

Empowering Agricultural Workers Through Community Health Worker-Led Pesticide Safety Workshops in Washington State

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Ileana María Ponce-González¹ , Griselda Arias², Elmer Diaz²,
and Michael L. Parchman³

Abstract

Background: It is difficult to reach migrant or refugee agricultural workers about pesticide exposure prevention. Here, we describe a community health worker (CHW)-led pesticide exposure prevention workshop and the impact of this program among migrant and refugee workers in Washington state.

Methods: A focus group of migrants and refugees participated in the development of a CHW-led Spanish language pesticide exposure prevention mobile phone app and workshop. Pre- and post-workshop surveys assessed pesticide training, knowledge, and characteristics.

Results: Community health workers facilitated 28 workshops attended by 263 participants from 49 agricultural communities. Approximately 79% of participants reported no prior pesticide training. Significant improvements were observed in the proportion familiar with illnesses associated with pesticides, knowledge about pesticide definition, ability to correctly identify the content of pesticide labels, and the correct method to wash fruits and vegetables.

Conclusions: Community health workers are effective in addressing the gaps in pesticide safety education and awareness among migrant and refugee communities. Further work is needed to assess how to better integrate a mobile phone app into this training and subsequent use of the knowledge.

Keywords

public health, CHW, pesticides workshops, migrants, peer to peer, hispanics

Agricultural workers face both acute and chronic health risks from pesticide exposure, including skin irritation, respiratory issues, and even some cancers.¹ They are particularly vulnerable to pesticide exposure due to insufficient knowledge and training on how to protect themselves.²⁻⁴ Not only are they exposed to chemicals in the fields and surrounding areas during work hours but they may also inadvertently carry these substances home on their skin and clothing.^{4,5} This poses a risk of secondary exposure to their families.

Washington State ranks second only to California in the production of fruits, tree nuts, and vegetables.⁶ Pesticide application rates for these crops are 4.5 times the national average, posing significant health risks to farmworkers.⁷ The Washington State Department of Health's Pesticide Illness Surveillance and Prevention Program investigated 251 events affecting 275 individuals in 2022.⁸ Nearly 70% of these events met the Centers for Disease Control and Prevention

and National Institute for Occupational Safety and Health criteria for acute pesticide exposure illnesses. In addition, underreporting of potential acute pesticide-related illnesses remains a significant issue.³ Many affected individuals do not seek

¹ Community Health Worker Coalition for Migrants and Refugees, Edmonds, WA, USA

² Office of Environmental Public Health Sciences, Environmental Public Health Division, Washington State Department of Health, Olympia, WA, USA

³ Center for Accelerating Care Transformation, Department of Health Systems Science, Kaiser Permanente Bernard J. Tyson School of Medicine, Seattle, WA, USA

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Corresponding Author:

Ileana Maria Ponce-Gonzalez, Community Health Worker Coalition for Migrants and Refugees, 24315 89th PL W, Edmonds, WA 98026, USA.
Email: ileanaponce@chwcoalition.org



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medical attention due to a lack of awareness, fear of job loss, or risk of deportation.

While numerous resources on pesticide exposure are available from state and federal agencies, many of these are only available in English. Although professionals often conduct training sessions such as agricultural extension agents, it is difficult to reach agricultural workers within migrant or refugee communities.³ Rarely is this information disseminated by individuals working in the agricultural sector.

Community Health Workers (CHWs), also known as “Promotores” within the Hispanic community, can be effective in disseminating health information to underserved communities through linguistically appropriate and culturally sensitive methods.^{9,10} The Community Health Worker Coalition for Migrants and Refugees (CHWCMR), a nonprofit in Washington State, has experience with a community-informed approach to train CHWs who then facilitate educational workshops as trusted members of their local community. Examples include programs that address influenza vaccination, diabetes, and oral health.^{11–13}

Community Health Worker Coalition for Migrants and Refugees identified a need to offer pesticide training in Washington state that is both culturally and linguistically appropriate, aimed at enhancing Hispanic agricultural workers’ understanding of pesticide safety while considering their language and literacy.⁴ Although CHWs have been utilized in many states to disseminate information about mitigating the harms from pesticide exposure, there are few if any evaluations of the impact of those programs within Hispanic migrant and refugee agricultural workers. Here, we describe the structure and components of the pesticide exposure prevention program, evaluation outcomes from the workshops conducted by CHWs, lessons learned, and future steps.

Methods

Participants and Setting

Community health workers who were members of CHWCMR were recruited from agricultural communities in mostly rural areas across the state for the program. Washington state counties represented by these CHWs included Skagit, Thurston, Pierce, Yakima, Benton, Franklin, and Whatcom. Community health workers worked in pairs to recruit local community members to participate in the workshops. The goal for each workshop was to have 10 to 25 participants.

Program Development and Implementation

The project commenced with the creation of the “Pestisol” mobile phone app (developed in Spanish for CHWCM). The app provides the user with access to a series of short videos about pesticide exposure prevention in Spanish developed by the University of California Davis in collaboration with the University of Oregon with support from the United States Department of Agriculture. An interactive series of questions allows the user to assess their knowledge and review materials to refresh their knowledge. A focus group of 47 community members, primarily migrants and refugees, informed the development of the phone app and then tested the pesticide exposure prevention measures guided by the app. A training curriculum for 2-h pesticide workshops was subsequently developed by incorporating feedback from the focus group. An outline of the 2-h workshop and topics covered can be found in Table 1.

The training approach taken by CHWs involved first building trust and forging personal connections with agricultural workers within their local community and then recruiting

Table 1. Workshop Content.

| Topic | Description | Time |
|---|--|--------|
| Welcome, introduction and pre-workshop survey | CHW introductions and an overview of the workshop content | 10 min |
| Download Pestisol mobile phone app | CHWs-assisted participants with downloading the app on their smart phones and demonstrated its features | 10 min |
| What are Pesticides? | Describe types of pesticides, ingredients, and chemical and physical properties | 15 min |
| EPA Worker Protection Standards (WPS) for pesticide handlers | A 22-min EPA approved video with the expanded training content from 2015 standards from the Pesticide Educational Resources Collaborative (PERC) | 30 min |
| Acute and Chronic Pesticide Exposure | Entry routes, effects of exposure, toxicity, and ways to prevent | 10 |
| Environmental Pesticide Exposure | Impact of pesticides in the environment: soil, water, ecosystem, due to overuse and misuse | 10 |
| Cleaning fruits and vegetables | A hands-on interactive demonstration of evidence-based techniques | 10 |
| How to protect children, pets, and family members from pesticide exposure | Distribution and review of a cartoon booklet developed by CHWCMR | 10 |
| Practical Solutions for Pesticide Safety | A review of 24 solutions and ideas identified on farms and developed in partnership with farmers, educators, and researchers in Washington State | 10 |
| Review, conclusions, and post-workshop survey | A question-and-answer session followed by completion of the post-workshop survey. | 5 |

Abbreviations: CHW, community health worker; CHWCMR, Community Health Worker Coalition for Migrants and Refugees; EPA, Environmental Protection Agency.

them to participate in the 2-h interactive workshop either at a local community center or agricultural worker housing sites. The workshop curriculum used real-world examples to highlight the critical nature of pesticide safety and was tailored to align with cultural beliefs, practices, and values. During these workshops, participants downloaded the Pestisol phone app. After each workshop, CHWs conducted home visits to the residences of agricultural workers and collaborated with local community leaders to discuss pesticide safety.

Data Collection and Analysis

This is an observational pre-post intervention study. A survey was administered by the CHWs to all workshop participants before and after the educational program to evaluate the workshop. The survey asked about their characteristics, prior pesticide training experience, their knowledge about pesticides and associated health risks, and how to reduce the risk of pesticide exposure (see Appendix). The change in the proportion of the correct response to individual questions on the survey from pre-workshop to post-workshop was assessed using a χ^2 test.

This program was supported by funding from the Washington Department of Ecology's Public Participation Grant program in 2019. The overall evaluation design and methods were reviewed and determined to meet Category 1 exempt criteria by the Kaiser Permanente Washington Health Research Institute's Institutional Review Board.

Results

From 2019 to 2023, 48 migrant CHWs facilitated pesticide workshops. Collaborating in pairs, they held 28 sessions attended by 263 participants from 49 agricultural communities across Washington state. All attendees successfully downloaded the "Pestisol" phone app and shared it with an additional 10 migrants each, totaling 2950 downloads. While the first workshops in 2019 were in-person, subsequent sessions shifted online due to the COVID-19 pandemic. Community health workers trained between 10 and 25 migrants per workshop. Participant characteristics are displayed in Table 2. All participants in the workshops returned both pre- and post-workshop surveys.

Prior to the workshop, 79% reported that they had no prior training in preventing pesticide exposure. Two-thirds of participants (66%) reported they had worked with pesticides for more than 3 years. Among those with 5 or more years of experience working with pesticides, only 30% of participants had received pesticide-specific training (see Figure 1).

The proportion with correct responses to individual questions within each group on the pre- and post-workshop surveys is found in Table 3. These improvements were statistically significant across all questions: the proportion who were familiar with illnesses associated with pesticide exposure (from 19.2% to 38.9%), knowledge about the definition of pesticides (from 56% to 65.6%), ability to correctly identify the content of labels on pesticides (from 36.5% to 54%), and identification of

Table 2. Characteristics of Workshop Participants.

| | |
|---------------------------------------|-------|
| Age, mean (SD) | |
| 18-34 | 33.0% |
| 34-44 | 38.4 |
| 44-64 | 25.1 |
| ≥65 | 3.5 |
| Percent Female | 70% |
| <u>Education</u> | |
| None | 14.4% |
| Completed Primary School | 26.1 |
| Completed High School | 34.2 |
| Some College | 14.0 |
| Completed College or higher | 11.3 |
| <u>Country of Origin</u> | |
| Ecuador | 50.4% |
| Mexico | 33.8 |
| Guatemala | 5.0 |
| Honduras | 2.7 |
| Other | 8.1 |
| <u>How Long Work with Pesticides?</u> | |
| Less than 12 months | 21.2% |
| 1-2 years | 11.0 |
| 3-5 years | 10.2 |
| More than 5 years | 28.6 |
| I do not remember | 29.0 |

the correct method to wash fruits and vegetables (from 59% to 90%).

Discussion

Community Health Workers were successful in engaging with and training members of their local community about pesticides. Remarkably, 79% of all workshop participants reported no prior training regarding pesticide exposure, and even among those who had worked with pesticides for 5 years or more, only 70% reported any prior training. The agricultural workforce is increasingly diverse, comprising many immigrant workers with limited English proficiency and educational backgrounds.³ These factors make safety and health training a challenge.

Although a significant improvement, only 54% were able to correctly identify the content of pesticide labels after completing the workshop. In the context of pesticide regulation, the Environmental Protection Agency mandates that pesticides come with detailed labels. Adhering to the guidelines on these labels can minimize exposure risks.¹⁴ Equally concerning is that only 38.9% were familiar with illnesses associated with pesticide exposure after the workshop, although a significant improvement from the 19.2% before the workshop. This may delay seeking appropriate health care and thus contribute to underreporting of pesticide-associated illnesses.

Limitations of the results from this evaluation include the potential for desirability bias in the responses provided on the surveys, especially the post-workshop survey as participants

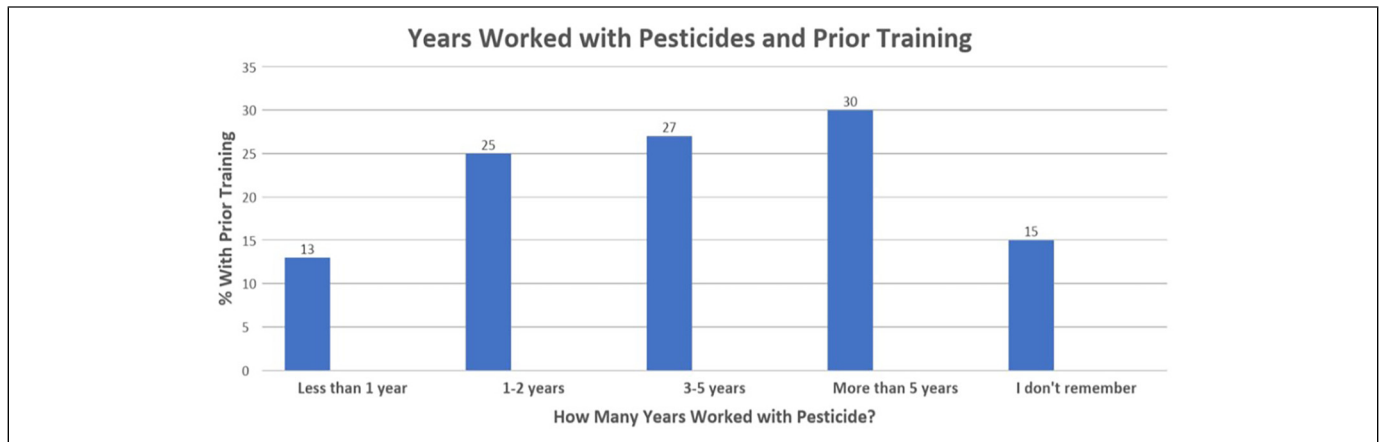


Figure 1. Years worked with pesticides and prior training.

Table 3. Pre-Post Workshop Survey Results.

| Question | Pre-workshop | Post-workshop | Pearson Chi-square (<i>P</i> value) |
|--|--------------|---------------|--------------------------------------|
| % Familiar with diseases and conditions associated with pesticide exposure | 19.2% | 38.9% | Chi-square = 30.5 (<i>P</i> < .001) |
| % correct response about the definition of pesticides | 56% | 65.6% | Chi-square = 34.8 (<i>P</i> < .001) |
| % correct response about the information available on pesticide labels | 36.5% | 54% | Chi-square = 32.5 (<i>P</i> < .001) |
| % correct response about how to correctly wash fruits and vegetables | 59.1% | 89.7% | Chi-square = 12.2 (<i>P</i> < .001) |
| % who correctly identified PPE | 86.8% | 92.2% | Chi-square 41.62, (<i>P</i> < .001) |

may want to provide the response that the CHW wanted to see. Although a higher percentage of workshop participants were female than in the agricultural worker population, most of these were spouses of farmworkers. Otherwise, participants have characteristics like agricultural workers in other states. No data are available to evaluate the subsequent usefulness of the Pestisol app to workshop participants, although to date 2950 individuals have downloaded the app, far more than the number of workshop participants. Finally, we were unable to perform a long-term impact evaluation. Understanding the sustained effects of the intervention beyond the immediate post-workshop period is crucial for practical implications and future research.

Conclusions

Community health workers offered a unique approach to address gaps in pesticide safety education and awareness among migrant and refugee communities in Washington State. As a trusted member of their community, they were able to successfully recruit and engage with workshop participants and improve their pesticide safety knowledge. Although CHW-led workshops can be a successful approach for pesticide exposure prevention, further evaluation of how to integrate workshops more successfully with a mobile phone app and subsequent use of the knowledge by participants is needed.

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ORCID iDs

Ileana María Ponce-González  <https://orcid.org/0000-0003-2139-9578>

Data Availability Statement

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

References

1. Das R, Steege A, Baron S, Beckman J, Harrison R. Pesticide-related illness among migrant farm workers in the United States. *Int J Occup Environ Health*. 2001;7(4):303–312. doi:10.1179/107735201800339272
2. Arcury TA, Estrada JM, Quandt SA. Overcoming language and literacy barriers in safety and health training of agricultural workers. *J Agromedicine*. 2010;15(3):236–248. doi:10.1080/1059924X.2010.486958
3. Prado JB, Mulay PR, Kasner EJ, Bojes HK, Calvert GM. Acute pesticide-related illness among farmworkers: barriers to reporting to public health authorities. *J Agromedicine*. 2017;22(4):395–405. doi:10.1080/1059924X.2017.1353936
4. Suratman S, Edwards JW, Babina K. Organophosphate pesticides exposure among farmworkers: pathways and risk of adverse health effects. *Rev Environ Health*. 2015;30(1):65–79. doi:10.1515/reveh-2014-0072
5. Temkin AM, Uche UI, Evans S, et al. Racial and social disparities in Ventura County, California related to agricultural pesticide applications and toxicity. *Sci Total Environ*. 2022;853:158399. doi:10.1016/j.scitotenv.2022.158399
6. United States Department of Agriculture, National Agricultural Statistics Service Information, 2017 Census of Agriculture, Fruit, Tree Nut, and Berry Production at. https://www.nass.usda.gov/Publications/Highlights/2019/2017Census_Fruit_TreeNut_Berry_Production.pdf
7. Ferguson R, Dahl K, DeLonge M. *Farmworkers at Risk—The Growing Dangers of Pesticides and Heat*. 2019. Union of Concerned Scientists; 2019, [cited 09/26/2023]. Farmworkers at Risk | Union of Concerned Scientists (ucsusa.org).
8. CDC. Pesticide illness and injury surveillance. 2023 [cited 09/26/2023]. <https://www.cdc.gov/niosh/topics/pesticides/default.html>
9. Hansmann KJ, Kind AJH. Community health workers and COVID-19. *Health Aff (Millwood)*. 2020;39(6):1097. doi:10.1377/hlthaff.2020.00554
10. Rosenthal EL, Brownstein JN, Rush CH, et al. Community health workers: part of the solution. *Health Aff (Millwood)*. 2010;29(7):1338–1342. doi:10.1377/hlthaff.2010.0081
11. Ponce-Gonzalez IM, Perez K, Cheadle AD, Jade M, Iverson B, Parchman ML. A multicomponent health education campaign led by community health workers to increase influenza vaccination among migrants and refugees. *J Prim Care Community Health*. 2021;12:215013272110556. doi:10.1177/21501327211055627
12. Ponce-Gonzalez IM, Jimenez N, Rodriguez E, Srivastava A, Parchman ML. Community health worker-led implementation of the Stanford Youth Diabetes Coaching Program in underserved Latinx communities. *J Prim Care Community Health*. 2023;14:21501319231158285. doi:10.1177/21501319231158285
13. Ponce-Gonzalez IM, Cheadle AD, Parchman ML. Correlation of oral health education by community health workers with changes in oral health practices in migrant populations in Washington state. *J Prim Care Community Health*. 2021;12:21501327211002417. doi:10.1177/21501327211002417
14. de Boer A. Labelling and denominating lung toxicity effects of pesticides. *Curr Opin Pulm Med*. 2021;27(4):263–270. doi:10.1097/MCP.0000000000000781

Author Biographies

Ileana Maria Ponce Gonzalez, MD, MPH is the founder and executive director of the CHW Coalition for Migrants and Refugees. She has a master's degree in public health from Johns Hopkins University and worked for the National Institutes of Health and the Agency for Healthcare Research and Quality prior to her current position. She has worked in academic and clinical settings, local and state government, and public health administration, where she has extensive experience working with diverse segments of the community in three different countries: Nicaragua, Chile and the United States.

Griselda Arias, MHA is the Pesticides Program manager in the Office of Environmental Public Health Sciences within the Washington State Department of Health and oversees the Acute Pesticide Illness and Surveillance program in the Health Homes and Communities section. She has a master's degree in health administration from the University of Washington.

Elmer Diaz is a toxicologist at the Washington State Department of Health with expertise in children's products and site assessments. He has over fifteen years of public health experience with a background in risk-assessment level report writing and evaluating toxicological impacts of chemicals.

Michael L. Parchman, MD, MPH is a family physician and health services researcher who recently retired from the Kaiser Permanente Washington Health Research Institute in Seattle. His research focused on improving outcomes for people living with chronic conditions. He also has many years of experience as a medical educator and clinician at academic medical centers working with underserved minority populations.

Appendix: Pesticide Workshop Survey

1. Where were you born?
 - (a) Ecuador
 - (b) Mexico
 - (c) Guatemala
 - (d) Honduras
 - (e) Other
2. What is your age?
 - (a) 18-34
 - (b) 34-44
 - (c) 44-64
 - (d) More than 65
3. What is your gender?
 - (a) Female
 - (b) Male
4. What is the highest level of education you completed?
 - (a) None
 - (b) Completed Primary School
 - (c) Completed High School
 - (d) Some College
 - (e) Completed College or higher
5. Before today, had you received any training on pesticides?

- (a) Yes
 - (b) No
6. How long have you worked with pesticides?
- (a) Less than 12 months
 - (b) 1-2 years
 - (c) 3-5 years
 - (d) More than 5 years
 - (e) I do not remember
7. Are you familiar with conditions or diseases that are related to pesticide exposure?
- (a) Yes
 - (b) No
8. Pesticides are:
- (a) Substances used to control insects, weeds, fungi, rodents, bacteria, or unwanted organisms.
 - (b) Used in gardens and farmland.
 - (c) Beneficial for pest control
 - (d) Used to prevent the growth of molds and fungi, disinfectants to prevent the spread of bacteria, and compounds used to control rats and rodents.
- (e) All options above
9. The pesticide label includes information about:
- (a) How to use pesticides
 - (b) How to prevent contamination of rivers by pesticides
 - (c) How to control the spread of pesticides in the environment
 - (d) All the options above
 - (e) I'm not sure
10. Fruits and vegetables can be cleaned of pesticides:
- (a) If ingested directly from the package, as well as
 - (b) If we wash fruits and vegetables with a mixture of water, salt and vinegar.
 - (c) If we keep them in the refrigerator all the time
 - (d) If we wash them with water only
 - (e) All the above
11. Personal protective equipment (PPE) includes gloves, goggles, boots and a belt.
- (a) Yes
 - (b) No