Pesticide Safety Training and Access to Field Sanitation Among Migrant Farmworker Mothers from Starr County, Texas

E. M. Shipp, S. P. Cooper, K. D. Burau, J. N. Bolin

ABSTRACT. *Very little published research describes employer compliance with EPA–mandated Worker Protection Standard (WPS) pesticide safety training and the OSHA Field Sanitation Standard among farmworker women in general and mothers specifically. A goal of both standards is limiting farmworkers' exposure to potentially hazardous agricultural pesticides. Data from a NIOSH–supported cohort study ("Injury and Illness Surveillance in Migrant Farmworker Families") allowed for examining these issues. The cohort included 267 migrant farmworker families who usually reside along the Texas–Mexico border (Starr County, Texas). Data were collected in Starr County during in–home interviews. Of 102 mothers who participated in migrant farm work during summer 2001, 57 (55.9%) reported having ever received training/instruction in the safe use of pesticides, while 47 (46.1%) reported having received training within the previous five years, as required by WPS. Of trained mothers, 91.5% to 93.6% reported that their training covered key WPS areas: (1) entry into a recently treated field, (2) pesticide related injuries/illnesses, and (3) where to go and who to contact for emergency care following exposure. Regarding access to field sanitation, 67.5% to 84.2% of 77 mothers who worked outside Texas reported employer–provided decontamination supplies (e.g., soap, wash water, towels, and toilet facilities). However, a strikingly smaller proportion (12% to 28%) of 25 mothers who worked within Texas reported access to the same resources, suggesting discrepancies in compliance across the U.S. Due to the low level of employer compliance with both WPS and OSHA mandated standards, increased enforcement and an alternate delivery of pesticide training is recommended.*

Keywords. *Farm workers, Field sanitation, Hispanics, Migrant workers, Mothers, Pesticide safety training.*

Despite advances in technology and a steady decline in the number of farmworker jobs in the U.S. since the early 1900s (USDA, 2002), the need for the unique capabilities of human hands to cultivate and harvest crops remains. Because em-

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ployment opportunities vary by crop and season, migrant and seasonal farmworkers fulfill much of the current agricultural workforce requirements. Nationally, there are between 1 and 4 million migrant and seasonal workers (U.S. GAO, 1992), with an estimated 197,393 migrant and seasonal workers in Texas alone (Larson, 2000). In the U.S., the migrant and seasonal workforce is a special population that is increasingly foreign−born (81%) and unauthorized (52%) (Mehta et al., 2000). The majority of farmworker families are impoverished, with an estimated median annual family income of less than $10,000 per year (Mehta et al., 2000).

Despite the importance of these workers to food production and the U.S. agricultural economy, little is known about their occupational health and feasible means of ensuring it (Mobed et al., 1992; Rust, 1990; Slesinger, 1992; Villarejo and Baron, 1999). This is of great concern given that agriculture consistently ranks among the most hazardous industries in the U.S. (Rautiainen and Reynolds, 2002). In addition, this vulnerable population of hired farmworkers has limited access to health care and the financial resources needed to treat an occupational injury or illness. In California, one of the most progressive states regarding farmworker health issues, only 11.4% of farmworkers that participated in the 1999 California Agricultural Worker Health Survey (CAWHS) reported having some type of employer−provided health insurance (Villarejo et al., 2000).

Exposure to pesticides is a recognized occupational hazard associated with farm work (Fenske, 1997; U.S. GAO, 2000), and farmworkers are identified as the primary population exposed to pesticides (U.S. GAO, 2000). “Pesticide” is a term used to describe a variety of agents including insecticides, herbicides, fungicides, and rodenticides (Ecobichon, 2001). The negative health effects of pesticide exposure are broad and include acute effects (e.g., upper respiratory tract irritation, contact dermatitis, eye irritation, fatigue, nausea, and death) as well as chronic effects (e.g., neurological disorders, paralysis, and cancer) (U.S. EPA, 1999; U.S. GAO, 2000). Recently treated fields serve as the source of exposure for the majority of farmworkers. Residues persist on crop surfaces as well as in the soil, where they can be dislodged and deposited on skin surfaces (Das et al., 2001). Accordingly, dermal absorption is the dominant route of exposure for fieldworkers, although absorption can occur through other routes, such as through the respiratory and digestive systems (Fenske, 1997; U.S. EPA, 1999).

Annually in the U.S., physicians diagnose an estimated 10,000 to 20,000 agricultural workers with pesticide−related illnesses and injuries (U.S. EPA, 1992a). Blondell (1997) suggests that pesticide−related illness may be under−reported for a variety of reasons, including: affected workers may not seek treatment, physicians may not recognize the symptoms as pesticide related, and an overall lack of access to medical care.

Recognizing the benefits of preventing exposure to farmworkers, the U.S. Environmental Protection Agency (EPA), under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), put forth the Worker Protection Standard (U.S. EPA, 1992b). Established in 1992, WPS went into full effect in 1995. A major goal of WPS is to reduce the risk of occupational injury or illness among farmworkers and pesticide handlers through implementation of specific workplace behaviors. WPS also seeks to minimize accidental exposure of workers and others to pesticides used in agriculture.

A key requirement of WPS gives employers the responsibility for providing their agricultural workers with pesticide safety training. Initially, workers must be trained prior to accumulating five workdays in areas treated within the previous 30 days, or where a restricted−entry interval has been in effect. Workers must be trained every five years thereafter. Employers must provide training in a language that employees can understand. The training must include information on eleven topic areas reviewed thoroughly in an article by Arcury et al. (1999). In summary, the training must discuss

the following: where and when pesticide exposure occurs while working; illnesses that may follow exposure; entry of pesticides into the body; signs and symptoms of pesticide poisoning; emergency first aid measures; ways of obtaining emergency medical care; decontamination procedures; hazards from chemigation (injection of a chemical into irrigation water) and drift; hazards from pesticide residues on clothing; warnings about taking pesticides or pesticide containers home; and a variety of other requirements (e.g., posting of warning signs and entry restrictions) intended to limit exposure (Arcury et al., 1999; U.S. EPA, 1992b). Of note, child or adolescent workers and establishments employing fewer than 11 employees are not exempt from WPS.

The available research evaluating WPS pesticide safety training suggests an overwhelming deficit in compliance across the U.S. Evidence suggests that 32% to 57% of field laborers have received some form of pesticide safety training (Arcury et al., 1999; Arcury et al., 2001; Jackson, 2002; McCauley et al., 2002; Villarejo et al., 2000). The available research includes studies primarily on male workers (Arcury et al., 2001; McCauley et al., 2002; Villarejo et al., 2000). In California in 1991, CAWHS involved surveying hired farmworkers (n = 971) ages 18 or older. Of these workers, approximately 553 (57%) reported having received training or instruction in the safe use of pesticides (Villarejo et al., 2000). In North Carolina, workers were surveyed in 1998 and 1999 as part of the PACE (Preventing Agricultural Chemical Exposure among North Carolina Farmworkers) project. Of these farmworkers, 270 (35.2%) in 1998 and 284 (54.9%) in 1999 reported having received pesticide safety training (Arcury et al., 2001). Regarding a study of young farmworkers employed in Oregon, only 33 (32.4%) migrant farmworker adolescents received any pesticide training. Out of 22 of these workers who reported mixing or applying pesticides, 8 (36.4%) workers reported receiving pesticide training (McCauley et al., 2002).

In addition to WPS, the Occupational Safety and Health Administration (OSHA) developed a field sanitation standard in 1987 (U.S. Department of Labor, 1987) that, if enforced, could also decrease pesticide exposures in workers (Das et al., 2001). This standard requires employers to supply reasonable access in the field to toilets, potable drinking water, and handwashing facilities. Unlike WPS, the OSHA field sanitation standard does not apply to employers with fewer than 11 employees. But like WPS, child workers are covered. Data assessing enforcement of the standard are limited largely to self−report surveys described below. Reports from farmworkers indicate that a greater proportion of employers may be complying with this standard compared to WPS (Das, 2001).

Data from the 1997−1998 National Agricultural Workers Survey (NAWS) suggest that the majority of workers had access to drinking water (98%), water for washing (84%), and toilets (87%) (Mehta et al., 2000). While these percentages are large, given the size of the NAWS sample (n = 4,199), the numbers of farmworkers in the sample without these items is substantial. Similarly, the majority of workers in the CAWHS sample (n = 971) reported access to drinking water (87%), water for washing (82%), and toilets (88%) (Villarejo et al., 2000). In 1999, a large proportion of farmworkers in the PACE study in North Carolina also reported ”always or usually“ having access to drinking water (92.8%), drinking cups (69.9%), and showers (97.0%) (Arcury et al., 2001). However, nearly half of the sample reported ”seldom or never“ having access to a field toilet (52.9%) or water for washing (44.7%).

In most states, implementation and enforcement of WPS and the OSHA field sanitation standard is accomplished through state agencies such as state departments of agriculture. In addition, state governments may choose to augment the standards or issue additional legislation. For example, Texas issued the Agricultural Hazard Communication Act (TAHCA) focusing on the workers’ right to know. It mandates the following:

> "Agricultural laborers employed by employers covered by this chapter who may be exposed to chemicals . . . shall be informed of the exposure and shall have access to the workplace chemical list and MSDSs for those chemicals. Laborers, on request, shall be provided a copy of a specific MSDS. In addition, laborers shall receive training on the hazards of the chemicals and on measures they can take to protect themselves from those hazards and shall be provided with appropriate personal protective equipment as required by this chapter."

In effect since 1988, TAHCA strengthens WPS by requiring that agricultural employers, pesticide handler employers, and contractors must: (1) designate an individual or organization to represent individual workers who are trying to obtain pesticide information; (2) make available a Workplace Chemical List (WCL); (3) make available material safety data sheets (MSDS) from the pesticide dealer for every chemical on the WCL; (4) not refuse to hire a worker only because he/she has not completed a WPS training program or does not have a verification card; (5) provide and read crop sheets (e.g., information about pesticide health and safety and the most common pesticides used on each crop) to untrained workers and workers without a verification card; and (6) notify the local fire chief of chemicals that are stored for more than 72 hours at the workplace (Texas Department of Agriculture, 1988). Unlike WPS, TAHCA only applies to employers who annually use or store chemicals covered by TAHCA in excess of 55 gallons or 500 pounds and who have an annual payroll that meets or exceeds $50,000 for permanent employees or $15,000 for migrant and seasonal workers.

As described above, there is some research describing WPS pesticide safety training and field sanitation among farmworker populations composed of adolescents or largely male workers. However, little data exist describing pesticide safety training and field sanitation among women. The present study examines this issue in a sample of farmworker mothers who migrate away from their homes in Starr County, Texas, to do farm work, usually during the summer months.

Methods

The present study utilized data from a larger prospective cohort funded by the National Institute for Occupational Safety and Health (5 R01 OH04041), "Illness and Injury Surveillance in Migrant Farmworker Families." The objective of the cohort study was to estimate the frequency of acute occupational injuries (e.g., mechanical, equipment, and pesticide related) and to identify risk factors for these injuries among migrant farmworker families during 2000 and 2001. The Committee for the Protection of Human Subjects at the University of Texas Houston Health Science Center reviewed and approved the cohort study (HSC−SPH−99−070). The cohort consisted of 267 migrant farmworker families who spent the night away from their usual home in Starr County (located along the Texas−Mexico border) to do farm work. The New Generation System (NGS), a school−based tracking system, functioned as a surveillance method to identify potential participating families. Eligible families had at least one child in the Rio Grande City Consolidated Independent School District (RGCCISD) and the Migrant Education Program during the 1998−1999 school year. Nearly 60% of all students in Starr County are enrolled in RGCCISD, and it is the largest of three districts in the county. Created in 1997, the purpose of NGS is to identify migrant students and to transfer enrollment, demographic, academic, and health data across the U.S. as these students move with their families for agricultural work (Texas Education Agency, 1996). During the 1998−1999 school year, the Migrant Education Program in RGCCISD maintained files computerized

through NGS on 1,200 families. This database was sampled randomly to form the cohort of 267 families.

Bilingual interviewers from Starr County, Texas, administered the data collection instrument at the end of the 2000 (year 1) and 2001 (year 2) migration seasons from October to January. The mother served as the primary respondent for the family. In addition to items assessing demographics, injury, and various risk factors, the year 2 follow−up survey included five items about pesticide safety training, seven items about employer−provided field sanitation, and six items about field sanitation self−provided by the mothers. All of these items were not included on the year 1 survey. Interviewers administered the follow−up survey in participants' homes in Starr County, Texas. Administration time was approximately 45 minutes. Items were in both Spanish and English, allowing participants to choose their preferred language.

Of the 267 eligible families in the cohort, 143 (53.6%) families migrated away from their usual homes in Starr County, Texas, to do farm work in the U.S. in year 2. One hundred and thirty−seven mothers (95.8%) completed the follow−up survey in year 2, of which 103 (72.0%) mothers actually participated in field work either alone or alongside family members. One mother was excluded from the present analysis due to missing data. Therefore, the sample for the present analysis includes 102 mothers who both migrated and participated in field work in year 2.

The present analysis is descriptive and was completed using Intercooled STATA 7.0 for Windows (STATA, 2001). We computed counts, frequency distributions, and percentages for each variable. The analysis included access to specific field sanitation items in year 2 stratified by mothers who worked only in Texas versus mothers who worked only outside of Texas. In addition, we described specific field sanitation items by type of provider (i.e., employer, self).

Results

All mothers (n = 102) were Hispanic. Their ages ranged from 28 to 63 years (median age of 41 years). The number of lifetime farm work years ranged from 2 to 44 years with a median of 14 years. Approximately 24.5% (25) of the mothers worked only at sites located in Texas during year 2, while approximately 75.5% (77) of the mothers worked only outside of Texas. None of the mothers worked both inside and outside Texas during the 2001 migration season. Worksites outside of Texas were located in Arkansas, California, Colorado, Illinois, Indiana, Michigan, Minnesota, North Dakota, Nebraska, Ohio, Oklahoma, Tennessee, and Washington. Of mothers working only in Texas, 76% (19) worked at a single site, 20% (5) worked at two sites, and 4% (1) worked at three sites during the 2001 migration season. Of mothers working only outside of Texas, 58.4% (45) worked at a single site, 27.3% (21) worked at two sites, 10.4% (8) worked at three sites and 3.9% (3) worked at four sites. The total number of months worked during the 2001 migration season for mothers in Texas ranged from 0.5 to 5 months with a mean of 1.48 months and a median of 1 month. Mothers who worked outside of Texas worked for a greater portion of the migration season, ranging from 0.5 to 9 months with an average of 2.72 months and a median of 2 months.

The majority of mothers in Texas worked at sites growing cotton or peanuts. Frequently worked crops in the other states included: asparagus, beets, corn, cotton, grain, grapes, peaches, and potatoes. The most prevalent job activity performed by mothers in Texas was hoeing (81.3%). For mothers working in other states, the most prevalent job activities included sorting/selecting (16.2%), hoeing (13.8%), and harvesting by hand from the ground (13.1%).

Table 1. Pesticide safety training among migrant farmworker mothers, Starr County, Texas, 2001 (*n* = 102).

Variable	Frequency (%)
Mothers ever trained (*n* = 102)	57 (55.9%)
Mothers trained during the last five years (*n* = 102)	47 (46.1%)
Language used to deliver training (*n* = 47)	
Spanish	37 (78.7%)
Both	7 (14.9%)
English	3 (6.4%)
Training discussed when to enter recently treated fields (*n* = 46)[a]	43 (93.5%)
Training discussed illnesses/injuries related to pesticide exposure (*n* = 47)	44 (93.6%)
Training discussed who to contact/where to go for emergency medical care if exposed (*n* = 47)	43 (91.5%)

[a] One missing value.

Of the 102 mothers, 55.9% (57) reported having ever received pesticide safety training, and 46.1% (47) reported having received safety training in the previous five years (table 1). The 47 mothers who reported having received training in the last five years also reported that their training covered key WPS areas. Between 90.9% and 93.2% reported that the training discussed safe entry into a recently pesticide−treated field, illness/injuries related to pesticide exposure, and who to contact or where to go for emergency medical care following exposure to pesticides. The training was delivered most frequently in Spanish (78.7%) or a combination of Spanish and English (14.9%).

The proportion of mothers working outside of Texas who reported that their employer provided field sanitation items differed markedly from workers employed in Texas (table 2). The majority (67.5% to 84.2%) of employers outside of Texas provided water for drinking, disposable cups, toilet facilities, toilet paper, soap and water for washing hands, and towels for drying hands. Conversely in Texas, a minority (12.0% to 28.0%) of employers provided these items. Regarding self−provided field sanitation, a higher proportion (76.0% to 88.0%) of farmworker mothers employed in Texas supplied their own field sanitation items compared with the proportion (17.1% to 36.4%) of their counterparts employed in the other states (table 3). The number of mothers working in states other than Texas was insufficient to examine the other states compared to Texas separately.

Table 2. Employer−provided field sanitation among migrant farmworker mothers, Starr County, Texas, 2001 (*n* = 102).

Sanitation Item	Texas Only (*n* = 25)	Other States Only[a] (*n* = 77)
Clean drinking water	7 (28.0%)	54 (70.1%)
Disposable cups	7 (28.0%)	52 (67.5%)
Toilet facilities[b]	6 (24.0%)	64 (84.2%)
Toilet paper[b]	6 (24.0%)	63 (82.9%)
Water for washing hands	5 (20.0%)	55 (71.4%)
Soap for washing hands	5 (20.0%)	53 (68.8%)
Towels for drying hands	3 (12.0%)	54 (70.9%)

[a] Arkansas, California, Colorado, Illinois, Indiana, Michigan, Minnesota, North Dakota, Nebraska, Ohio, Oklahoma, Tennessee, and Washington.

[b] One missing value in the “other states only” group.

Table 3. Self−provided field sanitation among migrant farmworker mothers, Starr County, Texas, 2001 (*n* = 102).

Sanitation Item	Texas Only (*n* = 25)	Other States Only[a] (*n* = 77)
Clean drinking water	20 (80.0%)	28 (36.4%)
Disposable cups	19 (76.0%)	25 (32.5%)
Toilet paper[b]	19 (76.0%)	13 (17.1%)
Water for washing hands	20 (80.0%)	21 (27.3%)
Soap for washing hands	21 (84.0%)	17 (22.1%)
Towels for drying hands	22 (88.0%)	20 (26.0%)

[a] Arkansas, California, Colorado, Illinois, Indiana, Michigan, Minnesota, North Dakota, Nebraska, Ohio, Oklahoma, Tennessee, and Washington.

[b] One missing value in the "other states only" group.

Discussion

This study supports that a minority of migrant farmworker mothers receive pesticide safety training. Given that mothers migrated with their families to do farm work, the results of this study may also reflect the family training levels. Although the proportion of mothers who received pesticide safety training was low (55.9% ever, 46.1% within the previous five years), it is similar to percentages reported from other studies (32% to 57%) (Arcury et al., 2001; Jackson, 2002; McCauley et al., 2002; Villarejo et al., 2000). Although unlikely, the proportion of trained mothers could be low if the mothers in our study were not working in a recently treated field or area and were therefore exempt from WPS. Most of the trained mothers reported that their training addressed some of the main WPS areas. However, we did not assess the pesticide safety knowledge of the mothers. Thus we could not determine whether the training that covered key WPS areas broadened the mothers' awareness of pesticide safety or impacted their behavior. For example, 69 workers in the PACE project in North Carolina had received training in the current training year or season of the survey. However, a third of the farmworkers were unable to identify a single mode of exposure (Arcury et al., 1999), indicating that the training may not effectively teach basic safety concepts.

Regarding field sanitation, a markedly higher proportion of mothers working outside of Texas reported usual access to employer−provided items compared to workers in Texas. This is supported by the large proportion of Texas workers who usually supplied their own field sanitation. Referring to the PACE project from 1999 as a comparison, 92.8% reported always or usually having access to drinking water, 69.9% reported access to separate drinking cups, 34.5% reported access to water for washing, and 31.4% reported access to a field toilet (Arcury et al., 2001). A limitation of our study is that the data did not allow for examining whether the farmworker mothers used the field sanitation items (e.g., washing hands before eating or smoking) made available to them. In addition, we were not able to determine if the mothers labored on farms with fewer than 11 employees, guaranteeing that the OSHA field sanitation standard applied. Although families were randomly sampled from NGS, generalizability of study findings may be limited if the families enrolled in NGS differ markedly from those not participating in NGS. Additional limitations of this study include a relatively small sample size (*n* = 102) and self−reported data.

Conclusion

Taken collectively, the few available studies indicate a need for increased enforcement of WPS and the OSHA field sanitation standard in several states (Arcury et al., 2001; U.S. GAO, 2000; Jackson, 2002; McCauley et al., 2002; Villarejo et al., 2000). This study further documents that non−compliance with these standards in Texas may be a frequent occurrence. Data suggest that enforcement of safety standards at migrant farmworker worksites is effective at reducing exposure to pesticides and other agricultural chemicals (Vela−Acosta et al., 2002).

Other needs include increased access to pesticide safety information as well as educational materials tailored for migrant, hired, and female laborers (Parrott et al., 1999; Quandt et al., 1999). Showing a video or distributing a leaflet such as those currently in circulation is sufficient for satisfying WPS regulations but may not impart migrant farmworkers with the knowledge of how to protect themselves or the reasons they should make a behavioral change (Quandt et al., 1999). Arcury et al. (2002) suggest that safety training will be ineffective unless farmworkers feel a sense of control in creating a safer workplace and make a subsequent behavioral change (e.g., washing hands before eating or smoking).

Finally, mothers who believe in their ability to prevent or minimize pesticide exposure and who understand basic pesticide safety may be more likely to pass their knowledge and behavior along to their family members and other young children. This may be of great importance, given that current agriculture labor standards in some states such as Texas allow 14 year olds to work for unlimited hours, and 16 year olds can perform hazardous jobs, including handling pesticides (U.S. GAO, 1992). Finally, given the known work involvement of very young children and the low level of employer compliance with both the WPS and OSHA mandated standards, federal and state agencies should increase enforcement of these standards, and employers should offer alternative delivery of WPS pesticide safety training.

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