

The Oregon Migrant Farmworker Community: An Evolving Model for Participatory Research

Linda A. McCauley,¹ Marco Beltran,² Jacki Phillips,³ Michael Lasarev,¹ and Diana Sticker¹

¹Center for Research on Occupational and Environmental Toxicology, Oregon Health Sciences University, Portland, Oregon, USA; ²Academy for Educational Development, Washington, DC, USA; ³Oregon Child Development Coalition, Wilsonville, Oregon, USA

Migrant farmworker communities present distinct challenges that require new approaches for community participation in research. In the State of Oregon an agency that advocates for the migrant farmworker community has collaborated successfully with university researchers to implement a research program directed to reducing pesticide exposures among the children of migrant farmworkers. The research process has included both qualitative research methods with members of the community and quantitative approaches to measure pesticide dust residues in homes, biomarkers of pesticide exposure, and effects on health. A committee of university and community stakeholders advises the research. Evaluative processes have been initiated to assess the effectiveness of the participatory model used in this project. The components of the preliminary process evaluation and results are presented. Evaluative data show that researchers and community members differ on perceptions of community involvement and the extent to which communication problems have been resolved between the two groups. Suggestions for improved community involvement and communication are given. *Key words:* community participation, farmworkers, pesticides, process evaluation. — *Environ Health Perspect* 109(suppl 3):449–455 (2001). <http://ehpnet1.niehs.nih.gov/docs/2001/suppl-3/449-455mccauley/abstract.html>

The exposure of farmworkers and their children to pesticides has been an area of increasing public health concern, and national groups have addressed the special health concerns and research needs of the migrant population (1–4). The migrant farmworker community in Oregon is similar to other migrant farmworker communities in being disadvantaged, medically indigent, having poor health, and having poor access to healthcare. The children of farmworkers have limited access to healthcare and infants are at high risk for illness and poor nutrition (5).

As with many disenfranchised communities, there is potential for migrant farmworker communities to benefit from initiatives that engage the community in partnerships with healthcare providers and researchers. However, the migrant farmworker community presents distinct challenges by its very nature and requires new approaches for community participation in research. The migratory nature of this community itself impedes community organization efforts. Although farmworkers often have a clear identification with other members of the community, frequent migration prohibits the building of community resources. The places where community members come together are constantly shifting, and the group is constantly changing in membership. Some community experts also feel that traditional migrant streams are evolving as new employment opportunities become available to migrant communities in the United States (6). The community itself is evolving, with different groups from outside the United States being replaced with others. For example, the proportion of migrant

farmworkers who do not speak Spanish as their primary language appears to be increasing as persons from areas of Mexico and Central America, where indigenous languages are commonly used, are recruited to meet the labor shortage in the United States. New immigrating populations have language barriers and a lack of familiarity with resources in the community, which present additional challenges in community-building capacity. Although participatory research is a challenge in the migrant community, efforts can be developed to involve migrant farmworkers and advocates for the migrant community in research initiatives (7–9).

The goal of this article is to describe the development of an evolving model that incorporates participation of groups that serve the migrant farmworker community and advocate for their unique health concerns and needs. The characteristics of Oregon's migrant farmworker community and a community-based organization are presented. The process of evaluating community-based research initiatives is discussed, and preliminary process evaluation of the participatory model is presented.

Research Aims

The primary focus of our research program has been to use a community participatory model to characterize the degree of exposure to pesticides and potential health effects in migrant farmworkers and their children. Almost one half of migrant farmworkers travel with other family members, including small children (10), but little is known about potential health effects associated with pesticide

exposure in this population (1–3). Pesticide exposure can occur from a number of sources such as contaminated soil, dust, work clothing, water, and food, or through drift, the deposition of a pesticide off target. Pesticides can be deposited in the home by residues on the parents' clothes and shoes and by pets. Pesticides may persist in indoor environments longer than in outdoor soil due to the lack of degradative processes such as sun, rain, and soil microbial activity. Because children are in a delicate developmental stage, their vulnerability to the effects of pesticide exposure is heightened.

Investigations in the last decade have documented levels of pesticides in homes of farmers and nonseasonal farmworker families living within 200 ft of an orchard compared to referent families (11). In these studies organophosphate pesticide compounds were found in 62% of household dust samples. Factors in the migrant family environment could potentially increase pesticide levels in the home, specifically, the close proximity of housing to the fields where spraying occurs, the substandard housing in which migrant families often live, the number of persons living in the dwelling, inadequate laundry facilities to cleanse clothing of pesticide residues, and multiple family members working in the agricultural fields. Given the emerging research regarding the extent of residential exposures to pesticides, our project was designed to answer one question of paramount importance to the migrant

This article is based on a presentation at the Workshop on Farmworkers and Pesticides: Community-Based Research held at the American Public Health Association Meeting on 7 November 1999 in Chicago, Illinois, USA.

Address correspondence to L.A. McCauley, Center for Research on Occupational and Environmental Toxicology, Oregon Health Sciences University, 3181 SW Sam Jackson Park Rd., Mailcode L606, Portland, OR 97201-3098 USA. Telephone: (503) 494-2501. Fax: (503) 494-4278. E-mail: mccauley@ohsu.edu

The authors thank all the members of the farmworker community and staff of the Oregon Child Development Coalition for their kind participation in this project.

This work was funded by the National Institute of Environmental Health Sciences grants RO1 ES98707 and R13-ES10197.

Human Subjects: All protocols in this study were conducted in accordance with national and Oregon Health Sciences University institutional guidelines for the protection of human subjects.

Received 24 November 2000; accepted 22 January 2001.

farmworker community: "Is the health of our children being jeopardized by the pesticide exposures in our homes?"

The premise of our research program is that achieving environmental equity can be best accomplished through a team effort involving farmworkers, community groups serving farmworkers, farm owners/growers, local healthcare providers, and research scientists. The project has focused on four major areas of scientific inquiry: assessment of housing conditions and pesticide residues in household dust; assessment of biologic markers of pesticide exposure in adults and children; development of methods to assess neurobehavioral function in non-English-speaking children; and development of culturally appropriate educational interventions with migrant families.

Characteristics of Farmwork in Oregon

Agriculture is a major industry in Oregon. In 1995 more than 17,500,000 acres were devoted to agriculture (12,13). This acreage was divided among roughly 38,500 farms, with an average size per farm of 455 acres. Many of the crops grown in Oregon are particularly advantageous for studying pesticide exposure in farmworkers because production of these crops involves high to moderate field-worker pesticide exposure. The crops that are both chemically intensive and employ a large number of seasonal workers include strawberries, blackberries, nursery and greenhouse crops, and apple and pear orchards.

According to the State of Oregon Employment Department, more than 80,000 farmworkers worked in Oregon fields in 1997 (14). Within Oregon more than 90% of all farm laborers are from Latin America, almost exclusively from Mexico. Most of the migrant farmworkers in Oregon live near the fields where they work, with the largest population located in the Willamette Valley, the region between the Coastal and Cascade mountain ranges in the western region of the state.

Description of the Community-Based Organization

The community partner in our research program is the Oregon Child Development Coalition (OCDC), a private, not-for-profit corporation with central offices located in Wilsonville, Oregon. OCDC was organized in 1971, under the name of the Migrant Indian Coalition, to address the needs of migrant and seasonal farmworkers, as well as Native American families. In 1975 the organization became the grantee for the Migrant HeadStart (MHS) program in Oregon. The mission of OCDC is to provide service and expertise to empower low-income families so they may succeed in their communities and

to support parents and contribute to the nurturing and development of children. The OCDC directly administers and operates MHS programs serving over 2,000 migrant children (from birth through 5 years of age) and their families per year at 24 centers located throughout Oregon. The program provides childcare and medical, dental, and social services during the migrant farmworker season (May–November). The MHS programs serve 40% of all migrant children 3–6 years of age in the state and 75% of eligible children in the geographic areas where centers are located. Prior to the establishment of OCDC, migrant farmworkers in Oregon had few childcare options while they worked. The OCDC is an established minority organization with proven ability to access and serve minority populations. A parent policy council that determines the long-term goals of the organization and participates in the development of the OCDC budget and allocation of resources guides the work of OCDC.

Prior to the partnership with university researchers, OCDC routinely collected extensive background information on child enrollment forms. The child health forms included information on exposure to pesticides. OCDC workers often made visits to farmworker homes and had informal impressions of housing conditions and exposures to pesticides but were unable to collect and synthesize the data effectively to influence opinion and policy regarding farmworkers. OCDC also found it difficult to describe the health status of migrant farmworker children in Oregon without acknowledging the extensive research that was still needed. OCDC felt that a partnership with a research center would facilitate the process of informing the public about the characteristics and needs of migrant farmworkers in Oregon and that the research process would facilitate the comparison of the Oregon population to the migrant farmworker population nationwide.

Researchers need quality data that can be used to identify the needs of a community and that can then be used to develop effective intervention strategies. Intervention researchers must demonstrate the ability to gain community entry, enhance community support for research, and demonstrate methods of information dissemination. In our project the partnership with OCDC allowed researchers access to the migrant farmworker community to generate credible data. OCDC developed the capacity to use hard data to improve the health status of an underserved community. This partnership has strengthened and expanded relations among migrant farmworker communities, major community agencies serving migrant families, healthcare providers, and universities. In addition, partnership with a research

institution has enabled OCDC to leverage the current work to obtain additional funding for other efforts.

The Migrant Farmworker Community in Oregon

As new migrant streams develop in the United States and people from different countries and regions join the migrant farmworker labor force, the characteristics of the community change. In 1997 the initial period of the partnership between OCDC and the Oregon Health Sciences University (OHSU), we conducted interviews with migrant families that were enrolling their children in the MHS programs offered by OCDC. All interviews were conducted in partnership with members from OCDC. We visited the migrant family homes for the purpose of conducting the interviews at the same time OCDC was making home visits to enroll children in their MHS programs. We surveyed 96 migrant farmworker families in two communities of the Willamette Valley of Oregon (52 in Washington County and 44 in Hood River County) (15–17). Figure 1 shows where these two areas are located in the state. Forty-nine percent of the 96 families indicated they came to Oregon directly from Mexico, 34.4% from California, 9.4% from Washington, and 6.2% from other states. The majority indicated they had lived 6 months or less in their previous location, with 83.1% indicating they did some type of agricultural work at their previous location. The average number of moves the families made in the preceding 12 months was 1.5 (SD = 1.1). The average family size was 4.8 persons (range, 3–10 persons).

In these 96 homes, 166 adults reported that they were currently working in agriculture. There were both similarities and differences between these two communities, demonstrating that even within a relatively small geographic area, distinct differences can be found in communities of migrant farmworkers. Table 1 shows the mean age for the 166 adult migrant agricultural workers was 30.1 years (SD = 7.1), with the youngest worker being 19 years of age and the oldest being 53 years of age. There were 94 (56.7%) males and 72 (43.4%) females working in agriculture. The education level of the 166 adults ranged from 0 to 13 years, with a mean of 5.4 years (SD = 3.3). Adults in Washington County had a mean education level of 4.4 years (SD = 3.1) compared to a mean of 6.8 years (SD = 2.9) for adults in Hood River County ($p < 0.05$). Adults in Hood River County spoke Spanish as their primary language, whereas 39 (43.3%) of the adults from Washington County spoke indigenous languages. Of the 39 who spoke indigenous languages, 30 (76.9%) spoke

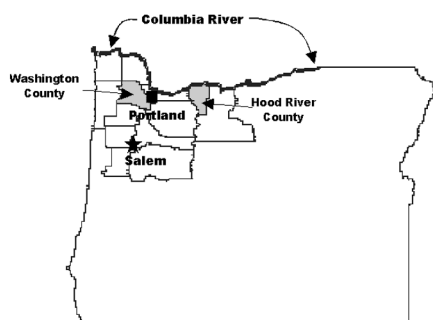


Figure 1. Sites for Oregon migrant farmworkers studies in 1997. Data were collected from two migrant farmworker communities (Washington County and Hood River County). Both communities are in northwest Oregon, physically separated by approximately 100 miles.

Mixteco, 7 (17.9%) spoke Trique, and 2 (5.1%) spoke Kanjobal. Twenty-six adults (15.7%) in the total sample indicated they spoke English as a second language.

The majority of migrant farmworkers in our survey indicated they were fieldworkers; 16.4% were packers. Twenty-one workers indicated they mixed or applied pesticides, herbicides, or fungicides as part of their current job responsibilities (13% of the total sample). Workers performed multiple job tasks because workers do many jobs over a season and over a year. Workers in Washington County primarily pick berry crops (blackberry, blueberry, raspberry, and strawberry), whereas workers in Hood River County primarily prune, thin, and pick orchard crops (apple, cherry, peach, and pear).

Migrant family housing also differs among communities in Oregon. In Washington County the farmworkers reside in a variety of housing including large labor camps, trailers, and apartment dwellings. Labor camps tend to be in close proximity to agricultural fields, with 70% of the labor camps within 30 meters of agricultural fields or nurseries. Large labor camps are not frequently seen in the Hood River community, but the available housing tends to be in close proximity to agricultural fields. In both communities the area in front of the homes is considered a common area and is usually bare earth. Most of the labor camps have a common play area for children. Only one of the homes we visited had a window air-conditioning unit. The large majority of farmworkers in both communities leave their doors and windows open for ventilation. Approximately half the migrant housing had community washing machines on site. The remainder used public laundry facilities. In Washington County, 40% of the 52 homes visited had no running water compared to 14% of the 44 dwellings we visited in Hood River. The housing in both communities was very crowded, with less than 150 ft² per person. Families living in cabins had an average of 74

Table 1. Characteristics of the 166 adults residing in the residences of the 96 migrant families recruited from Washington County and Hood River.

Characteristics	Washington County <i>n</i> = 97	Hood River County <i>n</i> = 69	Total <i>n</i> = 166
Mean age (SD)	29.5 (7.6)	30.8 (6.4)	30.1 (7.1)
Gender			
Male	53 (54.6%)	41 (59.4%)	94 (56.7%)
Female	44 (45.4%)	28 (40.6%)	72 (43.4%)
Mean years of education* (SD)	4.4 (3.1)	6.8 (2.9)	5.4 (3.3)
Primary language (11 missing)			
Spanish	51 (56.7%)	65 (100%)	116 (78%)
Indigenous	39 (43.3%)	0 (0%)	39 (22%)

**p* < 0.05.

ft² per person, whereas those in other housing shared an average of 157 ft² per person.

Although initial surveys we conducted focused on two large migrant farmworker communities, other migrant farmworker communities exist throughout Oregon. The migratory patterns of migrant farmworkers in Oregon vary, and it is not unusual for some migrant families to move from one farming community to another within the state. Families may also migrate only between Oregon and California, spending an appreciable amount of time in each state. No longer do the majority of migrant farmworkers live in Mexico and travel into the United States for a short time to work during harvest periods. Instead, a large community of farmworkers is staying in the United States and traveling among several agricultural regions. There appear to be large numbers of farmworkers choosing to “settle-out” in one primary geographic area. The families surveyed in Washington County are very mobile, many coming from Mexico, Central America, or other U.S. states and staying in Oregon for only 1–2 months. In comparison, the Hood River families stay as long as 3–6 months and return repeatedly from year to year to work for the same growers. These differences were factors in the determination of a community participatory model that could best serve the migrant farmworker community in Oregon.

Achievements of the Research Program

The work we have accomplished in the first 4 years of the project has been the result of ongoing dialogue and participation by university and community researchers. Our initial surveys were conducted in the homes of migrant farmworkers with research assistants from the university and OCDC. We have used this community-based approach to examine the relationships among levels of pesticides in homes and type of agricultural crop, pesticides used on the crops, proximity of housing to the agricultural field, and home characteristics

including ventilation, size and traffic patterns (15–17). These analytical investigations were made possible by investigators on the research team who specialize in environmental assessment, biomarker technology, and geographic information systems mapping.

We have investigators skilled in using qualitative research methods who, in collaboration with community members, have interviewed workers on culturally effective training methods for migrant workers and their families, developed a video on reducing pesticide exposures to children, and demonstrated the educational impact of the video (18). Our research team also includes investigators in neurobehavioral assessment who are developing culturally appropriate methods to assess non-English-speaking children and adults potentially exposed to pesticides. These investigators have worked to develop a battery of tests appropriate for assessing subtle neurotoxic effects from pesticide exposure in non-English-speaking children and adults (19–21).

Evolving Nature of the Participatory Model

The multifaceted nature of our project has resulted in a research model that includes components key to any participatory model, but also components that differ from other projects and are the result of the expressed desires of the community agency and the research institution. The initial contractual partnership was established between OHSU and OCDC (depicted by the circles on Figure 2). This contract included sharing of the monetary resources of the project and collaboration in the hiring of research personnel (whether housed at OCDC or OHSU). Two bilingual research staff members were hired (one housed in OCDC and one at OHSU) to serve as key persons to solidify the research effort between the two groups. We established a research advisory committee to provide both community and research oversight and advice. The advisory committee meets 3 times a year at the OCDC headquarters or in selected agricultural communities. Representatives from different stakeholder groups serve on this committee; key representatives are farmworkers whose children had received services from OCDC, growers of the areas where we were conducting field investigations, scientific advisors with expertise in pesticide exposure and health effects, and representatives from the healthcare provider community serving migrant farmworkers. The growers have made considerable impact on the advisory committee by sharing their expertise in regional agricultural practices, voicing concerns about the exposures of their own children, and recommending effective methods to disseminate the results of our project to effect changes in the grower community. The growers and parents

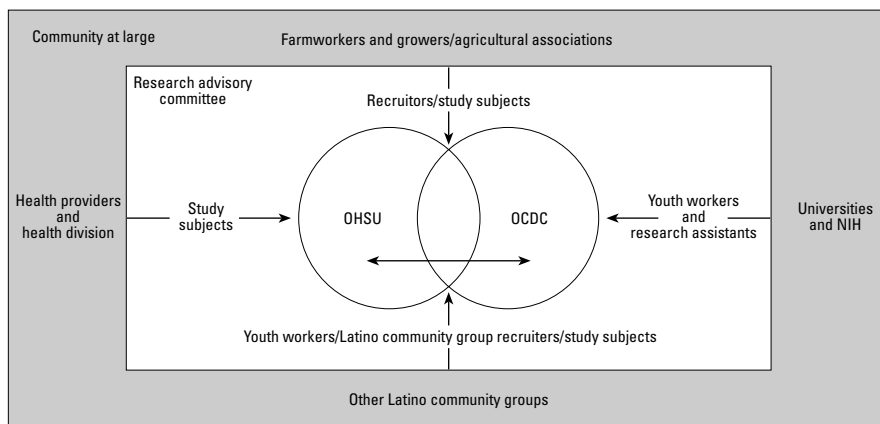


Figure 2. Initial model in 1997 for community participatory research. Original partnership was between OHSU and OCDC with advisement from a Research Advisory Committee consisting of representatives from farmworkers and growers, universities, health providers, and other representatives of the Latino community. In addition to advice, each of the stakeholder groups on the advisory committee provided assistance in providing subjects for the study, recruitment, and youth workers or research assistants.

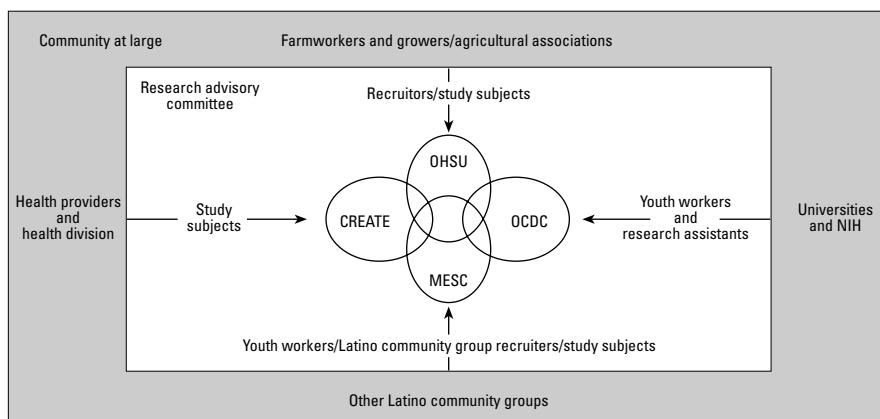


Figure 3. Evolving model for community participation (2000). While the original structure has been maintained, the number of partnerships between researchers and community groups has enlarged. The inner circles depict additional funding that has been obtained to form research partnerships with CREaTe and the Migrant Education Services of Oregon (MESC). These additional projects receive oversight and advice from the Research Advisory Committee.

who participate on the Research Advisory Committee have, in most cases, served in other advisory capacities to OCDC prior to the beginning of the research project. The committee provided assistance in identifying groups for pilot work and reviewed study forms, instruments, educational materials, and results from the study. The research project and participatory model both evolved with the creation of additional partnerships with migrant farmworker advocacy organizations. Figure 3 shows the evolved model with formal linkages with two other community organizations, Oregon Migrant Education Program and CREaTe (Creating Roads to Empowerment and Advancement through Education). The Oregon Migrant Education Program is a state agency that provides English as a Second Language programs for Oregon’s migrant farmworkers. This program has partnered with OHSU investigators to provide pesticide training in their curriculum. OHSU investigators have developed research

programs addressing the pesticide knowledge and risk perception of adolescent farmworkers enrolled in the Oregon Migrant Education Program. CREaTe is a community education program targeted to high-risk Latino youth. Our partnership with CREaTe has included the provision of employment opportunities to Latino youth as research assistants and the provision of environmental science education in their science curriculum. These new partnerships were made possible by obtaining additional funding to support initiatives related to pesticide exposure in migrant farmworkers.

A major component of our project focused on the need to better understand the underserved, disenfranchised migrant farmworker community and to incorporate feedback from community representatives at every step of the research process. As a result, we have parent representation on our Research Advisory Committee. Because the advisory committee meets year-round, and our migrant community

moves to other areas, some of the parent participants have been members of the migrant community that used OCDC services in the past, but who have begun to settle more permanently in Oregon agricultural communities. The members of the migrant community and the parents of migrant children have provided input on who should contact families for participation and when, the appropriateness of advertisements, and the appropriateness of the teams that are put together to collect data in migrant family homes. They have also accompanied the university and community researchers to national meetings on participatory research.

Evaluation of the Community-Based Research Approach

Is this partnership model working? Much deliberation is occurring on the components of a successful community participatory model. Projects have to provide results that are incentives for both parties to continue or expand the relationship. From the researcher perspective the result of the partnership should be an advancement of the science, frequently evaluated by the number of scientific publications and presentations made on the process and results of the research. Another important indicator is the ability of the project to result in new scientific developments and additional funding for other initiatives. Through this partnership, national and international presentations have been made on the work being accomplished (15–17,22–37) and scientific manuscripts are in various stages of publication or review (18–21,38–44). Additional funding has been obtained to expand our research program to the special population of adolescent farmworkers.

The assessment of the model’s success in the community is more difficult to evaluate. Key areas noted by others as important indicators of success of community-based projects focus on the process of establishing and maintaining the partnerships and assessment of the impact of the project on the community. Evaluation of the impact of the project in the community will be an ongoing process. In the third year of the 4-year project, we began to gather quantitative and qualitative data on the success of the project by focusing on three areas: the involvement of the community in the research project, the collaborative process of the Research Advisory Committee, and the impact of the research project on the staff in the cooperating community agency.

To assess the perceived involvement of community members in the research process, interviews were held with each Research Advisory Committee member (12 members from the community or community agencies and 12 members from research institutions). These interviews sought feedback on the

processes of communication, partnership in decision making, usefulness of the approach, and information dissemination. An independent evaluator conducted the telephone interviews. Members of the Research Advisory Committee were categorized as either researchers ($n = 12$) or persons from the community ($n = 12$). Figure 4 shows the percentage of community members who reported they had involvement in the process of grant writing (42%), instrument design (50%), data collection (58%), data interpretation (50%), and presentation of the results of investigations (58%). A key component of the participatory process is mutual sharing of research results and dissemination of the results to both the researcher and community networks. Figure 5 shows that researchers on the advisory committee had higher perceptions of the degree of mutual work than members of the community. Eighty-three percent of the researchers stated that results of the investigations were prepared jointly, compared to 67% of the community members. The researchers all stated that information regarding the results of the investigations was prepared jointly compared to only 75% of the community members. Figure 6 shows that approximately half of both the researchers and community members believe there were communication problems; however, 100% of the researchers stated the communication problems were resolved, compared to only 50% of the community persons.

A second strategy was to examine process recordings of the Research Advisory Committee meetings. These were informal notes analyzed for the major themes surrounding conflict between researchers and community members and the topic areas of disagreements that surfaced. These notes revealed several instances of conflict resolution among the stakeholders in the project, e.g., management of violations observed during home visits to families living in migrant farmworker housing. Discussions were held on the committee's stance regarding the reporting of these Occupational Safety and Health Administration violations. The interpretation of data and whether pesticide exposures occur

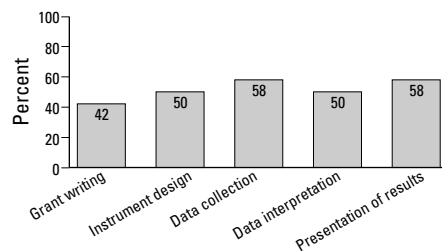


Figure 4. Evaluation of participatory nature of the Research Advisory Committee: perceptions of the involvement of community members in the research process.

disproportionately between farmworker and grower families has also been an area of disagreement. It was clear that growers differ on their perceptions of migrant community characteristics. Given that there are differences in the migrant community characteristics in different geographic regions, it is understandable that growers will have different opinions and views of the characteristics and needs of migrant farmworkers. The researchers and community members shared information about these differences and discussed common needs and concerns across all farming communities in Oregon.

Another area of disagreement concerned the message of the project's video that focuses on protecting children from pesticide exposure. The initial draft of the video script was written by a subcommittee of researchers and community members and reviewed by the Research Advisory Committee. There were components of the video the growers objected to, such as strong language about health hazards associated with pesticides, and use of the term "poison" versus "pesticides." The script was revised to exclude any reference to the safety of pesticide exposure during pregnancy, and the association between pesticide exposure and chronic diseases, including cancer, was not discussed. The researchers agreed to exclude these components because the scientific data are not consistent and there are no worker policies restricting pregnant women from agricultural work. The community members also asked that the actors depict a balance of being tired from work but also having fun and enjoying being with their co-workers and families. The farmworkers insisted that the pictures of women doing the majority of cleaning and laundry in the migrant housing were culturally appropriate, although growers and researchers felt that these scenes depicted women in a bad light. After a lengthy discussion, the complete script was reviewed, edited, and approved by all committee members, and a consensus on the nature of the video's message was reached.

The last component of our evaluation was to obtain data from persons who did not work directly on the research team, but who worked for the OCDC organization throughout the state. The statewide OCDC staff members were instrumental in informing

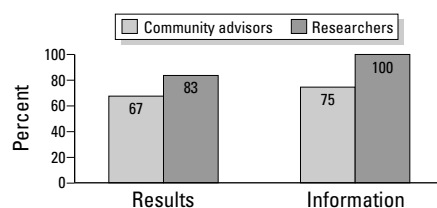


Figure 5. Comparison of researchers' and community members' perceptions of joint work on research project: Were results and information prepared jointly?

migrant families about the research project as well as assisting in study participant recruitment. Seventeen interviews were conducted to evaluate the involvement of OCDC staff in research. The results of the interviews revealed OCDC staff members did not have the opinion that the project drained resources of time and money. The majority of respondents reported the research project had had no impact on local resources of personnel time, materials, and transportation. However, most of the staff persons who participated in the project did not feel they personally learned a great deal more about pesticides. Although the project was being conducted in their center, they were not closely involved in the work. This finding points to a need for more training of staff in the purpose of the project and the exposures and health effects being measured. The workers in the centers reported they could use information from the project to share information, educate, and train farmworkers in the community.

During the interviews with 17 staff members, 5 reported that other community groups are becoming interested in the research project. Some staff members said they were fearful too much emphasis on the hazards of pesticide exposure would send the message to farmworkers to leave agriculture and get another job. Eight staff members reported that knowing about the project and participating in its implementation had increased their knowledge of where to access information about pesticide exposures. The majority of the staff reported that farmworker families have a high interest in the project, but that feedback to the parents needs to be prompt and consistent. The staff reported that some of the farmworker families are interested in the health effects of pesticides, but others are afraid of the topic. Specifically, the staff reported that if farmworkers believe they work in a place where regulations are not being followed, their participation in focus groups, completing questionnaires, and giving biologic or environmental samples to determine pesticide exposure could cause them to lose their jobs. Other parents may not want to know of the health risks because they are powerless to move or improve their housing and work situations. The majority of the staff members

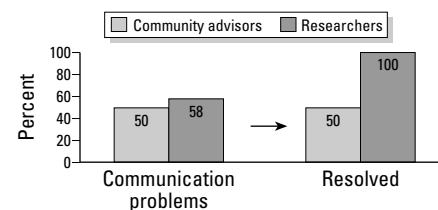


Figure 6. Comparison of researchers' and community members' perceptions of communication problems: Were there communication problems?

reported they had observed changes in the knowledge level or interest of farmworkers concerning pesticides after becoming involved in the project. One farmworker family reported they were more aware of the risks and asked the center staff to have a water station available outside the center so they could wash their hands before picking up children. Other staff reported knowledge had increased but follow-up is needed every year, and their families are requesting more information.

Overall, these three approaches to process evaluation provided preliminary data on the process of the participatory research model. The results of the evaluation were shared initially with members of the Research Advisory Committee. Improvements are still needed to ensure that community members perceive themselves as equal partners in the research process. Community perceptions of involvement in the research process were consistently lower than the degree to which researchers felt the community was involved. Project directors are taking steps to equalize this participation. For example, more community members are being hired to participate in research planning and implementation. Although our model has had resource sharing from its beginning, we will gradually shift more resources and project management to the community-based organization. As we increase the number of community members involved in the project, we will also implement more training of community members on aspects of the research process. This training will be conducted by members of the community rather than by researchers. It will be important to continue the evaluative process to assess the impact of these changes on perceived involvement from the community.

When all stakeholders are invited to review and critique the research program, conflict is inevitable. The aim is to assure that all stakeholder viewpoints are valued, but at the same time that the project adheres to the goals set forth in the research plan. The impact of the participatory model on the community is a more difficult aspect to evaluate. Although this evaluation began looking at the process of implementing the research project with a community organization, outcome measures to assess the impact on the agency and in the larger community need to be identified and measured.

Conclusions

The migrant farmworker population is at increased risk for pesticide exposure but has unique characteristics that make participatory research particularly challenging. This article has described some of the differences between communities of migrant workers and the problems language and mobility present to

the participatory research model. Scientific knowledge, community experience, and community-held knowledge are all essential for participatory research. Our project encompasses a variety of scientific approaches including qualitative work with community groups, educational approaches, exposure assessment, biologic monitoring of pesticide exposure, and the assessment of the effects of pesticide exposure on neurologic function. Our model includes significant input from both researchers and the numerous stakeholders concerned about the issue of pesticide exposure of agricultural workers and their children. The participatory research partnership between OCDC and OHSU is designed to have an impact on the process of community empowerment of the migrant farmworker community in Oregon. The evaluation of the process of participatory research and the outcomes and impact of the process on the community are crucial elements that must be demonstrated. Although the model is working in this Oregon project, adaptations would be expected in other settings. However the key components of the participatory process should be observable and measurable in any community setting.

REFERENCES AND NOTES

- GAO. Pesticides: Improvements Needed to Ensure the Safety of Farmworkers and Their Children. GAO/RCED-00-40. Washington, DC:U.S. General Accounting Office, 2000.
- Centers for Disease Control and Prevention. Report to Congress on Workers' Home Contamination Study Conducted under the Workers' Family Protection Act (29 U.S.C. 671a). Cincinnati, OH: National Institute for Occupational Safety and Health, 1995.
- Wilk V. Health hazards to children in agriculture. *Am J Ind Med* 24:283-290 (1993).
- Institute of Medicine. *Toward Environmental Justice: Research, Education, and Health Policy Needs*. Washington, DC:National Academy Press, 1999.
- Molina CW, Aguirre-Molina M. *Latino Health in the U.S.: A Growing Challenge*. Washington, DC:American Public Health Association, 1994.
- Zabin C, Kearney M, Garcia A, Runsten D, Nagengast C. *A New Cycle of Poverty: Mixtec Migrants in California Agriculture*. Davis, CA:The California Institute for Rural Studies, 1993.
- Israel B, Schulz A, Parker E, Becker A. Review of community-based research: assessing partnership approaches to improve public health. *Annu Rev Public Health* 19:173-202 (1998).
- Israel B, Checkoway B, Schulz A, Zimmerman M. Health education and community empowerment: conceptualizing and measuring perceptions of individual, organization and community control. *Health Educ Q* 21:149-170 (1994).
- Arcury T, Austin C, Quandt S, Saavedra R. Enhancing community participation in intervention research: farmworkers and agricultural chemicals in North Carolina. *Health Educ Behav* 24(4):563-578 (1999).
- Rosenberg HR, Steirman A, Gabbard SM, Mines M. Who Works on California Farms? Demographic and Employment Findings from the National Agricultural Workers Survey. Oakland, CA: Agriculture and Natural Resources Publication, 1998.
- Simcox N, Fenske R, Wolz S, Lee I, Kalman D. Pesticides in household dust and soil: exposure pathways for children of agricultural families. *Environ Health Perspect* 103(12):1126-1134 (1995).
- Pallack K. Oregon Farm Labor Housing Survey. Newberg:CASA of Oregon, 1991.
- Oregon Department of Agriculture. Oregon Nursery and Greenhouse Survey, 1994-1995. Portland, OR:U.S. Department of Agriculture National Agricultural Statistics Service and the Oregon Department of Agriculture, 1996.
- State of Oregon, Employment Department Workforce Analysis Section. Total Agricultural Employment by Calendar Year, Revised Series 1990-1997, 1997 Benchmark. Salem, OR:State of Oregon, Employment Department, 1998.
- McCauley L. Migrant farmworker research update. Presented at the National Advisory Council on Migrant Health, 4 May 2000, Portland, Oregon.
- McCauley L, Lasarev M, Santanta J, Phillips J, Muniz J, Rothlein J, Higgins G. Disproportionate pesticide exposures in western Oregon agricultural families. Presented at the NIH/NIEHS Workshop on the Role of Human Exposure Assessment in the Prevention of Environmental Disease, 22-24 September 1999, Rockville, Maryland.
- McCauley L, Beltran M. Utilization of a community-based research model to study pesticide exposures and health effects in migrant farmworkers. Presented at the NIEHS Annual Leadership Retreat, 16 May 2000, Airlie House, Virginia.
- Napolitano M, Beltran M, Phillips J, Bryan C, Lasarev M, McCauley L. Un Lugar Seguro Para Sus Niños: development and evaluation of a pesticide education video. *J Immigrant Health* (in review).
- Rohlman D, Bailey S, Brown M, Blanock M, Anger W, McCauley L. Establishing stable test performance in tests from the Behavioral Assessment and Research System (BARS). *Neurotoxicology* 21:715-724 (2000).
- Rohlman D, Gimenes L, Ebbert C, Anger W, Bailey S, McCauley L. Smiling faces and other rewards: using the Behavioral Assessment and Research System (BARS) with unique populations. *Neurotoxicology* 21:973-978 (2000).
- Rohlman D, Bailey S, Anger W, McCauley L. Assessment of neurobehavioral function with computerized tests in a population of Hispanic adolescents working in agriculture. *Environ Res* 85:14-24 (2001).
- McCauley L, Santana J, Napolitano M. Community-based research to reduce pesticide exposure in minority families. *Commun Nurs Res* 30:229 (1997).
- McCauley L, Santana J, Napolitano M, Beltran M, Higgins G, Rothlein J, Anger K. Community-Based research to reduce pesticide exposure in minority families. Presented at the American Public Health Association Annual Meeting, 7-12 November 1997, Indianapolis, Indiana.
- McCauley L, Bryan C, Lasarev M, Phillips J. Pesticide knowledge and work practices of minority adolescent farmworkers in western Oregon. Presented at the American Public Health Association Annual Meeting, 7-10 November 1999, Chicago, Illinois.
- McCauley L, Sticker D, Bryan C, Phillips J. Health beliefs and risk perceptions of minority adolescent farmworkers: implications for risk communication. Presented at the American Public Health Association Annual Meeting, 7-10 November 1999, Chicago, Illinois.
- Napolitano M, Beltran M. The dynamic process of focus groups with agricultural farmworkers: the Oregon experience. Presented at the American Public Health Association Annual Meeting, 14-18 November 1998, Washington, DC.
- Napolitano M, Beltran M, Phillips J. Preferences of migrant farmworkers in Oregon regarding pesticide education methods. Presented at the American Public Health Association Annual Meeting, 7-10 November 1999, Chicago, Illinois.
- Napolitano M. Community intervention to reduce environmental pesticides. Presented at the 4th International Family Nursing Conference, 11 November 1997, Valdivia, Chile.
- Beltran M. Evolving models for participatory research utilizing organizations supporting the community. Presented at the NIEHS-sponsored conference Farmworkers and Pesticides: Community-based Research, American Public Health Association Annual Meeting, 7-10 November 1999, Chicago, Illinois.
- Beltran M, McCauley L. Evaluating the participatory research model: results of an evaluation of the process. Presented at the NIEHS-sponsored conference Farmworkers and Pesticides: Community-Based Research, American Public Health Association Annual Meeting, 7-10 November 1999, Chicago, Illinois.
- Fransisco A, Lora J. Student panel on community-based research and environmental justice. Presented at the Environmental Justice Partnerships for Communication and Community-Based Prevention/Intervention Research Grantee Meeting, 1-3 November 1999, NIEHS, Research Triangle Park, North Carolina.
- McCauley L. Community-based research: a new paradigm for research institutions. Presented at the NIEHS-sponsored conference Farmworkers and Pesticides: Community-Based Research, American Public Health Association Annual Meeting, 7-10

- November 1999, Chicago, Illinois.
33. Napolitano M. Oregon's HETC Program: a successful partnership between OHSU and Latino farmworker communities. Presented at the American Public Health Association Annual Meeting, 17-21 November 1996, New York, New York.
 34. Anger W, Sizemore O, Grossmann S, Rohlman D, Glasser J. Human neurotoxicity research methods: behavioral testing in different cultural groups. Presented at the International Neurotoxicology Association, 29 June-4 July 1997, Szeged, Hungary.
 35. Anger W, Rohlman D, Bailey S, McCauley L. Adapting adult neurobehavioral tests to assess children. Presented at the Joint Conference of the International Society for Environmental Epidemiology and the International Society of Exposure Analysis, 15-18 August 1998, Boston, Massachusetts.
 36. Rohlman D, Bailey S, Brown M, Blanock M, Anger W. Establishing stable test performance: overcoming the learning curve. Presented at the Seventh International Symposium on Neurobehavioral Methods and Effects in Occupational and Environmental Health, 19-24 June 1999, Stockholm, Sweden.
 37. Rothlein J, Allen P, Muniz J, Phillips J, McCauley L. Migrant farmworker housing: analysis of housing characteristics and other factors affecting household pesticide contamination. Presented at the American Public Health Association Annual Meeting, 14-18 November 1998, Washington, DC.
 38. Napolitano M. Migrant farmworker health. In: Handbook of Immigrant Health (Lowe S, ed). New York:Plenum, 1998;261-276.
 39. Dupree-Jones K, Pandolf-Schenk C, Napolitano M. Migrant health issues. In: Community Nursing and Public Health, 5th ed (Stanhope M, Lancaster J, eds). St. Louis, MO: Mosby, 2000;701-713.
 40. Muir M. Migrant malaise. *Oregon Health* 1(1):22-25 (1998).
 41. Moate T, Muniz J, Furia M, Yu J. Unpublished data.
 42. Arcury T, Quandt S, McCauley L. Farmworkers and pesticide: community-based research. *Environ Health Perspect* 108:787-792 (2000).
 43. Higgins G, Muniz J, McCauley L. Monitoring acetylcholinesterase levels in migrant agricultural workers and their children using a portable test kit. *J Ag Saf Health* (in press).
 44. McCauley LA, Lasarev MR, Higgins G, Rothlein J, Muniz J, Ebbert C, Phillips J. Work characteristics and pesticide exposures among migrant agricultural families: a community-based research approach. *Environ Health Perspect* 109:533-538 (2001).