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Assessment of Pesticide Knowledge, Attitudes, and Practices
Among Pregnant Women in Northern Thailand

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Bachelor of Science
College of William and Mary
2009

Thesis Committee Chair: Dana Boyd Barr, Ph.D.

An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
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Abstract

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Background and Significance: Birth cohort studies conducted in the United States have found evidence of a connection between prenatal pesticide exposure and adverse neurodevelopmental outcomes. This association is currently under investigation in developing countries such as Thailand, where an estimated 400,000 neonates born each year are at risk of prenatal exposure due to their mother's agricultural occupation. Pesticide exposure in Thailand has been linked to unsafe practices and inappropriate beliefs about pesticides. However, limited information is available on the knowledge, attitudes, and practices of pesticide use among women of child-bearing age. Obtaining this information is essential to understand the factors that influence prenatal pesticide exposure, to develop interventions that prevent exposure, and ultimately to protect pregnant women and their children from the health impacts of pesticide exposure.

Methods: Knowledge, Attitudes, and Practices surveys were administered to 76 pregnant women in northern Thailand. Multivariate logistic regression was used to assess and quantify the extent to which pesticide-related knowledge and stage of pregnancy predict pesticide use behaviors. Additional analyses were conducted to inform future interventions by determining other factors that impact behavior and identifying populations at an elevated risk of exposure.

Results: Lower knowledge and earlier stage of pregnancy were marginally significantly associated with unsafe practices in the home, but were not associated with unsafe practices at work. Women who worked in agriculture before becoming pregnant, applied pesticides in the home before becoming pregnant, or had a previous child were significantly more likely to engage in unsafe behaviors in the home during their current pregnancy. Among women who worked in agriculture, unsafe behaviors at work were associated with unsafe behaviors at home.

Discussion and Conclusions: Increasing pesticide-related knowledge among pregnant women in northern Thailand may be effective in promoting safe practices and thus reducing prenatal exposure. Although unsafe behaviors are associated with other factors such as occupation and parity, these characteristics are not preventable by nature. Thus, knowledge remains an important predictor from the perspective of prevention. Knowledge-based interventions may be most effective when implemented early in pregnancy and targeted to at-risk sub-populations.

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INTRODUCTION

Pesticides: Definition and History

Pesticides are substances used in agriculture, in communities, and in the home to control organisms that threaten crop yield, carry disease, or are otherwise unwanted. Although pesticides were used as early as 2500 BC, the contemporary pesticide era began in the 1940s with the widespread production and use of DDT (Jones, 1973; Aspelin, 2003). DDT and other highly persistent organochlorine pesticides were gradually phased out when they came under public scrutiny after the publication of *Silent Spring* in the 1960s (USEPA, 1975). The book revealed the devastating ecological impacts of DDT and ultimately led to the establishment of the United States Environmental Protection Agency (USEPA) in 1970 (Lewis, 1985).

Organochlorine pesticides were replaced with acutely toxic, but less persistent, organophosphate pesticides. More recently, synthetic pyrethroid pesticides have taken over a large share of the market. New pesticides are constantly under development in the United States and worldwide (USEPA, 2011).

Classification

Pesticides can be classified by the type of pest they control, the severity of their health effects, or their chemical composition. Insecticides, fungicides, rodenticides, herbicides, and biocides are examples of categories defined by the target pest (Gilden et al., 2010; USEPA, 2010a). The World Health Organization (WHO) classifies pesticides by the severity of their potential human health impacts, ranging from unlikely to present acute hazard to extremely hazardous (WHO, 2009; table 1). These classifications are determined through toxicological studies using animal models. Finally, classes of pesticides can be defined by their chemical structure. For example, insecticides are further classified as organophosphates (OPs), pyrethroids, carbamates, or organochlorines, among many others (USEPA, 2010a).

Pesticide Exposure and Health Effects

Pesticides are important public health tools that are used to prevent vector-borne disease and to increase food supplies. However, recent research has shown that pesticides may also have negative impacts on public health. Studies have demonstrated acutely toxic effects at high doses, as well as chronic effects at low levels of exposure (Alavanja et al., 2004). Potential acute health effects of pesticide exposure include skin irritation, eye irritation, shortness of breath, salivation, nausea, vomiting, abdominal cramps, excessive fatigue, headache, muscle twitching, and numbness (USEPA, 2005). Extreme cases of acute pesticide exposure or pesticide poisoning can result in death (Eddleston et al., 2002). An estimated 1 to 5 million pesticide poisoning incidents occur worldwide each year, mostly in developing countries (FAO, 2004). The health impacts of chronic exposure to pesticides include effects on neurodevelopment, the reproductive system, the endocrine system, the immune system, and cancer (Gilden et al., 2010). Health outcomes such as attention deficit/hyperactive disorder (ADHD) and Parkinson's disease have also been linked to exposure to certain classes of pesticides (Marks et al., 2010; Le Couteur et al., 1999).

Exposure to pesticides can occur through occupational use, residential application, proximity to agricultural fields where pesticides are applied, and consumption of foods that have been treated with pesticides (USEPA, 2005). The routes of exposure to pesticides are oral ingestion, dermal absorption, and inhalation (Gilden et al., 2010). OP, carbamate, pyrethroid, and organochlorine insecticides have been shown to cross the human placenta, exposing developing fetuses as well (Stuetz et al., 2001; WHO, 2003; Kalayanarooj and

Nimmannitya, 2003). Prenatal exposure to pesticides is of particular concern due to the demonstrated neurodevelopmental toxicity of certain classes of pesticides (table 2).

The majority of evidence for developmental neurotoxicity in humans comes from OP insecticides. The primary mode of action of OP insecticides is inhibition of acetylcholinesterase, the enzyme that normally breaks down the neurotransmitter acetylcholine (Jeyaratnam and Maroni, 1994). Observed neurodevelopmental effects of OP insecticides include reflex abnormalities, reduced birth weight and length, increased reaction time, and reduced short-term memory and attention (see table 2).

Neurodevelopmental effects resulting from pyrethroid insecticides have been observed in animal models. These include changes in motor activity, changes in blood-brain permeability, and higher activity of the dopaminergic system (see table 2). Although reports on the developmental impacts of carbamates are limited, recent research demonstrated that this class of insecticides causes acetylcholinesterase inhibition in rats (Moser et al., 2010).

Pesticide Use and Regulation in the Developing World

Due to the potential health effects of pesticides, most countries have developed regulations to encourage safe use and control production, import, and export. In the United States, the USEPA has the authority to review pesticide safety, register pesticides for use, and regulate their import and export (USEPA, 2010b).

Developing countries often have weaker pesticide regulations and lower levels of enforcement than developed countries (Ecobichon, 2001; Eddleston et al., 2002). Thus, some pesticides that are banned in the United States due to their demonstrated health or ecological effects are still used in developing countries (Ecobichon, 2001; Abhilash and Singh, 2009). In addition, safe practices, such as the use of personal protective equipment and following recommendations on the labels of pesticide containers, are less common in the developing world (Ngowi et al., 2007). Although pesticide use in developing countries accounts for only 25% of the total usage worldwide, 99% of deaths from pesticide poisoning occur in developing countries (Ngowi et al., 2007). According to the WHO, pesticide poisoning can be prevented with safe practices and proper precautions (WHO, 1997).

Pesticide Exposure in Thailand

Partially as a result of different practices in developing countries, these populations have higher levels of exposure to pesticides than people in the developed world. In Thailand, where approximately 42% of the labor force is employed in agriculture, researchers have found higher cord blood pesticide levels in women-infant pairs than those found in similar studies in developed countries (CIA, 2011; Riederer, 2008). In addition, pesticide detection frequencies and median pesticide concentrations in the urine of children from Chiang Mai Province in Thailand were higher than those found in the urine of children in the United States (Panuwet et al., 2009).

The health impacts of these exposures are also evident in Thailand. In 2007, there were 1,452 reported pesticide poisoning incidents, or 2.3 per 100,000 population (Kachaiyaphum et al., 2010). The true number of incidents is likely much higher, as reported incidents include only those individuals who have symptoms that are severe enough to require medical attention, or who have access to healthcare (Kachaiyaphum et al., 2010). About 28% of farmers tested by the Ministry of Public Health in 2006 had risky or unsafe levels of cholinesterase depression, a marker of OP or carbamate pesticide exposure (Kachaiyaphum et al., 2010). In a study published in 2009, individuals who were occupationally exposed to pesticides reported pesticide-related signs and symptoms such as dizziness (88%), headache (91%), difficulty concentrating (13%), numbness in hands or feet (4%), nausea (82%), and abdominal pain (21%) in the past year (Jintana et al., 2009).

Although agricultural workers are considered to be the major population at risk, the general population can also be exposed to pesticides through environmental media and consumption of foods that are contaminated with pesticides. Jaipieam et al. (2009) measured the concentrations of three organophosphate pesticides in drinking water in Thailand. They found detectable levels of each pesticide, but the mean levels did not exceed U.S. drinking water standards (Jaipieam et al., 2009). However, individual samples did contain up to four times the Australian drinking water guidelines (Jaipieam et al., 2009). Thailand has not yet developed its own drinking water standards or guidelines for any of the pesticides measured in this study.

Another study found detectable levels of six different pesticides in domestic water wells in central Thailand (Hudak and Thapinta, 2005). Notably, four of these pesticides had been banned over 15 years before the study was conducted. Research also indicates that pesticide residues found on foods in Thailand could result in health impacts for consumers (Panuwet et al., 2009).

Pesticide Use and Regulation in Thailand

The use of chemical pesticides in Thailand dates back to World War II, when DDT was imported to control the spread of malaria (Thai PCD, 2005). Since then, their use has expanded to agricultural, industrial, and residential pest control. Most pesticides used in Thailand are imported rather than produced in-country, likely due to the difficulty in obtaining a permit for production from the government (Thai PCD, 2005). Thus, the amount of pesticides used is often represented as the amount imported. Using imported amounts as an indicator, the use of pesticides has grown dramatically. In 2003, over 50,000 tons of active ingredients of pesticides (including insecticides, fungicides, herbicides, and other classes) were imported into Thailand (Thai PCD, 2005). In contrast, only about 9,000 tons were imported in 1977 (Thai PCD, 2005).

During the Fifth Agricultural Census in Thailand, conducted in 2003, 54% of agricultural holdings reported using pesticides, with 73% of holdings in the northern region of the country reporting use (Thai NSO, 2003). A recent study from northern Thailand found that farmers currently use a number of insecticides, including OP, carbamate, pyrethroid, and organochlorine insecticides (Plianbangchang et al., 2009). However, about 25% of insecticides used by the farmers in the study were unidentifiable because the pesticides had been re-packaged into previously-used containers (Plianbangchang et al., 2009). In addition, one of the pesticides in use had been banned by the government.

The primary pesticide regulation in Thailand is the Hazardous Substances Act of 1992, which put three ministries in charge of regulating hazardous chemicals, including pesticides (Thai FDA, 2004; Thapinta and Hudak, 1998). Four agencies within these ministries currently regulate pesticides in Thailand – the Food and Drug Administration, the Department of Agriculture, the Department of Livestock Development, and the Department of Fisheries – depending on how the pesticides will be used (Panuwet et al., 2011). Due to the fragmentation of regulatory authority, pesticide management in Thailand is disjointed and incomplete. For example, domestic sales are largely unregulated, and the use of pesticides that have been banned due to their potential human health impacts still occurs (Panuwet et al., 2011). Further, the proper and safe use of pesticides is largely uncontrolled (Panuwet et al., 2011).

Pesticide Practices in Thailand

Unsafe practices can lead to observable health effects in workers exposed to pesticides (Khan et al., 2010). Research suggests that pesticide misuse by Thai farmers results in pesticide residues on food at levels that may threaten the health of consumers as well (Panuwet et al., 2009). Studies that administer questionnaires to agricultural workers have revealed a number of unsafe practices in Thailand.

Of 123 farmers interviewed in a study in northern Thailand, 81% reported reading the label on pesticide containers (Plianbangchang et al., 2009). However, only 32% reported reading every topic on the label. Use of personal protective equipment (PPE) was also low, including wearing gloves (42%), boots (21%), and long-sleeved shirts (21%). The most common reason for not wearing full PPE was a lack of knowledge about pesticide hazards. Other reasons included the high cost of the equipment and discomfort due to the humid climate (Plianbangchang et al., 2009). Only 9% reported showering after handling pesticides and 16% of farmers claimed that they kept empty pesticide containers at home for other uses (Plianbangchang et al., 2009).

In another questionnaire on pesticide practices among 90 occupationally exposed individuals in Thailand, 70% indicated that they used higher than recommended concentrations of pesticides (Jintana et al., 2009). Only 36% used PPE and only 13% bathed or changed clothes soon after spraying (Jintana et al., 2009). This study also took measurements of total blood cholinesterase activity as a marker of OP insecticide exposure. They found significantly lower levels of acetylcholinesterase activity in those who reported the unsafe behaviors of using higher than recommended concentrations of pesticides and not using personal protective equipment (Jintana et al., 2009). Because OP insecticides inhibit cholinesterase activity, lower levels of acetylcholinesterase activity indicate higher levels of pesticide exposure. Thus, in this study pesticide exposure was associated with certain unsafe pesticide practices.

Among 350 chili farm workers in Chaiyaphum Province, safe practices were more common (Kachaiyaphum et al., 2010). More than half of study participants reported taking a shower immediately after spraying pesticides (51%), washing their hands immediately after spraying pesticides (68%), wearing a long-sleeved shirt and trousers while spraying pesticides (87%), and carefully reading and understanding all instructions for pesticides (62%) (Kachaiyaphum et al., 2010). However, taking all behaviors into account, only 28% of participants had "good" pesticide use behaviors, while 61% had "moderate" pesticide use behaviors, and 11% had "poor" behaviors, according to defined cut-off points (Kachaiyaphum et al., 2010). Multiple linear regression analysis revealed that abnormal serum cholinesterase[1] levels, a marker of anticholinergic pesticide exposure, were associated with having moderate or poor pesticide-use behaviors (Kachaiyaphum et al., 2010).

Pesticide Attitudes in Thailand

Attitudes about pesticides may impact whether farmers use safe practices. Community members in a focus group conducted in northeastern Thailand identified "pesticide poisons" as a community hazard, but indicated that they use pesticides despite this potential health hazard because it enables them to sell their crops at a higher price (Inmuong et al., 2009). They also indicated that they know how to prevent pesticide poisoning, but that they have seen their parents and grandparents use pesticides with no health problems and are thus not too concerned about poisonings (Inmuong et al., 2009).

Survey results support the findings of this focus group. One study found that farmers did not seem to associate their individual susceptibility with unsafe pesticide practices (Alano et al., 2010). In a questionnaire distributed to hundreds of farmers in

[1] Serum cholinesterase, also called plasma or butyrylcholinesterase, is found in the serum or plasma fraction of blood. Its only known purpose is to serve as a "sink" which will absorb most of the assault by anticholinergic chemicals thereby protecting red blood cell and brain acetylcholinesterases (Broomfield et al., 1991; Raveh et al., 1993).

Pathumthani, most (80%) agreed with the statement that using chemical pesticides is unavoidable (Buranatrevedh and Sweatsriskul, 2005). However, in contrast to the focus group findings, 72% of farmers in this study indicated that they were concerned about pesticides in their body (Buranatrevedh and Sweatsriskul, 2005). In another survey, 67% of farmers strongly agreed that those in agricultural occupations are at risk of negative effects from pesticides (Kachaiyaphum et al., 2010). However, only 54% of these farm workers strongly agreed that using PPE could protect against exposure to chemicals, and only 44% strongly agreed that pesticide toxicity could cause death (Kachaiyaphum et al., 2010). Having low perceived susceptibility, determined by responses to these questions, was associated with abnormal serum cholinesterase levels (Kachaiyaphum et al., 2010). Thus, farm workers who did not think they were susceptible to the health effects resulting from pesticide exposure actually had higher levels of pesticide exposure.

Pesticide Knowledge in Thailand

Most information on the state of public knowledge about pesticides in Thailand comes from surveys among agricultural workers. In one such study, over 75% of chili farm workers identified oral (96%), dermal (85%), and inhalation (75%) as routes of exposure to pesticides (Kachaiyaphum et al., 2010). Neurological disease was identified as a risk of long-term pesticide exposure by 67% of participants (Kachaiyaphum et al., 2010). Respiratory disease was identified by 77% of participants, while cancer was identified by only 42% (Kachaiyaphum et al., 2010). About 90% of participants agreed that pesticide residues exist in soil, ground water, and on fruit, seeds, and vegetables (Kachaiyaphum et al., 2010). However, only 53% correctly indicated that pesticide residues could exist in the air as well (Kachaiyaphum et al., 2010). Taking all knowledge questions into account, 31% of participants had "high" pesticide-use knowledge, 51% had "moderate" knowledge, and 18% had "low" knowledge, according to defined cut-offs (Kachaiyaphum et al., 2010).

Many of these studies have recommended the implementation of educational interventions, which have been shown to be effective in increasing knowledge, altering attitudes, and improving pesticide practices in Thailand. In Ratchaburi province, the knowledge, attitudes, and practices (KAP) scores of 33 farmers who participated in a six-month training program were significantly improved after the training (Janhong et al., 2005; fig. 1). In another study conducted in Pathumthani, the mean knowledge score among hundreds of farmers increased following an educational intervention (Buranatrevedh and Sweatsriskul, 2005; table 3).

Research Justification

An estimated 400,000 neonates born in Thailand each year are at risk of prenatal exposure to pesticides resulting from their mother's agricultural occupation (UNICEF, 2010; USCIA, 2011). However, this number does not take into account other forms of maternal exposure, including exposure through home use and environmental media, and is thus likely an underestimate. In addition, large amounts of pesticides are used agriculturally and for vector control making widespread exposure to pesticides common. The potential health effects of pesticide exposure for both mothers and their developing fetuses have been documented. However, limited information is available on the knowledge, attitudes, and practices of pesticide use among women of child-bearing age in Thailand. Obtaining this information is essential to understand the factors that influence pesticide exposure, to develop interventions that prevent pesticide exposure, and ultimately to protect pregnant women and their children from the health impacts of pesticide exposure.

Specific Aims

1. To examine the factors that influence pesticide use among pregnant women in an agricultural community in northern Thailand.
2. To determine whether pesticide use behaviors differ by stage of pregnancy and state of knowledge about pesticides.
3. To facilitate development of an evidence-based intervention designed to increase knowledge and safe practices surrounding pesticide use among women enrolled in later studies.

METHODS

Research Context

Researchers at Emory University's Rollins School of Public Health and Chiang Mai University (CMU) are beginning a birth cohort study on the impacts of prenatal pesticide exposure in Chiang Mai Province, Thailand. The SAWASDEE[2] birth cohort study will investigate the long-term effects of *in utero* pesticide exposure in the developing world. The researchers have received NIH funding to enroll women beginning in Winter 2011 (Riederer, 2008). The study will collect data on prenatal pesticide exposure, maternal health status, birth outcomes, and neonatal neurological outcomes (Riederer, 2008).

The study population will consist of pregnant women residing in an agricultural community in Fang District, Chiang Mai Province in northern Thailand (fig. 2; pictured in appendix 1). This location and population was selected for the study because it is expected that pesticide exposures will be higher than in previous birth cohort studies and will therefore provide valuable information about different levels of prenatal pesticide exposure.

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[2] **SAWASDEE** stands for **S**tudy of **A**sian **W**omen **A**nd their Off**S**pring's **D**evelopment and **E**nvironmental **E**xposures.

In addition, the study population is hypothesized to have low levels of exposure to other potentially neurotoxic agents such as methyl mercury, lead, and polychlorinated biphenyls (Riederer, 2008).

To collect preliminary information for the birth cohort study, a separate cohort of 76 women were enrolled from the antenatal care (ANC) clinic at Fang Hospital in January and February of 2011 (pictured in appendix 1). Collaborators at CMU administered a survey to participants, who were distributed across all stages of pregnancy. Preliminary data suggest that about 50% of these women will be agricultural workers and that their mean age will be around 26 years (Riederer, 2008). Participation was limited to Thai nationals or foreigners with health insurance cards who had resided in Fang District for at least nine months before enrollment.

KAP Survey Development

Knowledge, attitudes, and practices (KAP) surveys help identify knowledge gaps, behavioral patterns, and commonly-held beliefs in order to increase understanding of the issue and elucidate targets and themes for interventions (WHO, 2007). They have been conducted in numerous countries, with various populations, on a multitude of subjects. KAP surveys focusing on pesticide use have been conducted in developing countries such as Brazil, Ghana, Egypt, and Thailand (Recena et al., 2006; Ntow et al., 2006; Farahat et al., 2009; Janhong et al., 2005). However, few of these surveys have focused on a population of pregnant women. This study works toward addressing the lack of information about factors influencing pesticide use among pregnant women in the developing world. Evaluation of the knowledge, attitudes, and practices of pregnant women upon enrollment in the survey cohort will also facilitate development of an educational intervention on safe pesticide use for women enrolling in the birth cohort study.

The KAP survey was developed in December 2009, using questions from previously-produced materials, with a limited number of additional self-produced questions designed to address pregnancy-specific issues and project-specific objectives. A literature review identified published journal articles in which the investigators used a pesticide KAP survey in the developing world. Through direct contact with the authors of these papers, the principal investigator obtained the KAP questionnaires used for these studies (Recena et al., 2006; Sam et al., 2008). Colleagues at CMU provided additional KAP questions from a CMU survey and a Mahidol University Master's student thesis (Sorat, 2004). After compiling a list of appropriate questions from these sources, gaps related to the population and objectives of this project were identified, and questions to account for this gap were developed.

Pesticide knowledge was evaluated using survey questions regarding pesticide training, exposure routes, long-term health effects, toxicity symptoms, and effective methods for preventing exposure. Attitudes were evaluated using questions about responsibility, susceptibility, effectiveness, and reasons for pesticide use. Safe practices were evaluated using questions about occupational use, home use, PPE use, and other safety precautions during and after pesticide spraying. Questions regarding pesticide use were asked prior to the knowledge and attitude questions to avoid biased answers that may result from reflection on pesticide hazards and risks.

Additional questions aimed at identifying demographic, occupational, and other factors associated with pesticide knowledge, attitudes, and practices were also included. These questions were adapted from the maternal baseline questionnaire used by the CHAMACOS[3] Study group at the University of California at Berkeley, and included

[3] CHAMACOS stands for **C**enter for the **H**ealth **A**ssessment of **M**others **a**nd **C**hildren **o**f **S**alinas. This is a Latina birth cohort developed in the Salinas Valley in California which is a predominantly agricultural region

occupational information, maternal and paternal demographics, medical history, and pregnancy history.

CMU collaborators translated the final KAP survey into Thai. The survey was pre-tested among Thai co-workers at CMU and pilot tested among seven pregnant women at the study site in July 2010. Feedback from survey administrators and test subjects was incorporated in extensive editing of the KAP survey for clarity, accuracy of translation, and interview length. Editing was conducted simultaneously in Thai and English by the principal investigator and CMU collaborators in August 2010. Appendix 2 contains both English and Thai versions of the full KAP survey used in this study.

The principal investigator developed a coding scheme, codebook, and files for data entry using Microsoft Excel. CMU collaborators were trained on the coding scheme as well as data entry procedures. Data entry files were in English, and both versions of the survey were numbered and labeled in English to ensure proper data entry.

Survey Administration

Participants were enrolled on a rolling basis in January and February of 2011. Subjects were asked to participate in the KAP study while visiting the ANC clinic at Fang Hospital. Written consent was obtained using an IRB-approved consent form. Human subjects approval was obtained at both Emory University and CMU (appendix 3). Confidentiality was maintained throughout the project. All observations were de-identified and the list that provides identification was kept at CMU on a computer requiring a password for access. Interviews were conducted in Thai by three trained survey administrators.

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with many migrant workers. The study/center's principal investigator is Brenda Eskenazi. For more information on this study, see http://ehs.sph.berkeley.edu/chamacos/.

CMU collaborators completed data entry in February 2011 and transmitted the de-identified data entry files to the United States, where data were analyzed by the principal investigator.

Data Analysis

In order to analyze the data on knowledge, attitudes, and practices of pesticide use in the study population, tests for differences in means and proportions and multivariable analyses were conducted using SAS 9.2 (Cary, NC). Knowledge, attitudes, and practices scores were calculated using previously-published methods where available (Dasgupta et al., 2005; Sam et al., 2008; Goldman et al., 2004). A total of seven scores, with one measuring knowledge, four measuring attitudes, and two measuring practices, were computed. Continuous measures did not follow a normal or log-normal distribution. Thus, the scores were dichotomized at the median for the majority of analyses. Univariate analyses were conducted to examine factors associated with each of the scores, along with additional variables of interest identified during preliminary analyses. Pesticide practice measures were used as the outcomes in multivariate logistic regression models to determine whether knowledge and stage of pregnancy were associated with practices and to quantify these associations.

Hypotheses

H1. Knowledge about pesticides is a significant predictor of pesticide practices and retains predictive importance after controlling for demographic characteristics and other potential confounders.

H2. Pesticide use and the factors that influence pesticide use differ by stage of pregnancy. Women in more advanced stages of pregnancy use less pesticides and adopt behaviors to minimize exposures.

Score Construction and Calculation

Knowledge was assessed using a method modified from Dasgupta et al. (2005), where a measure termed "misperception" indicated whether the participant correctly answered at least half of the questions related to pesticide knowledge. Because all participants in this study answered at least half of the questions correctly, knowledge scores above the median indicated a high degree of knowledge, while scores below the median indicated a low degree of knowledge. Correct answers were verified in the literature, and "don't know" responses were considered incorrect, based on the approach taken in prior studies (McCormack et al., 2002). Table 4 presents each knowledge question, the responses considered correct and incorrect, and the reference used for verification.

Four separate attitude scores were calculated and dichotomized for use in logistic regression models. First, two pesticide susceptibility attitudes scores were calculated. These included a measure of the attitudes on personal susceptibility to the health effects of pesticides ranging from 0 to 4, as well as a measure of the attitudes on the participant's child's susceptibility to the health effects of pesticides ranging from 0 to 8. The highest score in this range indicated the highest belief in susceptibility to health effects from pesticides and a score of 0 indicated the lowest belief in susceptibility to health effects from pesticides. A third attitude score demonstrated the extent to which the participant believed they had a personal responsibility for the safe use of pesticides, based on an attitudes score calculated by Sam et al. (2008). This score ranged from 0 to 12 with higher scores indicating a higher acceptance of personal responsibility for safe use. These first three attitude scores were all dichotomized at the maximum score because approximately 50% of participants scored at the maximum. A fourth attitude score was calculated to indicate the degree of the participant's belief in the usefulness of pesticides. This measure was only calculated for participants who personally applied pesticides either at work or at home, and was based on the number of options they specified as reasons for using pesticides. The pesticide usefulness attitude score ranged from 0 to 13 and was dichotomized at the mean of 4.2 due to its approximately normal distribution. Tables 5-8 present the methods for calculating each attitude score.

Pesticide practice indicators were the number of "risky behaviors" that the participant engaged in at work and at home, selected due to their potential to lead to pesticide exposure. This indicator was based on the risky behaviors defined by Goldman et al. (2004), which included improper handwashing, delayed bathing, lack of protective clothing, improper storage of clothing, low frequency of house cleaning, eating fruits and vegetables directly from the field, wearing work shoes into the house, and wearing work clothes into the house. One additional risky behavior was added to this indicator (storing pesticides in or around the home). Because not all participants were involved in agricultural occupations, two separate measures were developed for risky behaviors: at work and at home. Each of these pesticide practices measures were dichotomized into no risky behaviors or some risky behaviors. Tables 9-11 present the defined criteria for each risky behavior and separates the measures into behaviors at work and behaviors at home.

Descriptive Statistics and Univariate Analyses

Descriptive statistics for each variable were calculated and reported as means and standard deviations for continuous variables and numbers and proportions for categorical variables. Where questions did not apply to a particular participant (such as asking if the participant handles pesticides at work when they are not employed), the value for the variable was set to missing and the participant was excluded from the descriptive statistics for that variable. Pesticide knowledge, attitudes, and practices as well as demographic characteristics were compared between agricultural workers and non-agricultural workers (defined as those who reported working in agriculture since becoming pregnant, and those who did not report such an activity) using t-tests[4] and chi-square tests[5]. An alpha level of 0.05 was used in all analyses to establish statistical significance. Marginally significant results were also reported when the association was considered plausible.

Associations between relevant factors and personal characteristics (such as occupation, stage of pregnancy, and ethnicity) and the seven dichotomized knowledge, attitudes, and practices scores were examined using t-tests[4] and chi-square tests[5]. Characteristics associated with each score were identified when the p-value for the association was statistically significant (α=0.05) or marginally significant (approximately α=0.1) and deemed plausible. These associations were also examined for stage of pregnancy.

Multivariate Analyses and Model Construction

Multivariate maximum likelihood logistic regression models were constructed to further examine and quantify the extent to which knowledge and stage of pregnancy predict risky behaviors at work and risky behaviors at home. Knowledge was included as a continuous variable in order to improve precision and ease interpretation of the odds ratio. Stage of pregnancy was categorized as first trimester and second or third trimester. Both risky behavior measures were categorized as some or none.

Variables eligible for inclusion in the initial model consisted of the characteristics that were found to be associated with the outcome in univariate analyses. Variables that produced unstable estimates, were non-informative or not plausible, or that were a

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[4] For continuous variables that did not follow a normal distribution, Wilcoxon-Mann-Whitney tests (Wilcoxon two-sample tests, using a t approximation) were used.
[5] When an expected cell count for the chi-square test was less than 5, Fisher's exact tests were used.

component of a score already included in the model were excluded. Eligible variables were assessed for association with the primary predictor using t-tests[6], chi-square tests[7], and univariate linear regression. The initial model used for assessment of collinearity, interaction, confounding, and precision thus included the outcome of interest, the primary predictor, and variables associated with both the outcome and the primary predictor (with exclusions as described above). Participants with missing data for any of the variables included in the model were excluded from the corresponding analysis. The most appropriate final models were selected after consideration of collinearity, interaction, confounding, and precision.

Collinearity was assessed prior to consideration of interaction or confounding in order to eliminate collinear predictors, which can lead to unstable maximum likelihood estimates (Schaefer, 1983). Condition indices and variance decomposition proportions (VDPs) were calculated and a collinearity problem was identified when at least one condition index was approximately thirty or above (Belsley, 1992). Modeled variables with high VDPs (approximately 0.5) associated with such condition indices were eliminated from the model in order to decrease collinearity issues in the model and ensure accuracy of maximum likelihood estimates. To avoid unnecessary elimination, the variable with the greatest evidence of collinearity (the highest VDP corresponding to the highest condition index) was removed first, at which point collinearity was re-assessed to determine whether further removal was required. This was carried out sequentially until no further collinearity issues were evident.

Interaction was assessed using two-factor interaction terms between the primary predictor and each variable in the initial model. Examination of interaction was carried out

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[6] For continuous variables that did not follow a normal distribution, Wilcoxon-Mann-Whitney tests (Wilcoxon two-sample tests, using a t approximation) were used.
[7] When an expected cell count for the chi-square test was less than 5, Fisher's exact tests were used.

through hierarchical backward elimination of interaction terms as described by Kleinbaum and Klein (2002). During this procedure, the least significant interaction term was dropped from the full interaction model, resulting in a new reduced interaction model. After fitting this new interaction model, the next least significant interaction term was dropped. This process continued until any interaction terms remaining in the model were significant (Wald chi-square test, $\alpha=0.05$). If no significant interaction terms remained after backward elimination, there was no evidence of interaction in the model and interaction terms were not included in further procedures. Variables involved in interaction terms were retained in models during consideration of confounding and precision to ensure that the final model was hierarchically well-formulated (Kleinbaum and Klein, 2002).

Remaining variables not involved in any interaction terms were assessed for confounding. Evidence of confounding was present when eliminating a potential confounder or a group of potential confounders from the "gold standard" model resulted in a substantial change in the estimated odds ratio for the primary predictor. The gold standard model was defined as the model including all potential confounders and significant interaction terms. All possible combinations of predictors were considered, retaining the primary predictor and any variables involved in interaction terms (including the interaction terms themselves) in all possible models. All models yielding an odds ratio for the primary predictor within 10% of the odds ratio from the gold standard model were eligible for further consideration. Of these, the model with the highest precision, or the smallest confidence interval, for the odds ratio for the effect of the primary predictor was selected as the best overall model.

This procedure was implemented for all models of interest, resulting in hierarchically well-formulated final models accounting for relevant and significant interaction and confounding. Thus, these final models provide the most precise and accurate measure of the true association between the primary predictor and the outcome of interest based on the data collected.

Elucidating Targets for Intervention

Knowledge gaps were identified using descriptive statistics (means and proportions) to select the areas where knowledge was least prevalent. Significant differences in pesticide behaviors and knowledge between agricultural workers and non-agricultural workers were examined using t-tests[8] and chi-square tests[9]. Disparities were identified to inform interventions that might be geared toward a specific occupational cohort. Knowledge and behaviors were compared to determine whether specific (rather than general) knowledge of harmful actions and protective strategies led to correspondingly appropriate decisions regarding these actions and strategies. Factors associated with inconsistencies in declared knowledge and reported behaviors were examined using t-tests[6] and chi-square tests[7] to elucidate potential targets for intervention outside of simple knowledge dissemination.

Where knowledge was not significantly associated with practices after accounting for interaction and confounding, multivariate logistic regression models were constructed to identify the factors most strongly associated with risky behaviors. A simple backward elimination procedure was implemented, allowing variables other than knowledge to become a part of the final model. The least significant term was eliminated from the model sequentially until all remaining terms were significant (Wald chi-square test, α=0.05). While collinearity was addressed prior to backward elimination procedures, interaction and confounding were not assessed due to the lack of a previously-identified primary predictor.

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[8] For continuous variables that did not follow a normal distribution, Wilcoxon-Mann-Whitney tests (Wilcoxon two-sample tests, using a t approximation) were used.

[9] When an expected cell count for the chi-square test was less than 5, Fisher's exact tests were used.

This procedure was used to build predictive models for risky behaviors at work and risky behaviors at home that were not restricted by the selection of knowledge or stage of pregnancy as the primary predictor.

Model Fit Statistics

Likelihood ratio statistics, R-squared values, and percent concordant and discordant pairs were calculated to describe how well each model explains the observed data. For purposes of assessment and comparison of model fit, likelihood ratio tests were conducted to compare each model of interest to the corresponding model including the intercept only. This method was selected due to its application as a test for significance as well as ease of interpretation. A significant p-value (α=0.05) for this test indicates that including the variables in the model improves the fit of the model beyond the information provided by the intercept.

RESULTS

Demographic Characteristics and Pesticide Use

Demographic characteristics of the participants are presented in table 12. The mean age was 26 and the 76 participants were relatively evenly distributed throughout the first (28%), second (33%), and third (39%) trimesters.

Information on agricultural and residential pesticide use is presented in table 13. As expected, approximately half of the participants (45%) had worked in agriculture since becoming pregnant. Twenty-three (30%) women, all of whom had worked in agriculture since becoming pregnant, reported that pesticides were applied at their job. Pesticides had been applied in the homes of 39 (51%) participants since they became pregnant, with 21 (28%) personally applying those pesticides.

Pesticide Knowledge, Attitudes, and Practices: Descriptive Statistics

Seven total scores were calculated to summarize pesticide knowledge, attitudes and practices. These are presented in tables 14-16, with significant differences between agricultural workers and non-agricultural workers highlighted. The median knowledge score among all participants was 0.86 (table 14). Significantly higher proportions of participants who did not work in agriculture correctly answered two of the knowledge questions (chi-square and Fisher's exact tests, $p<0.05$). Mean overall knowledge scores did not differ significantly between agricultural and non-agricultural workers (0.83 and 0.85, respectively; Wilcoxon test, $p=0.10$)

Pesticide attitude scores and responses are presented in table 15. Comparisons between agricultural and non-agricultural workers revealed significant differences in attitudes on personal responsibility for the safe use of pesticides between the two groups, with significantly higher mean scores among non-agricultural workers (Wilcoxon test, $p<0.01$).

Proportions of participants who reported each risky behavior surrounding pesticide use can be found in table 16. Among the 34 participants who had worked in agriculture since becoming pregnant, 16 (47%) regularly engaged in at least one risky behavior related to their work. Among all participants, 55 (72%) engaged in at least one risky behavior related to daily life at home (table 16). The mean number of risky behaviors at work was 0.56 out of a possible 3 (median: 0), while the mean number of risky behaviors at home was 1.4 out of 7 (median: 1). Women who had worked in agriculture since becoming pregnant were more likely to have engaged in at least one risky behavior at home (chi-square test, $p<0.01$).

Univariate Analyses

Univariate analyses identified characteristics significantly associated with each of the seven summary scores, presented in tables 17-23. Higher knowledge was significantly associated with having at least some formal education and believing in personal responsibility for the safe use of pesticides (chi-square test, $p<0.05$; table 17). Both measures of risky behaviors were marginally significantly associated with knowledge, although those with higher knowledge scores were more likely to engage in risky behaviors at work (Wilcoxon and chi-square tests, $p<0.1$; tables 18, 19, 22). Among agricultural workers, those who engaged in risky behaviors at work engaged in more risky behaviors at home (chi-square test, $p=0.03$). Summary tables of the univariate associations between the seven knowledge, attitudes, and practices scores are presented in tables 24-26.

Women in their first trimester of pregnancy were significantly more likely to engage in risky behaviors at home (chi-square test, $p=0.03$; table 19). Univariate associations between stage of pregnancy (first trimester vs. second and third) and demographics and other characteristics are presented in table 27. Women in their first trimester were more likely to be agricultural workers and were less educated than women in later stages of pregnancy (chi-square tests, $p<0.05$; table 27).

Model Construction and Multivariate Analyses

The final model describing the association between knowledge and risky behaviors at work contained knowledge as the only predictor. There was no data-based evidence of confounding, as none of the variables associated with risky behaviors at work were associated with the continuous knowledge score (table 28). However, in order to ensure the accuracy of the model, eligible variables that were associated with risky behaviors at work were also assessed for interaction and confounding with knowledge. This analysis led to the same final model, with no evidence of interaction or confounding (table 29). The association between knowledge and risky behaviors at work was positive (OR = 1.14) but not significant ($p=0.21$; 95% CI: 0.93, 1.40). This model did not demonstrate improved predictive performance over a model containing only the intercept (likelihood ratio test, p=0.20; table 41).

The final model describing the association between knowledge and risky behaviors at home also contained knowledge as the only predictor. There was no evidence of interaction or confounding with any of the variables in the initial model (table 30). In the final model, presented in table 31, the association between knowledge and risky behaviors at home was negative (OR = 0.87) and marginally significant (p=0.10; 95% CI: 0.74, 1.03). Adding the predictor of knowledge to the model resulted in marginally but not statistically significantly improved fit compared to a model containing only the intercept (likelihood ratio test, p=0.09; table 41).

The univariate association between stage of pregnancy and risky behaviors at work was far from significant, so the corresponding model was not constructed. The final model for the association between stage of pregnancy (first trimester or second/third trimester) and risky behaviors at home included both stage of pregnancy and education, which was found to be a confounder of the association (table 32). In the univariate model containing only stage of pregnancy, the odds of engaging in a risky behavior at home among women in their first trimester were significantly higher than the odds among women in their second or third trimester (OR = 5.0, 95% CI: 1.1, 23.9). However, in the final model including the education, the odds ratio for stage of pregnancy was not statistically significant (OR = 4.1, 95% CI: 0.8, 20.6; table 33). The model including both stage of pregnancy and education fit the observed data significantly better than a model containing the intercept as the sole predictor (likelihood ratio test, p=0.04; table 41).

Elucidating Targets for Intervention

Targets for a knowledge-based intervention are presented in tables 34 and 35. The knowledge areas with the lowest median scores were pesticide toxicity symptoms and intake routes for pesticide exposure (table 34). The question most often answered incorrectly was related to the health effects of pesticides. Only 5% of participants knew that different pesticides have different health effects (table 35).

A comparison between the declared knowledge and reported behaviors of participants in respect to specific harmful actions and protective strategies are presented in table 36. Although virtually all participants agreed that spraying pesticides in the home could harm their fetus, 28 (37%) reported using pesticides in the home since they became pregnant. Similarly, all of the participants who did not wear gloves while using pesticides in the home indicated knowledge that wearing gloves when handling pesticides was an effective strategy to prevent pesticide exposure (table 36). Factors associated with these two most common inconsistencies in knowledge and behaviors are presented in tables 37 and 38.

In further exploring potential predictors of risky behaviors to identify targets for intervention other than simple knowledge dissemination, the only variable remaining in the model predicting risky behaviors at work after backward elimination of insignificant predictors was the number of risky behaviors the participant engaged in at home (table 39). Agricultural workers who engaged in more risky behaviors at home were more likely to engage in risky behaviors at work (OR = 2.2, 95% CI: 1.1, 4.5). Having a job involving farm work before becoming pregnant, using pesticides in the home before becoming pregnant, having a previous child, and having a high belief in the child's susceptibility to pesticides were identified as risk factors for engaging in risky behaviors at home (table 40). Both models demonstrated significantly improved fit compared to models containing only the corresponding intercept (likelihood ratio tests, $p<0.05$; table 41).

DISCUSSION

Knowledge, Attitudes, and Practices

Participants demonstrated relatively high knowledge about pesticides, with most participants answering over 80% of questions correctly. Pesticide knowledge was higher in this study population than in previous studies among agricultural workers in Thailand and other countries such as Bangladesh and Brazil (Kachaiyaphum et al., 2010; Sam et al., 2008; Recena et al., 2006). This may be due to this study's inclusion of non-agricultural workers, who had higher levels of education and marginally significantly higher levels of knowledge than agricultural workers. Knowledge did not significantly differ by age, ethnicity, or income, but those with at least some education were more likely to have higher pesticide-related knowledge.

Consistent with previous findings, attitudes on personal susceptibility to the health effects of pesticides were not associated with pesticide practices (Alano et al., 2010). Participants with lower beliefs in their personal susceptibility to pesticides also believed that they could develop an immunity to pesticides, a belief that was more common among agricultural workers. These attitudes may arise as a result of a familiarity with pesticides, supporting the results of a focus group discussion in northern Thailand where community members indicated that they were not concerned about pesticide poisonings because they had seen their parents and grandparents use pesticides without experiencing health problems (Inmuong et al., 2009). Participants with higher beliefs in their child's susceptibility to pesticides were more likely to engage in risky behaviors at home, again indicating that believing in susceptibility to pesticides does not play a role in preventing unsafe practices.

Beliefs in personal responsibility for the safe use of pesticides were higher among non-agricultural workers, who may not need to accept such responsibility on a regular basis. Unfortunately, agricultural workers, who are more likely to work with pesticides and should take responsibility for the safe use of pesticides, were less likely to indicate beliefs in the need for such actions.

Agricultural workers were also more likely to engage in risky behaviors in the home. However, certain behaviors were only considered risky when the participant had a household member who worked in agriculture, which was significantly more common among participants who worked in agriculture themselves (chi-square test, $p<0.01$). Thus, while it is difficult to assess the true association between working in agriculture and having unsafe practices in the home, it is clear that agricultural workers have a greater potential for exposure to pesticides in the home due to the increased potential for, and engagement in, risky behaviors.

Risky behaviors among this study population were far less common than among other populations, including primarily Spanish-speaking pregnant women in an agricultural community in California as well as agricultural workers in Thailand (Goldman et al., 2004; Plianbangchang et al., 2009; Jintana et al., 2009; Kachaiyaphum et al., 2010). While this could be a result of truly safer practices among this population of pregnant women, pilot testing of the survey indicates that these women may be unlikely to admit to engaging in risky behaviors due to a desire to please researchers. Although survey design prevented a bias that could arise from asking about knowledge prior to behaviors, this cultural barrier could not be completely removed through a simple multiple choice survey.

Knowledge and Stage of Pregnancy as Predictors of Practices

In this study, risky behaviors were used as a measure of potential pesticide exposure during pregnancy. Thus, predictors of the odds of engaging in risky behaviors were of great interest to identify women and fetuses at an elevated risk of pesticide exposure and to reveal potential targets for future interventions. Higher knowledge was marginally associated with decreased odds of engaging in risky behaviors at home. On average, the odds of engaging in risky behaviors at home decreased by 13% for every additional knowledge question answered correctly. This relationship held after searching for potential confounders and effect modifiers, indicating that an intervention to increase knowledge among pregnant women from all backgrounds in the study population could be effective at reducing potential pesticide exposure in the home. However, it should be emphasized that the association did not meet the criteria for significance. A study with a larger sample size may be necessary to confirm the relationship. Knowledge had no marginal or significant effect on the odds of engaging in risky behaviors at work, perhaps partially due to small sample size (the outcome was only assessed for the 34 agricultural workers).

Consistent with our hypothesis, women in early stages of pregnancy were significantly more likely to engage in risky behaviors at home. This was also consistent with the observation that more women had worked in a job involving potential pesticide exposure, personally applied pesticides, or had pesticides applied in their home before becoming pregnant. These observations may indicate that women alter their pesticide use behaviors when they become pregnant as well as when they advance to later stages of pregnancy. However, upon controlling for education as a confounder, the relationship between stage of pregnancy and risky behaviors at home was only marginally significant. It appears that in our sample population, women in their first trimester were less educated than women in other trimesters, thus leading to lower knowledge and more risky behaviors at home, outside of the effect of stage of pregnancy alone. However, the relationship remained marginally significant, and with a larger sample size a true relationship between stage of pregnancy and risky behaviors at home may become more evident. The model including both stage of pregnancy and education demonstrated significantly improved model fit over a model containing only the intercept. This indicates that the combination of these variables resulted in effective prediction of risky behaviors at home among the women in this study. Stage of pregnancy was not marginally or significantly associated with risky behaviors at work, again potentially due to small sample size.

Targets for Intervention

Participants had the least knowledge about pesticide toxicity symptoms and intake routes for pesticide exposure and were highly knowledgeable about populations that can be harmed by pesticides, including developing fetuses. The observation that knowledge about the symptoms of pesticide toxicity symptoms was low can be attributed to the fact that this study population contained non-agricultural workers, who are less likely to be familiar with pesticide poisonings. The majority of hospitalizations for accidental pesticide poisonings occur through occupational exposure (Wesseling et al., 1993). Thus, increasing knowledge of pesticide toxicity symptoms among non-agricultural workers may not be the most effective use of an intervention. The knowledge areas of greatest interest for future interventions including all pregnant women in northern Thailand should therefore focus on intake routes for pesticides, potential health impacts of pesticides, and strategies to prevent pesticide exposure.

Interventions targeted toward agricultural workers should focus on pesticide toxicity symptoms, along with providing information about the populations that can be harmed by pesticides, an area in which agricultural workers scored significantly lower than non-agricultural workers. Interventions targeted toward non-agricultural workers should focus on intake routes for pesticides, potential health impacts of pesticides, and strategies to prevent pesticide exposure.

Inconsistencies in knowledge and behavior were associated with other potentially harmful behaviors including risky behaviors at work, smoking, and not taking vitamins. This indicates that women who continue to use pesticides in the home while they are pregnant despite the knowledge that doing so could harm their fetus may be prone to engaging in potentially hazardous behaviors in other aspects of life. For these women, increasing knowledge about pesticides may not be effective in preventing pesticide exposure.

After exploring the relationships between the predictors of interest and the odds of engaging in risky behaviors at home and work, it became clear that neither knowledge or stage of pregnancy alone significantly predicted unsafe pesticide practices. In order to fulfill the aims of the research, it was necessary to identify other predictors of unsafe pesticide practices. The "best" predictor of the odds of engaging in risky behaviors at work identified through backward elimination was the number of risky behaviors the participant reported at home. Including risky behaviors at home led to significant improvement in model fit compared to a model containing only the intercept, a target that was not met in the model containing knowledge as the predictor. The odds of engaging in risky behaviors at work increased two-fold for each risky behavior the participant reported at home. Although it does not immediately seem helpful to discover that risky behaviors at work can be predicted by those at home, it does point to the idea that interventions to decrease the number of risky behaviors at home may be effective in decreasing risky behaviors at work as well. In addition, risky behaviors at home may serve as a proxy for risky behaviors at work in future studies. Behaviors at home can be assessed among all women enrolling in future studies, as opposed to behaviors at work, which are specific to agricultural workers and thus can only be assessed in half of the study population.

Four predictors associated with risky behaviors at home remained significant after backward elimination. It has already been noted that agricultural workers were more likely to report risky behaviors at home, so the observation that having a job involving farm work before becoming pregnant is associated with risky behaviors in the home is not surprising. This observation helps to identify a group at high risk for potential pesticide exposure during pregnancy using a characteristic that can be determined quickly and objectively. Similarly, the observation that participants who used pesticides in the home before becoming pregnant were more likely to practice unsafe pesticide use behaviors while pregnant is also intuitive and can quickly allow for categorization into high and low risk of exposure and need for intervention. However, this characteristic may be more subjective to the potential cultural barriers described previously. In addition, women with a previous child were significantly more likely to engage in risky behaviors at home during the current pregnancy. This is consistent with previous findings that women in the United States were more likely to engage in harmful behaviors such as use of tobacco and lower utilization of prenatal care during their second pregnancy than during their first (Blankson et al., 1993). These observations indicate that women carrying their first child may be more likely to take precautions and use safe practices during pregnancy. Women carrying a child that is not their first may need to be reminded that safe pesticide practices during pregnancy are necessary to protect her developing fetus.

Although the predictors identified in backward elimination are informative to identify populations at risk of exposure to target interventions, they are not preventable by nature. Thus, pesticide knowledge retains its predictive importance from the perspective of prevention.

CONCLUSIONS AND RECOMMENDATIONS

Research Strengths

The results of this survey provide much-needed information about the state of pesticide-related knowledge, attitudes, and practices among pregnant women in northern Thailand. This population has been largely understudied, as most research in pesticide exposure focuses on agricultural workers. Examining pesticide use behaviors and the factors that influence these behaviors among pregnant women provides information about prenatal exposure in a vulnerable population of developing fetuses. Perhaps most importantly, the results also suggest that increasing knowledge in this population may promote safe pesticide practices in the home and at work, thus protecting this vulnerable population. Exploring this relationship using solely a baseline survey is a novel concept, as most single time-point studies simply describe the current state of knowledge, attitudes, and practices in the population of interest. Those that go on to investigate the relationship between knowledge and behavior usually do so in regard to the effectiveness of a knowledge-based intervention, using both a baseline and a follow-up study. The methods presented here provide a strategy to determine whether such interventions have the potential to be successful, to recognize other factors and characteristics that may influence their success, and to identify sub-populations and information topics as targets for intervention. Thus, this type of analysis can serve to inform preventive efforts prior to implementation.

Research Limitations

Limitations of this research project include survey design, sample size, and lack of a direct measure of exposure. This survey was based on previously-published work, pre-tested, pilot tested, and extensively edited to ensure proper translation, coherence, and relevance. However, survey validation according to defined methods was outside the scope of this project. Although attempts were made to include questions that would identify women who blindly answered affirmatively for all options listed under a given topic area, a method to control for these responses was not identified. Knowledge might be best measured through open-ended questions, where participants are asked to provide the information without potentially leading questions or a restricted number of choices. Additionally, the lack of critical feedback through pilot testing of the survey indicates that these women may be overly concerned with pleasing the researchers. This could lead to a culture-specific reporting bias, which may partially explain why safe practices were more prevalent in this study than in previous findings.

The study was also limited by a small sample size. Although the study included 76 women, it was presumably difficult to detect true relationships between the variables of interest among the sub-samples in the study such as agricultural workers or women who personally applied pesticides. For example, the power of analyses predicting risky behaviors at work among agricultural workers was limited by a sample size of 34.

Additionally, the primary outcomes of interest in this study were proxies for exposure to pesticides rather than direct measures. Although there is evidence that unsafe pesticide practices lead to increased exposure, this relationship has not been confirmed among pregnant women in Thailand or their fetuses (Jintana et al., 2009; Kachaiyaphum et al., 2010). While it is practical to assume that risky behaviors lead to exposure in this population, it can only be stated that they lead to the potential for exposure. Further research is required to strengthen the results of this study and confirm that the risky behaviors of interest lead to actual exposure in this population.

As with all surveys, the potential for interviewer bias or incorrect coding of data is of concern. However, the data entry file provided by the study nurse was in perfect condition according to the code book provided. This observation is extremely encouraging and indicates that proper procedures were followed and that errors arising from survey administration and data entry were minimal.

Conclusions and Recommendations

Consistent with the research hypotheses, pesticide knowledge and stage of pregnancy appear to have some capacity to predict engagement in behaviors leading to the potential for pesticide exposure among pregnant women in northern Thailand. However, these characteristics may not be the best predictors. Unsafe, or risky, behaviors in the home are associated with occupation and pesticide use before becoming pregnant, as well as parity. Unfortunately, these predictors are not amenable to behavior change and thus do not offer an opportunity for prevention. While these characteristics are informative to aid researchers and public health workers in targeting interventions to populations at an elevated risk of exposure, knowledge remains an important predictor for preventive purposes.

Further research is necessary to confirm the relationship between pesticide knowledge and practices, or to determine other factors that better predict practices and offer opportunities for intervention. Similar survey studies with a larger sample size may provide more power to detect a true relationship. However, it is also clear that barriers to the transition of knowledge into behavior exist. Focus groups and qualitative interviews could help to identify these barriers by providing an opportunity for open discussion that is not available through multiple choice surveys. Qualitative research could also remove a potential cultural bias identified through pilot testing that may have led women to under-report risky behaviors. Future research should also focus on determining whether engaging in risky behaviors is associated with actual pesticide exposure for both the woman and her future child. This could be accomplished using biomonitoring data that will be collected through the SAWASDEE birth cohort in conjunction with the survey used here, which captures women's behaviors surrounding pesticide use during pregnancy.

Meanwhile, interventions in northern Thailand aimed at preventing pesticide exposure during pregnancy should focus on increasing knowledge about pesticides, specifically intake routes for pesticide exposure, potential health impacts, and strategies to prevent pesticide exposure. These interventions should aim to prevent risky behaviors at home, which are in turn associated with risky behaviors at work. Interventions should be implemented while women are in their first trimester, as evidence indicates that women may engage in more risky behaviors during the early stages of pregnancy. When funding is limited, these interventions should be targeted to the groups identified as most likely to engage in unsafe pesticide practices during pregnancy. These include women who worked in agriculture before becoming pregnant, who personally applied pesticides in the home before becoming pregnant, or who have been pregnant before. Evaluations should be conducted to determine effectiveness and inform future research and exposure prevention efforts.

Overall, pregnant women in an agricultural community in northern Thailand were found to be relatively knowledgeable about pesticides. However, many still engage in behaviors that put them and their fetuses at risk of pesticide exposure and related health effects. Opportunities for intervention and future research are available, and prevention efforts should be implemented to protect this unique and vulnerable group of women and their future children.

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TABLES AND FIGURES

Table 1. Pesticide Classifications from the WHO (Source: WHO, 2009)

WHO Class		LD_{50} for the rat (mg/kg body weight)	
		Oral	Dermal
Ia	Extremely hazardous	< 5	< 50
Ib	Highly hazardous	5–50	50–200
II	Moderately hazardous	50–2000	200–2000
III	Slightly hazardous	Over 2000	Over 2000
U	Unlikely to present acute hazard	5000 or higher	

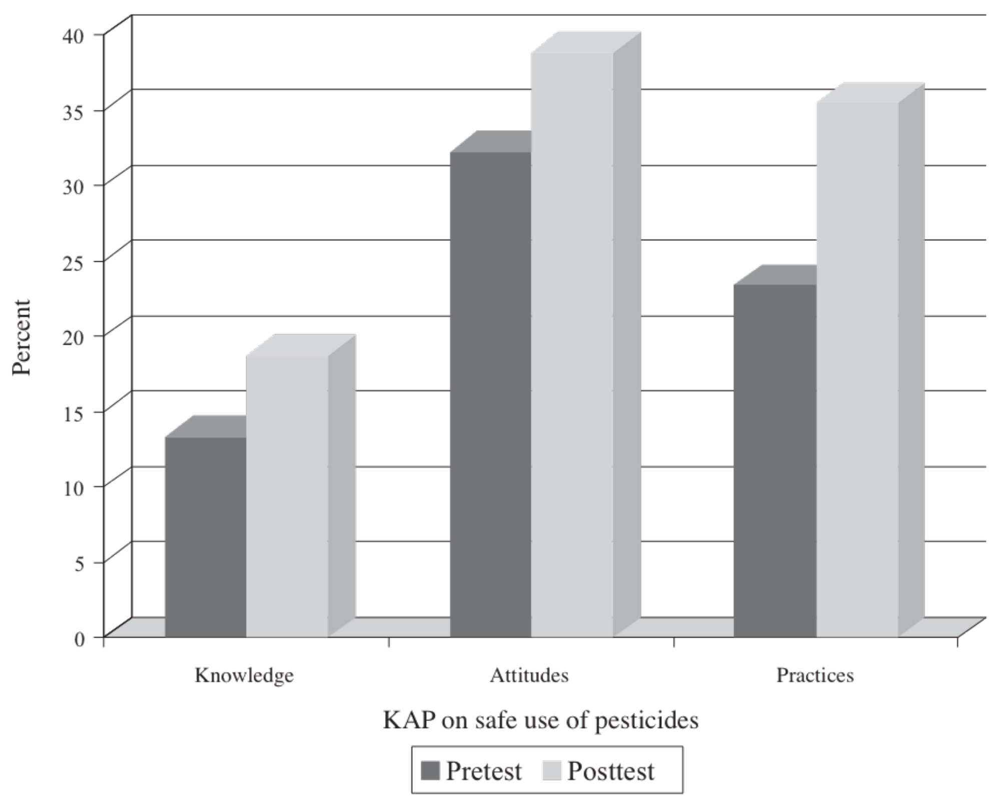

Figure 1. Pesticide Knowledge, Attitudes, and Practices among 33 farmers before and after a 6-month educational intervention (Source: Janhong et al., 2005)

Table 2. Neurodevelopmental toxicity of selected classes of pesticides (adapted from Bjorling-Poulsen et al., 2008)

Pesticide class	Developmental neurotoxicity reported in humans	Notes	References
Organo-phosphates	Reflex abnormalities in neonates and affected mental development		Young et al, 2005; Eskenazi et al, 2007
	Reduced head circumference in infants and anomalies in primitive reflexes	Chlorpyrifos	Berkowitz et al, 2004; Engel et al, 2007
	Reduced birth weight and length and developmental delay at 3 years of age	Chlorpyrifos	Whyatt et al, 2004; Rauh et al, 2006
	Visuospatial deficits	Prenatal exposure	Grandjean et al, 2006
	Increased reaction time	Current exposure in children	Grandjean et al, 2006
	Reduced short term memory and attention	Methyl parathion	Ruckart et al, 2004
Carbamates	No reports found		
Pesticide class	**Developmental neurotoxicity reported in animals**	**Notes**	**References**
Pyrethroids	Increased motor activity, lack of habituation, changes in mAChR density	Mouse model	Ahlbom et al, 1994; Eriksson et al, 1991; Eriksson et al, 1990; Talts et al, 1998
	Learning changes	Rat model	Moniz et al, 1990
	Changes in motor activity	Rat model	Husain et al, 1992
	Changes in sexual behavior and higher activity of the dopaminergic system	Rat model	Lazarini et al, 2001
	Changes in mAChR expression	Rat model	Aziz et al, 2001; Malaviya et al, 1993
	Changes in blood-brain permeability	Rat model	Gupta et al, 1999
	Affected development of reflexes, swimming ability	Mouse model, parental exposure	Farag et al, 2006

Table 3. Pesticide knowledge scores before and after intervention (Source: Buranatrevedh and Sweatsriskul, 2005)

Time	Total scores (% of all respondents)		
	< 5	6–9	10–12
Before intervention	10.4	70.2	19.4
After intervention	5.4	79.9	14.7

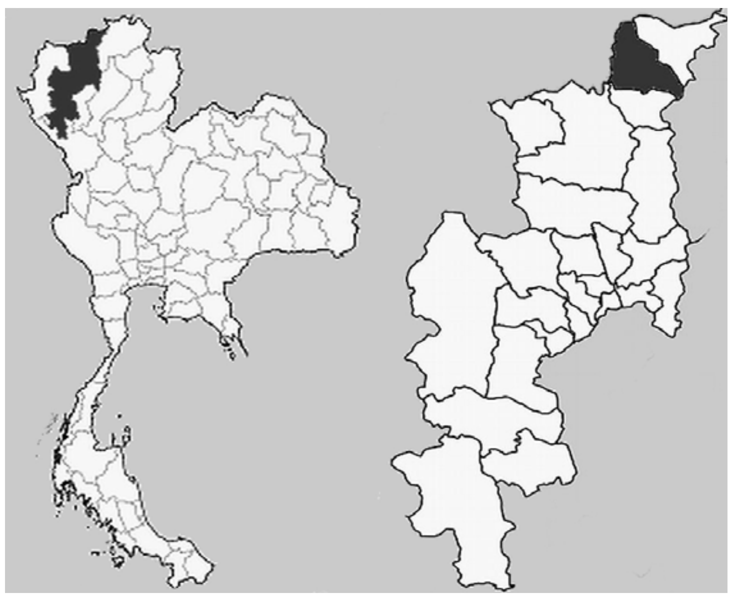

Figure 2. Study location. The map on the left shows Chiang Mai Province; the map on the right shows Fang District within Chiang Mai Province.

Table 4. Knowledge Questions		Correct Response	Source
I believe that the following actions could be harmful to my fetus:			
	Smoking cigarettes	Yes	Cotton, 1994
	Eating fruits	No	Nemours Foundation, 2010
	Drinking alcohol	Yes	Eustace et al., 2002
	Spraying pesticides in the home	Yes	Sanborn et al., 2004
	Spraying pesticides at work	Yes	Sanborn et al., 2004
	Light exercise	No	Artal and O'Toole, 2003
	Taking vitamins	No	
	Taking supplements	No	
Exposure to pesticides can have an adverse effect or impact on human health		Agree	USEPA, 2010c
Do all the pesticides have the same adverse health effect on the human body?		No	USEPA, 2010c
Pesticides can be harmful to the health of:			
	The general population	Yes	NCI, 2010
	The agricultural workers who apply them	Yes	Das et al., 2001
	Other agricultural workers	Yes	USEPA, 2005
	People who consume the crops	Yes	McKone et al., 2007
	Farm residents	Yes	USEPA, 2005
	Residents of cities and communities near the farm	Yes	USEPA, 2005
Which of the following are intake pathways for pesticides?			
	Breathing in pesticides	Yes	McKone et al., 2007
	Getting bit by a mosquito	No	
	Getting pesticides on the skin	Yes	McKone et al., 2007
	Swallowing pesticides	Yes	McKone et al., 2007
	Consuming foods from farms that use pesticides	Yes	McKone et al., 2007
Pesticide containers can be reused safely after cleaning		Disagree	USEPA, 2005

Which of the following can be effective in preventing pesticide exposure?		
Wearing full protective equipment when handling pesticides	Yes	USEPA, 2010d
Wearing gloves when handling pesticides	Yes	USEPA, 2010d
Washing fruits and vegetables before eating them	Yes	USEPA, 2005
Covering mouth and nose with your hand while spraying pesticides	No	Palis et al., 2006
Washing hands in the stream after handling pesticides	Yes	Salvatore et al., 2008
Taking a bath immediately after spraying pesticides	Yes	Salvatore et al., 2008
Washing clothes worn at the farm separate from other clothes	Yes	USEPA, 2005
According to your knowledge, the toxicity symptoms of pesticides can be which of the following?		
Headache	Yes	USEPA, 2005
Watery eyes / sore eyes	Yes	USEPA, 1999
Heart attack / stroke	Yes	USEPA, 2005
Nausea / vomiting	Yes	USEPA, 2005
Excessive salivation	Yes	USEPA, 2005
Cough / cold / chest pain / breathlessness	Yes	USEPA, 1999
Skin rash / skin irritation / itching	Yes	USEPA, 2005
Abdominal pain / diarrhea	Yes	USEPA, 2005
Muscle weakness / fatigue / body pain	Yes	USEPA, 2005
Pesticides protect people from pest-related diseases	Agree	WHO, 2011
Pesticides are poisonous	Agree	USEPA, 2005
Pesticide hazard can cause death	Agree	Casey, 1994
You can smoke, drink, and eat during pesticide spraying	Disagree	USEPA, 2005
If I eat and drink near areas where pesticides have been sprayed I will not be exposed to pesticides	Disagree	Fenske et al., 1990
Which of the following are potential health impacts of pesticides?		
Pesticide poisoning	Yes	Eskenazi et al., 1999
Cancer	Yes	USEPA, 2010c
Obesity	No	
Slower learning	Yes	Kofman et al., 2006
Irritated skin	Yes	USEPA, 2010c
Coughing	Yes	Eskenazi et al., 1999

Table 5. Attitudes on personal susceptibility to health effects from pesticides*	Response indicating higher belief in susceptibility^
Using a large amount of pesticides for only a short time is not harmful to my health	Disagree
Using a small amount of pesticides for a long time is not harmful to my health	Disagree

*Score ranges from 0-4 with higher scores indicating a higher belief in personal susceptibility to health effects from pesticides.

^These responses were awarded 2 points, while the opposite response was awarded 0 points. Responses of "not sure" or "don't know" (indicating beliefs in between the extremes) were awarded 1 point.

Table 6. Attitudes on future or current children's susceptibility to health effects from pesticides*	Response indicating higher belief in susceptibility^
Using a large amount of pesticides for only a short time is not harmful to the health of my fetus	Disagree
Using a small amount of pesticides for a long time is not harmful to the health of my fetus	Disagree
Adults are more resistant to pesticides than children	Agree
Adults are more resistant to pesticides than babies	Agree

*Score ranges from 0-8 with higher scores indicating a higher belief in the participant's child's susceptibility to health effects from pesticides.

^These responses were awarded 2 points, while the opposite response was awarded 0 points. Responses of "not sure" or "don't know" (indicating beliefs in between the extremes) were awarded 1 point.

Table 7. Attitudes on responsibility for safe use based on Sam et al. (2008)*	Response indicating acceptance of responsibility^
It is necessary to read or understand the label of a pesticide bottle or container	Agree
If a pesticide is sold in the market it means it is safe no matter how or by whom it is used	Disagree
A pesticide is effective only if its effect can be seen immediately after spraying	Disagree
A pesticide is more effective if it is sprayed according to personal experience and not necessarily according to the recommended amount	Disagree
Every person who uses a pesticide is responsible for its safe use	Agree
After using pesticides for a number of years, a person can develop an immunity to pesticides	Disagree

*Score ranges from 0-12 with higher scores indicating a higher acceptance of personal responsibility for the safe use of pesticides.

^These responses were awarded 2 points, while the opposite response was awarded 0 points. Responses of "not sure" or "don't know" (indicating beliefs in between the extremes) were awarded 1 point.

Table 8. Attitudes on the usefulness of pesticides*		Question indicates belief in pesticide usefulness?^
I use pesticides in the home because:		
	They protect my home and family from mosquitoes	Yes
	They protect my home and family from other insects	Yes
	They protect my home and family from rodents	Yes
	They protect my home and family from termites	Yes
	They protect my home and family from other pests	Yes
	They protect my home and family from disease	Yes
	They keep my home clean	Yes
	A family member told me to	No
	Following advice from a doctor, nurse, community leader, health volunteer, or government official	No
	Other	Yes
I use pesticides at work because:		
	They kill insects that would harm the plants	Yes
	They kill other pests that would harm the plants	Yes
	They get rid of bacteria growing on the plants	No
	They kill other unwanted plants	Yes
	They make the plants grow taller	Yes
	I am told to apply them	No
	Other	Yes

*Score ranges from 0-13 with higher scores indicating a higher belief in the usefulness of pesticides (scored as missing if the participant did not personally apply pesticides).

^Affirmative responses to these questions were awarded 1 point each, while all other responses were awarded 0 points.

Table 9. Risky behaviors defined by Goldman et al. (2004)	Corresponding KAP survey questions
Sometimes or never washing hands in the field before smoking or eating	A20
Not bathing immediately after work	A21
Not wearing adequate clothing to protect against pesticide exposure (long-sleeved shirt, something to cover the head, and gloves)	A18, D5, K3
Storing or washing farm-worker clothes together with family clothes	J8, J12
Cleaning the house less than a few times per week	C2
Eating fruits and vegetables directly from the field	B11A
Household member(s)wearing work shoes from the field into the home	J4
Household member(s)wearing work clothes from the field into the home for more than 30 minutes	J6

Table 10. Risky behaviors at work*	Corresponding KAP survey questions
Sometimes or never washing hands in the field before smoking or eating	A20
Not bathing immediately after work	A21
Not wearing adequate clothing to protect against pesticide exposure (long-sleeved shirt, something to cover the head, and gloves)	A18

*These scores were only calculated for participants who worked in agriculture while pregnant

Table 11. Risky behaviors at home	Corresponding KAP survey questions
Not wearing personal protective equipment when using pesticides in the home	D5, K3
Storing or washing farm-worker clothes together with family clothes*	J8, J12
Cleaning the house less than a few times per week	C2
Eating fruits and vegetables directly from the field	B11A
Household member(s) wearing work shoes from the field into the home*	J4
Household member(s) wearing work clothes from the field into the home for more than 30 minutes*	J6
Household member(s) storing pesticides from work in or around the home	J13

*Only considered risky when participants had household members who worked in agriculture

Table 12. Demographic Characteristics of Participants

	All [Mean (SD) / N (%)]	Agricultural Workers [Mean (SD) / N (%)]	Non-Agricultural Workers [Mean (SD) / N (%)]	p-value for Significant Differences	Test Used
Month of pregnancy	5.5 (2.6)	4.9 (2.7)	5.9 (2.4)		
Trimester of pregnancy					
1st	21 (28%)	14 (41%)	7 (17%)		
2nd	25 (33%)	10 (29%)	15 (36%)		
3rd	30 (39%)	10 (29%)	20 (48%)		
Age (years)	26 (6.8)	26.6 (7.0)	26.1 (6.7)		
Highest level of education achieved				0.0020	Chi-square*
None, never attended school	33 (43%)	23 (68%)	10 (24%)		
Primary school	12 (16%)	5 (15%)	7 (17%)		
Junior high school	10 (13%)	1 (3%)	9 (21%)		
High school (no diploma)	15 (20%)	5 (15%)	10 (24%)		
Diploma/technical school/equivalent	4 (5%)	0 (0%)	4 (10%)		
Some college	2 (3%)	0 (0%)	2 (5%)		
College graduate or more	0 (0%)	0 (0%)	0 (0%)		

Table 12 (cont'd). Demographic Characteristics of Participants

	All [Mean (SD) / N (%)]	Agricultural Workers [Mean (SD) / N (%)]	Non-Agricultural Workers [Mean (SD) / N (%)]	p-value for Significant Differences	Test Used
Household monthly income				0.0049	Chi-square*
1,500 Baht or less	2 (3%)	2 (6%)	0 (0%)		
1,501 to 3,000 Baht	6 (8%)	4 (12%)	2 (5%)		
3,001 to 6,000 Baht	22 (29%)	13 (38%)	9 (21%)		
6,001 to 9,000 Baht	21 (28%)	8 (24%)	13 (31%)		
9,001 to 12,000 Baht	13 (17%)	1 (3%)	12 (29%)		
12,000 Baht and above	6 (8%)	1 (3%)	5 (12%)		
Don't know / Not sure	6 (8%)	5 (15%)	1 (2%)		
Income is enough to live off of					
Yes, and enough for saving	33 (43%)	13 (38%)	20 (48%)		
Yes, but not enough for saving	28 (37%)	14 (41%)	14 (33%)		
No	15 (20%)	7 (21%)	8 (19%)		
Ethnicity				0.0036	Chi-square*
Thai	34 (45%)	8 (24%)	26 (62%)		
Thai Yai	31 (41%)	20 (59%)	11 (26%)		
Burmese	2 (3%)	2 (6%)	0 (0%)		
Chinese	2 (3%)	0 (0%)	2 (5%)		
Other	7 (9%)	4 (12%)	3 (7%)		
Country of birth				0.0019	Chi-square
Thailand	46 (61%)	14 (41%)	32 (76%)		
Burma	30 (39%)	20 (59%)	10 (24%)		
China	0 (0%)	0 (0%)	0 (0%)		
Other	0 (0%)	0 (0%)	0 (0%)		

Table 12 (cont'd). Demographic Characteristics of Participants

	All [Mean (SD) / N (%)]	Agricultural Workers [Mean (SD) / N (%)]	Non-Agricultural Workers [Mean (SD) / N (%)]	p-value for Significant Differences	Test Used
Number of pregnancies before current pregnancy	0.86 (0.82)				
0	29 (38%)	13 (38%)	16 (38%)		
1	30 (39%)	15 (44%)	15 (36%)		
2	15 (20%)	6 (18%)	9 (21%)		
3	2 (3%)	0 (0%)	2 (5%)		
Number of children living with participant	0.56 (0.60)				
0	37 (49%)	15 (44%)	22 (52%)		
1	35 (46%)	17 (50%)	18 (43%)		
2	4 (5%)	2 (6%)	2 (5%)		

* Validity of chi-square test is questionable due to low expected cell counts

Table 13. Occupational and Residential Pesticide Use Among Pregnant Women in Northern Thailand

	Agricultural Workers [Mean(SD) / N(%)]	Non-Agricultural Workers [Mean(SD) / N(%)]	All [Mean(SD) / N(%)]	p-value for Significant Differences	Test Used
Occupational Pesticide Use					
Worked since becoming pregnant	34 (100%)	32 (76%)	66 (87%)	0.0017	Fisher's exact
Worked in agriculture since becoming pregnant	34 (100%)	N/A	34 (45%)		
Personally applied pesticides at work since becoming pregnant	8 (24%)	0 (0%)	8 (11%)		
Had a job where pesticides were applied since becoming pregnant	23 (68%)	0 (0%)	23 (30%)		
Worked in a job involving potential pesticide exposure before becoming pregnant	33 (97%)	13 (31%)	46 (61%)	<0.0001	Chi-square
Residential Pesticide Use					
Pesticides used in the home since becoming pregnant	16 (47%)	23 (55%)	39 (51%)		
Pesticides used in the home before becoming pregnant (one participant did not know)	16 (47%)	27 (66%)	43 (57%)		
Personally applied pesticides in the home since becoming pregnant	9 (26%)	12 (29%)	21 (28%)		
Personally applied pesticides in the home before becoming pregnant	10 (29%)	16 (38%)	26 (34%)		
Personally applied pesticides on pets since becoming pregnant	4 (12%)	11 (26%)	15 (20%)		

Table 14. Correct Responses to Knowledge Questions for All Participants and by Occupation

Question	Correct Response, N (%)			p-values for Significant Differences	Test for Differences
	All Participants	Agricultural Workers	Non-Agricultural Workers		
I believe that the following actions could be harmful to my fetus:					
Smoking cigarettes	75 (99%)	33 (97%)	42 (100%)		
Eating fruits	67 (88%)	28 (82%)	39 (93%)		
Drinking alcohol	76 (100%)	34 (100%)	42 (100%)		
Spraying pesticides in the home	73 (96%)	34 (100%)	39 (93%)		
Spraying pesticides at work	74 (97%)	34 (100%)	40 (95%)		
Light exercise	65 (86%)	27 (79%)	38 (90%)		
Taking vitamins	66 (87%)	29 (85%)	37 (88%)		
Taking supplements	58 (76%)	28 (82%)	30 (71%)		
Summary score, mean (SD)	0.91 (0.15)	0.90 (0.15)	0.91 (0.16)		
Exposure to pesticides can have an adverse effect or impact on human health	76 (100%)	34 (100%)	42 (100%)		
Do all the pesticides have the same adverse health effect on the human body?	4 (5%)	0 (0%)	4 (10%)		

Table 14 (cont'd). Correct Responses to Knowledge Questions for All Participants and by Occupation

Question	Correct Response, N (%)			p-values for Significant Differences	Test for Differences
	All Participants	Agricultural Workers	Non-Agricultural Workers		
Pesticides can be harmful to the health of:					
The general population	64 (84%)	26 (76%)	38 (90%)		
The agricultural workers who apply them	76 (100%)	34 (100%)	42 (100%)		
Other agricultural workers	72 (95%)	31 (91%)	41 (98%)		
People who consume the crops	67 (88%)	25 (74%)	**42 (100%)**	0.0004	Fisher's exact
Farm residents	73 (96%)	32 (94%)	41 (98%)		
Residents of cities and communities near the farm	69 (91%)	29 (85%)	40 (95%)		
Summary score, mean (SD)	0.92 (0.15)	0.87 (0.18)	**0.97 (0.08)**	0.0014	Wilcoxon
Which of the following are intake pathways for pesticides?					
Breathing in pesticides	76 (100%)	34 (100%)	42 (100%)		
Getting bit by a mosquito	27 (36%)	12 (35%)	15 (36%)		
Getting pesticides on the skin	72 (95%)	31 (91%)	41 (98%)		
Swallowing pesticides	76 (100%)	34 (100%)	42 (100%)		
Consuming foods from farms that use pesticides	75 (99%)	33 (97%)	42 (100%)		
Summary score, mean (SD)	0.86 (0.10)	0.85 (0.18)	0.87 (0.10)		
Pesticide containers can be reused safely after cleaning	66 (87%)	28 (82%)	38 (90%)		

Table 14 (cont'd). Correct Responses to Knowledge Questions for All Participants and by Occupation

Question	Correct Response, N (%)			p-values for Significant Differences	Test for Differences
	All Participants	Agricultural Workers	Non-Agricultural Workers		
Which of the following can be effective in preventing pesticide exposure?					
Wearing full protective equipment when handling pesticides	70 (92%)	32 (94%)	38 (90%)		
Wearing gloves when handling pesticides	74 (97%)	34 (100%)	40 (95%)		
Washing fruits and vegetables before eating them	76 (100%)	34 (100%)	42 (100%)		
Covering mouth and nose with your hand while spraying pesticides	37 (49%)	17 (50%)	20 (48%)		
Washing hands in the stream after handling pesticides	13 (17%)	9 (26%)	4 (10%)		
Taking a bath immediately after spraying pesticides	74 (97%)	32 (94%)	42 (100%)		
Washing clothes worn at the farm separate from other clothes	76 (100%)	34 (100%)	42 (100%)		
Summary score, mean (SD)	0.79 (0.09)	0.81 (0.09)	0.76 (0.10)		
The toxicity symptoms of pesticides can be:					
Headache	71 (93%)	33 (97%)	38 (90%)		
Watery eyes / sore eyes	68 (89%)	32 (94%)	36 (86%)		
Heart attack / stroke	26 (34%)	12 (35%)	14 (33%)		
Nausea / vomiting	67 (88%)	28 (82%)	39 (93%)		
Excessive salivation	58 (76%)	26 (76%)	32 (76%)		
Cough / cold / chest pain / breathlessness	58 (76%)	26 (76%)	32 (76%)		
Skin rash / skin irritation / itching	75 (99%)	34 (100%)	41 (98%)		
Abdominal pain / diarrhea	57 (75%)	25 (74%)	32 (76%)		
Muscle weakness / fatigue / body pain	61 (80%)	26 (76%)	35 (83%)		
Summary score, mean (SD)	0.79 (0.19)	0.79 (0.19)	0.79 (0.18)		

Table 14 (cont'd). Correct Responses to Knowledge Questions for All Participants and by Occupation

Question	Correct Response, N (%)			p-values for Significant Differences	Test for Differences
	All Participants	Agricultural Workers	Non-Agricultural Workers		
Pesticides protect people from pest-related diseases	40 (53%)	19 (56%)	21 (50%)		
Pesticides are poisonous	75 (99%)	33 (97%)	42 (100%)		
Pesticide hazard can cause death	74 (97%)	33 (97%)	41 (98%)		
You can smoke, drink, and eat during pesticide spraying	69 (91%)	32 (94%)	37 (88%)		
If I eat and drink near areas where pesticides have been sprayed I will not be exposed to pesticides	71 (93%)	30 (88%)	41 (98%)		
Which of the following are potential health impacts of pesticides?					
Pesticide poisoning	71 (93%)	31 (91%)	40 (95%)		
Cancer	68 (89%)	27 (79%)	**41 (98%)**	0.0192	Fisher's exact
Obesity	50 (66%)	20 (59%)	30 (71%)		
Slower learning	58 (76%)	23 (68%)	35 (83%)		
Irritated skin	72 (95%)	31 (91%)	41 (98%)		
Coughing	66 (87%)	30 (88%)	36 (86%)		
Summary score, mean (SD)	0.84 (0.17)	0.79 (0.21)	0.88 (0.12)		

Knowledge Score Summary	All Participants	Agricultural Workers	Non-Agricultural Workers	p-value	Test for Differences
Mean (SD)	0.84 (0.07)	0.82 (0.07)	0.85 (0.07)		
Median (IQR)	0.86 (0.10)	0.84 (0.10)	0.86 (0.10)		
N (%) Above Median Score	41 (54%)	16 (47%)	25 (60%)		

Table 15. Pesticide Attitude Scores and Responses for All Participants and by Occupation

Attitudes on personal susceptibility to health effects from pesticides	Response indicating higher belief in susceptibility	Mean (SD) / N (%) All Participants	Mean (SD) / N (%) Agricultural Workers	Mean (SD) / N (%) Non-Agricultural Workers	p-value for Significant Differences	Test for Differences
Using a large amount of pesticides for only a short time is not harmful to my health	Disagree	65 (86%)	27 (79%)	38 (90%)		
Using a small amount of pesticides for a long time is not harmful to my health	Disagree	61 (80%)	26 (76%)	35 (83%)		
Personal Susceptibility Attitudes Score Summary						
Mean (SD)		3.4 (1.3)	3.2 (1.5)	3.6 (1.0)		
Median (IQR)		4.0 (0.0)	4.0 (1.0)	4.0 (0.0)		

Attitudes on child's susceptibility to health effects from pesticides	Response indicating higher belief in susceptibility	All Participants	Agricultural Workers	Non-Agricultural Workers	p-value for Significant Differences	Test for Differences
Using a large amount of pesticides for only a short time is not harmful to the health of my fetus	Disagree	66 (87%)	26 (76%)	40 (95%)	0.0362	Fisher's exact
Using a small amount of pesticides for a long time is not harmful to the health of my fetus	Disagree	64 (84%)	26 (76%)	38 (90%)		
Adults are more resistant to pesticides than children	Agree	63 (83%)	29 (85%)	34 (81%)		
Adults are more resistant to pesticides than babies	Agree	65 (86%)	30 (88%)	35 (83%)		

Child Susceptability Attitudes Score Summary						
Mean (SD)		7.0 (1.8)	6.8 (2.0)	7.2 (1.7)		
Median (IQR)		8.0 (2.0)	8.0 (3.0)	8.0 (1.0)		

Attitudes on personal responsibility for safe use of pesticides	**Response indicating acceptance of responsibility**	**All Participants**	**Agricultural Workers**	**Non-Agricultural Workers**	**p-value for Significant Differences**	**Test for Differences**
It is necessary to read or understand the label of a pesticide bottle or container	Agree	66 (87%)	27 (79%)	39 (93%)		
If a pesticide is sold in the market it means it is safe no matter how or by whom it is used	Disagree	58 (76%)	21 (62%)	37 (88%)	0.0073	Chi-square
A pesticide is effective only if its effect can be seen immediately after spraying	Disagree	58 (76%)	21 (62%)	37 (88%)	0.0073	Chi-square
A pesticide is more effective if it is sprayed according to personal experience and not necessarily according to the recommended amount	Disagree	52 (68%)	19 (56%)	33 (79%)	0.0344	Chi-square
Every person who uses a pesticide is responsible for its safe use	Agree	73 (96%)	33 (97%)	40 (95%)		
After using pesticides for a number of years, a person can develop an immunity to pesticides	Disagree	61 (80%)	23 (68%)	38 (90%)	0.0129	Chi-square
Responsibility Attitudes Score Summary						
Mean (SD)		10.4 (2.0)	9.5 (2.3)	11.1 (1.2)	0.0009	Wilcoxon
Median (IQR)		11.0 (2.0)	10.0 (4.0)	12.0 (2.0)		

Attitudes on the usefulness of pesticides (among those who applied pesticides)	Question indicates belief in pesticide usefulness	All Participants	Agricultural Workers	Non-Agricultural Workers	p-value for Significant Differences	Test for Differences
I use pesticides in the home because:						
They protect my home and family from mosquitoes	Yes	19 (90%)	9 (100%)	10 (83%)		
They protect my home and family from other insects	Yes	20 (95%)	9 (100%)	11 (92%)		
They protect my home and family from rodents	Yes	16 (76%)	7 (78%)	9 (75%)		
They protect my home and family from termites	Yes	14 (67%)	7 (78%)	7 (58%)		
They protect my home and family from other pests	Yes	16 (76%)	6 (67%)	10 (83%)		
They protect my home and family from disease	Yes	8 (38%)	3 (33%)	5 (42%)		
They keep my home clean	Yes	13 (62%)	6 (67%)	7 (58%)		
A family member told me to	No	9 (43%)	5 (56%)	4 (33%)		
Following advice from a doctor, nurse, community leader, health volunteer, or government official	No	6 (29%)	3 (33%)	3 (25%)		
Other	Yes	0 (0%)	0 (0%)	0 (0%)		
I use pesticides at work because:						
They kill insects that would harm the plants	Yes	8 (100%)	8 (100%)	N/A		
They kill other pests that would harm the plants	Yes	5 (63%)	5 (63%)	N/A		
They get rid of bacteria growing on the plants	No	8 (100%)	8 (100%)	N/A		
They kill other unwanted plants	Yes	8 (100%)	8 (100%)	N/A		
They make the plants grow taller	Yes	8 (100%)	8 (100%)	N/A		
I am told to apply them	No	4 (50%)	4 (50%)	N/A		
Other	Yes	0 (0%)	0 (0%)	N/A		

	All Participants	Agricultural Workers	Non-Agricultural Workers	p-value for Significant Differences	Test for Differences
Usefulness Attitudes Score Summary					
Mean (SD)	5.2 (2.5)	5.4 (2.9)	4.9 (2.0)		
Median (IQR)	5.0 (4.0)	4.5 (4.0)	5.5 (3.0)		

Table 16. Risky Behaviors Among All Participants and by Occupation

Risky Behaviors at Work	N (%)			p-values for Significant Differences	Test for Differences
	All Participants	Agricultural Workers	Non-Agricultural Workers		
Sometimes or never washing hands in the field before smoking or eating	N/A	3 (9%)	N/A		
Not bathing immediately after work	N/A	11 (32%)	N/A		
Not wearing adequate clothing to protect against pesticide exposure (long-sleeved shirt, something to cover the head, and gloves)	N/A	5 (15%)	N/A		
Risky Behaviors at Work Score Summary					
Mean (SD)	N/A	0.56 (0.66)	N/A		
Median (IQR)	N/A	0.0 (1.0)	N/A		
N (%) with at least one risky behavior at work	N/A	16 (47%)	N/A		

Table 16 (cont'd). Risky Behaviors Among All Participants and by Occupation

Risky Behaviors at Home	N (%)			p-values for Significant Differences	Test for Differences
	All Participants	Agricultural Workers	Non-Agricultural Workers		
Not wearing personal protective equipment when using pesticides at home	18 (24%)	8 (24%)	10 (24%)		
Storing or washing farm-worker clothes together with family clothes*	7 (9%)	**6 (18%)**	1 (2%)	0.0406	Fisher's exact
Cleaning the house less than a few times per week	3 (4%)	1 (3%)	2 (5%)		
Eating fruits and vegetables directly from the field	23 (30%)	**16 (47%)**	7 (17%)	0.0041	Chi-square
Household member(s) wearing work shoes from the field into the home*	6 (8%)	3 (7%)	3 (8%)		
Household member(s) wearing work clothes from the field into the home for more than 30 minutes*	30 (39%)	**20 (59%)**	10 (24%)	0.0019	Chi-square
Household member(s) storing pesticides from work in or around the home^	21 (28%)	11 (32%)	10 (24%)		
Risky Behaviors at Home Score Summary					
Mean (SD)	1.4 (1.3)	**1.9 (1.2)**	1.0 (1.2)	0.0016	Wilcoxon
Median (IQR)	1.0 (2.0)	2.0 (2.0)	1.0 (1.0)		
N (%) with at least one risky behavior at home	55 (72%)	**30 (88%)**	25 (60%)	0.0054	Chi-square

*Only considered risky when participants had household members who worked in agriculture

^Missing data for one subject

Table 17. Factors Associated with Having a Knowledge Score Below the Median

Factors Associated with Lower Knowledge	p-value	Test Used
Having a job where pesticides are used	0.0980	Chi-square
Wearing a scarf at work (among agricultural workers)	0.0159	Chi-square
Not receiving pesticide training	0.0326	Fisher's exact
Believing that pesticides are effective only if the effects are seem immediately after spraying	0.0003	Chi-square
Believing that pesticides are effective only if they are sprayed according to personal experience	0.0507	Chi-square
Having no formal education	0.0258	Chi-square
Not being Thai	0.0905	Chi-square
Not taking vitamins before becoming pregnant	0.0030	Fisher's exact
Baby's father having no formal education	0.0968	Chi-square
Not reporting experiencing pesticide effects	0.0271	Chi-square
Fewer risky behaviors at work	0.0197	Wilcoxon
Lower responsibility attitudes	0.0170	Wilcoxon

Table 18. Factors Associated with Engaging in At Least One Risky Behavior at Work

Factors Associated with Risky Behaviors at Work	p-value	Test Used
Not washing fruits and vegetables before becoming pregnant	0.0782	Fisher's exact
Getting fruits and vegetables directly from the field since becoming pregnant	0.0890	Chi-square
Having pesticides applied in the home since becoming pregnant	0.0890	Chi-square
Having pesticides applied in the home before becoming pregnant	0.0890	Chi-square
Not knowing that mosquito bites are not a potential intake route for pesticides	0.0570	Chi-square
Not having pesticide training		
Higher knowledge of pesticide toxicity symptoms	0.0418	Chi-square
Knowing that pesticides are not always more effective when sprayed according to personal experience	0.0343	Chi-square
Younger age	0.0755	t-test
Personally applying pesticides to pets since becoming pregnant	0.0392	Fisher's exact
Higher knowledge scores	0.0890	Chi-square
More risky behaviors at home	0.0265	Wilcoxon

Table 19. Factors Associated with Engaging in At Least One Risky Behavior at Home

Factors Associated with Risky Behaviors at Home	p-value	Test Used
Trimester 1 (vs. trimesters 2 and 3)	0.0292	Chi-square
Working in agriculture since becoming pregnant	0.0054	Chi-square
Having a job where pesticides are used since becoming pregnant	0.0150	Chi-square
Doing farmwork before becoming pregnant	0.0048	Chi-square
Getting fruits and vegetables directly from the field before becoming pregnant	0.0168	Chi-square
Having pesticides applied in the home since becoming pregnant	0.0142	Chi-square
Personally applying pesticides in the home before becoming pregnant	0.0051	Chi-square
Believing that adults are more resistant to pesticides than children	0.0369	Fisher's exact
Believing that adults are more resistant to pesticides than babies	0.0010	Fisher's exact
Having no formal education	0.1066	Chi-square
Having an lower income	0.1138	Chi-square
Being born outside of Thailand	0.0843	Chi-square
Having a previous child	0.0353	Chi-square
Having at least one child living in the home	0.0526	Chi-square
Lower knowledge scores	0.0786	Wilcoxon
Higher beliefs in their child's susceptibility to the health effects of pesticides	0.0159	Chi-square
Higher beliefs in the usefulness of pesticides	0.1118	Chi-square

Table 20. Factors Associated with Lower Beliefs in Personal Susceptibility to the Health Effects of Pesticides

Factors Associated with Lower Personal Susceptibility Attitudes	p-value	Test Used
Not knowing that pesticides can harm agricultural workers other than the workers that apply them	0.0393	Fisher's exact
Not knowing that you cannot safetly reuse pesticide containers	0.0505	Fisher's exact
Knowing that salivation is a pesticide toxicity symptom	0.0043	Fisher's exact
Not knowing that you should not smoke, drink, and eat while spraying pesticides	0.0502	Fisher's exact
Not believing that you can be exposed to pesticides if you eat and drink near areas where pesticides have been sprayed	0.0831	Fisher's exact
Believing that all pesticides sold on the market are safe	0.0267	Fisher's exact
Believing that you can develop an immunity to pesticides	<0.0001	Fisher's exact
Not knowing that cancer is a potential health effect of pesticides	0.0157	Fisher's exact
Lower knowledge of pesticide health impacts	0.0099	Fisher's exact
Having enough income to live off of	0.0159	Fisher's exact
Not having a child at home	0.0806	Chi-square
Not reporting effects of pesticide or other environmental exposures	0.0935	Chi-square
Low child's susceptibility attitudes	<0.0001	Chi-square

Table 21. Factors Associated with Lower Beliefs in The Child's Susceptibility to the Health Effects of Pesticides

Factors Associated with Lower Child's Susceptibility Attitudes	p-value	Test Used
Having pesticides applied outside the home only (among those with pesticides applied in the home since becoming pregnant)	0.0466	Fisher's exact
Using personal protective equipment when spraying pesticides in the home*	0.1194	Fisher's exact
Not having pesticides applied in the home before becoming pregnant	0.0809	Fisher's exact
Knowing that eating fruits and vegetables does not harm the fetus	0.0502	Fisher's exact
Not knowing that pesticides can harm agricultural workers other than the workers who apply them	0.0903	Fisher's exact
Not knowing that pesticides can harm people who consume the crops	0.1310	Fisher's exact
Knowing that covering the mouth does not effectively prevent pesticide exposure	0.0087	Chi-square
Knowing that salivation is a pesticide toxicity symptom	0.0325	Chi-square
Not knowing that you should not smoke, drink, and eat while spraying pesticides	0.0291	Fisher's exact
Believing that all pesticides sold on the market are safe	0.0543	Chi-square
Believing that you can develop an immunity to pesticides	0.0130	Fisher's exact
Not knowing that cancer is a potential health effect of pesticides	0.1002	Fisher's exact
Lower pesticide health impact scores	0.0979	Fisher's exact
Not using pesticides to control mosquitoes*	0.0476	Fisher's exact
Not using pesticides to control rodents*	0.0630	Fisher's exact
Not using pesticides for disease protection*	0.0445	Fisher's exact
Not using pesticides to keep the house clean*	0.0307	Fisher's exact
Housemates not storing pesticides	0.0550	Chi-square
Not personally applying pesticides on pets since becoming pregnant	0.1243	Fisher's exact
Fewer risky behaviors at home	0.0044	Wilcoxon
Lower beliefs in personal susceptibility to the health effects of pesticides	<0.0001	Chi-square
Lower beliefs in the usefulness of pesticides	0.0538	Fisher's exact
Lower beliefs in the usefulness of pesticides	0.0860	t-test

*Among those who personally applied pesticides in the home

Table 22. Factors Associated with Lower Beliefs in Personal Responsibility for the Safe Use of Pesticides

Factors Associated with Lower Responsibility Attitudes	p-value	Test Used
Working since becoming pregnant	0.0917	Fisher's exact
Working in agriculture since becoming pregnant	0.0266	Chi-square
Doing farmwork before becoming pregnant	0.0026	Chi-square
Believing that exercise can harm the fetus	0.0189	Fisher's exact
Lower knowledge of actions that can harm the fetus	0.1016	Wilcoxon
Not knowing that pesticides can harm consumers who eat the crops	0.0691	Fisher's exact
Not knowing that pesticides can harm residents near the farm	0.0167	Fisher's exact
Lower knowledge of the populations that can be harmed by pesticides	0.0261	Wilcoxon
Not knowing that mosquito bites are not a potential intake route for pesticides	0.0387	Chi-square
Lower knowledge of the intake routes for pesticides	0.0176	Wilcoxon
Not having pesticide training	0.0128	Fisher's exact
Lower knowledge of the potential health impacts of pesticides	0.1041	Chi-square
Having no formal education	<0.0001	Chi-square
Having an lower income	0.0299	Chi-square
Not being Thai	0.0008	Chi-square
Not being born in Thailand	0.0009	Chi-square
Child's father not being Thai	0.0040	Chi-square
Child's father not being born in Thailand	0.0007	Chi-square
Child's father having no education	0.0006	Chi-square
Not separating work clothes from other clothes in the laundry	0.0716	Fisher's exact
Lower cooperation (fair/poor vs. good/excellent)	0.0084	Fisher's exact
Lower knowledge score	0.0513	Chi-square

Table 23. Factors Associated with Lower Beliefs in the Usefulness of Pesticides

Factors Associated with Lower Usefulness Attitudes	p-value	Test Used
Having a job where pesticides were used since becoming pregnant	0.1089	Fisher's exact
Having pesticides applied outside the home only (vs. inside only or both)	0.0714	Fisher's exact
Not applying pesticides before becoming pregnant	0.0070	Fisher's exact
Not knowing that pesticides can harm residents near the farm	0.0635	Fisher's exact
More knowledge of the effective strategies to prevent pesticide exposure	0.0670	Wilcoxon
Not believing that pesticides protect people from disease	0.0055	Chi-square
Not believing that you can be exposed to pesticides if you eat and drink near areas where pesticides have been sprayed	0.0635	Fisher's exact
Having housemates who are agricultural workers	0.0838	Fisher's exact
Lower child's susceptibility attitudes	0.0419	Wilcoxon

Table 24. Associations Between Outcomes of Interest (Categorical by Categorical; Chi-square and Fisher's exact tests used)

	Knowledge	Risky Behaviors at Work	Risky Behaviors at Home	Personal Susceptibility Attitudes	Child's Susceptibility Attitudes	Responsibility Attitudes
Risky Behaviors at Work	0.09					
Risky Behaviors at Home	0.17	0.60^				
Personal Susceptibility Attitudes	0.70	1.0^	0.24^			
Child's Susceptibility Attitudes	0.60	0.39	**0.02**	**<0.01**		
Responsibility Attitudes	**0.05**	0.46^	0.65	0.66	0.83	
Usefulness Attitudes	0.46	0.59^	0.17^	0.62^	**0.05^**	1.0^

^Fisher's exact tests used

Table 25. Associations Between Outcomes of Interest (Categorical by Continuous; Wilcoxon tests used)

	Knowledge	Risky Behaviors at Work	Risky Behaviors at Home	Personal Susceptibility Attitudes	Child's Susceptibility Attitudes	Responsibility Attitudes
Risky Behaviors at Work	0.17					
Risky Behaviors at Home	0.08	0.34				
Personal Susceptibility Attitudes	0.55	0.68	0.20			
Child's Susceptibility Attitudes	0.93	0.30	**<0.01**	**<0.01**		
Responsibility Attitudes	0.43	0.24	0.67	0.49	0.52	
Usefulness Attitudes	0.57	0.27	0.89	0.37	**0.04**	0.79

Table 26. Associations Between Outcomes of Interest (Continuous by Categorical; Wilcoxon tests used)

	Knowledge	Risky Behaviors at Work	Risky Behaviors at Home	Personal Susceptibility Attitudes	Child's Susceptibility Attitudes	Responsibility Attitudes
Risky Behaviors at Work	0.11					
Risky Behaviors at Home	0.50	**0.03**				
Personal Susceptibility Attitudes	0.64	0.95	0.23			
Child's Susceptibility Attitudes	0.87	0.46	**0.03**	**<0.01**		
Responsibility Attitudes	**0.02**	0.41	0.40	0.14	0.46	
Usefulness Attitudes	0.91	0.96	**0.01**	0.56	0.20	0.12

Table 27. Factors Associated with Stage of Pregnancy

Factors Associated with First Trimester (vs. Second/Third)	**p-value**	**Test Used**
Working since becoming pregnant	0.0536	Fisher's exact
Working in agriculture since becoming pregnant	0.0175	Chi-square
Being involved in farmwork before becoming pregnant	0.0210	Chi-square
Getting fruits and vegetables directly from the field since becoming pregnant	0.0418	Chi-square
Having pesticides applied in the home at least once per month	0.0528	Chi-square
Not knowing that pesticides can harm agricultural workers other than the workers that apply them	0.0617	Fisher's exact
Not knowing that mosquito bites are not a potential intake route for pesticides	0.0636	Chi-square
Not knowing that covering the mouth does not effectively prevent pesticide exposure	0.0302	Chi-square
Not knowing that nausea is a symptom of pesticide toxicity	0.0113	Fisher's exact
Knowing that fatigue is a symptom of pesticide toxicity	0.0544	Fisher's exact
Using pesticides to keep the home clean (among those who used pesticides)	0.0515	Fisher's exact
Less knowledge of pesticide intake routes	0.0451	Chi-square
Less knowledge of pesticide intake routes	0.0445	Wilcoxon
Not having any education	0.0023	Chi-square
Not being Thai	0.0799	Chi-square
Not being born in Thailand	0.0515	Chi-square
Not taking vitamins since becoming pregnant	0.0035	Fisher's exact
Baby's father not being Thai	0.0867	Chi-square
Baby's father not being born in Thailand	0.0054	Chi-square
Baby's father not having education	0.0121	Chi-square
Lower cooperation	0.0914	Chi-square
Risky behaviors at home	0.0292	Chi-square

Table 28. Building the Final Model for the Association Between Knowledge and Risky Behaviors at Work

Risky behaviors at work associated with:	p-value	Test used	Reason for exclusion from final model
Not washing fruits and vegetables before becoming pregnant	0.0782	Fisher's exact	Not informative/plausible
Getting fruits and vegetables directly from the field since becoming pregnant	0.0890	Chi-square	Not informative/plausible
Having pesticides applied in the home since becoming pregnant	0.0890	Chi-square	Not associated with continuous knowledge score
Having pesticides applied in the home before becoming pregnant	0.0890	Chi-square	Not associated with continuous knowledge score
Not knowing that mosquito bites are not a potential intake route for pesticides	0.0570	Chi-square	Part of knowledge score
No one who received training reported any risky behaviors			High variance, estimate unstable
Higher knowledge of pesticide toxicity symptoms	0.0418	Chi-square	Part of knowledge score
Knowing that pesticides are not always more effective when sprayed according to personal experience	0.0343	Chi-square	Part of knowledge score
Younger age	0.0755	t-test	Not associated with continuous knowledge score
Personally applying pesticides to pets since becoming pregnant	0.0392	Fisher's exact	High variance, estimate unstable
Higher knowledge scores	0.0890	Chi-square	Continuous measure used due to unstable OR estimate
Higher knowledge scores	0.1695	Wilcoxon	

Table 29. Final Model for the Association Between Knowledge and Risky Behaviors at Work

Predictor	Odds Ratio	Confidence Interval	Width of Confidence Interval	Parameter Estimate	Standard Error	p-value
Intercept	N/A	N/A	N/A	-5.41	4.28	0.2066
Knowledge	1.14	(0.93, 1.40)	0.474	0.13	0.11	0.2139

Table 31. Final Model for the Association Between Knowledge and Risky Behaviors at Home

Predictor	Odds Ratio	Confidence Interval	Width of Confidence Interval	Parameter Estimate	Standard Error	p-value
Intercept	N/A	N/A	N/A	6.68	3.54	0.0590
Knowledge	0.87	(0.74, 1.03)	0.29	-0.14	0.08	0.1021

Table 33. Final Model for the Association Between Stage of Pregnancy and Risky Behaviors at Home

Predictor	Odds Ratio	Confidence Interval	Width of Confidence Interval	Parameter Estimate	Standard Error	p-value
Intercept	N/A	N/A	N/A	1.02	0.51	0.0445
Trimester1	4.12	(0.82, 20.64)	19.82	1.42	0.82	0.0847
Education	0.58	(0.19, 1.83)	1.64	-0.54	0.58	0.3527

Table 30. Building the Final Model for the Association Between Knowledge and Risky Behaviors at Home

Risky behaviors at home associated with:	p-value	Test used	Reason for exclusion from final model
Trimester 1 (vs. trimesters 2 and 3)	0.0292	Chi-square	Not associated with continuous knowledge score
Working in agriculture since becoming pregnant	0.0054	Chi-square	No evidence of confounding or interaction
Having a job where pesticides are used since becoming pregnant	0.0150	Chi-square	No evidence of confounding or interaction
Doing farmwork before becoming pregnant	0.0048	Chi-square	Not associated with continuous knowledge score
Getting fruits and vegetables directly from the field before becoming pregnant	0.0168	Chi-square	Not informative/plausible
Having pesticides applied in the home since becoming pregnant	0.0142	Chi-square	Not associated with continuous knowledge score
Personally applying pesticides in the home before becoming pregnant	0.0051	Chi-square	Not associated with continuous knowledge score
Believing that adults are more resistant to pesticides than children	0.0369	Fisher's exact	Part of susceptibility score
Believing that adults are more resistant to pesticides than babies	0.0010	Fisher's exact	Part of susceptibility score
No education	0.1066	Chi-square	No evidence of confounding or interaction
Low income	0.1138	Chi-square	Not associated with continuous knowledge score
Being born outside of Thailand	0.0843	Chi-square	No evidence of confounding or interaction
Having a previous child	0.0353	Chi-square	Not associated with continuous knowledge score
Having children living at home	0.0526	Chi-square	Not associated with continuous knowledge score
Lower knowledge scores	0.0786	Wilcoxon	
High child's susceptibility attitudes	0.0159	Chi-square	Not associated with continuous knowledge score
High usefulness attitudes	0.1118	t-test	Not associated with continuous knowledge score

Table 32. Building the Final Model for the Association Between Stage of Pregnancy and Risky Behaviors at Home

Risky behaviors at home associated with:	p-value	Test used	Reason for exclusion from final model
Trimester 1 (vs. trimesters 2 and 3)	0.0292	Chi-square	
Working in agriculture since becoming pregnant	0.0054	Chi-square	No evidence of confounding or interaction
Having a job where pesticides are used since becoming pregnant	0.0150	Chi-square	Not associated with stage of pregnancy
Doing farmwork before becoming pregnant	0.0048	Chi-square	No evidence of confounding or interaction
Getting fruits and vegetables directly from the field before becoming pregnant	0.0168	Chi-square	Not informative/plausible
Having pesticides applied in the home since becoming pregnant	0.0142	Chi-square	Not associated with stage of pregnancy
Personally applying pesticides in the home before becoming pregnant	0.0051	Chi-square	Not associated with stage of pregnancy
Believing that adults are more resistant to pesticides than children	0.0369	Fisher's exact	Part of susceptibility score
Believing that adults are more resistant to pesticides than babies	0.0010	Fisher's exact	Part of susceptibility score
No education	0.1066	Chi-square	
Low income	0.1138	Chi-square	Not associated with stage of pregnancy
Being born outside of Thailand	0.0843	Chi-square	No evidence of confounding or interaction
Having a previous child	0.0353	Chi-square	Not associated with stage of pregnancy
Having children living at home	0.0526	Chi-square	Not associated with stage of pregnancy
Lower knowledge scores	0.0786	Wilcoxon	Not associated with stage of pregnancy
High child's susceptibility attitudes	0.0159	Chi-square	Not associated with stage of pregnancy
High usefulness attitudes	0.1118	t-test	Not associated with stage of pregnancy

Table 34. Knowledge Area Scores - Means and Medians

Knowledge Area	Median Score (IQR)	Mean Score (SD)	Range
Pesticide toxicity symptoms	0.78 (0.33)	0.79 (0.19)	0.33-1.00
Intake routes for pesticide exposure	0.80 (0.20)	0.86 (0.10)	0.60-1.00
Potential health impacts of pesticides	0.83 (0.17)	0.84 (0.17)	0.17-1.00
Strategies to prevent pesticide exposure	0.85 (0.14)	0.79 (0.09)	0.43-1.00
Activities that are harmful to the fetus	1.00 (0.13)	0.91 (0.15)	0.25-1.00
Populations that are harmed by pesticides	1.00 (0.17)	0.92 (0.15)	0.17-1.00

Table 35. Knowledge Questions Most Often Missed as Targets for Intervention

Knowledge Question	% Answered Correctly
Not all pesticides have the same adverse health effect on the human body	4 (5%)
Washing hands in the stream after handling pesticides can be effective in preventing pesticide exposure	13 (17%)
A heart attack or stroke is not a symptom of pesticide toxicity	26 (34%)
Getting bit by a mosquito is not an intake pathway for pesticides	27 (36%)
Covering mouth and nose with your hand while spraying pesticides is not effective in preventing pesticide exposure	37 (49%)
Pesticides protect people from pest-related diseases	40 (53%)
Obesity is not a potential health impact of pesticides	50 (66%)
Abdominal pain and diarrhea are symptoms of pesticide toxicity	57 (75%)
Excessive salivation is a symptom of pesticide toxicity	58 (76%)
Coughing and breathlessness are symptoms of pesticide toxicity	58 (76%)
Slower learning is a potential health impact of pesticides	58 (76%)

Table 36. Inconsistencies in Knowledge and Behavior

Behaviors That Can Harm the Fetus	Indicated Knowledge of Harmful Effects	Reported Behavior	Had Knowledge But Reported Behavior
Smoking cigarettes	75 (99%)	1 (1%)	1 (1%)
Spraying pesticides in the home (including on pets)	73 (96%)	28 (37%)	27 (36%)
Spraying pesticides at work	74 (97%)	8 (11%)	8 (11%)
Strategies to Prevent Pesticide Exposure	**Indicated Knowledge of Strategy's Effectiveness**	**Did Not Use Strategy When Necessary**	**Had Knowledge But Did Not Report Using Strategy**
Wearing full protective equipment when handling pesticides	70 (92%)	5 (15%)	4 (5%)
Wearing gloves when handling pesticides	74 (97%)	18 (24%)	18 (24%)
Washing fruits and vegetables before eating them	76 (100%)	6 (8%)	6 (8%)
Washing hands in the stream after handling pesticides	13 (17%)	3 (9%)	1 (1%)
Taking a bath immediately after spraying pesticides	74 (97%)	11 (32%)	10 (13%)
Washing clothes worn at the farm separate from other clothes	76 (100%)	6 (8%)	6 (8%)

Table 37. Factors Associated with an Inconsistency in Declared Knowledge and Reported Behavior – Spraying Pesticides in the Home While Pregnant

Factors Associated with Pesticide-Spraying Inconsistency	p-value	Test Used
Working since becoming pregnant	0.0868	Fisher's exact
Not washing fruits and vegetables before becoming pregnant	0.1237	Fisher's exact
Applying pesticides before becoming pregnant	<0.0001	Chi-square
Housemates applying pesticides before becoming pregnant	0.0446	Chi-square
Knowing that pesticides can harm the general population	0.0466	Fisher's exact
Knowing it is necessary to read the pesticide label	0.0868	Fisher's exact
Knowing that adults are more resistant to pesticides than babies	0.0849	Fisher's exact
Not taking vitamins before becoming pregnant	0.0608	Fisher's exact
Washing clothes separately (among those with housemates who work in agriculture)	0.0730	Fisher's exact
Smoking before becoming pregnant	0.0416	Fisher's exact
Reporting experiencing effects of pesticides	0.0356	Chi-square
Risky behaviors at work	0.0231	Wilcoxon
Risky behaviors at work	0.0159	Chi-square
High usefulness attitudes	0.1279	Fisher's exact

Table 38. Factors Associated with an Inconsistency in Declared Knowledge and Reported Behavior – Wearing Gloves while Spraying Pesticides

Factors Associated with Glove-Wearing Inconsistency	p-value	Test Used
Not washing hands	0.0329	Fisher's exact
Working in food processing before becoming pregnant	0.0834	Fisher's exact
Not washing fruits and vegetables before becoming pregnant	0.0846	Fisher's exact
Using pesticides inside the house (vs. outside only or both)	0.0133	Chi-square
Using pesticides before becoming pregnant	<0.0001	Chi-square
Believing that using a large amount of pesticides for a short time can be harmful to the health of your fetus	0.1052	Fisher's exact
Believing that using a small amount of pesticides for a long time can be harmful to the your health	0.0159	Fisher's exact
Believing that using a small amount of pesticides for a long time can be harmful to the health of your fetus	0.0583	Fisher's exact
Believing that adults are more resistant to pesticides than babies	0.0572	Fisher's exact
Not believing that everyone is responsible for the safe use of pesticides	0.1378	Fisher's exact
Not knowing that pesticide poisoning is a potential health impact of pesticides	0.0831	Fisher's exact
Using pesticides to protect from disease	0.1473	Fisher's exact
Child's father not having any education	0.0959	Chi-square
Housemates who work in agriculture wearing shoes into the home after work (among those with housemates who work in agriculture)	0.0179	Fisher's exact
Reporting effects of pesticides or other environmental exposures	0.0192	Chi-square
Lower cooperation (fair/poor/good vs. excellent)	0.0192	Chi-square
More risky behaviors at work	0.0101	Wilcoxon
Risky behaviors at work	0.0145	Fisher's exact
High personal susceptibility attitudes	0.0551	Fisher's exact
Higher personal susceptibility attitudes	0.0440	Wilcoxon
High child's susceptibility attitudes	0.0065	Chi-square
Higher child's susceptibility attitudes	0.0087	Wilcoxon

Table 39. Final Model for Other Predictors of Risky Behaviors at Work

Predictor	Odds Ratio	Confidence Interval	Width of Confidence Interval	Parameter Estimate	Standard Error	p-value
Intercept	N/A	N/A	N/A	-1.62	0.78	0.0380
Riskyhome	2.20	(1.08, 4.47)	3.39	0.79	0.36	0.0299

Table 40. Final Model for Other Predictors of Risky Behaviors at Home

Predictor	Odds Ratio	Confidence Interval	Width of Confidence Interval	Parameter Estimate	Standard Error	p-value
Intercept	N/A	N/A	N/A	-2.60	0.91	0.0041
Farmbefore	9.47	(2.15, 41.76)	39.61	2.25	0.76	0.0030
Pestapplied	12.16	(1.97, 75.14)	73.18	2.50	0.93	0.0072
Prevchild	4.06	(1.05, 15.73)	14.69	1.40	0.69	0.0428
Susceptchild	5.83	(1.38, 24.66)	23.29	1.76	0.74	0.0167

Table 41. Model Fit Statistics

Outcome	Predictors	R-squared	Percent Concordant Pairs	Percent Discordant Pairs	-2 log L (intercept only)	-2 log L (intercept and covariates)	p-value
Risky behaviors at work							
	Knowledge	0.05	61%	32%	47.0	45.4	0.1991
	Risky behaviors at home	0.16	63%	18%	47.0	41.0	0.0138
Risky behaviors at home							
	Knowledge	0.04	59%	32%	89.6	86.6	0.0855
	Stage of pregnancy	0.08	48%	17%	89.6	83.2	0.0414
	Farmwork before pregnant, pesticides applied before pregnant, previous child, child's susceptibility attitudes	0.34	85%	10%	85.5	55.9	<0.0001

Appendix 1. Photographs of Study Site

Image 1. Agricultural Fields in Fang District, Chiang Mai Province, Thailand

Image 2. Fang Hospital, Fang District, Chiang Mai Province, Thailand

Image 3. Antenatal Care Clinic, Fang Hospital, Fang District,
Chiang Mai Province, Thailand

Appendix 2. KAP Survey

Chiang Mai Birth Cohort – Pilot Study
KAP QUESTIONNAIRE
(Interview immediately after enrollment)

Hello, my name is ______________. I want to start by thanking you for your help with this survey. I want to let you know that all of your answers to these questions are completely confidential. If you feel uncomfortable answering any of these questions, please let me know. We would appreciate your being as honest as possible in your answers. Do you have any questions before we begin? Thank you for helping us with this important project!

INTERVIEWER USE ONLY	
Interviewer initials	____________ □□□
Interview date	□□/□□/□□□□ Day / Month / Year
Interview start time	□□:□□
Language of interview Thai......01 Thai Yai......02 Burmese......03 Other (SPECIFY) ___________________......04	
Patient's due date	□□/□□/□□□□ Day / Month / Year

1. What month of pregnancy are you in? ____ MONTH OF PREGNANCY

A. Occupational Information/Physical Exertion

Now, I would like to ask you some questions about any jobs you may have held since you became pregnant.

1. Have you worked since you became pregnant, since your last menstrual period?

Yes 01
No…….**(NEXT SECTION)** 02
NR 999

		A. Job 1 or most recent job
8.	Since you became pregnant, at this job have you done any agricultural work? (including fertilizer handling and application, agricultural pesticide handling, equipment or tractor operation, foreman of agricultural work, farm field work, packing shed work, nursery or greenhouse work, or waxing fruits)	YES...............01 NO…..............02
11	During this pregnancy, at this job did you do…	
	i. Golf course or other landscape maintenance?	YES …….....01 NO ………….02
	ii. Control for termites or other pests in homes or buildings?	YES …….....01 NO ………….02
	iii. Work in a cannery or food processing plant where you handle fruits or vegetables?	YES …….....01 NO ………….02
12	Since you became pregnant, do/did you apply pesticides or insecticides at this job?	YES…….......01 NO**…………...**02
16	Since you became pregnant, are/were pesticides or insecticides used at this job? **(CODE 777 IF NOT WORKING)**	YES………....01 NO**(GOTO18)**02 NA**(GOTO18)**NA

		A. Job 1 or most recent job
18	During this pregnancy, have you usually worn at this job… i. Long-sleeved shirt?................ ii. Cotton gloves? .... iii. Hat or something covering your head? .... iv. Scarf/handkerchief to cover your face? .... v. Rubber boots?........................	 YES...............01 NO…..............02 YES...............01 NO.................02 YES….............01 NO.................02 YES...............01 NO.................02 YES...............01 NO.................02
20	During this pregnancy, when you are/were at this job, do/did you wash your hands before eating or smoking?	ALWAYS........01 USUALLY......02 SOMETIMES.03 NEVER..........04
21	During the time you worked at this job, did you usually bathe or shower...? i. Daily, before work ii. Daily, immediately after work at work place iii. Daily, immediately after arriving home from work iv. Daily, more than 1 hour after arriving home from work v. Several times a week vi. Once a week or less often	 YES...............01 NO…..............02 YES...............01 NO…..............02 YES...............01 NO…..............02 YES...............01 NO…..............02 YES...............01 NO…..............02 YES...............01 NO…..............02

30.	In the year before you became pregnant, have you done…	
	A. Farm field work?..................................	YES.............. 01 NO.................02
	B. Packing, canning, or food processing where you handled fruits, vegetables, or flowers?..	YES.............. 01 NO.................02
	C. Nursery or greenhouse work?.............	YES.............. 01 NO.................02
	D. Golf course or landscape maintenance?...	YES.............. 01 NO.................02

B. Housing Characteristics

	A…since you became pregnant?	B...in the year before you became pregnant?
10. How often have your fruits and vegetables been washed before you ate them…	Always…………………………..01 Usually……………………….02 Sometimes……………………03 Almost never………………….04 DK…………………………...888 NR…………………………...999	Always…………………………..01 Usually……………………….02 Sometimes……………………03 Almost never………………….04 DK…………………………...888 NR…………………………...999
11. Have you eaten fruits and vegetables that came directly from the fields… (Do not include those from your home garden)	Yes…………………………….01 No…………………………….02 DK…………………………...888 NR…………………………...999	Yes…………………………….01 No…………………………….02 DK…………………………...888 NR…………………………...999

C. House Cleaning

2. How often do you clean your home?	Daily or more often........................ 01 A few times a week .... 02 Once a week .... 03 Once every couple of weeks......... 04 Once a month or less often .... 05 DK .... 888 NR 999

D. Pesticide Use

> I would like to ask you some questions about pesticides that have been used in and around any of the homes you have lived in since you became pregnant. Pesticides can come in sprays, bombs, poison pellets or bait, powder, chalk, roach motels, traps, or ant stakes.

4. Since you became pregnant, have pesticides or insecticides been used around any of your homes to kill pests?	YES .... 01 NO… .... 02 DK 888
4C. Were these pesticides used inside or outside your home?	INSIDE .... 01 OUTSIDE…................. 02 BOTH .... 03 DK 888

4E. How often have these pesticides been applied?

Daily 01
Weekly… 02
1 to 3 times per month 03
<1 time per month 04
DK 888

4F. Did you personally apply any of these pesticides?

YES 01
NO 02
DK 888

5. **(SKIP IF SHE DID NOT PERSONALLY APPLY PESTICIDE)**
When you applied the pesticides, did you wear any protective clothing such as gloves or mask?

YES 01
NO 02
DK 888

11.	In the year before you became pregnant…	
	A. Did you personally apply pesticides at home?..	YES...................................... 01 NO...02 DK…………………………...888
12.	A. Did anyone other than you apply pesticides at your home?............................	YES...................................... 01 NO...02 DK…………………………...888

E. Pesticide Knowledge, Attitudes, Practices

Now I would like to ask you some general questions about human health and pesticides. Please answer as best you can according to your knowledge and opinions.

1. I believe that the following actions could be harmful to my fetus	Yes	No	DK
A. Smoking cigarettes	01	02	888
B. Eating fruits	01	02	888
C. Drinking alcohol	01	02	888
D. Spraying pesticides in the home	01	02	888
E. Spraying pesticides at work	01	02	888
F. Light exercise	01	02	888
G. Taking vitamins	01	02	888
H. Taking supplements	01	02	888

---

2. Exposure to pesticides can have an adverse effect or impact on human health

AGREE.................................. 01
DISAGREE.... **(GO TO 4)**...... 02
NOT SURE.... **(GO TO 4)**.... 888

---

3. If yes, do all the pesticides have the same adverse health effect on the human body?

YES 01
NO.. 02
NOT SURE.......................... 888

4. Pesticides can be harmful to the health of…	Yes	No	DK
A. The general population	01	02	888
B. The agricultural workers who apply them	01	02	888
C. Other agricultural workers	01	02	888
D. People who consume the crops	01	02	888
E. Farm residents	01	02	888
F. Residents of cities and communities near the farm	01	02	888

5. Which of the following are intake pathways for pesticides?	Yes	No	DK
A. Breathing in pesticides	01	02	888
B. Getting bit by a mosquito	01	02	888
C. Getting pesticides on the skin	01	02	888
D. Swallowing pesticides	01	02	888
E. Consuming foods from farms that use pesticides	01	02	888

---

6. It is necessary to read or understand the label of a pesticide bottle or container.

AGREE....................................01
DISAGREE……………….........02
NOT SURE……………..........888

---

7. Pesticide containers can be reused safely after cleaning.

AGREE....................................01
DISAGREE……………….........02
NOT SURE……………..........888

8. Which of the following can be effective in preventing pesticide exposure?	Yes	No	DK
A. Wearing full protective equipment when handling pesticides	01	02	888
B. Wearing gloves when handling pesticides	01	02	888
C. Washing fruits and vegetables before eating them	01	02	888
D. Covering mouth and nose with your hand while spraying pesticides	01	02	888
E. Washing hands in the stream after handling pesticides	01	02	888
F. Taking a bath immediately after spraying pesticides	01	02	888
G. Washing clothes worn at the farm separate from other clothes	01	02	888

9. According to your knowledge, the toxicity symptoms of pesticides can be which of the following?	Yes	No	DK
A. Headache	01	02	888
B. Watery eyes / sore eyes	01	02	888
C. Heart attack / stroke	01	02	888
D. Nausea / vomiting	01	02	888
E. Excessive salivation	01	02	888
F. Cough / cold / chest pain / breathlessness	01	02	888
G. Skin rash / skin irritation / itching	01	02	888
H. Abdominal pain / diarrhea	01	02	888
I. Muscle weakness / fatigue / body pain	01	02	888

10. Have you received training about pesticides?

YES.. 01
NO.......................**(GO TO 12)** 02
NOT SURE ....**(GO TO 12)** 888

11. If yes, please answer the following:

A. Where did you receive training? ____

B. When did you last receive training? ____

C. What topics were discussed in this training?

	Yes	No	DK
i. Pesticide poisoning	01	02	888
ii. Personal protective equipment	01	02	888
iii. Health effects of pesticides	01	02	888
iv. Proper spraying techniques	01	02	888
v. Other, specify _______________________	01	02	888

Do you agree or disagree with the following statements?	Agree	Disagree	Not sure
12. Pesticides protect people from pest-related diseases	01	02	888
13. Pesticides are poisonous	01	02	888
14. Pesticide hazard can cause death	01	02	888
15. You can smoke, drink, and eat during pesticide spraying	01	02	888
16. Using a large amount of pesticides for only a short time is not harmful to my health	01	02	888
17. Using a large amount of pesticides for only a short time is not harmful to the health of my fetus	01	02	888
18. Using a small amount of pesticides for a long time is not harmful to my health	01	02	888
19. Using a small amount of pesticides for a long time is not harmful to the health of my fetus	01	02	888
20. Adults are more resistant to pesticides than children	01	02	888
21. Adults are more resistant to pesticides than babies	01	02	888
22. If I eat and drink near areas where pesticides have been sprayed I will not be exposed to pesticides	01	02	888

23. If a pesticide is sold in the market it means it is safe no matter how or by whom it is used	01	02	888
24. A pesticide is effective only if its effect can be seen immediately after spraying	01	02	888
25. A pesticide is more effective if it is sprayed according to personal experience and not necessarily according to the recommended amount	01	02	888
26. Every person who uses a pesticide is responsible for its safe use	01	02	888
27. After using pesticides for a number of years, a person can develop an immunity to pesticides	01	02	888

28. Which of the following are potential health impacts of pesticides?	Yes	No	DK
A. Pesticide poisoning	01	02	888
B. Cancer	01	02	888
C. Obesity	01	02	888
D. Slower learning	01	02	888
E. Irritated skin	01	02	888
F. Coughing	01	02	888

29. I use pesticides in the home because…	Yes	No	DK
A. They protect my home and family from mosquitoes	01	02	888
B. They protect my home and family from other insects	01	02	888
C. They protect my home and family from rodents	01	02	888
D. They protect my home and family from termites	01	02	888
E. They protect my home and family from other pests	01	02	888
F. They protect my home and family from disease	01	02	888
G. They keep my home clean	01	02	888
H. A family member told me to	01	02	888
I. Following advice from a doctor, nurse, community leader, health volunteer, or government official	01	02	888
J. Other, Specify ________________________________	01	02	888

30. I use pesticides at work because…	Yes	No	DK
A. They kill insects that would harm the plants	01	02	888
B. They kill other pests that would harm the plants	01	02	888
C. They get rid of bacteria growing on the plants	01	02	888
D. They kill other unwanted plants	01	02	888
E. They make the plants grow taller	01	02	888
F. I am told to apply them	01	02	888
G. Other, Specify _______________________________	01	02	888

F. Demographics

1. How old are you? ____ ____ YEARS OLD

---

4. What is the last grade that you completed in school?

None, never attended school....................... 01
P. 1-6 (primary).. 02
M. 1-3 (junior high/high school) 03
M. 4-6 (high school/no diploma) 04
Diploma/technical school/equivalent 05
Some college 06
College graduate or more 07

---

5. Are you currently attending school?

Yes.. 01
No 02
DK.. 888
NR.. 999

---

7. How much money do you and other people who live in your home bring home each month? **(READ CATEGORIES)**

1,500 Baht or less 01
1,501 to 3,000 Baht........................... 02
3,001 to 6,000 Baht........................... 03
6,001 to 9,000 Baht........................... 04
9,001 to 12,000 Baht 05
More than 12,000 Baht 06
DK.. 888
NR.. 999

---

9. Think about where you live, the food you eat, and the things you can afford to do and buy. Do you think you can afford these with your household income?

Yes, I can afford and have enough for saving.................. 01
Yes, I can afford and not have enough for saving............ 02
No... 03

---

10. Now I would like to ask you some questions about your ethnicity. What ethnic group best describes you?

Thai 01
Thai Yai 02
Burmese 03
Chinese 04
Other (SPECIFY) ______________ 05
DK 888
NR 999

---

11. In what country were you born?

Thailand 01
Burma 02
China 03
Other (SPECIFY) ______________ 04
DK 888
NR 999

G. Medical History

Now I would like to ask you questions about any vitamins that you take or have taken in the three months before pregnancy up until now.

19. In the 3 months before you became pregnant, did you take any prenatal or multivitamins?

Yes 01
No 02
DK 888
NR 999

---

20. Since you became pregnant, have you taken any prenatal or multivitamins?

Yes 01
No 02
DK 888
NR 999

H. Pregnancy History

1. Excluding this pregnancy, how many times have you been pregnant? (Probe: No matter what happened with the pregnancy)	____ ____ TIMES DK.................. 888 NR 999
2. How many children do you have that are currently living with you?	____ ____ CHILDREN DK.................. 888 NR 999

I. Paternal Demographics

1. What is your baby's father's ethnic background?	Thai .... 01 Thai Yai.. 02 Burmese... 03 Chinese .... 04 Other (SPECIFY) ______________05 DK.. 888 NR.. 999
2. In what country was your baby's father born?	Thailand .... 01 Burma .... 02 China... 03 Other (SPECIFY) ______________04 DK.. 888 NR.. 999
3. What is the last grade that your baby's father completed in school?	None, never attended school....................... 01 P. 1-6 (primary).. 02 M. 1-3 (junior high/high school) .... 03 M. 4-6 (high school/no diploma) ....04 Diploma/Technical school/equivalent .... 05 Some college... ....06 College graduate or more .... 07 DK.. 888 NR.. 999

J. Household Members

1. Do any of the people who live with you work in agriculture?	YES .... 01 NO .... 02 DK 888
4. Do any of these people (including yourself) usually wear their work shoes into your current home?	YES .... 01 NO .... 02 DK 888
6. Do any of these people wear their regular work clothes in your home for more than ½ hour before they change?	YES .... 01 NO .... 02 DK 888
8. Are these regular work clothes kept separately from other family clothes?	YES .... 01 NO .... 02 DK 888
12. Are these work clothes mixed with the family wash or washed separately?	Mixed with family wash .... 01 Washed separately .... 02 DK 888
13. Does anyone store containers or bags of pesticides from work in or around the home you live in now?	YES .... 01 NO .... 02 DK 888

K. Pets

I would like to know about any pets that have lived inside your home since you became pregnant. Please include any dogs, cats, birds, or other furry pets that belong to you or to anyone who lives inside your home, including people who are not related to you.

2. Since you became pregnant, have you personally applied flea or tick shampoo, dips or powders on any of your pets?
   - YES 01
   - NO ... **(GO TO Q. 4)** 02
   - DK ... **(GO TO Q. 4)** .. 888

3. Did you wear gloves when you used these products?
   - YES 01
   - NO 02

M. Personal Habits Information

Now I would like to ask you some questions about your smoking habits.

---

6. In the three months before you became pregnant, did you smoke any cigarettes?
   - YES 01
   - NO .... **(GO TO Q. 8)** 02
   - DK .... **(GO TO Q. 8)** 888

---

8. Since you became pregnant, have you smoked any cigarettes?
   - YES 01
   - NO .... **(GO TO Q. 10)** 02
   - DK .... **(GO TO Q. 10)** 888

N. Other Exposures and Concerns

4. Do you know of any effects that pesticides or other environmental exposures in Fang District may have had on you or your family? Please mention any and all problems that come to mind.

YES 01
NO 02
DK 888

A. Please explain: ___________________________

____

____

Z. Additional Questions

1. How long have you lived in Fang?	____ ____ YEARS ____ ____ MONTHS (99: Since I was born)
2. Is your current house near an agricultural area?	I live in an agricultural area/orchard/farm .... 01 I live near an agricultural area (<500m)................. 02 I don't live near an agricultural area (>500m)........ 03 DK.. 888 NR 999
3. What Medicare benefits have you used for antenatal care for this pregnancy?	Gold health card .... 01 Health insurance card for foreigner....... 02 Medicare benefit for officer.................... 03 Social Security....................................... 04 None (paid by myself) .... 05 Other, (SPECIFY)________________ 06 DK .... 888 NR 999
4. What month of pregnancy was your first visit to ANC?	____ ____ MONTHS (888: DK)
5. During this pregnancy, how many times have you visited ANC?	____ ____ TMES (888: DK)
6. During this pregnancy, have you visited ANC for every regular appointment?	Yes, on time every appointment .... 01 Yes, but not on time every appointment ..... 02 No, because ______________________ .. 03
7. Currently, do you still work?	YES **(GO TO Q. 8)**.. 01 NO.. **(GO TO Q. 7A)**.. 02
7A. One year ago, did you work?	YES **(GO TO Q. 7B)**.. 01 NO..... **(GO TO Q. 9)**.. 02

7B. When did you stop working?	Before I knew that I was pregnant .... 01 After I knew that I was pregnant .... 02 (at ___ ___ month of pregnancy because ___________________________________ ___________________________________)
8. What is your employment status?	I have my own business/orchard/farm................... 01 I am an employee .... 02 Other, Specify_____________________________ 03
8A. When do you plan to stop working?	____ ____ MONTHS When doctor orders or I can't work anymore...... 77 I will work up until delivery .... 99 DK... 888
9. After delivery, do you plan to work?	YES **(GO TO Q. 9A)**.. 01 NO... **(GO TO Q. 10)**.. 02 DK .. **(GO TO Q. 9A)**.. 02
9A. If you plan to work after delivery, does your work involve agriculture?	YES .... 01 NO 02
9B. When do you plan to start working again?	Within 3 months after delivery .... 01 Within 6 months after delivery .... 02 After 6 months after delivery .... 03 DK 888
10. Do you plan to move from Fang?	YES.**(GO TO Q. 10A)**. 01 NO... **(GO TO Q. 11)**.. 02 DK.....**(GO TO Q. 11)**. 02

10A. When do you plan to move from Fang?	Within 3 months after delivery .... 01 Within 6 months after delivery .... 02 After 6 months after delivery .... 03 DK .... 888 Reason ___________________________ ___________________________________
11. Will you breast feed your baby by yourself?	Yes............ **(GO TO Q. 11A)**................ 01 No... 02 DK .... 888 Reason for No or DK _________________ ___________________________________ ___________________________________
11A. How long will you breast feed your baby?	3 months after delivery .... 01 6 months after delivery .... 02 1 year after delivery .... 03 Over 1 year after delivery .... 04 DK 888

INTERVIEWER REMARKS

PLEASE ANSWER THE FOLLOWING QUESTIONS IMMEDIATELY AFTER THE INTERVIEW.

1. Overall, the respondent's cooperation was:

   Excellent..............................01
   Good....................................02
   Fair......................................03
   Poor.....................................04

แบบสอบถามโครงการนำร่อง รหัส________________

แบบสัมภาษณ์พื้นฐาน ฉบับที่ 2 วันที่ 22 ธันวาคม 2553

(สัมภาษณ์ทันทีหลังจากลงทะเบียน)

สวัสดีค่ะ ดิฉันชื่อ ...... เป็นเจ้าหน้าที่โครงการวิจัยนี้ รู้สึกขอบคุณท่านเป็นอย่างมากที่สละเวลาเพื่อตอบแบบสอบถามนี้ ดิฉันขอยืนยันว่าคำตอบที่ท่านตอบมานั้นจะถูกเก็บเป็นความลับ หากท่านรู้สึกไม่สบายใจหรือไม่อยากตอบคำถามใดสามารถปฏิเสธที่จะตอบคำถามนั้นได้ และขอให้ท่านตอบคำถามต่อไปนี้ด้วยความซื่อสัตย์ หากท่านมีข้อสงสัยใดๆสามารถถามได้ก่อนการสัมภาษณ์นี้ค่ะ

ผู้สัมภาษณ์	______________________ □□□	
วันที่สัมภาษณ์	□□/□□/□□□□ (วันที่/เดือนที่/พ.ศ.)	
เวลาที่สัมภาษณ์	□□:□□ น.	
ภาษาที่ใช้สัมภาษณ์		
	ไทย...01	
	ไทใหญ่...02	
	พม่า...03	
	อื่นๆ (ระบุ) ________________..................04	
กำหนดคลอด	□□/□□/□□□□	(วันที่/เดือนที่/พ.ศ.)

1. **ขณะนี้** ท่านมีอายุครรภ์กี่เดือน □ เดือน

ส่วนที่ A : อาชีพและกิจกรรมทางกายภาพ

ต่อไปนี้ ดิฉันจะขอถามท่านเกี่ยวกับงานที่ท่านทำตั้งแต่ท่านได้เริ่มตั้งครรภ์นี้

1. **ตั้งแต่เริ่มตั้งครรภ์นี้**หรือหลังจากประจำเดือนไม่มา ท่านได้ทำงานหรือไม่

ใช่...01

ไม่ใช่..02 (ข้ามไปทำส่วนที่ B: ลักษณะที่อยู่อาศัย)

ไม่ตอบ..999

*ดิฉันจะถามท่านเกี่ยวกับงานที่ท่านได้ทำ**ระหว่างที่ตั้งครรภ์นี้** โดยจะเริ่มถามจากงานที่ทำล่าสุด*

(หากอาสาสมัครทำงานมากกว่า 1อย่าง ให้ผู้สัมภาษณ์ถามไปทีละงาน)

คำถามต่อไปนี้เป็นคำถามเกี่ยวกับข้อมูล**ตั้งแต่เริ่มตั้งครรภ์นี้**	A งานที่ 1 หรืองานล่าสุด
8. **ตั้งแต่เริ่มตั้งครรภ์** ท่านทำงานเกษตรหรือไม่ (ได้แก่ การใช้ปุ๋ย การใช้สารเคมีกำจัดศัตรูพืช การใช้เครื่องมือเครื่องจักรทางการเกษตร คนงานในสวน ทำสวนทำไร่ บรรจุหีบห่อพืชผล ดูแลสวนหย่อม หรือ แว็กซ์เคลือบผลไม้)	ใช่...........01 ไม่ใช่........02
11. **ตั้งแต่เริ่มตั้งครรภ์นี้**ท่านทำอะไรบ้างในงานนั้น i. ดูแลพื้นที่สวนหย่อม สนามหญ้าในรีสอร์ท หรือสถานที่ท่องเที่ยว ตกแต่งสวน	ใช่...........01 ไม่ใช่........02
ii. กำจัดแมลงรบกวนภายในอาคาร	ใช่...........01 ไม่ใช่........02
iii. โรงงานผักผลไม้บรรจุกระป๋อง หรือโรงงานอาหารที่เกี่ยวข้องกับพืชผักผลไม้	ใช่...........01 ไม่ใช่........02
12. **ตั้งแต่เริ่มตั้งครรภ์** ท่านได้ใช้สารเคมีกำจัดศัตรูพืชในงานนี้หรือไม่	ใช่...........01 ไม่ใช่........02
16. **ตั้งแต่เริ่มตั้งครรภ์** ที่ทำงานของท่านมีการใช้สารเคมีกำจัดศัตรูพืชหรือไม่ (ไม่ได้ทำงาน............777 และไปข้อ 18)	ใช่...........01 ไม่ใช่........02 (ไปข้อ 18)
18. **ตั้งแต่เริ่มตั้งครรภ์นี้**ท่านได้สวม...ดังต่อไปนี้บ้างหรือไม่ i. เสื้อแขนยาว	ใช่...........01 ไม่ใช่........02

ส่วนที่ A : อาชีพและกิจกรรมทางกายภาพ　　　　　　　　　　　　　　　　รหัส_______________

คำถามต่อไปนี้เป็นคำถามเกี่ยวกับข้อมูล**ตั้งแต่เริ่มตั้งครรภ์นี้**	A งานที่ 1 หรืองานล่าสุด
ii. ถุงมือผ้า	ใช่...........01 ไม่ใช่........02
iii. หมวกหรือผ้าคลุมศีรษะ	ใช่...........01 ไม่ใช่........02
iv. ผ้าคลุมหน้า ผ้าเช็ดหน้าสำหรับปิดหน้า	ใช่...........01 ไม่ใช่........02
v. รองเท้าบู๊ท	ใช่...........01 ไม่ใช่........02
20. **ตั้งแต่เริ่มตั้งครรภ์นี้**ในเวลาทำงานท่านได้ล้างมือก่อนทานอาหารหรือสูบบุหรี่หรือไม่	ทุกครั้ง.......01 บ่อยๆ.......02 บางครั้ง.....03 ไม่เคย.......04
21.ขณะทำงาน ท่านมักจะอาบน้ำชำระร่างกายอย่างไร	
i ทุกวัน, ก่อนทำงาน	ใช่...........01 ไม่ใช่........02
ii ทุกวัน, อาบทันทีในที่ทำงานหลังเสร็จงาน	ใช่...........01 ไม่ใช่........02
iii ทุกวัน, ทันทีที่กลับบ้าน	ใช่...........01 ไม่ใช่........02
iv ทุกวัน, หลังกลับบ้านมากกว่า 1 ชั่วโมง	ใช่...........01 ไม่ใช่........02
v อาบเป็นบางวันในหนึ่งสัปดาห์	ใช่...........01 ไม่ใช่........02
vi สัปดาห์ละครั้งหรือน้อยกว่านั้น	ใช่...........01 ไม่ใช่........02

ส่วนที่ A : อาชีพและกิจกรรมทางกายภาพ รหัส_______________

*คำถามต่อไปนี้เป็นคำถามเกี่ยวกับอาชีพของท่านและสมาชิกในครอบครัวท่าน**<u>ในช่วง 1 ปีก่อนที่ท่านจะตั้งครรภ์</u>***

30. **<u>ใน 1 ปีก่อนตั้งครรภ์</u>** คุณได้ทำงานเหล่านี้หรือไม่	ใช่	ไม่ใช่
A. ทำงานในเรือกสวนไร่นา	01	02
B. ทำงานบรรจุ ห่อ หรือกระบวนการอาหารที่ต้องสัมผัสผัก ผลไม้ และดอกไม้	01	02
C. ทำงานในโรงเพาะชำต้นไม้	01	02
D. ทำงานดูแลสนามหญ้า สวนหย่อมในสนามกอล์ฟหรือรีสอร์ท	01	02

ส่วนที่ B : พฤติกรรมการบริโภค

	A. ตั้งแต่ท่านเริ่มตั้งครรภ์นี้	B. 1 ปีก่อนหน้าตั้งครรภ์นี้
10. ท่านล้างผักผลไม้ก่อนรับประทานบ่อยเท่าใด	ทุกครั้ง...01 เกือบทุกครั้ง...02 บางครั้ง...03 แทบไม่เคย...04 ไม่ตอบ...999	ทุกครั้ง...01 เกือบทุกครั้ง...02 บางครั้ง...03 แทบไม่เคย...04 ไม่ตอบ...999
11. ท่านได้เก็บผักผลไม้จากสวนมากินสดๆหรือไม่ (ไม่รวมที่ปลูกกินเองที่บ้าน)	ใช่...01 ไม่ใช่...02 ไม่ทราบ...888 ไม่ตอบ...999	ใช่...01 ไม่ใช่...02 ไม่ทราบ...888 ไม่ตอบ...999

ส่วนที่ C : การทำความสะอาดที่พักอาศัย

2. ท่านทำความสะอาดที่พักอาศัยบ่อยเพียงใด

ทุกวัน...01
สัปดาห์ละสองสามวัน...02
สัปดาห์ละครั้ง...03
สองสัปดาห์ทำ 1 ครั้ง...04
เดือนละครั้งหรือน้อยกว่า...05
ไม่ทราบ...888
ไม่ตอบ...999

ส่วนที่ D :การใช้สารเคมีกำจัดศัตรูพืช รหัส________________

ส่วนที่ D : การใช้สารเคมีกำจัดศัตรูพืช

*ดิฉันจะถามเกี่ยวกับการใช้สารเคมีกำจัดแมลงและสัตว์รบกวนภายในหรือรอบๆบริเวณที่พักอาศัยของท่าน**ตั้งแต่เริ่มตั้งครรภ์นี้** ซึ่งสารเคมีดังกล่าวอาจเป็น แบบสเปรย์ฉีดพ่น ระเบิด ก้อนหรือเม็ด ผงโรย ชอล์กขีด กับดักกาว กับดักกล หรืออื่นๆ*

4. **ตั้งแต่เริ่มตั้งครรภ์นี้** มีการใช้สารเคมีเพื่อกำจัดแมลงหรือสัตว์รบกวนภายในที่พักอาศัยของท่านหรือไม่

ใช่………………………………..01 ไม่ใช่…………………………..02

ไม่ทราบ……………………………888

4C. ท่านได้ใช้สารเคมีนี้ใช้ภายในหรือภายนอกที่พักอาศัย

ภายใน ....01 ทั้งคู่............03

ภายนอก.....02 ไม่ทราบ....888

4E. ท่านได้ใช้สารเคมีนี้บ่อยเพียงใด

ทุกวัน.................01 <1 ครั้งต่อเดือน....04

ทุกสัปดาห์..........02 ไม่ทราบ............888

1-3 ครั้งต่อเดือน...03

4F. ท่านเป็นผู้ใช้สารเคมีนี้เองหรือไม่

ใช่......01 ไม่ทราบ....888

ไม่ใช่..02

5. (ข้ามถ้าท่านไม่ได้ใช้ยากำจัดแมลงหรือสัตว์รบกวนด้วยตัวเอง)

ขณะที่ใช้ยากำจัดแมลงหรือสัตว์รบกวน ท่านได้สวมเครื่องแต่งกายป้องกันเช่น ถุงมือ หรือหน้ากากหรือไม่

ใช่……………………………………..01 ไม่ใช่…………………………………..02

ไม่ทราบ……………………………888

11. **<u>ในระยะ 1 ปีก่อนตั้งครรภ์</u>**

A <u>ท่าน</u>ได้ใช้สารเคมีกำจัดแมลงที่บ้านหรือไม่

ใช่……………………..01 ไม่ใช่……………………02

ไม่ทราบ………………888

12. **<u>ในระยะ 1 ปีก่อนตั้งครรภ์</u>**

A <u>สมาชิกภายในบ้าน</u>ได้ใช้สารเคมีกำจัดแมลงที่บ้านหรือไม่

ใช่………………..01 ไม่ทราบ………888

ไม่ใช่………………02

ส่วนที่ E :การทดสอบความรู้ ทัศนคติ และการปฏิบัติเกี่ยวกับการใช้สารเคมีกำจัดศัตรูพืช รหัส_______________

ส่วนที่ E : การทดสอบความรู้ ทัศนคติ และการปฏิบัติเกี่ยวกับการใช้สารเคมีกำจัดศัตรูพืช

ดิฉันจะถามเกี่ยวกับความรู้และความเห็นของท่านต่อสุขภาพและสารเคมีกำจัดแมลงหรือศัตรูพืช ขอให้ท่านเลือกคำตอบที่ตรงกับท่านมากที่สุด

1. **ท่านเชื่อว่า**สิ่งต่างๆต่อไปนี้เป็นอันตรายต่อทารกในครรภ์ของท่าน	ใช่	ไม่ใช่	ไม่แน่ใจ
A. สูบบุหรี่	01	02	888
B. ทานผลไม้	01	02	888
C. ดื่มเครื่องดื่มแอลกอฮอล์	01	02	888
D. ใช้สารกำจัดแมลงหรือศัตรูพืชในบ้าน	01	02	888
E. ใช้สารกำจัดแมลงหรือศัตรูพืชที่ทำงาน	01	02	888
F. ออกกำลังกายเบาๆ	01	02	888
G. ทานวิตามิน	01	02	888
H. ทานอาหารเสริม	01	02	888
2. **ท่านเห็นด้วยว่า**การสัมผัสสารเคมีกำจัดศัตรูพืชจะก่อให้เกิดผลเสียกับสุขภาพของท่าน	01 ไปข้อ 3	02 ไปข้อ 4	888 ไปข้อ 4
3 ถ้าใช่ สารเคมีกำจัดศัตรูพืชทุกชนิดจะมีผลต่อสุขภาพเหมือนๆกัน	01	02	888
4. สารเคมีกำจัดศัตรูพืชเป็นอันตรายต่อสุขภาพแก่ใครบ้าง			
A คนทั่วไป	01	02	888
B เกษตรกรที่ใช้สาร	01	02	888
C เกษตรกรทั่วไป	01	02	888
D ผู้ที่ทานพืชผักผลไม้	01	02	888
E ผู้ที่อาศัยในพื้นที่เกษตร	01	02	888
F ผู้ที่อาศัยใกล้พื้นที่เกษตร	01	02	888
5. เราสามารถได้รับสารสัมผัสสารเคมีกำจัดศัตรูพืชได้จากทางใดต่อไปนี้			
A การสูดดมสารเคมีฯเข้าสู่ร่างกาย	01	02	888
B โดนยุงกัด	01	02	888
C สารเคมีฯซึมผ่านผิวหนัง	01	02	888
D การกลืนกินสารเคมีฯเข้าไป	01	02	888
E ทานพืชผักผลไม้สดๆจากสวนที่มีการใช้สารเคมีฯ	01	02	888

6. **ท่านเห็นด้วยว่า**การอ่านฉลากคำแนะนำการใช้สารเคมีกำจัดศัตรูพืชให้เข้าใจก่อนใช้มีความจำเป็น

เห็นด้วย………..01 ไม่เห็นด้วย…….02

ไม่แน่ใจ………888

ส่วนที่ E :การทดสอบความรู้ ทัศนคติ และการปฏิบัติเกี่ยวกับการใช้สารเคมีกำจัดศัตรูพืช รหัส_______________

7. **ท่านเห็นด้วยว่า**ภาชนะบรรจุสารเคมีกำจัดศัตรูพืชสามารถนำมาใช้ใหม่ได้หลังจากทำความสะอาดแล้ว

เห็นด้วย...........01 ไม่เห็นด้วย........02

ไม่แน่ใจ.........888

8. ท่านสามารถหลีกเลี่ยงการสัมผัสสารเคมีกำจัดศัตรูพืชได้โดยอุปกรณ์ใดบ้างต่อไปนี้	ใช่	ไม่ใช่	ไม่แน่ใจ
A. สวมชุดและอุปกรณ์ป้องกันทั้งตัวเมื่อต้องใช้สารเคมีกำจัดศัตรูพืช	01	02	888
B. สวมถุงมือเมื่อต้องใช้สารเคมีกำจัดศัตรูพืช	01	02	888
C. ล้างผักผลไม้ก่อนรับประทาน	01	02	888
D. ใช้มือปิดปากและจมูกระหว่างเก็บเกี่ยว	01	02	888
E. ล้างมือในแหล่งน้ำในสวน	01	02	888
F. อาบน้ำทันทีหลังจากฉีดพ่นสารเคมีกำจัดศัตรูพืช	01	02	888
G. ซักเสื้อผ้าที่ใส่ทำงานในสวนแยกกับเสื้อผ้าอื่นๆ	01	02	888
9. **ตามที่ท่านทราบ** อาการใดต่อไปนี้ที่เกิดจากการสัมผัสสารเคมีกำจัดศัตรูพืช			
A. ปวดหัว	01	02	888
B. แสบตา น้ำตาไหล	01	02	888
C. โรคหัวใจ, หลอดเลือดตีบ	01	02	888
D. คลื่นไส้ อาเจียน	01	02	888
E. น้ำลายมาก	01	02	888
F. ไอ/ มีไข้/ เจ็บหน้าอก/ หายใจติดขัด	01	02	888
G. ผิวหนังแสบไหม้ ระคายเคือง คัน	01	02	888
H. ปวดท้อง ท้องเสีย	01	02	888
I. อ่อนเพลียเมื่อยล้า กล้ามเนื้อไม่มีแรง	01	02	888

ส่วนที่ E :การทดสอบความรู้ ทัศนคติ และการปฏิบัติเกี่ยวกับการใช้สารเคมีกำจัดศัตรูพืช รหัส______________

10. ท่านเคยเข้าฝึกอบรมเกี่ยวกับสารเคมีกำจัดศัตรูพืชหรือไม่

ใช่...........................01　　　　ไม่แน่ใจ…………...888 ไปข้อ 12

ไม่ใช่.....................02 ไปข้อ 12

11. ถ้าเคย　A. ท่านฝึกอบรมที่ใด (ระบุ) ____________________

B. ท่านฝึกอบรมครั้งสุดท้ายเมื่อใด (ระบุ) __ __/ __ __ __ __ (เดือน / พ.ศ.)

C. ท่านเคยฝึกอบรมในเรื่องใด	ใช่	ไม่ใช่	ไม่แน่ใจ
i ความเป็นพิษของสารเคมีกำจัดศัตรูพืช	01	02	888
ii การป้องกันตนเองจากอันตรายจากการใช้สารเคมีกำจัดศัตรูพืช	01	02	888
iii ผลกระทบต่อสุขภาพจากสารเคมีกำจัดศัตรูพืช	01	02	888
iv เทคนิคการใช้สารเคมีกำจัดศัตรูพืชอย่างถูกวิธี	01	02	888
v อื่นๆ ระบุ________________________	01	02	888

ส่วนที่ E :การทดสอบความรู้ ทัศนคติ และการปฏิบัติเกี่ยวกับการใช้สารเคมีกำจัดศัตรูพืช รหัส_______________

ข้อ	ท่านเห็นด้วยกับข้อความต่อไปนี้หรือไม่	เห็นด้วย	ไม่เห็นด้วย	ไม่แน่ใจ
12	สารกำจัดแมลงป้องกันคนจากโรคติดเชื้อที่เกิดจากแมลงได้	01	02	888
13	สารเคมีกำจัดแมลงหรือศัตรูพืชเป็นสารพิษ	01	02	888
14	อันตรายจากสารเคมีกำจัดแมลงหรือศัตรูพืชทำให้ตายได้	01	02	888
15	เราสามารถสูบบุหรี่ ดื่มน้ำหรือทานอาหารระหว่างฉีดพ่นสารเคมีกำจัดศัตรูพืช	01	02	888
16	การใช้สารเคมีกำจัดศัตรูพืชในปริมาณมากในช่วงเวลาสั้นๆไม่เป็นอันตรายต่อสุขภาพของท่าน	01	02	888
17	การใช้สารเคมีกำจัดศัตรูพืชในปริมาณมากในช่วงเวลาสั้นๆไม่เป็นอันตรายต่อสุขภาพทารกในครรภ์ของท่าน	01	02	888
18	การใช้สารเคมีกำจัดศัตรูพืชในปริมาณน้อยๆเป็นเวลานานไม่เป็นอันตรายต่อสุขภาพของท่าน	01	02	888
19	การใช้สารเคมีกำจัดศัตรูพืชในปริมาณน้อยๆเป็นเวลานานไม่เป็นอันตรายต่อสุขภาพทารกในครรภ์ของท่าน	01	02	888
20	ผู้ใหญ่มีความต้านทานต่อสารเคมีกำจัดศัตรูพืชมากกว่าเด็ก	01	02	888
21	ผู้ใหญ่มีความต้านทานต่อสารเคมีกำจัดศัตรูพืชมากกว่าทารก	01	02	888
22	การดื่มน้ำหรือทานอาหารใกล้บริเวณที่มีการฉีดพ่นสารเคมีกำจัดศัตรูพืชไม่เป็นอันตราย	01	02	888
23	ถ้าสารเคมีกำจัดศัตรูพืชใดมีวางขายในร้านค้าทั่วไป แสดงว่าไม่เป็นอันตรายไม่ว่าจะนำไปใช้โดยผู้ใดหรืออย่างไร	01	02	888
24	สารเคมีกำจัดศัตรูพืชจะมีประสิทธิภาพก็ต่อเมื่อสามารถเห็นผลออกฤทธิ์ทันทีหลังฉีดพ่นเท่านั้น	01	02	888
25	การใช้ปริมาณสารเคมีกำจัดศัตรูพืชตามประสบการณ์ที่เคยใช้ให้ประสิทธิภาพดีกว่าใช้ในปริมาณตามคำแนะนำในฉลาก	01	02	888
26	ผู้ที่ใช้สารเคมีกำจัดศัตรูพืชทุกคนควรตระหนักถึงความปลอดภัยในการใช้สารเคมีกำจัดศัตรูพืช	01	02	888
27	ร่างกายสามารถสร้างภูมิต้านทานต่อพิษของสารเคมีกำจัดศัตรูพืชได้หลังจากได้ใช้สารเคมีกำจัดศัตรูพืชเป็นเวลานานหลายปี	01	02	888

ส่วนที่ E :การทดสอบความรู้ ทัศนคติ และการปฏิบัติเกี่ยวกับการใช้สารเคมีกำจัดศัตรูพืช รหัส______________

28. สารเคมีกำจัดศัตรูพืชสามารถก่อให้เกิดผลต่อสุขภาพดังต่อไปนี้	ใช่	ไม่ใช่	ไม่แน่ใจ
A . ความเป็นพิษจากสารเคมีกำจัดศัตรูพืช	01	02	888
B. มะเร็ง	01	02	888
C. อ้วน	01	02	888
D. เวียนรู้ช้า	01	02	888
E. ระคายเคืองผิวหนัง	01	02	888
F. ไอ	01	02	888

29. ท่านใช้สารเคมีกำจัดแมลงหรือศัตรูพืชภายในบ้าน เพราะ	ใช่	ไม่ใช่	ไม่แน่ใจ
A . ป้องกันยุง	01	02	888
B. ป้องกันแมลงอื่น เช่น แมลงสาบ มด	01	02	888
C. ป้องกันสัตว์กัดแทะ เช่น หนู	01	02	888
D. ป้องกันปลวก	01	02	888
E. ป้องกันสัตว์รบกวนอื่นๆ	01	02	888
F. ป้องกันโรค	01	02	888
G. เพื่อให้บ้านสะอาด	01	02	888
H. สมาชิกภายในบ้านบอกให้ใช้	01	02	888
I. ทำตามเจ้าหน้าที่แนะนำ เช่น หมอ พยาบาล เจ้าหน้าที่สถานีอนามัย อสม	01	02	888
J. อื่นๆ ระบุ___________________________	01	02	888

30. ท่านใช้สารเคมีกำจัดศัตรูพืชที่ทำงานเพราะ	ใช่	ไม่ใช่	ไม่แน่ใจ
A . กำจัดแมลงที่ทำลายพืชผล	01	02	888
B. กำจัดสัตว์รบกวนอื่นๆที่ทำลายพืชผล เช่น หนู	01	02	888
C. กำจัดจุลินทรีย์ที่ก่อโรคในพืช	01	02	888
D. กำจัดวัชพืช	01	02	888
E. เพื่อให้พืชผลเจริญเติบโตดีขึ้น	01	02	888
F. มีผู้อื่นบอกให้ใช้	01	02	888
G. อื่นๆ ระบุ___________________________	01	02	888

ส่วนที่ F : ข้อมูลประชากรทั่วไป

1. อายุ _______ปี

4. การศึกษาสูงสุด

ไม่เคยเรียนหนังสือ……………………..01	อนุปริญญา หรือประกาศนียบัตร……..05
ประถมศึกษาปีที่ 1-6 …………………..02	ปริญญาตรี……………………………….06
มัธยมศึกษาปีที่ 1-3……………………..03	สูงกว่าปริญญาตรี………………………..07
มัธยมศึกษาปีที่ 4-6……………………..04	

5. ขณะนี้ท่านกำลังศึกษาอยู่หรือไม่

ใช่ ……………………………….01	ไม่ใช่…………………………..02
ไม่ทราบ…………………………..888	ไม่ตอบ………………………..999

7. รายได้<u>ทั้งหมดของครอบครัว</u>ต่อเดือน ของท่านคือ

น้อยกว่าหรือเท่ากับ 1,500 บาท......01	9,001 - 12,000 บาท........................05
1,501 - 3,000 บาท.........................02	มากกว่า 12,000 บาท......................06
3,001 - 6,000 บาท.........................03	ไม่ทราบ…………………………..888
6,001 - 9,000 บาท.........................04	ไม่ตอบ……………………………..999

9. รายได้ของครอบครัวท่านพอใช้สำหรับเป็นค่าใช้จ่ายภายในบ้านของท่านหรือไม่

พอใช้ และมีเงินเหลือเก็บ…………..01	พอใช้ แต่ไม่มีเงินเหลือเก็บ......02
ไม่พอใช้ …………………………..03	

10. ท่านเป็นคนเชื้อชาติ/ชนเผ่าใด

ไทย ……………………………………01	อื่นๆ (ระบุ) _____________.............05
ไทใหญ่..02	ไม่ทราบ………………………………888
พม่า..03	ไม่ตอบ………………………………..999
จีน/จีนฮ่อ...04	

11. ท่านมีสัญชาติอะไร (ประเทศที่เกิด)

ไทย......(ไปข้อ 14)……………......01	อื่นๆ (ระบุ) _____________.......04
พม่า...02	ไม่ทราบ………………………888
จีน……......................................03	ไม่ตอบ………………………..999

ส่วนที่ G : ประวัติทางการแพทย์

*ดิฉันจะถามเกี่ยวกับข้อมูลสุขภาพและประวัติทางการแพทย์ของท่าน**ในช่วงสามเดือนก่อนตั้งครรภ์นี้จนถึงปัจจุบัน***

19. **<u>ในระยะเวลา 3 เดือนก่อนตั้งครรภ์</u>** ท่านได้รับประทานวิตามินเสริมหรือไม่

ใช่……………………01 ไม่ใช่………………..02

ไม่ทราบ……………888 ไม่ตอบ……………..999

20. **ตั้งแต่เริ่มตั้งครรภ์นี้** ท่านได้รับประทานวิตามินเสริมหรือไม่

ใช่…………..01 ไม่ใช่……….02 (ไปข้อ 22)

ไม่ทราบ……888 (ไปข้อ 22) ไม่ตอบ…….999 (ไปข้อ 22)

ส่วนที่ H : ประวัติการตั้งครรภ์

1. ท่านเคยตั้งครรภ์ทั้งหมดกี่ครั้ง **ไม่รวมครั้งนี้** (ไม่ว่าผลตั้งครรภ์จะเป็นอย่างไร) □□ ครั้ง

ไม่ทราบ………………………………888 ไม่ตอบ…………………………………999

2. ปัจจุบัน ท่านมีบุตรอยู่กี่คน □□ คน

ไม่ทราบ………………………………888 ไม่ตอบ…………………………………999

ส่วนที่ I :ข้อมูลบิดา รหัส_______________

ส่วนที่ I : ข้อมูลสามีของท่าน (บิดาของบุตรในครรภ์นี้)

1. สามีของท่านเป็นคนเชื้อชาติ/ชนเผ่าใด

ไทย 01
ไทใหญ่.................................02
พม่า......................................03
จีน/จีนฮ่อ..............................04
อื่นๆ (ระบุ) ____________05
ไม่ทราบ.......................888
ไม่ตอบ.......................999

2. สามีของท่านมีสัญชาติอะไร

ไทย..01
พม่า..02
จีน..03
อื่นๆ (ระบุ) ____________.......04
ไม่ทราบ.............................888
ไม่ตอบ.............................999

3. การศึกษาสูงสุดของสามีของท่าน

ไม่เคยเรียนหนังสือ...........................01
ประถมศึกษาปีที่ 1-6 02
มัธยมศึกษาปีที่ 1-3..........................03
มัธยมศึกษาปีที่ 4-6..........................04
อนุปริญญา หรือประกาศนียบัตร.........05
ปริญญาตรี......................................06
สูงกว่าปริญญาตรี............................07

ส่วนที่ L :สมาชิกในครอบครัว รหัส_______________

ส่วนที่ J : สมาชิกในครอบครัว

1. มีผู้ที่เคยพักอาศัยอยู่ร่วมกันกับท่านที่ทำงานเกี่ยวข้องกับการเกษตรหรือไม่

ใช่...........01

ไม่ใช่........02

4. มีสมาชิกที่อาศัยอยู่ร่วมกับท่านทั้งหมดกี่คน (รวมตัวท่านเองด้วย) ที่สวมหรือนำรองเท้าที่ใส่ทำงานเข้ามาภายในที่พักอาศัย

☐☐ คน (ไม่มี ....00 ไม่ทราบ............888)

ได้แก่ (ชื่อ)____

6. สมาชิกที่อาศัยสวมเครื่องแต่งกายที่ใส่ทำงานเข้ามาภายในที่พักอาศัย นานมากว่าครึ่งชั่วโมงก่อนเปลี่ยนเครื่องแต่งกายหรือไม่

ใช่..01 ไม่ใช่...................................02

ไม่ทราบ.................................888

8. ท่านเก็บชุดเครื่องแต่งกายสำหรับใส่ทำงานแยกจากเสื้อผ้าอื่นๆหรือไม่

ใช่..01 ไม่ใช่.......................................02

ไม่ทราบ.................................888

9. ท่านเก็บชุดเครื่องแต่งกายสำหรับใส่ทำงานในถุงหรือกล่องปิดผนึกเฉพาะแยกต่างหากหรือไม่

ใช่..01 ไม่ใช่.......................................02

ไม่ทราบ.................................888

12. เสื้อผ้าที่สวมใส่ทำงานเหล่านี้ซักรวมหรือแยกจากเสื้อผ้าของครอบครัว

รวม...............................01 ไม่ทราบ.......................888

แยก...............................02

13. มีผู้นำภาชนะบรรจุสารเคมีกำจัดศัตรูพืชจากที่ทำงานกลับมาที่พักหรือรอบที่พักของท่านใช่หรือไม่

ใช่..01 ไม่ทราบ.......................................888

ไม่ใช่.......................................02

ส่วนที่ K : สัตว์เลี้ยง

ดิฉันจะถามเกี่ยวกับสัตว์เลี้ยงภายในที่พักอาศัยของท่านในช่วงที่ท่านตั้งครรภ์นี้ ได้แก่ สุนัข แมว นก หรือสัตว์มีขนอื่นๆ ที่ท่านหรือสมาชิกภายในบ้านท่านเลี้ยงไว้

2. **ตั้งแต่เริ่มตั้งครรภ์นี้** ท่านได้ใช้ผลิตภัณฑ์กำจัดเห็บหมัด เช่น แชมพู แป้ง กับสัตว์เลี้ยงของท่านหรือไม่

ใช่……………………….01 ไม่ใช่……………………...02 (ไปข้อ 4)

ไม่ทราบ…………………888(ไปข้อ 4)

3. ท่านสวมใส่ถุงมือขณะใช้ผลิตภัณฑ์ดังกล่าว

ใช่…………………………………..01 ไม่ใช่………………………………...02

ส่วนที่ M : ลักษณะนิสัย

ดิฉันจะขอถามเกี่ยวกับประวัติการสูบบุหรี่ของท่าน

6. **<u>ในช่วงสามเดือนก่อนตั้งครรภ์</u>**ท่านสูบบุหรี่หรือไม่

ใช่…………………..01 ไม่ใช่………………..02 (ข้ามไปข้อ 8)

ไม่ทราบ……………888 (ข้ามไปข้อ 8)

8. **ตั้งแต่เริ่มตั้งครรภ์นี้**ท่านสูบบุหรี่อยู่หรือไม่

ใช่………………..01 ไม่ใช่……………..02 (ข้ามไปข้อ 10)

ไม่ทราบ…………888 (ข้ามไปข้อ 10)

ส่วนที่ Z : คำถามเพิ่มเติม

1. ท่านอาศัยอยู่ในอำเภอฝางมานานเท่าใดจนถึงปัจจุบัน __ __ปี กับ __ __เดือน ตั้งแต่เกิด 99

2. ที่พักอาศัยปัจจุบันของท่านอยู่ในพื้นที่การเกษตรหรือไม่

ตั้งอยู่กลางพื้นที่เกษตรหรือสวนไร่นา...........01 ไม่ทราบ...888

อยู่ใกล้พื้นที่เกษตร (ไม่เกิน 500 เมตร)..........02 ไม่ตอบ...999

ไม่ใกล้พื้นที่เกษตร(เกิน 500 เมตร)...............03

3. ในการตั้งครรภ์ครั้งนี้ ท่านใช้สิทธิสวัสดิการอะไรบ้างในการใช้บริการโรงพยาบาล

บัตรทอง..01 ไม่ได้ใช้สิทธิพิเศษ(จ่ายเงินเอง)..................05

บัตรประกันสุขภาพต่างด้าว.......................02 อื่นๆ ระบุ___________________________06

สิทธิข้าราชการ พนักงานของรัฐ รัฐวิสาหกิจ...03 ไม่ทราบ...888

ประกันสังคม.......................................04 ไม่ตอบ...999

4. ท่านมาฝากครรภ์นี้ครั้งแรกที่โรงพยาบาลฝางตอนอายุครรภ์เท่าใด __ __เดือน

ไม่ทราบ.........................888

5. ตั้งแต่เริ่มตั้งครรภ์นี้ ท่านมาพบแพทย์ตามนัดแล้วทั้งหมดกี่ครั้ง __ __ครั้ง ไม่ทราบ..............888

6. ในการตั้งครรภ์ครั้งนี้ ท่านได้มาตรวจครรภ์ตามที่แพทย์นัดสม่ำเสมอทุกครั้งหรือไม่

ทุกครั้ง ตามนัด...01 ไม่ทุกครั้ง เพราะ__________________.........03

ทุกครั้ง แต่มีบางครั้งมาไม่ตรงตามนัด...........02

7. ขณะนี้ ท่านทำงานอยู่หรือไม่

ใช่..................01 (ไปข้อ 8) ไม่ใช่...................02 (ไปข้อ 7A)

7A. 1 ปีก่อนหน้านี้ ท่านทำงานหรือไม่

ใช่..................01 (ไปข้อ 7B) ไม่ใช่...................02 (ไปข้อ 9)

7B. ถ้าท่านเคยทำงานมาก่อนหน้านี้ ท่านหยุดงานตั้งแต่เมื่อไหร่ (แล้วข้ามไปข้อ 9)

ก่อนทราบว่าตั้งครรภ์

หลังทราบว่าตั้งครรภ์ ตอนอายุครรภ์ ______เดือน เหตุผลการหยุดงาน_________________________________

ส่วนที่ Z :คำถามเพิ่มเติม รหัส_______________

8. ถ้าปัจจุบันท่านยังทำงานอยู่ ท่านมีสถานะการทำงานอย่างไร

ธุรกิจส่วนตัว, ทำสวนไร่นาของตัวเอง...01 อื่นๆ ระบุ______________________03

ลูกจ้าง, รับจ้างทำสวนไร่นา..............02

8A. ท่านคาดว่าจะหยุดทำงานเมื่ออายุครรภ์เท่าไร __ __เดือน

จนกว่าแพทย์สั่ง, ทำงานไม่ไหว............77 จนกว่าจะคลอด.................................99

ไม่ทราบ..........................888

9. หลังจากคลอด ท่านคาดว่าจะทำงานหรือไม่

ใช่.............01(ไปข้อ 9A) ไม่ใช่.........02(ไปข้อ 10) ไม่ทราบ..........888 (ไปข้อ 9A)

9A. ถ้าท่านคาดว่าจะกลับไปทำงานหลังคลอด งานที่ท่านจะทำเกี่ยวกับการเกษตรหรือไม่

ใช่..........................01 ไม่ใช่...............02

9B. ท่านคาดว่าจะกลับไปทำงานเมื่อใด

ภายใน 3 เดือนหลังคลอด.......01 หลังจาก 6 เดือนหลังคลอด......03

ภายใน 6 เดือนหลังคลอด.......02 ไม่ทราบ...........................888

10. หลังคลอด ท่านคาดว่าจะย้ายที่พักอาศัยออกจากอำเภอฝางหรือไม่

ใช่...................01(ไปข้อ 10A) ไม่ใช่.........02 (ไปข้อ 11) ไม่ทราบ..........888 (ไปข้อ 11)

10A. ท่านคาดว่าจะย้ายที่พักอาศัยออกจากอำเภอฝางเมื่อใด

ภายใน 3 เดือนหลังคลอด.......01 หลังจาก 6 เดือนหลังคลอด......03

ภายใน 6 เดือนหลังคลอด.......02 ไม่ทราบ...........................888

เหตุผล____

11. หลังคลอด ท่านคาดว่าจะเลี้ยงบุตรด้วยนมมารดาหรือไม่

ใช่..01(ไปข้อ 11A) ไม่ทราบ................888

ไม่ใช่.................................02

หากตอบว่าไม่ใช่หรือไม่ทราบ เพราะ____

11Aหากท่านคาดว่าจะเลี้ยงบุตรด้วยนมมารดา ท่านจะเลี้ยงบุตรด้วยนมมารดานานเท่าใด

3 เดือนหลังคลอด.......01 มากกว่า 1 ปีหลังคลอด..........04

6 เดือนหลังคลอด.......02 ไม่ทราบ 888

1 ปี หลังคลอด...........03

ส่วนที่ N:ข้อมูลอื่นๆที่เกี่ยวข้องกับการได้รับสารพิษ รหัส_______________

ส่วนที่ N : ข้อมูลอื่นๆที่เกี่ยวข้องกับการได้รับสารพิษ

4. ท่านทราบเกี่ยวกับปัญหาเรื่องสารเคมีป้องกำจัดศัตรูพืชหรือปัญหาสิ่งแวดล้อมอื่นๆที่พื้นที่อำเภอฝางหรือไม่

ใช่.................................01 ไม่ใช่..............................02

ไม่ทราบ.........................888

A อธิบาย____

ความคิดเห็นของผู้สัมภาษณ์

กรุณากรอกข้อมูลนี้ทันทีเมื่อสิ้นสุดการสัมภาษณ์

ความร่วมมือโดยรวมของอาสาสมัครเป็นอย่างไร

ดีมาก................01

ดี......................02

พอใช้................03

แย่......................04

Appendix 3. Institutional Review Board Approval Forms

EMORY UNIVERSITY

ID: IRB00018962

View: SF - IRB Study Identification

Date: Thursday, December 02, 2010 10:04:39 AM

Print Close

Study Identification Information

1.0 * **Enter the Full title of the study (include any version dates from the sponsor)**

In utero pesticide exposures and neurodevelopmental outcomes in a prospective birth cohort

2.0 * **Enter a SHORT identifying title for tracking purposes:**

Pesticide exposure in a Thai birth cohort

3.0 **What is the estimated start date of this study:**

01-May-09

4.0 **What is the estimated completion date of this study:**

30-Apr-12

5.0 * **Enter the name of the Principal Investigator (There can only be ONE Principal Investigator and the Principal Investigator must have an Emory affiliation):**

P Ryan **Dept**:Envir & occup Health

6.0 **Enter the name of Emory Co-Investigators:** (this includes Emory personnel and non-Emory persons with a sponsored account)

Last	First	Dept
Barr	Dana	Envir & occup Health
Riederer	Anne	Envir & occup Health

7.0 **Enter the name of Emory Study Coordinators:** (this includes Emory personnel and non-Emory persons with a sponsored account)

Last	First	Dept
There are no items to display		

8.0 **Enter the names of other Emory Study Staff (other than PI, Co-I's and Coordinator's):** (this includes Emory personnel and non-Emory persons with a sponsored account)

	Last	First	Dept	Type
[View]	Borkowski	Winslow	IRB	Collaborator

9.0 **Enter information on Non-Emory Study Staff:** (this is for non-Emory personnel who will not be logging into eIRB)

	Name	Affiliation	Type
[View]	Alyson Lorenz	MPH student, Rollins School of Public Health	Collaborator
[View]	Ampica Mangklabruks	Chiang Mai University	Collaborator
[View]	Areerat Limpastan	Fang District Hospital	Co-Investigator
[View]	Dana B. Barr	Department of Environmental Health, Rollins School of Public Health	Co-Investigator
[View]	Jantana Jongpipan	Fang Hospital	Co-Investigator
[View]	Linda Aurpibul	Chiang Mai University - Research Institute for Health Sciences	Co-Investigator
[View]	Niphan Srinual	Chiang Mai University - Research Institute for Health Sciences	Study Nurse
[View]	Onsri Short	Chiang Mai University - Research Institute for Health Sciences	Study Nurse
[View]	Parinya Panuwet	CDC/NCEH/DLS	Collaborator
[View]	Robin Whyatt	Columbia Center for Children's Environmental Health, Columbia University	Collaborator
[View]	Sukon Prasitwattanaseree	Chiang Mai University	Collaborator
[View]	Tanyaporn Kerdnoi	Chiang Mai University	Collaborator
[View]	Thongbai Nuntaratphun	Fang Hospital	Study Nurse
[View]	Tipkullanath Nutpreeyapath	Fang Hospital	Study Nurse
[View]	Tippawan Prapamontol	Chiang Mai University	Co-Investigator
[View]	Warangkana Narksen	Chiang Mai University - Research Institute for Health Sciences	Lab Tech

No 2/2011

CERTIFICATE OF ETHICAL CLEARANCE

Human Experimentation Committee

Research Institute for Health Sciences (RIHES)

Chiang Mai University, Chiang Mai, Thailand

Title of Project or Study: Assessment of Pesticide Knowledge, Attitudes and Practices among Pregnant Women in Northern Thailand

Principal Investigator: Miss Alyson Lorenz

Participating Institution: Emory University Rollins School of Public Health, USA (Master's Degree Student (Global Environmental Health))

Approved by the RIHES Human Experimentation Committee on **13 January 2011**

Date of Expiry: **12 January 2012**

List of Approved Documents:

Documents	**Version/Date**
1. Full Protocol (English Version)	-
2. Summary of Protocol	Version 2/22 December 2010
3. Information Sheet for Participant	Version 2/22 December 2010
4. Informed Consent Form	Version 2/22 December 2010