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Implementing a Community-Based Social Marketing Project to Improve Agricultural Worker Health

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The Together for Agricultural Safety project is a community-based social marketing project working to reduce the adverse health effects of pesticide exposure among fernery and nursery workers in Florida. In 3 years, the collaboration between university and community researchers has embodied many of the principles of community-based research while completing multiple stages of formative data collection required for a social marketing project. This hybrid approach to developing a health intervention for a minority community has been successful in its early stages because the community partners are organized, empowered, and motivated to execute research activities with the assistance of academic partners. However, this work has also been labor intensive and costly. This article describes the lessons learned by project partners and considers the limitations of this approach for agricultural health research. *Key words:* agricultural worker health, community-based research, environmental health, pesticides, social marketing. — *Environ Health Perspect* 109(suppl 3):461–468 (2001).

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Agricultural workers and their families represent a low-income community of color at increased risk for exposures to environmental contaminants such as pesticides (1–4). Workers in all agricultural industries experience dermal, oral, and respiratory contact with a variety of pesticides known to be harmful to humans (5,6). This exposure can result in a variety of acute symptoms such as headaches, dizziness, nausea, and shortness of breath, and health problems such as asthma, dermatitis, and acute pesticide poisoning (5,7–10). Animal and some human studies have shown pesticides can also have chronic effects on the neurologic, respiratory, immune, and reproductive systems and can be carcinogenic and mutagenic (2,11–14).

Fernery workers in central Florida exemplify a population that experiences frequent, intense pesticide exposure. These workers often have full-body contact with ferns they are cutting and thus with any pesticide that has been sprayed onto the plants. Workers are surrounded on all sides by ferns that can grow thigh high. Throughout the day workers bend over and thrust their arms into masses of ferns in order to cut the fronds at the plant's base.

Fern cutters often labor in fields enclosed by black mesh netting. Chemicals cannot dissipate as easily in these enclosed areas as in open fields, and this can increase workers' exposure levels. Because of this increased danger, some protective regulations are stricter for industries such as ferneries than for other agricultural industries (15).

Federal regulations such as the Occupational Safety and Health Administration Field Sanitation Standard (16) and

the U.S. Environmental Protection Agency Worker Protection Standard (WPS) (15) require employers to provide basic safety measures against pesticide exposure such as hand-washing facilities, pesticide safety training, and decontamination sites. The WPS also requires employers to post specific information about pesticides being used and to provide instructions to workers about how to prevent pesticides from entering the body through proper skin and clothes washing. Pesticide safety training recommendations include washing before eating, drinking, using chewing gum or tobacco, or using the toilet; washing/showering with soap and water, shampooing hair, and putting on clean clothes after work; and washing work clothes separately from other clothes before wearing them again (15).

Yet, studies show workers are often not informed about the chemicals used in their workplaces nor provided access to the facilities needed to reduce health risks, such as clean water and soap for washing (5). In their study of North Carolina agricultural workers, Ciesielski et al. (5) found 58% of workers surveyed reported water was not available to wash hands during work. In Florida, WPS regulations are poorly enforced, violations are underreported by workers who fear retribution, and few violators who are identified are penalized (17). An investigation by agricultural worker advocates in Florida reported that there were only 46 complaints of worker injury due to agricultural use of pesticides in Florida from January 1992 to mid-May 1997, and that the state issued only two fines (17).

Furthermore, recommended safety measures are often difficult for many

agricultural workers to implement. Workers may not have daily access to washing machines or showers. Many workers are paid a piece rate and are too pressed for time during the workday to adhere to safety precautions. For example, fernery workers are paid a certain amount for each bunch of ferns they cut. Because they must focus on picking as many bunches as possible, they may not take the time to wash their hands every time they break for food, water, or to use the bathroom.

One way agricultural workers have empowered themselves to try to reduce the adverse health effects of pesticide exposure has been through the educational efforts of community-based organizations. In Florida the Farmworker Association of Florida (FWAF) has been instrumental in such efforts. The FWAF is a grassroots membership organization that has advocated for Florida agricultural workers for more than 15 years. The group offers worker safety training that was developed by the National Farmworker Health and Safety Institute (18) and is based on interactive, popular education theory. However, the FWAF has not been able to reach as many workers as it would like nor has it been able to substantially alter the ways in which most employers typically train their workers at the worksite.

Health science researchers at the University of Florida (UF) in Gainesville, Florida, joined efforts with the FWAF and a social marketing firm, Best Start, Inc., to obtain funding to expand the efforts at the FWAF to reduce pesticide exposure among

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central Florida's farmworkers. In 1997 this partnership of community-based and academic organizations obtained 4 years of funding from the National Institute of Environmental Health Sciences. The partners formed the Together for Agricultural Safety/Unidos para la Seguridad Agricola/Tet Ansamn pou Sekirite Agrikilti (TAS) project to assist agricultural worker communities in creating effective solutions to the problem of pesticide exposure. The specific goals of TAS are to design, implement, and evaluate a health intervention to reduce the adverse health effects of pesticide exposure among central Florida fernery and nursery workers. The TAS research process adheres to community-based research principles and a social marketing research framework.

The roles of the UF researchers in the project include providing project management and administration; experience and training in data collection, analysis, intervention development, and program evaluation; and dissemination of project results through professional forums. The Best Start, Inc. consultant develops and guides the project team through a systematic social marketing process from conducting formative research activities to designing and testing intervention material.

The FWAF provides access to the nursery and fernery communities, assists with project management, and grants staff members and staff time to conduct research activities. Furthermore, the FWAF staff's insight and knowledge of the reality of workers' lives is one of the most valuable components of the project, especially in the development of data collection instruments.

This article describes the nature and quality of partner participation and interactions as the TAS team collected data to guide the development of the intervention. The purpose of this discussion is to explain how community-based research in environmental health can be carried out jointly by community and academic partners. We extend beyond the theoretical discussions of how community partners and academics can work together to describe the actual activities of the collaboration, what the roles of the partners were, and the pros and cons of collaborative research activities. This article focuses on the process of conducting this community-based research rather than on research findings or the creation of the intervention to reduce pesticide exposure.

Methods

Nursery and fernery workers were selected for this project because they are exposed to high levels of pesticides and because they generally do not migrate, making it possible to work with them throughout the year. The FWAF estimates there are between 10,000 and 12,000

workers in the nursery industries and about 13,000 workers in the fernery industries in five central Florida counties. These workers are primarily Mexican, but there are also small groups of Haitian and African-American workers. In the fernery industry, workers are paid by the piece. In the nursery industry, workers are paid primarily by the hour, although some are paid by the piece and by the hour.

To accomplish its intervention goal, the TAS team relied on community-based research principles (19) and social marketing methods (20) in all its data collection activities. Community-based research empowers academic and community partners through cooperative research and action (21). Social marketing provides the conceptual framework that guides the research and strategy development process. The TAS academic and community partners conducted five qualitative and quantitative research activities using these principles and methods. The following sections elaborate on community-based research principles and the social marketing framework and how these principles were applied in the TAS data collection activities.

Community-Based Principles

A community-based approach was adopted by TAS because of the increasing recognition that community participation contributes to the success of health promotion programs (22). Community-based research involves an explicit concern for the organizational and community aspects of public health (21). Israel et al. (19) describe it as "... an ecological approach that recognizes that individuals are embedded within social, political and economic systems that shape behaviors and access to resources necessary to maintain health." In contrast to health interventions that focus exclusively on individual behavior, TAS partners wanted to also focus on the social and occupational factors that affect agricultural worker behavior, such as working conditions and the pressure of surplus worker availability on workers' willingness to challenge worksite practices. The team believes a community-based approach is necessary to develop strategies that are culturally viable and sustainable. The elements of a community-based approach incorporated into the TAS project include: *a*) participation of community partners in all phases of the project, including research; *b*) promotion of co-learning and empowerment of all partners through reciprocation of skills and knowledge; *c*) acceptance of the research activities as cyclical, (e.g., sometimes strategies need to be reconsidered and new data must be collected); and, *d*) broad dissemination of project knowledge, not only among TAS partners but to workers, employers, healthcare providers, and other community members (19).

Social Marketing Framework

Social marketing was selected as the conceptual framework to guide consumer research, strategy development, analytic techniques, and program monitoring to identify ineffective activities that require modification and effective activities worth sustaining. Social marketing is

the application of commercial marketing technologies to the analysis, planning, execution, and evaluation of programs designed to influence voluntary behavior of target audiences in order to improve their personal welfare and that of their society. (23)

A community-based approach to social marketing requires that community partners become active participants in setting goals and directing each phase of the marketing process. Academic researchers work with community partners to use a systematic, data-driven marketing model to design effective behavior change strategies. Through this collaborative participation and the resulting increased competence, community partners and groups gain more power over social and tangible resources (24,25).

The bedrock of the social marketing approach is extensive formative research, which involves data collection activities conducted before a program begins in order to understand how consumers perceive a product, its price, and other factors that influence consumer behavior (such as the marketing concepts of price and promotion). Research is used in social marketing to segment the target population into homogeneous subgroups based on characteristics that influence their responsiveness to marketing interventions, such as the product benefits they find most attractive. Research results guide the selection of segments to be targeted and the development of a comprehensive marketing plan to reach each target segment. The marketing plan includes activities designed to modify structural factors (e.g., policies or availability of equipment or washing facilities) as well as motivate target audiences to change their behavior (26).

TAS Project Research Activities

In the first 3 years of the project, the TAS team conducted five different formative research activities. In order to adhere to community-based research principles, the team decided at the beginning of the project to carry out all activities only through collaboration. Although it was not practical for every team partner to participate in every activity, the team could jointly decide which combinations of partners were best suited to complete certain tasks. These decisions were made at regular team meetings.

This approach is more time intensive and complex than unilateral decision making, but it promotes empowerment and a feeling of equitable ownership and generates a broader range of insights than a single decision maker could gain. Working collaboratively on research activities provides a reiteration of the project's goals and allows for a mutual reflection on the journey to reach those goals. Finally, the TAS project team believes the collaborative approach will ensure sustainability of project efforts and encourage future collaboration between the team partners.

The following sections describe the TAS collaborative data collection activities and include explanations of how tasks were divided between community and academic partners.

Participant Observation

Early in the project, the community partners asked academic partners to spend a few days working in the fern fields and nurseries to get a more realistic view of workers' situations. Two community partners facilitated these workdays by making arrangements with employers and supervisors they knew, who agreed to allow the academic partners to work at their businesses. Four academic partners worked for a day in a fernery and three worked for a day in two nurseries. In addition to working, the academic partners talked with and observed other workers and conducted quick ethnographic assessments of the work-sites. The entire TAS team participated in debriefing the academic researchers about their work experiences at a general team meeting. This activity was critical to the project, as it provided the academic partners with first-hand experience in the realities of fernery and nursery work and the constraints on workers' behaviors.

Focus Groups

The project team used focus groups to develop an understanding of workers' attitudes and behaviors regarding pesticide use. These groups also generated qualitative data that were instrumental in developing the survey questionnaire and in understanding survey results. Community partners attended training on focus groups; collaborated on the questioning guide; scheduled the groups; contacted participants; moderated; participated in debriefings; translated and transcribed tape recordings of the groups; reviewed transcriptions with an academic partner; reviewed, edited, and discussed the summary; and presented the summary to community members. Academic partners also attended training on focus groups; collaborated on the questioning guide; scheduled groups in some cases; brought and monitored recording equipment; took notes; participated in debriefings; reviewed transcriptions with

the community partners; analyzed the data; wrote the summary; and reviewed, edited, and discussed the summary. Five community partners participated in these groups as moderators, and two academic partners participated as co-moderators.

The team conducted 16 focus groups with the following categories of participants: male or female workers who either had no children or had children younger than 10 years of age; male or female workers with children older than 10 years; and older workers. The groups were generally assembled according to gender, ethnicity, and occupation. The decision to form groups according to ethnicity (Mexican or Haitian) and occupation (nursery or fernery) was based on the critical differences in work experiences and safety practices between these communities. All focus groups were conducted either in Spanish or in Haitian Creole.

Healthcare Provider Interviews

Community partners informed the TAS team that workers are concerned about gaining access to healthcare and about the response of healthcare providers to workers' general health problems and possible pesticide-related symptoms. The team decided to gain a better understanding of healthcare provider knowledge of pesticide-related illnesses and the barriers workers face in getting adequate healthcare in the target communities. The team also realized that healthcare providers could be a potential target audience for intervention and that it was therefore important to gather information from this sector of the community.

Community partners identified public and private providers who served nursery and fernery workers. One community partner contacted providers, conducted personal and telephone interviews, transcribed and analyzed interview results, and helped prepare presentations of these results. Three academic partners also contacted providers and conducted personal interviews, analyzed interview results, prepared presentations, and sent the result summary back to the interview providers.

The team conducted 14 face-to-face and telephone interviews with healthcare providers in four counties. These providers included doctors, nurses, and outreach workers. About one third were private practitioners, and the rest worked at public or community health clinics. The interview questions focused on providers' practices related to workers, their general knowledge of workers' health concerns, barriers in providing services for these workers, and knowledge of pesticide-related illnesses and reporting requirements. The results of the interviews were compiled and summarized for use in guiding later parts of the project.

Results were presented to the entire TAS team during a general meeting, which helped assure a more balanced interpretation of what the providers said and educated all parties on how healthcare providers viewed the problem of pesticide exposure.

Employer/Supervisor Interviews

The TAS team determined interviews with employers and supervisors were necessary to understand the structural problems associated with occupational pesticide exposure and safety practices. Because the FWF is a worker advocacy group, the project team agreed employers would be more likely to respond to interviews conducted by the academic partners. Although three community partners made contact with and helped to interview supervisors they knew at ferneries and nurseries, only academic partners contacted and interviewed employers.

The employer interviews brought up important issues about confidentiality. Employers may have been reluctant to be interviewed if they thought the information they provided would be reported to worker advocacy organizations. Therefore, the interviewer assured all employers that even though the interviewer was working with the FWF, all employers' identities would be confidential, and interview results would be presented only in a summary for research purposes. A total of 25 employer and supervisor interviews were completed.

Household Surveys

After gathering qualitative data, the next step in the TAS community-based social marketing approach was to identify factors associated with target behaviors. Based on extensive analysis of the focus group data, the TAS team selected two behaviors with the potential to impact pesticide exposure: hand washing and adherence with entry interval regulations. Focus group results were also used to identify predictors of these behaviors (perceived benefits, costs, social norms, etc.) and the vocabulary workers use to discuss pesticide exposure. A large question pool was developed and distributed to the entire team for review and comment. During several meetings the TAS team discussed the relative importance of each item, selected items for the survey, and revised the wording of many items. The partners who developed the survey wrote approximately 20 drafts before the team felt the instrument was ready for translating and pretesting with workers.

Pretesting the Survey Instrument

The draft survey instrument was translated into Spanish and Haitian Creole. An academic partner and a community partner pretested the survey with 16 Haitian nursery

workers, and a community partner pretested it with 12 Hispanic nursery and fernery workers.

Mapping and Sampling

The project partners agreed a random sample of workers across categories of ethnic groups, occupational groups, and geographic communities would provide the most valid set of information on worker behaviors and attitudes about pesticide exposure. However, because no enumeration of workers was available for the target communities, the team had to enumerate all potential worker residences. For Hispanic workers the team selected 13 communities, and several teams blocklisted individual worker households by drawing maps of every home believed or known to be a household of fernery or nursery workers. This process resulted in a listing of the residences of more than 1,000 workers. From these lists, an academic partner randomly selected on a computer samples of respondent households.

Because the Haitian nursery worker community is more dispersed than the Mexican worker population, Haitian workers were enumerated by a community partner and an academic partner through a snowball sampling process. Haitian interviewers and survey respondents were asked for names of other Haitians who work in nurseries. The Haitian nursery worker community is small and more tight-knit, and the project team believed it would be possible to find and survey the complete population in this manner.

Surveying

Eight Hispanic and Haitian interviewers were originally recruited from the FWAF and from target communities. One academic partner also participated as an interviewer. An academic partner conducted a training session for the interviewers about the project and the surveying goals, how to administer informed consent and research surveys, how to track attempted and completed interviews, and how to document subject responses. Interviewers practiced and sometimes conducted interviews in pairs.

These data collection activities appropriately defined the problem from many perspectives by gathering information from a range of stakeholders about knowledge, beliefs, and practices regarding pesticide exposure. Because of the collaboration the outcomes of participation were effective and equally shared, and partners grew in their knowledge of one another and in their knowledge of the challenges to agricultural worker protection.

After completing the formative research phase of the project, the entire TAS team participated in a process evaluation activity. For each activity at least one academic partner and one community partner who participated

in that activity were asked to briefly answer the following questions:

- What did you or your group (FWAF, UF, Best Start, Inc.) gain from this activity?
- Do you think this activity helped advance the TAS project, and if so, how?
- How did this activity affect the relationship between the community and academic partners in this project?

Respondents either wrote down their own comments or dictated their comments to another partner who transcribed them. This exercise was designed to encourage TAS project team partners to reflect on the research activities, to participate in an internal assessment of the strengths and weaknesses of the project, and to collaborate on producing a balanced summary of the research activities. It created a collective documentation of the project's history and served as a tool to help the project move forward to the next step—designing and implementing the health intervention (27). When these comments are presented in academic forums, it allows community partners' perspectives on research to be considered in arenas where they are sometimes overlooked.

Results of the TAS Project Process Evaluation

This section presents the results of the self-evaluation exercise in the form of brief summaries, followed by the direct comments by community and academic partners related to each TAS research activity. These quotes are reprinted here with the full knowledge and permission from their authors. Some quotations have been edited for brevity, either by the author or with permission of the author.

Participant Observation

The workdays enhanced mutual trust between the partners. It was the first data collection activity. Although this type of participant observation is a common ethnographic research activity, the TAS workdays occurred largely because of the strong suggestions and arrangements made by the community partners. The academic partners' participation in this activity helped them earn the trust and respect of the community partners. It also provided the academic partners with a critical perspective of the realities of farm work and pesticide safety measures. These TAS partners continue to draw on their workday experiences in designing the program intervention. As a data collection exercise, the workdays helped in developing the focus group questions as well as subsequent survey questions.

Community partner's comment on participant observation.

This workday plan proved to be valuable in our overall collaborations together. The academic partners saw firsthand the conditions

under which fern and nursery workers work. Care was taken on the part of FWAF staff to select places where the conditions were not the worst nor the best so the experience would not be too weighted. At the first project meeting after the work days, the academic partners came in and started by saying the ideas that they had originally had and why they now knew why they wouldn't work.

Academic partner's comment on participant observation.

Participant observation provided the academic partners with firsthand understanding of the tasks farmworkers conduct each day and the ways in which they are exposed to chemicals during the workday. It also gave the team an understanding of the many factors that influence farmworkers' behaviors, especially those related to pesticide exposure, and allowed researchers to assess the ease with which a variety of protective measures could be adopted. For example, only a few hours of work in the ferneries convinced the team that protective gloves would be impractical to recommend to fernery workers because of the discomfort and impact on productivity.

Focus Group Research

The comments on the focus groups indicate the importance of this activity in defining the problem to be addressed, even for the community group. The significance of language and how workers characterize pesticides exposure expanded all partners' perspectives. Although the activity did not have a material impact on the partners' relationships, according to the community partner, it did help to establish that the partners would work cooperatively.

Community partner's comment on focus groups.

I think this activity was good for the FWAF because for the first time we gathered a variety of people of different ages and gender. It gave me ideas to use for other meetings. The translation process was interesting. I have never had the experience of having every single word translated. There were words that have specific meanings in this community that needed to be explained through the translation and we did that. It helped having bilingual people working on this activity. I think this activity helped the project. For example, at first I did not understand where the questions in the worker survey came from. Now I realize that the questions came directly from the information in the focus groups. In other studies, we worked just from instructions and the information was not shared with the community. In this project, we are working together and creating new solutions together and the FWAF can answer the community's questions about the study.

Academic partner's comment on focus groups.

The focus groups were helpful to the academic partners because they provided a body of rich, ethnographic data that would have otherwise taken a long time to gather. This data has been valuable in interpreting the worker survey results because anyone looking at the survey answers knows more about their true meaning. For example, the survey data may show that a high percentage of workers say that their employers always post warning signs indicating that area has been recently sprayed with pesticides. But from the focus groups we know that at least in one industry, the signs are always up or always up and folded shut—whether or not there has been an application.

Healthcare Provider Interviews

This activity was a further step in the joint collection of data that presented new information to both parties. Unanticipated findings led TAS partners to an increased concern about the role of healthcare services in educating and treating agricultural workers who experience pesticide exposure. This activity also resulted in the project adding a new dimension of intervention planning that involves healthcare providers.

Community partner's comment on healthcare provider interviews.

Interviewing healthcare providers confirmed the thoughts that FWF had about the care being received by farmworkers. That is, most times there is no connection made between occupation and symptoms, therefore, there is usually no correlation between illness and pesticides recorded in the patients' file. Because the doctor's opinion holds a lot of weight with farmworkers, a doctor's decision about whether to make a connection of symptoms to pesticides or occupation could affect the farmworkers' interpretation of the dangers of workplace chemicals. Also, since the project's health intervention has not yet been designed and healthcare providers are a possible target audience, this was vital information to obtain for decision making within the project team regarding the intervention.

Academic partner's comment on health-care provider interviews.

The interviews with healthcare providers were useful to the larger project for several reasons. First, they allowed our research team to obtain some understanding of the perceived seriousness of health problems associated with worker exposures to pesticides from the perspective of health providers. Second, they allowed us to gain some sense of health provider interest in and familiarity with pesticide exposure-

related health problems. Third, they allowed us limited opportunities to sensitize the health provider community to these issues. We learned several things. Among the most important was the limited understanding that most healthcare providers have of pesticide-related illnesses. Diagnosis is a difficult problem and the hurdles they have to go through to have something linked to pesticide exposure are daunting. Another possible outcome was the potential future extension of the project to include health provider training.

Employer and Supervisor Interviews

Initially, the community partners were reluctant to contact employers about the project. However, after the interview summary was presented to the team partners, they realized an effective intervention must include working with owners and supervisors rather than working as adversaries. Employers have ultimate control over their workplaces, and supervisors have daily control over workers. Interviews with these two groups showed their perceptions of occupational pesticide exposure often differ from those of the workers. For a health intervention to succeed in the workplace, where owners and supervisors have control, it must be based on some common ground shared by all affected groups. The TAS team determined a workplace intervention would be less successful and sustainable if the burden of behavioral change were placed solely on one group.

Community partner's comment on employer/supervisor interviews.

This activity helped advance the project because we have the point of view and opinion of the employers. We can identify how we can reduce exposure of workers to pesticides by knowing the feelings of the employers. This activity affected the relationship between FWF and academic partners in a positive way. It shows that we can do things to complement each other.

Academic partner's comment on employer and supervisor interviews.

The academic partners learned that for smaller nursery firms, employees are long-term and year-round and owners establish personal relationships and try to keep employees. Nevertheless, the pay is low, there is no overtime, and few employers offer benefits like health insurance. Employers are worried about the labor market, but none seemed concerned about pesticide danger or how it may affect employee loyalty. This may play a role in future social marketing: safety may be used as a way for employees to evaluate a good firm. Owners also felt that once employees get information on pesticides they begin complaining about the effects. But the burden for protection currently weighs more on the employees' shoulders.

Survey of Workers

Comments on the survey process, from questionnaire development to data analysis, reflect some shared frustrations. First, most of the partners agreed the survey development process was long and sometimes tedious. Community-based research is known to be more time-consuming than that conducted solely by academic researchers (19). The social marketing emphasis on extensive formative research also added to the time demands required to complete this activity. However, partners also agreed the results produced by the survey process were worth the time invested. These results included not only materials such as a collection of community maps and a large amount of survey data, but less obvious benefits, such as the sense of equitable ownership of data and knowledge of research methods. Finally, the academic partners' comments about the survey process reflect why community-based research can be so valuable when working with populations such as agricultural worker communities. In this activity the community partners provided the culturally appropriate language needed for the questionnaire, access to an often hidden population, and the time and work needed to complete the survey.

Community partner's comment on developing the survey instrument.

While the number of revisions of the survey became very tedious at times, everyone really got into it and gave very good insights, which enabled the finished product to be 'owned' by everyone, who were therefore committed to using it in the best way possible. I believe the whole process speaks strongly to 'ownership' by all and a sense of a strong, respectful partnership. By being a part of this process, FWF learned about all the factors that must be considered to develop a survey that can produce thorough and valuable results. This activity helped advance the project because the careful scrutiny of the focus group data, followed by thorough revisions of the survey instrument, allowed us to develop the final questionnaire derived from worker knowledge shared with us.

Academic partner's comment on developing the survey instrument.

The community team provided valuable input into the development of the survey instrument, suggesting the appropriate vocabulary to use for each item, helping to identify potential response values for many items and generally ensuring that the questions were culturally appropriate and easy to understand. Discussions about individual items also generated valuable insights into feasibility of potential interventions. Although the time and patience required to develop a survey together greatly

exceeded that usually required for this task, the end result was well worth the effort. I also believe the exercise reinforced our commitment to conduct the formative research in a collaborative fashion and contributed to our skills in working as one team rather than separate academic and community subteams.

Community partner’s comment on mapping and sampling.

The FWAF gained a lot from this activity. I had training on mapping in the past but it was just to map the fields. I was surprised at the number of worker houses that we found during the mapping. It will help me in my organizing work. It gave us maps and information that will help the FWAF staff here conduct their work for the census. It helped the organizers here establish contact with the worker families.

Academic partner’s comments on mapping and sampling.

Mapping specified size of target population and the sampling improved data reliability. This activity advanced the project greatly by producing valid, representative survey results that the project can use to develop the intervention. It also improved the relationships between partners through cooperative work, i.e., academic and community partners worked side-by-side.

Community partner’s comment on surveying.

I believe that we learned a little more about what was integral to this project. We learned how important it is for everyone as a group and a community to follow a process and a series of steps within a project in order to get a result that will always be well focused on getting a solution.

The recruitment of additional leaders to help with the surveys didn’t work well in all cases. In the Haitian community, they already had full-time jobs and I believe the little time they had for themselves deterred

them from dedicating good time. Even when we hired Hispanic staff part-time, some found it too difficult and dropped out, although others were able to really work well in the process.

Academic partner’s comments on surveying.

The completed surveys have generated a large amount of data that the project team will use to design its health intervention. Language barriers prevented most of the academic partners from actually conducting any of the interviews – which could have contributed to their understanding of workers’ realities. There was also a sense that if academic partners had accompanied interviewers, it might have made the interviewers or respondents uncomfortable. Thus, most of the academic partners were far enough removed from this particular interviewing process that they did not gain sense of the challenges it presented for the interviewers, nor could they evaluate the success of the survey instrument, the interviewer training, or the comprehension of the respondents. Although the general feeling was that the community partners did an outstanding job of interviewing, it may be beneficial for all parties if academic partners played a more direct role in the interviewing process.

Discussion

These data collection activities appropriately defined the problem of how to reduce pesticide exposure from many perspectives, by gathering information from a range of stakeholders about knowledge, beliefs, and practices regarding pesticide exposure. The TAS approach is similar to the multimode, multidomain model described by Arcury et al. (28). This model regards communities as multidimensional and posits that modes of interaction and domains of participation with the communities of interest should also be multidimensional to be most effective (28). We use the model of Arcury et al. to depict the involvement of the community and level of intensity of partnership activities (Table 1).

The model also summarizes the five main data collection activities completed during the formative research stage of the project.

In the conceptual model of Arcury et al., different types of community representation can be involved in different modes of interaction (28). A community can be represented by an existing community group, community groups created by researchers, community leaders, and other community individuals. In TAS, an existing community group, the FWAF, serves as the lead community organization, but other important community members such as employers and health professionals are also involved. The TAS community partners are full participants in each phase of the research. Using the domains of participation outlined by Arcury et al. (28), they are involved in consultation (discussion and questioning); strategic planning (collaboratively designing the research); and implementation (assisting with data collection, analysis and interpretation).

Because of the extent of collaboration in the TAS project, outcomes of participation are effectively and equally shared, partners grow in their knowledge of one another and in their knowledge of the challenges to agricultural worker protection. Through the TAS model, academic researchers work with community members to use a systematic, data-driven marketing model to design effective behavior change strategies. Three years into the project, the partners found this collaborative approach to research to be effective, and the community group has become empowered to collect and use data to address local problems, as was noted in the quotes above. Although perceived to be tedious at times, the community partners have come to appreciate the value of careful data collection and have learned to rely on these data to guide their activities. The academic partners have learned about the many facets of agricultural work, regulation and enforcement of worker safety laws, workers’ beliefs and practices related to pesticide exposure, and individual and community perceptions of pesticides.

Table 1. TAS Activities by modes, domains, and their outcomes.^a

Modes of interaction	Domains of participation (from least to most intensive)			Outcomes
	Consultation	Strategic planning	Implementation	
Partnership with community group	Monthly meetings	Shared decision making	Cooperative implementation	Partners share goals, knowledge, skills
Formative data collection activities				
Participation/observation	Partners discuss needs for certain types of information and how to get it	Partners cooperatively plan data collection activities	Partners share staff hiring, training, supervision, data analysis, and interpretation	Academic partners experience farmwork and understand costs of prevention
Focus groups				Community partners learn more about perspectives of workers and healthcare providers
Healthcare provider interviews				All partners understand challenges to implementing basic changes and facilities
Supervisor interviews				Community partners learn survey research skills
Surveys with workers				
Creation of a community advisory committee	Partners agree that extended power base is needed	Partners cooperatively select partners and set up meetings	Partners hold meetings and cooperatively present findings	Project extends its reach and effectiveness

^aThis table is an adaptation of the community participation model by Arcury et al. (28).

Community-based research has been accomplished by the TAS project through a commitment by all partners to share all information, power, and decision making. Social marketing's behavioral orientation has encouraged program planners to set behavioral objectives and design strategies that address the critical factors that determine the audience's adoption of target behaviors. Through extensive formative research, community partners who do not have time or interest to participate more directly in the planning process can still contribute to important program decisions.

In addition to empowerment and shared learning, the social marketing approach of examining product benefits, product, price, and other factors that influence consumer behavior has also been valuable to this project. Without the extensive qualitative and quantitative data collection, the partners may have overlooked many aspects of pesticide exposure, such as the impact of the beliefs about washing hands in cold or unclean water on washing behaviors; the importance of co-worker influence on washing behaviors; and the beliefs about the importance of washing or entering a worksite that has been sprayed too early, on the frequency of preventative practices. All of our formative research has been integrated to provide a comprehensive picture of the costs and benefits of various protective practices to fernery and nursery workers.

The TAS project has encountered many challenges associated with community-based research (19). Early in the TAS project, academic partners learned the FWF had negative experiences with academic researchers on a previous project, making the organization reluctant to accept a new academic partner. The FWF expected that UF researchers would want to control the relationship and retain power over project decisions. An important element in building trust with the FWF was the selection of a person with whom they had already established a working relationship to serve as project manager and liaison between the academic and community partners. The academic partners' willingness to travel for more than 2 hours to FWF offices for all meetings and to spend time early in the project working in a fernery and in nurseries also helped build rapport with community partners. Nevertheless, it still required almost 2 years of shared decision-making for the team to build a sense of equal partnership.

Other barriers that presented challenges to the TAS project, common to community-based research (19), included

- Differences in ethnicity and language between some partners, which made communication challenging at first
- Difficulties in establishing firm roles and expectations for project partners, despite

the elaboration of major roles in the grant proposal. Role definitions for each project activity changed somewhat, so establishing confidence in new roles took time and communication

- Concerns by the community group that academic researchers may not want to challenge the status quo (21) or confront the structural causes of pesticide exposure
- Periodic fatigue by community partners, especially with the tedious survey development and data analysis activities, and periodic frustration by academic partners that research was not moving along more quickly.

Some of these barriers were relatively easy to resolve. For example, to overcome language barriers, the project translated essential documents into Spanish and Haitian Creole. Academic partners had to learn to avoid jargon and buzzwords and to make better use of visual aids. Other barriers, however, required greater time and persistence to overcome. Regular meetings with the full team were essential not only for the communication of roles and expectations, but also so partners could discuss any frustrations or concerns they had about ongoing issues. During the survey, for example, team meetings were used to update all partners on the activity's progress, to encourage and support interviewers, and to reassure academic partners about meeting deadlines.

Because community-based research at this most intensive level of participation requires an extensive commitment of time and resources, it may not be advisable or even possible to use this approach in many public health projects. However, the TAS partners learned it is especially valuable when focusing on issues of environmental health and equity in a marginalized community such as Florida agricultural workers. The community-based research process encourages workers and other community members to share their perspectives on an environmental health issue that directly affects the worker communities. This community insight is data academic researchers may normally find difficult to obtain, but when gathered to seek solutions, community partners are more willing to participate.

Community-based research values a broad range of knowledge, whether based on someone's personal experiences as a worker or community member or on their knowledge of statistical analysis. The TAS partnership provides additional support to the efforts for change by offering sound research and data for academic partners and community partners to use in ways most valuable to them and by developing an intervention process that seeks to include workers, employers, supervisors, healthcare providers, and other members of the workers' communities.

Without collaboration the ability to broaden the base of potential target audiences may have been impossible.

Each new phase of research and intervention, however, brings new challenges. As the TAS project enters its intervention phase, we are alert to issues involving a shift of focus and competing opinions about the interventions that will work best. The next stages of collaboration will focus on developing a unified vision of an intervention that will be effective and accepted by community and academic researchers as well as by members of the worker community at large.

The use of community-based research for challenging social problems is effective, but only when all partners accept the values and principles of this approach and make a commitment to the daily demands associated with this work. The results of this work strengthen all parties and seem to have a multiplicative effect on communities. Community-based research is an effective approach that brings the voice and knowledge of the people to problem solving through collaborative efforts.

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