__________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

76. ¿Usted sabe si los siguientes malestares pueden ocurrir después del contacto con los pesticidas?

Mareos	○
Dolores de cabeza	○
Dolor de estómago	○
Dolores musculares	○
Vómito	○
Sudoración	○
Saliva abundante	○
Falta de aliento	○

77. ¿Usted sabe si las siguientes enfermedades pueden ocurrir por contacto con los pesticidas?

Ataques de asma	○
Daños al cerebro	○
Problemas de fertilidad	○
Defectos de nacimiento	○
Nerviosismo	○
Problemas de las hormonas	○
Ciertos tipos de cancer	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #___________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

78. ¿Qué es lo **primero que debe hacerse** cuando una persona se siente mal y se sospecha del contacto con pesticidas? [**leer todas y marcar solo una]**

Dar algún remedio (agua, leche, otra cosa)	○
Dar alguna medicina para sentirse mejor	○
Seguir las instrucciones de la etiqueta	○
Buscar ayuda médica o llamar al centro de envenenamientos	○

79. Durante estas últimas 4-6 semanas, ¿se ha hecho lo siguiente en esta casa?

	Si	No
Se deshizo de cosas que no quiere (tiliches) que estaban **adentro**	○	○
Se deshizo de cosas que no quiere (tiliches) que estaban **afuera**	○	○
Instaló mosquiteros en ventanas o puertas	○	○
Puso trampas o papeles engomados adentro de la casa para deshacerse de alguna plaga	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #__________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

80. En las **últimas 4 semanas**, ¿qué tan seguido se ha hecho en esta casa lo siguiente?

	Nada seguido ◄······► 1	2	3	Muy seguido 4
Lavar los platos y trastes de la cocina	○	○	○	○
Limpiar las superficies de la cocina y mesas	○	○	○	○
Trapear los pisos y/o aspirar la alfombra	○	○	○	○
Tapar la comida y/o mantenerla guardada en el refrigerador	○	○	○	○
Sacar la basura	○	○	○	○
Ventilar el baño después de bañarse (abrir ventana o prender extractor)	○	○	○	○
Ventilar la cocina (al cocinar y después de cocinar)	○	○	○	○
Tapar la basura de afuera	○	○	○	○

81. En el futuro, cuándo va a **decidir usar pesticidas**? **Escoja** la situación que más se parece a lo que podría decidir en el futuro **[Leer todas y marcar solo una**]

	Si	No
Para evitar que las plagas entren o crezcan adentro de la casa	○	○
A la primera señal de un problema de plagas	○	○
Cuando el problema de plagas es muy grande	○	○
Cuando otros métodos parecen no funcionar	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #___________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

82. Se han aplicado pesticidas en su casa desde nuestra visita anterior (hace 4-6 semanas)?

	Si (pase a pregunta #13)	No
Por usted o alguien de su familia	○	○
Por un fumigador que su familia contrató	○	○
Por el dueño de la casa (o un fumigador contratado por el dueño)	○	○

83. Por qué no se aplicaron pesticidas en esta casa? **[Leer todas y marcar una respuesta**]

	Si	No
Porque no había plagas (o al menos no tanta plaga como para usar pesticidas)	○	○
Porque usted y su familia decidieron no usar pesticidas y utilizaron otros métodos para deshacerse de las plagas	○	○
El dueño aplicó pesticidas o contrato a alguien	○	○
¿Alguna otra razón por el que no usaron pesticidas?		

PASAR A PREGUNTA # 23 SI **<u>NO SE APLICÓ NINGÚN</u>** PESTICIDA DURANTE LAS 4-6 SEMANAS

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #___________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

84. Durante estas últimas 4-6 semanas, ¿Cuáles tipos de productos usó de los que hay en la foto [**mostrar cada foto y los productos de cada foto. Marcar lo que corresponda]**

	Nunca 1	2	3	Siempre 4
Foto 1	○	○	○	○
Foto 2	○	○	○	○
Foto 3	○	○	○	○
Foto 4	○	○	○	○

Otro, ¿cuál

85. En las **últimas 4-6 semanas**, ¿en esta casa se ha aplicado *polvo de avión*…

	Si	No	No Sabe
Adentro de la casa	○	○	○
Afuera de la casa	○	○	○

86. En las últimas **4-6 semanas** al aplicar pesticidas adentro de la casa **usted o alguien** en su familia…

	Si	No	Ni ella ni su familia aplicaron pesticidas
¿Leyó la etiqueta antes de aplicarlo?	○	○	○
¿Siguió todas las instrucciones de la etiqueta?	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #___________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

87. Durante estas últimas 4-6 semanas, ¿Dónde se aplicaron los **pesticidas…**

	Nunca 1	2	3	Siempre 4
Cocina y comedor	○	○	○	○
Cuartos de dormir	○	○	○	○
Baños	○	○	○	○
Sala, cuarto familiar o de TV	○	○	○	○
Otros cuartos (garaje, oficina, lavandería)	○	○	○	○

88. En las últimas 4-6 semanas durante la aplicación de los pesticidas adentro de la casa ya sea **por usted o alguien de la familia**…

	Si	No	Ni ella ni su familia aplicó pesticidas
¿Usted (o alguien en su familia) usó manga larga y pantalones al aplicarlos	○	○	○
¿Usted (o alguien en su familia) usó guantes al aplicarlos?	○	○	○
¿Usted (o alguien en su familia) usó tapabocas (mascarilla) al aplicarlos?	○	○	○

89. Durante las últimas 4-6 semanas, Si **usted o alguien más de su familia** aplicó pesticidas, se lavó o bañó después de haber aplicado los pesticidas?

Si	No	Ni ella ni su familia aplicó pesticidas
○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #____________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

90. En las últimas 4-6 semanas durante la aplicación de pesticidas **por usted, alguien de su familia o el dueño** de la casa…

	Si	No
¿Los niños estaban en la casa durante la aplicación?	○	○
¿La comida y los trastes de la cocina estaban tapados?	○	○
¿Los juguetes estaban tapados o guardados durante la aplicación?	○	○

91. Durante las últimas 4-6 semanas, se ventiló la casa después de haberse aplicado los pesticidas?

Si	No
○	○

92. Durante las **últimas 4-6 semanas,** ¿se ha vaciado un pesticida en otro recipiente diferente al original?

Si	No	Ni ella ni su familia aplicó pesticidas
○	○	○

93. Durante las últimas 4-6 semanas, ha usado algún pesticida con instrucciones en otro idioma que no entiende? (Inglés, Chino, otro idioma)?

Si	No	Ni ella ni su familia aplicó pesticidas
○	○	○

94. ¿Usted sabe si se han aplicado pesticidas cerca de su casa o en su barrio?

Si	No
○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #___________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

95. Cuando los pesticidas se aplican en el barrio o cerca de la casa, usted cree que la gente **debería hacer lo siguiente**…

	Si	No
Cerrar las ventanas	○	○
Tapar los juguetes que estén afuera	○	○
Lavar los juguetes que estaban afuera durante la aplicación de pesticidas en el barrio	○	○
Apagar el aire acondicionado	○	○
Poner tapetes en la entrada para limpiar los zapatos antes de entrar	○	○

96. Durante estas últimas 4-6 semanas, ¿le ha pedido usted al dueño de la casa **que no aplique** pesticidas en su casa?

Si	No	No renta esta casa
○	○	○

97. Durante estas últimas 4-6 semanas, ¿le ha pedido al dueño **que le avise antes** de aplicar pesticidas?

Si	No	El dueño siempre avisa antes de aplicar pesticidas	No renta esta casa
○	○	○	○

98. Durante **las últimas 4-6 semanas, ¿su familia** usó algo de lo siguiente para alejar los moyotes o mosquitos?

	Si	No
Algo que se **unta** en las personas, por ejemplo líquidos, crema, o toallitas	○	○
Espray que se pone **en** las personas	○	○
Algo que se pone **alrededor** de las personas, por ejemplo espray, radiolitos, velas, etc.	○	○

99. Durante las **últimas 4-6 semanas**, ¿sus hijos menores de 11 años usaron repelente en su cuerpo para alejar moyotes, zancudos, o moscos?

SI ○ NO ○ [**Pase a la pregunta # 32]**

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #__________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

100. Durante las **últimas 4-6 semanas**, ¿Sus hijos menores de 11 años se pusieron el **repelente ellos mismos**

Nunca ◄·····► 1	2	3	Siempre 4
○	○	○	○

101. Durante las últimas 4-6 semanas, se aplicó el repelente…

	Nunca ◄ 1	2	3	► Muy seguido 4
A los niños en **sitios de la casa abiertos o ventilados**	○	○	○	○
En los brazos y piernas de los niños	○	○	○	○
En la cara de los niños	○	○	○	○
Alrededor de los ojos de los niños	○	○	○	○
En la boca o alrededor de la boca de los niños	○	○	○	○
En las manos de los niños	○	○	○	○
En el cuerpo debajo de la ropa de los niños	○	○	○	○
En la ropa de los niños	○	○	○	○

102. Durante las últimas 4-6 semanas, ¿**los niños se lavaron** las partes untadas con repelente **o se bañaron** al no necesitar el repelente?

Nunca ◄·····► 1	2	3	Muy seguido 4
○	○	○	○

LEER A LA PARTICIPANTE:

Ahora le preguntaré acerca **de lo que piensa** de los pesticidas**.** Por favor **ESPERE Y PIENSE detenidamente antes de escoger** el número que más se parece a lo que usted cree.

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #___________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

103. ¿Qué **tanto cree** en la información acerca de los pesticidas que dan…

	No cree nada 1	2	3	Cree mucho 4
L**os comerciales** de televisión anunciando el producto o también comerciales en el internet	○	○	○	○
Sus familiares, amigos, o conocidos	○	○	○	○
En las pláticas en agencias o instituciones (por ejemplo en la universidad, escuela, televisión, agencias de gobierno, clínicas)	○	○	○	○
En las pláticas en su comunidad (por ejemplo en centros comunitarios, iglesias, biblioteca, casas de líderes comunitarios)	○	○	○	○
P**or escrito** a través de reportes de expertos en publicaciones científicas, revistas, periódico	○	○	○	○
Por escrito a través de folletos, libritos cómicos, posters, etc.	○	○	○	○
P**or escrito** a través de anuncios del producto en el periódico, revistas, posters, etc.	○	○	○	○

104. ¿Qué tan de acuerdo está con lo que voy a leer:

	Nada de acuerdo 1	2	3	Muy de acuerdo 4
Los pesticidas que se usan **adentro del hogar** son seguros para la salud de los niños	○	○	○	○
Los pesticidas que se usan **afuera del hogar** son seguros para la salud de los niños	○	○	○	○
Los pesticidas que se usan **en la agricultura** son seguros para la salud de los niños	○	○	○	○
Las autoridades y las instituciones cuidan que los pesticidas sean seguros para la salud de los niños	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #___________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

105. ¿Qué **tan probable** es que los pesticidas que aplican **en su casa** …

	Nada probable 1	2	3	Muy probable 4
Dañen **su salud** o la **de las personas mayores de edad** que viven aquí	○	○	○	○
Dañen la **salud de sus hijos** que tengan **11 años o menos** de edad	○	○	○	○
Dañen la **salud de su bebé** en caso de que estuviera **embarazada**	○	○	○	○
Dañen la salud de su bebé en caso de que estuviera **amamantando**	○	○	○	○

106. Los pesticidas que **la gente usa** en la casa ¿qué **tan probable es que** …

	Nada probable 1	2	3	Muy probable 4
Disminuyan la capacidad de hombres y mujeres de tener hijos	○	○	○	○
Causen problemas en el cerebro y el sistema nervioso	○	○	○	○
Causen algún tipo de cáncer	○	○	○	○
Causen problemas respiratorios y de los pulmones	○	○	○	○
Causen alergias respiratorias y en la piel	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #___________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

107. ¿Qué **tan fácil cree** que es …

	Nada fácil 1	2	3	Muy fácil 4
T**ratar los malestares** causados por los pesticidas	○	○	○	○
C**urar las enfermedades** causadas por los pesticidas	○	○	○	○
C**urar los envenenamientos** causados por los pesticidas	○	○	○	○

108. Qué tan seguros son para sus **hijos menores de 11 años** los pesticidas que …

	Nada seguros 1	2	3	Muy seguros 4
Que ustedes aplican **adentro** su casa	○	○	○	○
Que ustedes aplican **afuera** de su casa	○	○	○	○
Que **aplican los fumigadores** en caso de ser contratados por usted o por alguien mas	○	○	○	○

109. Que **tan seguro** es para **sus hijos menores de 11 años** …

	Nada seguros 1	2	3	Muy seguros 4
Aplicar pesticidas en los **gabinetes** de la cocina	○	○	○	○
Aplicar pesticidas en el **piso** de la cocina	○	○	○	○
Aplicar pesticidas en el **cuarto** de los niños	○	○	○	○
Aplicar pesticidas en los lugares **donde juegan** los niños adentro de la casa	○	○	○	○
Guardar los pesticidas **en sitios bajos** (abajo del zinc, en cajones abajo de la cocina, baño o lavandería, etc.)	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #___________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

110. De acuerdo al olor de los pesticidas, ¿qué tan seguros son los pesticidas si …

	Nada seguros 1	2	3	Muy seguros 4
Huelen bien	○	○	○	○
No huelen a nada	○	○	○	○
Huelen mal	○	○	○	○

111. ¿Qué **tan peligrosos** son para sus **hijos menores de 11 años los pesticidas**…

	Nada peligrosos 1	2	3	Muy peligrosos 4
Que ustedes aplican **adentro** su casa	○	○	○	○
Que ustedes aplican **afuera** de su casa	○	○	○	○
Que **aplican los fumigadores** en caso de ser contratados por usted o por alguien mas	○	○	○	○
Aplicar pesticidas en los **gabinetes** de la cocina	○	○	○	○
Aplicar pesticidas en el **piso** de la cocina	○	○	○	○
Aplicar pesticidas en el **cuarto** de los niños	○	○	○	○
Aplicar pesticidas en los lugares **donde juegan** los niños adentro de la casa	○	○	○	○
Guardar los pesticidas en sitios bajos (abajo del zinc, en cajones abajo de la cocina, baño o lavandería, etc.)	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #___________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

112. Si hay contacto con **cantidades pequeñas** de pesticidas **durante algunas semanas**, ¿**cuánto daño causaría a la salud** de…

	Nada de daño 1	2	3	Mucho daño 4
Usted	○	○	○	○
Los que viven aquí y que son adultos o adolescentes	○	○	○	○
Su bebé en caso de que estuviera embarazada	○	○	○	○
Su bebé en caso de que esté amamantando	○	○	○	○
Sus hijos menores de 11 años	○	○	○	○

113. Si hay contacto con **cantidades pequeñas** de pesticidas **durante muchas semanas, meses o años,** **¿cuánto daño causaría a la salud** de…

	Nada de daño 1	2	3	Mucho daño 4
Usted	○	○	○	○
Los que viven aquí y que son adultos o adolescentes	○	○	○	○
Su bebé en caso de que estuviera embarazada	○	○	○	○
Su bebé en caso de que esté amamantando	○	○	○	○
Sus hijos menores de 11 años	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #__________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

114. Qué tan de acuerdo está con lo que voy a leer:

	Nada de acuerdo 1	2	3	Muy de acuerdo 4
Los pesticidas no hacen daño a los niños porque los pesticidas son hechos para las plagas solamente	○	○	○	○
Poco veneno no le hace daño a los niños	○	○	○	○
El pesticida no le llega al bebé adentro de una mujer embarazada	○	○	○	○
El pesticida no le llega al bebe que toma pecho, porque el pesticida no puede estar en la leche de pecho	○	○	○	○

115. Qué tan de acuerdo está con lo que voy a decir: **si ustedes usan menos** pesticida en su casa…

	Nada de acuerdo 1	2	3	Muy de acuerdo 4
Usted no tendría daños a su salud causados por los pesticidas	○	○	○	○
Su bebé no tendría daños a su salud en caso de estar embarazada	○	○	○	○
Su bebé que toma pecho no tendría daños a su salud	○	○	○	○
Sus hijos de 11 años y menos de edad no tendrían daños a su salud causados por los pesticidas	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #__________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

116. Qué tan de acuerdo está con lo voy a decir: si **ustedes usan correctamente los pesticidas…**

	Nada de acuerdo 1	2	3	Muy de acuerdo 4
Su casa estaría sin contaminación con pesticidas	○	○	○	○
Su casa estaría sin plagas	○	○	○	○
Ahorraría dinero al no necesitar mucho pesticida	○	○	○	○
Las plagas estarían controladas de manera que **no dañan la salud** de su familia	○	○	○	○
Las plagas estarían controladas de manera que **no molestan** a su familia	○	○	○	○
Las plagas estarían controladas de manera que **no destruyan su casa**	○	○	○	○

117. Qué **tan difícil sería** para usted:

	Nada difícil 1	2	3	Muy difícil 4
Lavar los platos y trastes muy seguido	○	○	○	○
Limpiar la cocina y las superficies y mesas seguido	○	○	○	○
Trapear los pisos y/o aspirar la alfombra seguido	○	○	○	○
Instalar y/o mantener en buen estado esprines en ventanas y puertas	○	○	○	○
Sacar la basura a diario	○	○	○	○
Mantener la basura de afuera tapada	○	○	○	○
Ventilar el baño después de bañarse (ventana o extractor)	○	○	○	○
Ventilar la cocina durante y después de cocinar	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #___________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

118. ¿Qué **tan difícil sería** para usted?

	Nada difícil 1	2	3	Muy difícil 4
Deshacerse de las plagas sin usar pesticidas	○	○	○	○
Usar el pesticida exacto para la plaga que desea controlar	○	○	○	○
Leer la etiqueta del pesticida antes de cada aplicación	○	○	○	○
Usar solamente pesticidas que tienen número de registro	○	○	○	○
Entender la información de la etiqueta	○	○	○	○
Seguir las instrucciones de la etiqueta	○	○	○	○
Usar métodos que **no tienen pesticida** para controlar las plagas	○	○	○	○
Hacer limpieza profunda de la casa periódicamente para evitar las plagas	○	○	○	○
Evitar que se apliquen pesticidas unos meses antes de que se embarace	○	○	○	○
Evitar que se apliquen pesticidas durante el embarazo	○	○	○	○
Evitar que se apliquen pesticidas durante el tiempo que amamanta a su bebé	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #___________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

119. ¿**Qué tan difícil sería** para usted…

	Nada difícil 1	2	3	Muy difícil 4
Usar manga larga y pantalones durante la aplicación de pesticidas	○	○	○	○
Usar guantes durante la aplicación de pesticidas	○	○	○	○
Usar tapabocas (mascarilla) durante la aplicación de pesticidas	○	○	○	○
Lavarse o bañarse después de aplicar pesticidas	○	○	○	○
Ventilar la casa después de aplicar pesticidas	○	○	○	○
Guardar los pesticidas en lugares donde los niños no los alcancen	○	○	○	○
Seguir las instrucciones para usar los repelentes en los niños	○	○	○	○
Evitar que los niños menores de 11 años se unten el repelente solos	○	○	○	○
Lavar o bañar los niños al no necesitar los repelentes	○	○	○	○

120. ¿Qué **tan difícil sería** para usted …

	Nada difícil 1	2	3	Muy difícil 4
Evitar que sus hijos estén durante la aplicación de los pesticidas	○	○	○	○
Reducir la contaminación con pesticidas en pisos y alfombras	○	○	○	○
Dejar de usar pesticidas en forma de espray, humo, vapores, o bombas	○	○	○	○
Evitar contaminar los juguetes durante la aplicación	○	○	○	○
Evitar contaminar platos, vasos y trastes durante la aplicación	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #__________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

121. En el futuro, **qué tan segura** está **de poder**…

	Nada segura de que pueda 1	◄·········► 2	3	Muy segura de que pueda 4
Aplicar pesticidas cuando no están los niños	○	○	○	○
Evitar que se apliquen pesticidas en su casa unos meses antes de que se embarace	○	○	○	○
Evitar que se apliquen pesticidas en su casa durante su embarazo	○	○	○	○
Evitar que se apliquen pesticidas en su casa durante el tiempo que da pecho a su bebé	○	○	○	○
Deshacerse de las plagas sin usar pesticidas	○	○	○	○
Hacer limpiezas profundas de la casa periódicamente para evitar las plagas	○	○	○	○
Evitar que se contaminen los juguetes durante la aplicación de pesticidas	○	○	○	○
Evitar contaminar los platos , vasos y trastes durante la aplicación de pesticidas	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #___________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

122. En el futuro, qué **tan segura está de poder** …

	Nada segura de de que pueda 1	◄······► 2	3	Muy segura de que pueda 4
Usar solo pesticidas que tienen número de registro	○	○	○	○
Dejar de usar pesticidas en forma de espray, humo, vapores, o bombas	○	○	○	○
Leer la etiqueta antes aplicar algún pesticida	○	○	○	○
Seguir las instrucciones para usar los pesticidas en la casa	○	○	○	○
Usar el pesticida exacto para la plaga que desea controlar	○	○	○	○
Usar manga larga y pantalones al aplicar pesticidas	○	○	○	○
Usar guantes al aplicar pesticidas	○	○	○	○
Usar tapabocas (mascarilla) al aplicar pesticidas	○	○	○	○
Ventilar la casa después de haber aplicado pesticidas	○	○	○	○
Guardar los pesticidas en lugares donde los niños no los alcancen	○	○	○	○
Reducir la contaminación con pesticidas de pisos y/o alfombras	○	○	○	○
Usar métodos que no tienen pesticidas para controlar las plagas	○	○	○	○

Lugar

1 (16 de Sept.)	2 (Km. 27)	3 (Luis Olague)	4 (San Elizario)	5 (S-Central El Paso)	6 (Sunland Park)
○	○	○	○	○	○

Cuestionario #

1	2
○	●

Código #___________________

1	2	3	4	5	6	7	8	9	0
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○

123. En el futuro, qué **tan segura está de poder**:

	Nada segura de que pueda 1	2	3	Muy segura de que pueda 4
Leer la etiqueta antes de usar repelente en los niños	○	○	○	○
Seguir las instrucciones para usar los repelentes en los niños	○	○	○	○
Evitar que los niños de 11 años y menos se pongan repelente solos	○	○	○	○
Lavar o bañar a los niños al no necesitar el repelente	○	○	○	○
Guardar los repelentes en lugares inaccesibles para los niños	○	○	○	○

MUCHAS GRACIAS POR SUS RESPUESTAS!!

Hora que termina la entrevista: ____________________

Domicilio: ______________________________________

Llenado por: _________________________ Revisado por: __________________

NOTAS:

Appendix 7: Pictures of Pesticide Products

Picture 1, front

Picture 1, back

Picture 2

Picture 3

Picture 4

Appendix 8: Perceptions about Pesticides and Health of U.S. and Mexican Participants

Perceived Susceptibility 1 **How likely is that pesticides applied in your house...?** Scale 1 (not likely) to 4 (very likely)	Significance of the Difference (Chi square)
Harm your health (and the health of other adults in the house)	5.522 (.132)
Harm the health or your children 11 years of age and less	4.787 (.188)
Harm the health of your unborn child (in the case you were pregnant)	7.108 (.069)

Perceived Susceptibility 2 **How likely is that pesticides people apply in the house...?** Scale 1 (not likely) to 4 (very likely)	Significance of the Difference Chi square (p value)
Reduce the ability of men and women to have children	2.975 (.395)
Cause problems in the brain or nervous system	4.626 (.201)
Cause certain type of cancer	5.819 (.121)
Cause allergies (respiratory or skin)	6.844 (.077)

Perceived Severity 1 **How easy you think it is to...?** Scale 1 (not easy) to 4 (very easy)	Significance of the Difference Chi square (p value)
Treat the symptoms caused by pesticides	3.680 (.288)
Cure the diseases caused by pesticides	3.638 (.303)
Cure/treat poisonings by pesticides	4.492 (.213)

Perceived Severity 2 **How safe are for your children 11 years of age and less...?** Scale 1 (not safe at all) to 4 (very safe)	Significance of the Difference Chi square (p value)
The pesticides applied inside your house	3.421 (.331)
The pesticides applied outside your house	4.882 (.181)
The pesticides applied by the exterminator (in case these are hired by you or by the owner of the house)	14.104 (.003)

Perceived Severity 3 **How safe it is to your children $\leq$ 11 years of age...?** Scale 1 (not safe at all) to 4 (very safe)	Significance of the Difference Chi square (p value)
To apply pesticides in the kitchen cabinets	2.790 (.425)
To apply pesticides in kitchen floors	4.421 (.219)
To apply pesticides in children’s bedroom	2.257 (.521)
To apply pesticides in the places where children play inside the house	5.469 (.140)

Perceived Severity 4 **How much do you agree with the following...?** Scale 1 (totally disagree) to 4 (totally agree)	Significance of the Difference Chi square (p value)
Pesticides do not harm children because pesticides are intended only for pests	2.828 (.419)
Little amount of poison does not harm children	3.707 (.295)
Pesticides do not reach the unborn child of a pregnant woman	2.695 (.441)
Pesticides do not reach breastfeed children because pesticides cannot be in the breast milk	4.329 (.228)

Additional Perceptions of safeness of pesticides **How much do you agree with the following...** Scale 1 (totally disagree) to 4 (totally agree)	Significance of the Difference (Chi square)
The pesticides applied inside the house are safe for the health of children	2.654 (.448)
The pesticides applied outside the house are safe for the health of children	2.912 (.405)
The pesticides applied in agriculture are safe for the health of children	3.256 (.354)
Authorities and institutions take care that pesticides are safe for the health of children	5.079 (.166)

Perceived Benefits 1 **How much do you agree with the following: If you apply less quantity of pesticides in your house...** Scale 1 (totally disagree) to 4 (totally agree)	Significance of the Difference Chi square (p value)
Your health would not be harmed by pesticides	.868 (.833)
The health of your unborn child would not be harmed (in the case you are pregnant)	.708 (.871)
The health of your breastfeed child would not be harmed	2.692 (.442)
Your children ≤11 yrs. of age would not be harmed by pesticides	2.463 (.482)

Perceived Benefits 2 **How much do you agree with the following: If you apply pesticides correctly...** Scale 1 (totally disagree) to 4 (totally agree)	Significance of the Difference Chi square (p value)
Your house would be less contaminated by pesticides	13.629 (.003)
Your house would be without pests	16.477 (.001)
You would save money by purchasing less pesticide products	13.686 (.003)
Pests would be controlled to the point of not harming the health of your family	19.301 (.000)
Pests would be controlled to the point of not bothering your family	17.787 (.000)
Pests would be controlled to the point of not damaging your property	15.716 (.001)

Perceived Barriers 1 **How difficult would be to you to...** Scale 1 (not difficult at all) to 4 (very difficult)	Significance of the Difference Chi square (p value)
Wash dishes frequently	4.582 (.205)
Clean kitchen, tables, surfaces frequently	2.154 (.541)
Vacuum/mop frequently	.294 (.961)
Take trash out daily	1.064 (.786)
Keep outside trash covered	6.432 (.092)
Ventilate frequently the bathroom during and after shower/bath to reduce humidity and prevent mold	1.335 (.721)
Ventilate the kitchen frequently during and after use to reduce humidity and prevent mold	3.626 (.305)
Conduct deep house cleanings periodically	8.351 (.039)

Perceived Barriers 2 **How difficult would be to you to...** Scale 1 (not difficult at all) to 4 (very difficult)	Significance of the Difference Chi square (p value)
Control pests without using pesticides	10.229 (.017)
Use the correct pesticide for the pest intended	6.186 (.103)
Read the label before the application of pesticides	11.738 (.008)
Use only pesticides with registration number	1.664 (.645)
Understand the information of the label	10.262 (.016)
Follow the instructions on the label	13.495 (.004)
Use methods that do not have pesticides to control pests	17.638 (.001)
Prevent application of pesticides few months before pregnancy	.834 (.841)
Prevent application of pesticides during pregnancy	3.771 (.287)
Prevent application of pesticides during your child’s breastfeeding period	2.990 (.393)

Perceived Barriers 3 **How difficult would be to you to...** Scale 1 (not difficult at all) to 4 (very difficult)	Significance of the Difference Chi square (p value)
Wear long sleeves and pants during application of pesticides	6.183 (.103)
Wear gloves during application of pesticides	9.759 (.021)
Wash or take a shower after application of pesticides	7.093 (.069)
Ventilate the place after application of pesticides	1.582 (.664)
Store pesticides in places where children cannot reach	10.893 (.012)
Follow instructions of the label to apply insect repellent to children	6.733 (.081)
Prevent that children $\leq$11 yrs. apply insect repellent by themselves	.895 (.827)
Wash or bathe children when insect repellent is no longer needed	1.669 (.664)

Perceived Barriers 4 **How difficult would be to you to...** Scale 1 (not difficult at all) to 4 (very difficult)	Significance of the Difference Chi square (p value)
Prevent children being present during application of pesticides	11.612 (.009)
Reduce the contamination of floors & carpets with pesticides during application	2.881 (.410)
Stop using indoor pesticides in the form of spray, coils, vapors, or bombs	6.692 (.082)
Prevent the contamination of toys during application of pesticides	3.772 (,287)
Prevent the contamination of dishes and cookware during application of pesticides	5.365 (.147)

Perceived Self-Efficacy 1 **In the future, how sure are you that you can...?** Scale 1 (not sure at all) to 4 (very sure)	Significance of the Difference Chi square (p value)
Apply pesticides when children are not present	1.582 (.663)
Prevent application of pesticides few months before pregnancy	2.953 (.399)
Prevent application of pesticides during pregnancy	1.181 (.757)
Prevent application of pesticides during breastfeeding period	1.757 (.624)
Get rid of pests without using pesticides	8.287 (.040)
Conduct deep house cleaning periodically to prevent pests	1.391 (.708)
Prevent contamination of toys during application of pesticides	6.190 (.103)
Prevent contamination of dishes and cookware during application of pesticides	2.968 (.397)
Reduce contamination with pesticides of floors and carpets	3.146 (.370)

Perceived Self-Efficacy 2 **In the future, how sure are you that you can...?** Scale 1 (not sure at all) to 4 (very sure)	Significance of the Difference Chi square (p value)
Use only pesticides with registration number	4.917 (.178)
Stop using indoor pesticides in the form of spray, coils, vapor, or bomb	7.468 (.058)
Read the label before application	5.796 (.122)
Follow instructions of the label	7.528 (.057)
Use the correct pesticide for the pest intended to control/destroy	5.802 (.122)
Wear long sleeves and pants during application of pesticides	9.307 (.025)
Wear gloves during application of pesticides	13.242 (.004)
Ventilate the place after application of pesticides	1.837 (.607)
Store pesticides where children cannot reach them	1.433 (.698)
Use methods without pesticides to control pests	7.623 (.054)

Perceived Self-Efficacy 3 **In the future, how sure are you that you can...?** Scale 1 (not sure at all) to 4 (very sure)	Significance of the Difference Chi square (p value)
Read the label before applying insect repellent to children	4.726 (.193)
Follow instructions of the label when applying insect repellents to children	2.705 (.439)
Prevent children $\leq$11 yrs. of age applying insect repellent themselves	1.445 (.695)
Wash or bath children when insect repellent is no longer needed	5.440 (.142)
Store insect repellents where children cannot reach them	2.688 (.442)

Additional Perceptions **How much do you agree with the following...** Scale 1 (totally disagree) to 4 (totally agree)	Significance of the Difference Chi square (p value)
The pesticides applied inside the house are safe for the health of children	2.654 (.448)
The pesticides applied outside the house are safe for the health of children	2.912 (.405)
The pesticides applied in agriculture are safe for the health of children	3.256 (.354)
Authorities and institutions take care that pesticides are safe for the health of children	5.079 (.166)

Appendix 9

Campbell, Brenton - Hoboken

From:	Safdar, Sheik - Hoboken
Sent:	Monday, May 02, 2011 10:20 AM
To:	Campbell, Brenton - Hoboken
Subject:	FW: NON-RIGHTSLINK
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From: Juarez, Patricia [mailto:pjuarez@utep.edu]
Sent: Sunday, April 10, 2011 5:51 PM
To: Permissions - US
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Importance: High

To Whom It May Concern:

I, Patricia M. Juárez-Carrillo respectfully request your permission to adapt the Figure 3.1 Health Belief Model Components and Linkages,on page 49 of Chapter 3: The Health Belief Model by Victoria L. Champion and Celette Sugg Skinner in the book "Health Behavior and Health Education. Theory, Research, and Practice" Glanz, Rimer, and Viswanath, Editors. Copyright 2008 by John Wiley & Sons, Inc. Jossey-Bass Publishers.

See attached letter for more information.

Your attention to this matter at your earliest convenicence is highly appreciated.

Patricia M. Juárez-Carrillo, MPH, Ph. D. Candidate University of Texas at El Paso Interdisciplinary Health Sciences Ph. D. Program College of Health Sciences & School of Nursing El Paso, Texas pjuarez@utep.edu 915-842-0270

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CURRICULUM VITA

Patricia M. Juárez-Carrillo holds a Master of Public Health by the University of Texas-Houston School of Public Health Regional Campus El Paso, Texas and entered to the Ph.D. Program on January 2006. Prior and during pursuing her degree, Ms. Juárez-Carrillo worked as project manager for numerous environmental health intervention and research projects for disadvantaged populations along the U.S.-México border while working for over 12 years with the Center for Environmental Resource Management at UTEP. Additionally, Ms. Juárez-Carrillo has been a consultant for organizations such as the Migrant Clinicians Network, Pan American Health Organization-Regional Border Office in El Paso, Texas, and the National Institute of Occupational Health and Safety among other. Ms. Juárez-Carrillo was awarded with the 2007 Texas Environmental Excellence Award for the "Healthy Homes" Project implemented in the Paso del Norte Region.

Ms. Juárez-Carrillo research interest revolves on environmental health, minorities, children, community-based participatory research, Hispanics/Latino, and environmental justice. She believes in empowering the public and students to achieve their potential and ensure their wellbeing through information and education. Professionally, she plans to continue educating the public and students and to partner with organizations through interdisciplinary approaches to address environmental health issues aimed to enhance the awareness of environmental risks and protect the health of the public.

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