Perspectives of Mothers in Farmworker Households on Reducing the Take-Home Pathway of Pesticide Exposure

Larkin L. Strong, PhD, MPH
Helene E. Starks, PhD, MPH
Hendrika Meischke, PhD, MPH
Beti Thompson, PhD

Farmworkers carry pesticide residue home on their clothing, boots, and skin, placing other household members at risk, particularly children. Specific precautions are recommended to reduce this take-home pathway, yet few studies have examined the perspectives of farmworkers and other household members regarding these behaviors and the reasons for or against adoption. The authors conducted semistructured interviews with 37 Mexican/Mexican-American women in farmworker households to explore the family and cultural context in which pesticide safety practices are performed and to identify factors that facilitate or hinder their adoption. Whereas women could describe the take-home pathway, they were less able to connect it with their family's susceptibility to pesticide exposure. Women experienced difficulty integrating the prevention behaviors into their everyday lives because of competing responsibilities, conflicts with their husbands' intentions and with cultural health beliefs, perceived lack of control, and community barriers that interfered with women's motivations. Implications for practice are discussed.

Keywords: *pesticides; farmworker; take-home pathway*

Migrant and seasonal farmworkers and their families face disproportionate and persistent environmental and occupational health risks that are inextricably linked with their immigration and low socioeconomic status. National data indicate that nearly 75% of farmworkers are Mexican-born, and the majority are young, male, undocumented, and report 7 or fewer years of formal education (U.S. Department of Labor, 2005).

Larkin L. Strong, Department of Epidemiology, The University of Texas M.D. Anderson Cancer Center, Houston. Helene E. Starks, Department of Bioethics and Humanities, University of Washington, Seattle. Hendrika Meischke, Department of Health Services, University of Washington, Seattle. Beti Thompson, Cancer Prevention Research Program, Fred Hutchinson Cancer Research Center, Seattle, Washington.

Address correspondence to Larkin L. Strong, PhD, MPH, Department of Epidemiology, The University of Texas M.D. Anderson Cancer Center, PO Box 301439, Houston, TX 77230-1439; e-mail: LLstrong@mdanderson.org.

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Farmworkers have limited employment opportunities outside of agriculture and little control over their work conditions. Pesticide exposure, in particular, is an important source of morbidity in farmworkers (Moses, 1989), and increasingly, studies indicate that household members of farmworkers are at elevated risk of exposure because of drift from nearby treated fields and a take-home pathway, in which pesticide residue is carried home on farmworkers' clothing, boots, and skin and in their work vehicles (Coronado, Vigoren, Thompson, Griffith, & Faustman, 2006; Thompson et al., 2003).

A growing number of studies provide evidence for the take-home pathway as a distinct source of pesticide exposure. Studies have found higher concentrations of pesticides in the homes of farmworkers and elevated levels of pesticide metabolites in farmworker children relative to nonfarmworker homes and children in the same communities, respectively (Lu, Fenske, Simcox, & Kalman, 2000). Pesticide metabolite concentrations in children have been associated with those of adult farmworkers in the same household and with pesticide concentrations in house dust samples, which in turn have been associated with detecting residue on children's hands and toys (Coronado et al., 2006; Curl et al., 2002; Quandt et al., 2004).

Pesticide residue in the home is of particular concern for children because of the time children spend near the floor (where pesticide residue may accumulate), their distinct hand-to-mouth behaviors, and their higher metabolic rate. Although the effects of low-level chronic exposure to pesticides in young children are not fully understood, some studies have identified neurobehavioral deficits, increased respiratory problems, and the development of childhood cancers as possible risks of pesticide exposure during early life (Daniels, Olshan, & Savitz, 1997; Eskenazi, Bradman, & Castorina, 1999; Rohlman et al., 2005).

Farmworkers and other household members are advised to take precautions to reduce the take-home pathway of pesticide exposure. These precautions include not wearing work clothing or shoes in the home, showering or bathing immediately after work, wearing clean work clothes daily, storing and laundering work clothes separately from other clothing, and refraining from holding children until after removing work clothes and/or bathing. Studies indicate that many farmworkers are not taking these precautions (Goldman, Eskenazi, Bradman, & Jewell, 2004; Thompson et al., 2003), yet very little research has focused on understanding the perspectives of farmworkers and other household members regarding these behaviors and the reasons for or against adoption. Economic constraints, cultural traditions, and competing priorities, among other factors, likely shape the attitudes, intentions, and actions of farmworkers and their household members around these precautions and may present challenges to their adoption.

We explored these issues from the perspective of Mexican and Mexican-American women in farmworker households with young children. We focused our study on women because traditional gender ideologies in Mexican culture promote women as caretakers of the home and family; in this domain, women often have power and influence over the behaviors of others (Galanti, 2003; Harvey, Beckman, Browner, & Sherman, 2002). We employed qualitative methods to investigate the family and cultural context in which pesticide safety practices are performed and to identify factors that may facilitate or hinder adoption of these behaviors within the household.

We used an ecological framework to guide this research to facilitate inquiry about influences on women's adoption of pesticide safety practices at multiple levels. Ecological approaches provide a strong foundation for investigating the context of individuals' experiences by emphasizing the role of the social, cultural, and physical environments to health and health behaviors in addition to individual-level factors (Green,

Richard, & Potvin, 1996; Sallis & Owen, 2002; Stokols, 1996, 2000). In so doing, ecological models underscore the importance of recognizing the multiple influences on behavior as an integral part of health promotion efforts.

METHOD

Setting and Participants

This study took place in the Lower Yakima Valley in Washington State, an area consisting of many small agricultural communities where the primary crops are apples, grapes, hops, pears, cherries, and peaches. The Valley lies in the southeastern region of Yakima County, where approximately 53,000 farmworkers work in agriculture (Larson, 2000).

Women were the focus of this study and were eligible to participate if they had at least one child 6 years of age or younger and were married to or living with a male farmworker currently performing fieldwork related to the production of crop agriculture. Thirty-seven women were recruited through multiple sources and a mixed sampling strategy that was intended to enhance variation in pesticide safety awareness and behaviors. Sources included staff from a concurrent community-based study that followed a convenience sample of 100 farmworker households (recruited from community organizations, the local Spanish radio station, and worksites) for 9 months to examine different pathways of pesticide exposure (23 women), the Migrant Head Start program (7 women), and referrals from family or friends who had already participated in our study (4 women). Sources helped to connect bilingual and bicultural study personnel to potential participants; study staff explained the study procedures and enrolled interested and eligible women. Study staff also approached and recruited women as they exited a local grocery store (3 women).

Data Collection, Management, and Analysis

The ecological framework informed both the interviews and the analysis by directing our attention to consider how individual, social, cultural, and physical environmental factors work together to explain women's motivations and behaviors to engage in safety practices. Semistructured interviews were conducted by the lead author and a bilingual and bicultural female staff member from the community and took place in women's homes between May and July 2005. Interview questions addressed the following topics: (a) women's demographic and occupational characteristics; (b) women's concerns for their children's health, particularly pesticide exposure; (c) behaviors by women and other household members to reduce their children's risk of pesticide exposure, particularly through the take-home pathway; (d) difficulties associated with taking these precautions; (e) how women learned of these precautions and their motivation for practicing them; (f) women's perceived responsibilities to their families; and (g) women's perceptions of their husbands' responsibilities to their families. Other questions were added during the study to address concepts that emerged in previous interviews. For example, after several women mentioned the need to wait up to 2 hours after work before showering to allow their bodies to cool down fully and avoid developing health problems, we added a question specifically inquiring about this cultural belief.

At the end of the interview, women were given a brochure developed by the Fred Hutchinson Cancer Research Center that dealt with pesticide safety practices in the workplace and at home. The brochure consisted of illustrations and brief text for each precaution. Women were asked to comment on the brochure, which often led to additional discussion. Women received $15 for their participation.

Based on women's preferences, the interviews were conducted either in Spanish ($n = 33$) or in English ($n = 4$) and were audio recorded. All recordings were transcribed; the Spanish language interviews were translated into English for analysis by bilingual staff from the Yakima Valley. The study design and data collection procedures were approved by the Institutional Review Boards at the University of Washington and the Fred Hutchinson Cancer Research Center.

Transcripts were managed and coded using Atlas.ti 5.0 (Scientific Software Development, 2005). The objective of our data coding process was to first capture as many concepts as possible and then examine the relationships and patterns of these concepts within and across the interviews to identify conceptual linkages, or themes (Ayres, Kavanaugh, & Knafl, 2003; Ryan & Bernard, 2003). Coding began with an initial set of codes drawn from the research and interview questions and was used to assign meaning to women's expressions; codes were augmented as additional concepts were identified. The ecological framework contributed to the identification of concepts by highlighting the various levels at which to examine influences on behavior: cognitive factors at the individual level, interpersonal relationships and sources of health information, cultural beliefs, characteristics of the home and family environment, and norms and resources in the community, including worksites. Two study personnel (including the lead author) independently coded 14 transcripts to establish the coding scheme and refine definitions ascribed to the codes. The two coders met to discuss their interpretations of the meaning of women's expressions, potential relationships between codes, and the possibility of alternative explanations. After the two coders reached consensus regarding the coding scheme, the lead author completed coding the remaining transcripts. We identified themes in the data by (a) noting the repetition of concepts within and across texts and (b) comparing expressions for a given concept across women and relating those expressions with women's discussions of the precautions their family performed (Ryan & Bernard, 2003). We created a matrix for each theme that included sample quotes of when women spoke of motivations to engage in pesticide safety behaviors and factors that facilitated or hindered their adoption.

RESULTS

Demographic and occupational characteristics of the 37 women are summarized in Table 1. The majority of women were born in Mexico (92%), worked as a farmworker during the agricultural season of April through October (68%), and reported low levels of education (mean = 8 years). On average, women were 33 years old and had three children. In general, women recruited through different avenues were similar demographically. Among the 12 women who were not currently farmworkers, 10 had been farmworkers in the past. Table 2 summarizes the take-home pathway precautions mentioned by the respondents. Notably, all women reported washing work clothes separately from family laundry. In addition to the behaviors in the table, three women described having designated work and family cars to prevent exposing their children to

Table 1. Demographic Characteristics (n = 37)

Age, mean (range)	33 years (19–45 years)
Education, mean (range)	8 years (3–12 years)
Birthplace, n (%)	
Mexico	34 (92%)
United States	3 (8%)
Time in the United States,[a] mean (range)	10 years (1–25 years)
Number of children, mean (range)	3 (1–8)
Age of children, mean (range)	7 years (7 months to 25 years)
Occupation, n (%)	
Farmworker	25 (68%)
Warehouse worker	2 (5%)
Other	2 (5%)
Not currently working	8 (22%)

a. Excludes the three women born in the United States.

Table 2. Pesticide Safety Practices Volunteered by Women[a]

Behavior	Percentage
Women who worked as farmworkers (n = 25)[b]	
Wash work clothes separately from household laundry	100
Remove work shoes before entering the home	60
Shower prior to picking up children (n = 23)[c]	22
Remove outer shirt when picking up children (n = 18)[c]	44
Shower immediately on arriving home (n = 20)[c]	35
Change clothes immediately on arriving home (n = 13)[c]	62
Husbands of nonfarmworker women (n = 12)[d]	
Wash work clothes separately from household laundry	100
Remove work shoes before entering the home	50
Shower immediately on arriving home	58
Change clothes immediately on arriving home (n = 5)	60

a. These numbers represent only what women volunteered about their or their husbands' practices as they were not asked explicitly about each behavior. In addition, some women were not familiar with their husband's practices.
b. Although women's husbands were also farmworkers, the frequencies refer to women's behaviors only.
c. The denominators vary by behavior depending on the number of women or men to which the behavior applied. For example, women whose children remained at home during the day were excluded from frequency calculations for behaviors related to picking up children. Similarly, women who reported showering prior to picking up their children were excluded from subsequent frequency calculations.
d. Frequencies refer to husbands' behaviors with the exception of washing work clothes separately, which was always performed by the women.

pesticide residue in the car used for work, and seven women who picked up their children directly from work offered additional precautions such as wrapping their infants in a blanket, asking the day care provider to place their infants in the car seat, or allowing older children to get in the car themselves.

Themes

Two related themes describing cognitive factors at the individual level accounted for women's motivations to engage in pesticide safety practices: (a) knowledge of the take-home pathway and (b) perceived family susceptibility to the harmful effects of pesticide exposure through this pathway. Five additional themes describe factors at multiple levels that interfered with women's ability to engage in the safety behaviors: (a) competing responsibilities in the home, (b) partner dynamics and differences in behavioral intentions, (c) beliefs about body temperature, (d) lack of control, and (e) barriers posed by day care providers.

Factors That Influence Motivation

Knowledge of Pesticides and the Take-Home Pathway. Not all women were familiar with the word *pesticide*. Terms commonly used by women included *spray* (the liquid form in which pesticides are applied), *dust* (the dried white residue that remains on foliage), and *chemicals*. All women considered pesticides to be dangerous, and 16 specifically referred to them as a poison or venom. Women who volunteered information about possible health effects mentioned vomiting, allergies, headaches, cancer, brain defects, rashes, asthma, and infertility.

All women were aware of the *potential* for the take-home pathway, as evidenced by their discussions of how they or their husbands bring pesticides home with them on their clothes. Yet their knowledge varied greatly about whether and how their children could be exposed via this route or whether this level of exposure could actually cause harm. Women who expressed confidence in their understanding of the take-home pathway generally were motivated to engage in safety practices.

> Because if I get home and just sit on the couch? I know that the dust is going to stay there that I brought from the fields. And then later, kids will be playing there, sitting there, so they're breathing it all in.

Conversely, women who were less certain that their children could be exposed and subsequently harmed through the take-home pathway generally reported taking fewer precautions. One woman whose only reported precaution included washing work clothes separately said the following:

> I have a daughter, and she also has asthma, but she doesn't go to the field. I don't know if this is something that we bring that harms her because it is during the season when she gets asthma.

Another woman seemed to recognize that her work clothes were contaminated, yet she was unsure whether exposing her children to her work clothes was harmful to them: "I mean when you come home and you have your dirty clothes from work and you carry your children, and well, I guess I'm not sure if that actually does affect them."

Perceived Susceptibility. Similarly, women who expressed specific concerns about their children getting sick or being harmed through the take-home pathway expressed greater motivation for taking precautions. Women's perceived susceptibility (defined as one's subjective perception of personal risk for developing a particular health condition; Rosenstock, 1990) was intertwined with their knowledge of the take-home pathway, yet

it also appeared to be a distinct concept. In spite of their knowledge, some women did not express concern about this route of pesticide exposure for their families. In general, women's lower perceived susceptibility stemmed from a belief that their children were not at risk for harmful effects of pesticide exposure in the absence of symptoms, if they washed work clothes separately from household laundry or if they did not take their children to the fields.

> I'm worried more about my husband because he's [in the fields], in contact with all that's there. But my daughters, well, no, I'm not worried about them because they're here in the house or at school.

For many women, increased susceptibility grew out of specific experiences that fostered recognition of their children's vulnerability to this source of exposure. For example, strong chemical smells were an indicator of the presence of pesticides and triggered the practice of separating work clothes from family laundry to prevent contaminating the children's clothes with the smell of pesticides. Respiratory problems or skin reactions in very young children were especially strong motivators for five women, particularly after they learned that they could take precautions to prevent further symptoms. Three women described how their children developed red bumps or rashes when they were very young. When the women took their children to the doctor, they were informed that this was likely because of carrying the children while in their work clothes. These experiences subsequently led to changes in the women's or their husbands' behavior.

> I just got really scared after she got so many little bumps. That was because [my husband] would get near her. Like an allergy or something. And so they gave her a little cream and they said it was because of that, because he would touch her. . . . And ever since then he'll get home and go in through the back and shower immediately, and now well nothing really happens to our little girl.

Interactions with providers were particularly influential for six women, even in the absence of symptoms associated with pesticide exposure. One woman described how visits with her child's pediatrician emphasized the importance of acting now to prevent health problems in the future.

> If he's waited all day at day care, you've been working all day, you can take 15 minutes out of that time and go change and take a shower for his health. If you don't take care of them then you're going to have to be running from work to the clinic with him all the time, 'cause he's gonna be sick. That's what they've always told me at the clinic.

Of 22 women who reported having a child currently or recently enrolled in a Migrant Head Start or similar program, 7 women specifically attributed their adoption of pesticide safety practices to the information they had learned through these programs, whose staff conduct sessions on pesticide safety and encourage parents to take precautions when they come to pick up their children. Other influential motivators included family members (including husbands) who had been in the United States for a longer period of time, participating in a research study on this issue, and learning about the precautions and health effects of pesticide exposure through the local Spanish radio station or the television. Thus, although a few women were influenced by more passive sources of information, such as the television or radio, the majority of women who perceived

their children's susceptibility to the take-home pathway in the absence of specific symptoms described personal, in-depth exchanges of information that both raised their level of awareness and enhanced their motivation for taking these precautions on a regular basis.

Factors That Affect Practicing Pesticide Safety Behaviors

Competing Responsibilities. Nearly 80% of women reported working at least part of the year out of necessity to supplement the family income, while maintaining primary responsibility for taking care of the home and tending the children. Competing demands on women's time was an important aspect of the family context that interfered with women's ability to take precautions. In general, time was very limited for the 29 women who worked. Of these women, 9 women described being overwhelmed with their daily household responsibilities, which included preparing meals, cleaning the home, doing laundry, helping children with their homework, and packing lunches for the next day. With limited time, women had to compromise.

> Well sometimes it was kind of hard because I would arrive home really late and once I got home I would have to prepare dinner, but I would try to the best of my ability to take the precautions, but you know, sometimes I couldn't because of my work. But I would still try.

These women were also frustrated with their husbands for not assisting them more.

> [The men] just get out of work and get home and don't do anything. And [my husband] says, "no, well all the time I drive home." And I tell him "yeah, but you get home and take a shower and just sit on the couch." And then while I'm cooking, making dinner, getting the lunch ready for the next day, washing dishes, sweeping and mopping, and getting the kids' pamper bag ready. It's hard. It's hard for one.

Women rationalized that because they help their husbands earn income, their husbands should assist them by contributing to household chores. Thirteen women stated that their husbands did help around the house. Two women expressed this well: "I tell my husband that in the fields I am a man, and at home he is a woman. We're going to share the duties equally." "If I'm working in another place and he gets home first, he should have something for me to eat . . . I tell him, you have to do all the work that a woman does." Men's participation in household chores facilitated women's efforts to take precautions by allowing them more time to devote to activities other than housework.

Shared Behavioral Intentions/Partner Dynamics. Shared behavioral intentions represent additional characteristics of the family context that influenced whether precautions were performed in the home. Shared intentions from the women's perspective were common; only four women stated that they wished their husbands took more precautions. In three of these cases, the men refused to remove their work shoes outside despite women's requests. One woman who worked at Head Start and was well educated on pesticide safety in children was frustrated with her husband over this issue. Despite the woman's knowledge, her husband was unwilling to accept her explanation.

> He believes that it is not true and then he says that, where do I get all this stuff from? He says I see it in magazines or . . . I tell him that these are things that they are teaching us so we're aware of them . . . I have shared a lot with him, and I still can't convince him. I think he's just lazy.

In an unusual case, a woman who did not work described how her husband calls his 3-year-old stepdaughter to collect his dirty work clothes each day and take them to the laundry basket as a lesson in household duties. The woman was concerned that this could harm her daughter, yet she was unable to convince her husband to do otherwise.

> I've told him that it can be harmful to her, but he doesn't seem to think that way, or I don't know. Because he wants her to learn how to do things when she is told to do something, so she obeys . . . so then I don't say anything.

These examples reveal the interplay between power dynamics in the relationship, knowledge of the take-home pathway, and perceived susceptibility. Despite women's attempts to educate their husbands, the men did not always comply. They may not perceive their children's risk of harm as a result of their actions, or they may prioritize other behaviors, as reflected above whereby the husband's desire to instill an understanding of gender roles and the need to be submissive took precedence over the potential for harm brought on by contact with contaminated clothing.

Men's level of involvement with children's health issues may depend on how they define their paternal responsibilities. One woman described how her husband did not attend a community training because he felt it did not pertain to him.

> When I had the kids in [Head Start] they had training for both the parents and I would invite him, but he would always say, "No, no, no. You go, you go. That's a woman's issue, that's for women" . . . I think it's because of our culture.

Men who view children's health as largely the responsibility of women risk perpetuating a knowledge gap about the take-home pathway, which may in turn affect their engagement in safety practices. Their willingness to comply with their wives' requests for behavior change may depend on how much credit, responsibility, and support they give their wives when the women act as advocates of the family's health.

Beliefs About Body Temperature. An important barrier to showering on arriving home involved the cultural belief that exposing one's body, while hot, to water can cause health problems, such as arthritis, backaches, and general discomfort. These concerns are thought to derive from humoral beliefs, which emphasize the need to balance hot and cold to avoid illness (Spector, 2000). This belief was widespread among study participants; of 27 women specifically asked about this issue, 21 commented that it is necessary to cool down fully before taking a shower to avoid health problems. Although the general premise was fairly consistent across women, there was considerable variation regarding certain aspects. For example, the necessary time to cool completely ranged from about 20 minutes to 3 hours. Some women explained that they were able to prevent health problems by adjusting the water temperature to match their body temperature, whereas others said that water of any temperature can cause harm. Perceived health effects ranged from immediate discomfort to long-term problems and those developing later in life such as arthritis. For 5 women, the need to cool fully extended to other behaviors in addition to showering, such as changing clothes or removing shoes right away to prevent exposing their bodies to fresh air. Some women were unsure of the effects yet were motivated by fear to wait.

Consequently, women who worked as farmworkers faced competing risks: potentially exposing their children to pesticide residue or increasing their risk of health problems now or later in life. How women weighed these risks influenced their intentions. Nine

women believed it was more important to shower immediately. Although some of these women acknowledged that they could develop health problems as a result, none described currently experiencing negative effects. For other women, negative experiences or fear of the consequences associated with showering immediately after work were strong incentives to cool down first.

> I never shower while I'm hot because it happened to me once already. I got home and showered immediately because I had an appointment with my boy. I showered right away and almost couldn't take the pain in my back. . . . So after that day I never shower right away.

At the same time, all women recognized the need to wash their hands before cooking or picking up their children regardless of whether this would cause discomfort.

Lack of Control. Lack of control was represented in two ways: perceived control over children's pesticide exposure in general and control over one's ability to take the recommended precautions, including when that involved changing the behaviors of others (mainly women's husbands) in the home. The first representation describes an individual-level perception, whereas the second refers to the context in which the behaviors are performed and the obstacles women encountered as part of their everyday lives. Three women alluded to the implausibility of being able to prevent pesticide exposure in their children given their work and the agricultural environment in which they live. In agricultural communities, this lack of control is very real; people may be exposed to pesticides regardless of their precautions because of the potential for pesticide residue to drift near their homes during application. One woman who has two children with asthma conveyed a sense of resignation regarding the inevitability of pesticide exposure for her children.

> Well, I don't think that there's one single way that can completely protect [the children] from [pesticides]. And so we don't get home and immediately shower. We first rest and so either way the pesticides that we bring from the worksite end up getting into our home.

Other women distinguished between exposure sources that were and were not under their control. One woman (who was emphatic about the need to take precautions) viewed these behaviors within the context of parental responsibility and stressed their importance in relation to health outcomes: "It's all in your hands, and your responsibility to make sure you change your clothes and wash your hands before you feed [your children]. Your child can potentially end up in a hospital if not for this."

Women were also frustrated with a perceived incompatibility between the recommended precautions and their daily routines. Options for women who worked as farmworkers were limited by their work schedules and the hours of operation of day care facilities, which left them little time to shower or change clothes before picking up their children. Another frustration was the lack of changing facilities at worksites that prevented women from changing their clothes prior to getting and holding their children. Women who expressed low perceived control over specific behaviors often framed their discussion around the lack of alternatives for their particular situations.

Barriers Posed by Day Care Providers. Three women encountered considerable hostility from private day care providers when they took additional time to shower before picking up their children. If they or their husbands arrived at the day care wearing clean

clothes, the day care providers chided them and suggested that they had not worked that day yet hired someone else to watch their children.

> Can you believe it? I arrived changed and with a pair of sandals. They saw me with sandals and said "You didn't work." I said "No, no, no" and they are like that. [The day care provider said] "Can you imagine getting tidy, going home, and taking a bath, all very comfortable, while someone has your children?"

These women stated that day care providers refused to watch their children if the women did not come straight from work, even if they were paid for the additional time.

DISCUSSION

We approached the topic of pesticide safety practices from the perspective of women to better understand the cognitive and contextual processes that influence adoption of these behaviors in Latino farmworker households with young children. By using in-depth interviews, this study further develops the conceptual foundation that guided our work by enhancing awareness of the ways in which influences at multiple levels contribute to women's motivation and ability to engage in these behaviors. Specifically, we found that factors from the following domains of the ecological framework were important influences on women's adoption of these precautions: (a) intrapersonal factors, such as knowledge of pesticides and the take-home pathway, perceived family susceptibility to harm through this exposure route, and perceived lack of control over the presence of pesticides in the physical environment; (b) the social and cultural context of the family, including the interpersonal relationships between women and their husbands, women's responsibilities in the home, and women's beliefs about body temperature; and (c) the organizational and community environments, whereby work characteristics and interactions with day care providers in the community hindered women's efforts to engage in the precautions.

Several of our findings reinforce and build on those of previous studies investigating farmworkers' perceptions and behaviors around pesticide exposure, particularly those involving women. Similar to other studies, women could describe the take-home pathway, yet they were less able to connect this route of pesticide exposure to their children's susceptibility and potential harm, especially in the absence of symptoms or if work clothing was washed separately from household laundry (Harthorn, 2003; Rao, Quandt, Doran, Snively, & Arcury, 2007). As noted by others, the widespread practice of washing work clothes separately may stem from the strong chemical odor emitted by the clothes that alerted women to the presence of pesticides. The rationale for taking other precautions may have been less apparent. For many women, specific experiences, such as health problems in their children and receiving information about the take-home pathway from trusted sources such as Head Start staff, health care providers, or family members, contributed to women's perceived susceptibility and subsequent motivation.

We also found that the recommendation to shower as soon as possible after work did not coincide with many women's health beliefs regarding the need to cool before showering. The prevalence of these beliefs and similar findings in North Carolina, where approximately 92% of farmworkers reported waiting to cool before showering (Arcury, Quandt, Cravey, Elmore, & Russell, 2001), underscores their importance for health

behaviors to minimize pesticide exposure. In this study, women's beliefs were validated through personal discomfort or the experiences of family members, forcing women to make difficult decisions that weighed perceived risks to their personal health against potential risks to their children's health.

Our results also emphasize women's difficulty integrating these precautions into their daily routines as a result of factors perceived to be outside of their control. Barriers included the lack of a place to change at work, limited time before the closing of day care facilities, conflicts with private day care providers, competing responsibilities at home, and differing abilities to shape the behavior of their husbands. The hostile attitudes of some private day care providers caused several women to forgo showering in advance and represent an example of disrespect by those who are in greater positions of power toward farmworkers in their efforts to protect themselves and their families from pesticide exposure. Farmworker reports of disrespect and discrimination by Latinos and Whites alike have been described by others and epitomize farmworkers' low status within an economic and ethnic hierarchy (Farquhar et al., 2008; Holmes, 2006). Women's frustration with the aforementioned factors reflects a sense of helplessness or lack of control over protecting their families from pesticide exposure. This is a common finding among farmworkers that has been examined primarily within an occupational context and has been associated with taking fewer precautions at work (Arcury, Quandt, & Russell, 2002; Vaughan, 1993).

Implications for Practice

Consistent with an ecological framework, our findings suggest that health promotion strategies that consider multiple levels of influence will be more effective than those that focus on a single domain (Green et al., 1996; Stokols, 1996). At the individual level, health education messages should aim to motivate women and farmworkers to protect their families from pesticide exposure by enhancing knowledge of the take-home pathway and perceived family susceptibility to this exposure route. Emphasizing the ways in which household members, particularly children, may be exposed could involve demonstrations to display how pesticide residue can be spread unintentionally from farmworkers to the home or others in the household. Messages should stress that pesticides may be present in the home despite the lack of a chemical odor and that children may be exposed even in the absence of health symptoms. Intervention messages also need to articulate clearly how each precaution helps reduce the take-home pathway rather than stating that they need to be performed without providing a clear rationale for the behavior.

At the same time, health promotion efforts are likely to prove ineffective if women view the behaviors as incompatible with their cultural beliefs or the structural circumstances of their everyday lives. Thus, intervention efforts need to be mindful of the social context of these behaviors and recognize that barriers exist in multiple domains of the ecological model that may hinder women's and families' efforts. Initiating discussions about precautionary measures that are consistent with cultural beliefs and can be incorporated into women's schedules may help address some of the barriers that contribute to women's perceived lack of control. Sensitivity to these barriers may require discussing various options, such as alternatives to showering immediately after work. Women who have negotiated these practices themselves represent important sources of input.

At the community level, collaborating with organizations that work with farmworker families will help disseminate information through channels accessible to all adults in

farmworker households and should provide opportunities for health education through credible and trusted sources. Women identified the Migrant Head Start programs and health care providers as particularly influential sources of health information; these and other organizations, such as the Farmworkers' clinics, the Farmworkers' Union, and county health departments, among others, should be an integral part of community-wide efforts to raise awareness about and address pesticide exposure and the take-home pathway. Thus, in addition to providing multiple avenues to reach both mothers and fathers in farmworker households, collaborating with these organizations may also facilitate opportunities for educating others in the community and help sustain outreach efforts. Women identified day care providers as another audience to include in outreach and community education activities.

It is also critical to ensure that worksite training incorporates education that focuses explicitly on the take-home pathway and that farmworkers are able to shower and/or change into clean clothes when leaving work. Women's comments revealed that many were not sufficiently knowledgeable about this exposure route. Although the U.S. Environmental Protection Agency (EPA) has issued training materials that include precautions relevant to the take-home pathway (U.S. EPA, 1995), this route of exposure is not specifically discussed, nor is it clear whether the distribution of this information is widespread. As suggested by Rao et al. (2007), worksite training that provides information in the form of a brochure or video that can be shared with household members may facilitate the education of nonfarmworkers on this issue. Unfortunately, studies in Washington and North Carolina suggest that only a fraction of farmworkers are trained in pesticide safety within the mandated 5-year time frame specified by the EPA (Arcury, Quandt, Austin, Preisser, & Cabrera, 1999; Strong, Thompson, Koepsell, & Meischke, 2008; U.S. EPA, 1992).

Limitations

Although we employed a mixed sampling strategy to enhance variation in women's beliefs and behaviors, it is possible that our findings do not reflect the full range of experiences of women in the Yakima Valley. In addition, women in this study had been in the United States for an average of approximately 10 years, so our findings may not adequately capture the experiences of women in farmworker households who only recently migrated. Nonetheless, women's narratives yielded a broad range of opinions and experiences that allowed us to better understand the factors that influence adoption of precautionary behaviors. Finally, we did not include men in our sample. Although the focus of this research was to understand the context in which pesticide safety practices are performed and the factors that influence adoption from the perspective of women, involving men would have contributed to discussions of men's and women's responsibilities in the home and shared behavioral intentions.

Conclusion

In this qualitative study, we found that women's knowledge and beliefs, family dynamics, and community and worksite characteristics each played a role in shaping household adoption of behaviors to reduce the take-home pathway of pesticide exposure. Intervention strategies will therefore need to improve the understanding, awareness, and perceived susceptibility of farmworker families around the take-home pathway and will also need to engage a variety of community organizations, service

providers, and worksites to address the lack of showering and changing facilities at work and to enhance worksite and community education on the risks of pesticide exposure. At the same time, although empowering farmworkers and their families to take precautions is a critical part of health promotion around this issue, effectively reducing the take-home pathway in this population, and occupational pesticide exposure in general, will require improvements in worksite safety and training and increasing employer compliance with safety standards.

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