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Human Participant Protection

This study was approved by the institutional review board of the University of California, Berkeley. Participants gave written informed consent

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Pesticide Exposure and Occupational Safety Training of Indigenous Farmworkers in Oregon

Julie Samples, JD, Elizabeth A. Bergstad, MPH, Santiago Ventura, BS, Valentin Sanchez, Stephanie Ann Farquhar, PhD, and Nargess Shadbeh, JD

This follow-up study assessed indigenous and Latino farmworkers' occupational health and safety needs and measured variables related to pesticide exposure and pesticide safety training among this population. Results yielded differences between indigenous workers and Latino workers related to language barriers, experiences of workplace discrimination, preferred modes of information dissemination, pesticide exposures, and sufficiency of pesticide training. Employing more people who speak indigenous languages as interpreters, community and organizational leaders, and health workers may remove some of the linguistic and cultural barriers to occupational safety training. (*Am J Public Health.* 2009;99:S581–S584. doi: 10.2105/AJPH.2009.166520)

Pesticide use in the United States exceeds 1.2 billion pounds per year.[1] Consequently, migrant agricultural workers in this country are likely to have high rates of pesticide exposure. The negative health effects associated with pesticide exposures are numerous.[2,3] Many of these effects are exacerbated for farmworkers from ethnic groups indigenous to Mexico and Guatemala that have linguistic and cultural histories different from those of Latino migrant populations. Roughly 40% of the 174 000 farmworkers in Oregon are indigenous persons from Mexico and Guatemala.[4,5] The lack of standardized written forms for many indigenous languages and the lack of knowledge regarding indigenous populations are barriers to providing

occupational health and safety training to these workers.

This article follows up on our November 2008 article[6] that presented our study's baseline survey findings. Our project was funded by the National Institute of Environmental Health Sciences and the National Institute for Occupational Safety and Health, and involved community partners from the Oregon Law Center, Salud Medical Center, Pineros y Campesinos Unidos del Noroeste (Northwest Treeplanters and Farmworkers United), the Portland State University School of Community Health, and Farmworker Justice. Here we present the findings of our follow-up survey and comparisons between baseline and follow-up survey results.

METHODS

With input from all project partners,[7] we used previously validated survey tools that had been used with farmworkers[5,8,9] to develop a baseline survey written in Spanish. Between April and October 2006, the indigenous community educator partners administered the baseline survey at labor camps, farmworker homes, and community centers.[6] The indigenous community educator partners administered the follow-up surveys between May and July 2008 at locations similar to those used for the baseline survey, in the Willamette Valley region of Oregon.

Project partners then prerecorded the baseline and follow-up surveys in the Mixteco Alto, Mixteco Bajo, and Triqui (Copala) indigenous languages to ensure that survey questions were linguistically appropriate. Of the 73 indigenous workers surveyed at follow-up, 45 spoke Mixteco or Triqui. Of those, 31 (69%) chose to complete the survey using the prerecorded tapes in their indigenous languages. We used SPSS version 15.0 (SPSS Inc, Chicago, IL) to analyze the follow-up data. Post hoc analyses that used the Bonferroni test were computed for significant ANOVAs to locate the differences between indigenous and time categories.

RESULTS

Of the 150 follow-up surveys administered, 73 were completed by indigenous workers and 77 were completed by Latino workers; 33% of respondents were female (Table 1). All respondents were from Mexico, and respondents reported speaking 12 native languages. The overwhelming majority of indigenous farmworkers did not identify Spanish as their primary language; rather, they named an indigenous language as their primary language. Indigenous workers were younger (35.9 vs 38.4 years), had less formal education in Mexico (4.3 vs 5.8 years), and had been in Oregon and the United States for a shorter period of time (5.5 vs 8.5 and 7.1 vs 11.2 years) than had Latino workers. Indigenous workers reported more individuals living in their households (6.3 persons) than did Latino workers (5.1 persons; $P<.01$).

When comparing job types on the basis of indigenous and nonindigenous status, we found significant differences between groups ($P<.001$). The most common job reported at follow-up was farm work, with 41% of respondents employed in that manner. Farm work employed 53% of indigenous workers and 29% of Latino workers. The next most commonly reported job was plant nursery work, reported by 30% of indigenous workers and 18% of Latino workers. Latinos were more likely to be employed in orchards (26%) and canneries (17%) than were indigenous workers (4% in orchards and 11% in canneries).

We found differences between indigenous and Latino workers with regard to workplace discrimination because of the worker speaking a native language ($P<.001$). Of those who reported experiencing workplace discrimination, 30% of indigenous workers reported discrimination because of speaking a native language, compared with the 8% of Latino workers who reported experiencing workplace discrimination for the same reason.

More indigenous than Latino participants reported that they had been treated by physicians who were unable to speak their native language ($P<.01$). Sixty-three percent of respondents reported having a physician who could not speak their native language (79% of all

TABLE 1—Demographic Characteristics of Follow-up Survey Participants (N = 150): Latino and Indigenous Workers, Willamette Valley, Oregon, May–July 2008

	Total Sample, Mean or No. (%)	Latino, Not Indigenous, Mean or No. (%)	Indigenous, Mean or No. (%)
Age, y	37.24	38.42	35.91
Years of education in Mexico[a]	5.1	5.8	4.28
Years lived in the United States[a]	9.23	11.21	7.13
Years lived in Oregon[a]	7.7	9.1	6.4
Gender			
Men	101 (67%)	52 (67%)	49 (67%)
Women	49 (33%)	25 (33%)	24 (33%)
No. people in home[a]	5.7	5.08	6.33
Type of work[a]			
Orchard	23 (15%)	20 (26%)	3 (4%)
Plant nursery	36 (24%)	14 (18%)	22 (30%)
Cannery	21 (14%)	13 (17%)	8 (11%)
Farm work	61 (41%)	22 (29%)	39 (53%)
Forestry	6 (4%)	6 (8%)	0 (0%)
Other	3 (2%)	1 (1%)	2 (3%)
Reported workplace discrimination as a result of speaking a native language[a]	27 (18%)	6 (8%)	21 (30%)
Had a doctor who did not speak native language[a]	43 (63%)	13 (43%)	30 (79%)
Interpreter was not provided during doctor's visit[a]	12 (20%)	0 (0%)	12 (32%)

Note. Percentages reported were calculated as a proportion of all respondents who answered each individual question. For non-indigenous Latinos, n = 77; for indigenous Latinos, n = 73.
[a]Differences between indigenous and Latino participants are significant at $P<.01$.

indigenous respondents and 43% of all Latino respondents). When asked about whether an interpreter had been provided when a physician did not speak a native language, all of the respondents who noted that no interpreter was provided were indigenous ($P<.01$).

Self-Reported Pesticide Exposure and Training

We identified significant differences between indigenous and Latino worker groups when comparing baseline and follow-up survey responses with regard to current pesticide exposures ($P<.001$), not ever working with pesticides ($P<.05$), and sufficiency of pesticide training (Table 2). At follow-up, more indigenous workers (43%) reported currently being exposed to pesticides than did Latino workers (25%); at baseline, the opposite had been reported, with fewer indigenous workers (31%) reporting current exposure to pesticides than did Latino workers (65%). Among the total subset of 136 farmworkers (80 respondents at follow-up) who reported that they never worked with pesticides, at follow-up more indigenous workers (86%) reported never working with pesticides than did Latino workers (77%).

Indigenous workers reported an increase in sufficiency of training at follow-up ($P<.05$), less written training overall ($P<.01$), and more written training in Spanish ($P<.001$). Latino respondents reported a decrease in written training ($P<.01$)—including written training in Spanish ($P<.001$)—from baseline to follow-up. Additionally, there was a decrease in the percentage of Latino respondents who reported not receiving training via individual presentation ($P<.05$). Table 2 presents data on pesticide training frequency, adequacy, and type as reported by both groups of farmworkers.

DISCUSSION

One of this study's limitations is its repeated-panel design, which does not track the same farmworkers over time. Such a design captures the net change of all of the changes, so changes should be interpreted with caution.[10] Also, the small sample size may reduce the study's statistical power and the generalizability of the study's findings to farmworkers who live outside of Oregon.

Our finding regarding the increased proportion of occupational training in Spanish for indigenous populations is cause for concern. Although indigenous workers reported more training in Spanish at follow-up than at baseline, it is unlikely that training in Spanish is the most effective means for conveying information to indigenous workers regarding pesticide exposures. It is encouraging that when training is provided, it is more likely to be presented orally than in writing, but it may be overly optimistic to assume that indigenous workers feel comfortable engaging with or requesting clarification from a presenter who does not speak their native language. Such reluctance, if it exists, could be caused by the identified discrimination against speakers of indigenous languages. This study did not evaluate the substantive content or adequacy of training.

Indigenous workers were more likely to report that their physician did not speak their language and that they were not provided with an interpreter in such health care settings. To reduce language and cultural barriers to health care access, more *promotores* (community health workers) should be deployed to meet the needs of the Latino and indigenous populations.[11,12] To address this issue, the project supported placement of an indigenous-language-speaking interpreter with the partner clinic.

At both baseline and follow-up survey administration, 69% of workers who spoke an indigenous language elected to complete the survey using prerecorded materials in their own language, rather than completing a survey written in Spanish. Our findings suggest that employing more people who speak indigenous languages as organizational leaders, interpreters, and health workers may help reduce some of the linguistic and cultural barriers to occupational safety training and other health and social services identified in this study. ■

TABLE 2—Comparison of Baseline and Follow-up Survey Results for Pesticide Exposure and Safety Training: Latino and Indigenous Workers, Willamette Valley, Oregon, May–July 2008

	Baseline, No. (%)	Follow-up, No. (%)	P[a]
Currently exposed to pesticides			
Indigenous workers	21 (31)	29 (43)	.002
Latinos	46 (65)	19 (25)	
Never worked in pesticides			
Indigenous workers	36 (75)	37 (86)	.038
Latinos	20 (71)	43 (77)	
Training was sufficient			
Indigenous workers	13 (72)	26 (81)	.039
Latinos	18 (82)	13 (81)	
No individual training presentation			
Indigenous workers	16 (80)	26 (79)	.019
Latinos	21 (78)	11 (65)	
Received written training			
Indigenous workers	8 (40)	10 (30)	.009
Latinos	17 (63)	3 (18)	
Received written training in Spanish			
Indigenous workers	3 (38)	22 (92)	.001
Latinos	13 (81)	5 (56)	

Note. Percentages reported were calculated as a proportion of all respondents who answered each individual question at each data measurement point. The total number of respondents varies for each question. For both baseline and follow-up, N = 150.

[a]*P* value reported indicates differences between baseline and follow-up results that are significant at $P<.01$.

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Contributors

J. Samples, S. Ventura, V. Sanchez, and N. Shadbeh provided expertise on farmworker communities in Oregon and helped develop research instruments, interpret data, and write the article. E.A. Bergstad analyzed and interpreted the data and contributed to article writing and editing. S.A. Farquhar facilitated development and implementation of research instruments and protocol, analyzed and interpreted data, and helped write the article. N. Shadbeh conceptualized the study and supervised all aspects of implementation and evaluation.

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The Portland State University institutional review board approved this study.

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Community Collaborations for Farmworker Health in New York and Maine: Process Analysis of Two Successful Interventions

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We conducted a process evaluation of 2 successful farmworker community-based participatory research intervention development projects (in Maine and New York State). Participant surveys measured satisfaction with the program process. We used qualitative methods to analyze free-text responses. Respondents indicated high satisfaction levels overall. The main concern was long-distance project coordination. Community-based participatory research programs in which (1) the work team defines the target health issue, (2) agricultural employers are meaningfully included, and (3) interventions are carried through to completion, warrant further study. (*Am J Public Health.* 2009;99:S584–S587. doi:10.2105/AJPH.2009.166181)

The Community Collaborations for Farmworker Safety and Health Project was established in 2003 as part of the Environmental Justice Initiative. We initiated the project in Washington County, Maine, and in the Hudson Valley of New York, in collaboration with a farmworker service agency and a physician in each location. This initiative was jointly sponsored by the National Institute of Occupational Safety and Health and the National Institute for Environmental Health Sciences; its goal was to establish community-based interventions that assisted populations that had traditionally suffered health disparities as a result of occupational or environmental conditions. The program model was based on hiring a local site coordinator, who then facilitated the recruitment and training of a local work team representing the agricultural community: farmworkers, farm owners, health care providers, and agricultural and community service agency representatives.

In Maine, the coalition developed and successfully piloted an ergonomically enhanced blueberry-harvesting rake. In New York, the program targeted eye irritation caused by high levels of extremely fine dust present in the "black dirt" region, with an intervention consisting of eyewear, eyewash, and training. Both interventions were subsequently evaluated with randomized trials and were found to be effective[1,2] (J.J.M., L.H., unpublished data, 2008). Regardless, understanding why the programs were successful is equally important. To answer this question, we collected process evaluation data throughout the project. Process evaluation breaks down a program into its component parts (e.g., forming a representative work team, making group decisions, and implementing the intervention) and seeks to understand how each unfolded from the point of view of the participants. It tells researchers how implementation was experienced, and if there were any unintended consequences. Process evaluation is a mechanism for systematically listening to participants and, thus, it is difficult to imagine a successful community-based participatory research (CBPR) program that does not include it.

METHODS

To evaluate participants' satisfaction and to solicit program feedback, we conducted structured interviews with work team members at the end of each of 4 program years (2004 through 2007). We aggregated responses and analyzed free-text comments for relevant themes.[3,4]