

Something for Everyone? A Community and Academic Partnership to Address Farmworker Pesticide Exposure in North Carolina

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Partnerships between academic researchers and community organizations are frequently formed to address environmental health concerns in underserved communities. Although such participatory approaches to research combine valuable assets of both partners, they are often difficult to maintain. We describe a partnership formed to investigate migrant and seasonal farmworker exposure to pesticides in North Carolina and to develop effective interventions to reduce exposure. North Carolina ranks fifth in the United States in the number of farmworkers; most are from Mexico, and a significant minority come to the United States on work contracts. Several barriers to establishing effective collaboration were recognized in this partnership, including stereotypes, cultural differences, competing demands for time and attention, and differences in orientation to power structures. To overcome these barriers, members of the partnership took actions in three domains: clarifying the different goals of each partner, operationalizing a model of participation that could involve many different community segments developing cultural sensitivity. By taking these actions, the work of the partnership was accomplished in ways that met the criteria for success of both academic researchers and community members. This approach can be used by others to develop collaborative relationships to investigate environmental health issues within a community-based participatory framework. *Key words:* environmental justice, health disparities, migrant farmworkers, participatory research, pesticide. — *Environ Health Perspect* 109(suppl 3):435–441 (2001). <http://ehpnet1.niehs.nih.gov/docs/2001/suppl-3/435-441quandt/abstract.html>

Partnerships of academic researchers and communities are recognized as potent organizational structures for addressing environmental health problems (1–3). Among other assets, researchers provide expertise in systematically collecting and analyzing data, whereas communities bring first-hand experience of the problems and their consequences. The fact such partnerships are themselves described, analyzed, and prescribed by funding agencies suggests these are not natural alliances. Although partnerships may create a unique opportunity to solve problems, they are contrary to expected patterns of interactions. It is our contention that those forming such partnerships will find them more productive and satisfying if they are mindful of their own expectations in a partnership, as well as those of the other party.

Environmental health problems lend themselves to community–researcher partnerships because the source of the health problem is often imbedded in a complex interaction of the physical environment, human biology, and such elements of social relations as race, gender, and class (4). Investigating the origin and extent of health problems often requires technical laboratory analyses beyond the resources of community members. The solutions usually involve modifications of individual behavior, interpersonal relations, and structural changes (5).

There is a growing literature on community–researcher partnerships and the conduct of community-based research (6–11).

The bulk of this literature comes from the perspective of the researcher, describing the value of this type of research and suggesting the problems encountered. Very few specifics of how to do this research are given, and only rarely are the voices of the community heard. The communities on which much of this literature focuses are low-income and minority populations that form geographically defined communities.

The approach taken and the population of interest in this article are different. Researchers and community representatives both contribute to the paper. Together we describe a community/researcher partnership formed to address issues of farmworker exposure to pesticides in North Carolina, drawing on the experiences of both sides of the partnership. The population is highly mobile and has little discernible formal organization. From the experiences of members of the team, we abstract a set of barriers experienced in carrying out the work of the partnership and then a model for successful collaboration in such a population.

Background

Modern agriculture depends on the use of a wide range of chemicals to maintain its current levels of productivity. Pesticides are the most frequently cited agricultural chemicals in discussions of health. Pesticides include insecticides, herbicides, fungicides, rodenticides, nematocides, acaricides, molluscicides, piscicides, and avicides. They are an extremely heterogeneous set of chemicals (12). Pesticides

and other agricultural chemicals come in different forms, including gas, liquid, dust, and granule. They are applied through spray, in irrigation water, and from the air. Although new products and techniques (no-till agriculture, integrated pest management) are being developed to reduce the amounts as well as the potential environmental and human health effects of these pesticides, they remain important and widely used (13).

For as long as there has been large-scale agriculture in the United States, a seasonal labor force has been employed to cultivate and harvest it. The harshness of farmworkers' lives has been a constant, characterized by deprivation and disease. President Truman pronounced in 1951 that "[w]e depend on misfortune to build up our force of migratory workers and when the supply is low because there is not enough misfortune at home, we rely on misfortune abroad to replenish the supply" (14). Today, over 85% of the fruits and vegetables produced in this country are harvested or cultivated by hand (15), and the current foreign-born labor force supports Truman's economic analysis of 50 years ago.

At the intersection of this dependence in U.S. agriculture on pesticides and on migrant and seasonal farmworkers is the environmental health concern for worker exposure. Many pesticides are readily absorbed by the body through contact with the skin, respiratory tract, eyes, and gastrointestinal system. Evidence is growing that exposure to many of these chemicals can have negative health consequences, including acute and chronic effects, as well as increased cancer risk (16). The most serious acute effects result from poisoning and can include death. In the United States these are usually due to poisonings with organophosphate pesticides that create toxic effects by inhibiting cholinesterase, a neurotransmitter

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found throughout the body. Other deaths result from the effects of chlorinated hydrocarbons that act as central nervous system stimulants. Other more minor acute effects include skin rashes and irritations of the eye and respiratory tract.

Chronic effects of pesticide exposure are less well documented. However, these have been reported for a variety of occupational groups, including chemical applicators and farmers, as a result of long-term exposure to pesticides or pesticide residues at levels insufficient to cause acute reactions. These chronic effects include neurologic problems such as anxiety, memory deficits, mood changes, vision impairments, and delayed neuropathy (17). Reproductive effects of many pesticides used in agriculture are known from animal and human studies. These indicate a whole range of effects—sterility, spontaneous abortions, and birth defects—are possible. Although the most conclusive human studies are from studies of reproductive end points linked to sperm and where type of chemical exposure was known (18,19), ecologic studies that deal with confounding variables in seeking to link exposure and outcome have reached similar conclusions for a variety of pregnancy outcomes (20).

Cancer, a delayed effect, has been linked to exposure to pesticides and other agricultural chemicals. Animal studies provide strong evidence that many agricultural chemicals are carcinogenic. These studies cross functional categories (e.g., herbicides, insecticides, fertilizers) and different chemical classes (21,22). Epidemiologic studies among farmers and other occupational groups routinely exposed to such chemicals find excesses of a variety of cancers among farmers, including leukemia, non-Hodgkin lymphoma, multiple myeloma, soft-tissue sarcoma, and cancers of the skin, brain, and prostate (22–24). Although the excesses of these cancers among farmers are small, the heterogeneity of exposure due to variability in farming operations and the grouping of all farmers together in epidemiologic studies likely produce underestimates of the risk for cancer in those farmers most exposed to agricultural chemicals (22).

Documenting chronic effects of pesticide exposure in farmworkers is exceedingly difficult because of the migratory nature of the population (21). Standard cohort studies are not possible, and even longitudinal studies of several months will result in an unacceptably high loss to follow-up. Nevertheless, because of evidence from other sources, we conclude that it is prudent to minimize exposures to active pesticides and to their residues (25).

Minimizing farmworker exposure is complicated by the social organization of the farming system. Farmworkers are usually in a relatively powerless position. They are

dependent on their employer for much-needed income, as well as housing, transportation, and other necessities, in some cases. Therefore, they are not likely to refuse to work in situations that would cause pesticide exposure and are not likely to report violations of worker protection laws (26,27).

The number of farmworkers and their dependents in the United States has been estimated at 4.2 million (28). Recent survey data collected as part of the National Agricultural Workers Survey (1997–1998) indicate that 42% have home bases outside the United States, and 56% are migrant workers who must travel more than 75 miles to at least one of the farm jobs held in a year. Most hold only one farm job annually (29).

Farmworkers in North Carolina

The farmworker population in North Carolina is estimated at 200,000 migrants and their dependents and twice that many seasonal workers who now live in the state year-round (30). Until 15 years ago this population was African American and white. Today its ethnic composition mirrors the national trend (30). Most workers are Latino, primarily from Mexico, but the population also includes individuals from Puerto Rico and the countries of Central America. These workers are employed in the production of a variety of crops, including green peppers, tobacco, cucumbers, sweet potatoes, apples, and Christmas trees.

The farmworker population in North Carolina differs from those in other areas of the country. North Carolina farmworkers are not organized, and because of the recent demographic changes, advocacy organizations to serve them are fairly new. Many of the workers come directly from southern Mexico rather than being a part of the established migrant streams out of Florida and Texas. Some workers now coming to North Carolina speak one of the Indian languages of Mexico, not Spanish, as a first language. A small but important proportion, perhaps 10–15% of migrant workers, come directly to North Carolina from Mexico on work contracts as part of the H2A visa program. North Carolina recruits more H2A workers than any other state (31). H2A workers come without families and are obligated to work only for the grower hiring them or return to Mexico.

PACE Project

PACE (Preventing Agricultural Chemical Exposure in North Carolina Farmworkers) was a 4-year project using a community-participation framework to design, implement, and evaluate interventions to reduce chemical exposure of farmworkers (2). The PACE community-based approach was centered on

a partnership between academic researchers (from Wake Forest University School of Medicine and University of North Carolina at Chapel Hill) and a community-based organization [the North Carolina Farmworkers' Project (NCFP)] that provides services and advocacy for and organizes farmworkers throughout the state.

The PACE project was conducted in an eight-county area in east-central North Carolina, where the greatest concentration of the state's migrant and seasonal labor force is employed. PACE was directed toward farmworkers employed in tobacco and cucumber production, as farmers use a wide variety of chemicals on these crops, and production of each involves considerable hand labor.

PACE was conducted using the PRECEDE-PROCEED planning framework for behavior change (5). This framework brings together a variety of theoretical approaches that can be combined in designing an intervention (32). PACE drew principally on three theoretical approaches: the health belief model (33) at the individual level, social cognitive theory (34) at the interpersonal level, and community empowerment (35) at the community level.

The PACE project began with a year of formative research to understand farmworker and grower beliefs and attitudes concerning the use of pesticides and their health effects. This revealed a number of areas in which the beliefs of both groups were at odds with scientific evidence (20). In particular, this research pointed to an absence of the concept of pesticide residues. Based on formative research, a health education intervention for farmworkers was constructed (36). The intervention focused on the issue of residues, was constructed to be relevant to the North Carolina farming system, and included an emphasis on farmworkers controlling their exposure to pesticides (25). It was tested using a randomized group trial, and the final pesticide safety education program was then disseminated to other service providers.

The sample of farmworkers interviewed for the trial bear out the transient nature of this population and how it is rather distinct from the rest of the U.S. farmworker population. Of the 290 farmworkers interviewed, 215 have a home base in 1 of 22 different states in Mexico, 7 come from another Latin American country, and 1 from Puerto Rico. Only 60 farmworkers report a home base in the United States: 5 in Florida, 53 in North Carolina, and 2 in other states.

Barriers to Effective Collaboration in PACE

In the course of the PACE project, the partners engaged in self-evaluation to assess the

structure of the partnership and to identify barriers impeding the progress of the project. They identified five categories of barriers.

As the PACE project commenced, stereotypes presented one of the first barriers to be overcome. Several types of stereotypes existed. Each partner had a stereotypic self-image, as well as a stereotypic image of the other partner. Community partners were used to thinking of themselves as lacking power, compared to advocates for other segments of the agricultural population (e.g., farmers). They worried they were not taken seriously in encounters with academics. Although they had had positive experiences with some researchers, in general they were used to thinking of academics as persons who came into a community to do research and then left with little benefit to the community. The community partners told stories of other researchers who ended projects and never returned to the community. Academic partners, in contrast, were used to thinking of themselves as in charge of projects, as having special knowledge of the appropriate methodology for research, and as being objective in the way they viewed the world. Although they too had had some positive experiences working with communities, their stereotype of community organizations was that these were driven by self-interest that could compromise scientific studies. They were concerned community members would have little patience with the process of obtaining scientific results, as they thought they already knew the answer. As one academic colleague of the PACE scientific investigators noted,

“When I think about working with a community group, my continuing nightmare is that a house catches on fire and I have to coordinate with a community group to put it out. Community groups are just not responsive to time constraints and deadlines, they don’t get things done, they expect to get paid whether or not they complete their share of the work, they have continual internal feuding, and they habitually blame the academic researchers for any problems they encounter.”

A second barrier was culture. The PACE partners recognized that, as with most groups, each of the PACE partners had its own values, traditions, languages, and accepted codes of behavior. Communication and collaboration are impaired to the extent that these differ between academic and community partners. The cultural model for the scientists was one of slow, systematic work and change. A single project tended to be viewed as part of a large body of work, with cumulative effects on health and well-being. In contrast the community partners were advocates and activists. They were focused on social change with a much shorter time horizon.

In conducting farmworker research the cultural differences often include ethnic differences. In the case of PACE the academic partners were predominantly white and English speaking, whereas the community members were Latino and Spanish speaking. Aside from language the PACE partners differed in the channels of communications they were accustomed to using. The academic partners were used to conducting much of their work using relatively brief, impersonal forms of communication. They frequently conducted research-related business via conference calls, and exchanged information using answering machines, e-mails, and memos. In contrast the community partners lacked access to many of these forms of technology. They were accustomed to using face-to-face interactions to accomplish their work. The more social and informal style of interaction meant community organization members expected to spend time in face-to-face meetings in which personal information was exchanged.

The competing demands for time and attention created barriers. Each of the academic scientists was involved in a number of other research projects, most unrelated to the PACE project. They also had obligations for teaching and service in their universities and in national professional organizations. The community partners ran a variety of programs for the community and had the responsibility for helping individual members get immediate help with legal, housing, health, and other needs. Although the community-based organization had an interest in health, it was not the primary focus for their organization. To network with other farmworker groups, members frequently traveled to national conferences and were often invited to meetings out of state on very short notice. Leaders of the community-based organization served as farmworker representatives on committees for a number of state agencies, which put further demands on their time. Some of their staff members worked part-time and others were volunteers. Because the PACE partners usually saw each other at PACE-related meetings, these other demands on their time were largely invisible and contributed to an impression by each group that the other was less focused on PACE than expected.

Differences in orientation to power structures created tensions between partners. University researchers were aware they represented a variety of organizations in their work and communities: their universities, their state government and its constituents, their funding agencies, and their professions. The NCFP had limited connections to governmental and private power structures; therefore, taking confrontational positions or making inflammatory statements were

not an issue. Indeed, the NCFP used confrontational and inflammatory actions to draw attention and support to their positions. For example, to illustrate the substandard conditions in migrant housing, NCFP staff members took a very soiled mattress that passed inspection standards to the North Carolina governor’s office and threw it on the floor after having alerted the news media about their intended actions.

Distance was an obvious barrier. The academic and community partner offices were located about an hour and a half drive apart. This added 3 hours travel time to any meeting. Thus, meetings were scheduled far in advance and were not spontaneous. However, community members often acted spontaneously, canceling and rescheduling meetings with very little notice. Academics appeared inflexible in scheduling meetings because they were not willing to change when community priorities changed. There were pressures on the partners to have meetings accomplish considerable business. When other demands on time interfered with attending meetings or accomplishing work between meetings, this was a source of frustration to the other partner.

Finally, there were obvious differences in resources. Both partners were well aware of salary differences. Whereas the community partners thought a truly equal partnership should mean an equal division of funds, the university partners were used to linking funding to specific divisions of labor for project tasks. At the same time, the university partners knew the project fit within the existing social structure that rewarded professors and doctors more than community organizers, and they were not always comfortable with this.

Although the grant that funded this collaboration paid the research expenses (including salary, travel, phones, supplies) for each partner, the differences in infrastructure were striking. The academic partners had secretaries and accountants who managed the paperwork. They had comfortable offices with reliable heating, cooling, and plumbing. They had computer-support personnel to keep their computers running and up-to-date. They had e-mail and sophisticated telephone message systems. They had libraries. The community partners, in contrast, had offices in a rented storefront. The same people who worked on the PACE project interviewing and developing interventions also wrote proposals to bring funding to the organization and pay salaries. They were responsible for paying the bills and writing the checks that kept their organization running. In addition, when there was work to do maintaining the equipment and facilities, staff members had to do it. The community partner organization had a very

limited budget. When the university asked for proof of an independent audit, this almost caused the community group to withdraw, as they did not have the extra resources to pay for an audit. Community members beyond the employees of the community-based organization who were involved in PACE often did not have telephones or reliable mail service, and they lacked reliable transportation to attend meetings. One result of differences in resources was greater burnout and turnover in the community partner organization staff.

These barriers were recognized as obstacles for establishing successful collaboration in which all participants could participate freely. As the PACE project progressed, the partners developed strategies for overcoming these barriers, and a model for successful collaboration evolved.

Steps toward Successful Collaboration

In retrospect, partners in the PACE project recognized three types of actions that were key to overcoming barriers and moving toward successful collaboration. Few of these were clearly articulated from the beginning. Rather, they emerged from the process of trying to work together, from frustrations and miscommunications, and from struggling to overcome the barriers. The types of actions include clarifying goals, operationalizing a broad model for community involvement, and developing cultural sensitivity.

Clarifying Goals

Each partner in community-based research—community member and scientist—has motives or goals for the collaboration that stand above the specific aims of the individual project. These goals are best recognized at the outset of the collaboration, though in PACE they emerged as the partnership developed.

In PACE the community collaborators identified several goals for involvement in any research project. They wanted to have community-initiated research projects that addressed issues identified by the community. The community collaborators resented any group that treated them in a paternalistic fashion, telling them what problems their community members faced. PACE fit their priorities because they were already engaged in presenting pesticide education to farmworkers. Further, the community collaborators were interested in research conducted with the community, not on it. Like many minority communities the PACE community partners were highly sensitive to being research guinea pigs. Yet rather than rejecting research, they had a well-developed vision of what an acceptable partnership would look like. For example, the community partners sought ways to develop leadership and other skills among

community members. Therefore, they wanted involvement by community members in data collection in such a way that the community could reflect on data and the results of data analysis, and use these for actions that dealt with issues and problems in the community. The community partners were insistent that they participate in research that valued and respected the knowledge of community members, that is, research that recognized community members as experts.

In addition, the community collaborators wanted to have the opportunity to shape research results to be more accessible to the community. They believed that the microscopic approach of previous research projects had led to negative, or at least not very relevant results that created apathy among community members. The goal of the organization was to help translate the results into meaningful information that could energize their community.

The community collaborators saw working with academic partners as a way to legitimize community concerns. Involvement with researchers and large mainstream institutions like universities could give greater credence to their concerns for workers' rights and safety. Such an alliance would help them cross class barriers. The community partners saw the partnership as an opportunity to create positive experiences within their community that could interest community members in research. Having a positive experience in a research project could challenge the community's perceptions about the allocation of power and resources. Finally, they wanted relations with academic partners who could assist communities to develop research projects that could be effective tools for change in the future. They recognized that both public and private funds were available for projects that could assist the community. Although they had been successful with some of these sources in the past, involvement with university researchers might enhance their ability to compete for these by giving them legitimacy across class barriers.

The scientific partners had somewhat different goals for the research process. They wanted to employ a research design that adhered to the scientific method as closely as possible. This included using systematic and established procedures for sampling, measurement, and data analysis. They knew that their research procedures had to meet ethical standards, that is, participants in research had to understand the risks and benefits of participation in the research. They knew the assurance of confidentiality and ethical standards could sometimes seem awkward in a community setting. The boundary between collecting research data and providing service as a part of the mission of the community organization could be blurred. Although the scientific

partners were aware that certain findings in a community study (e.g., child abuse) carried with them obligations for reporting, research in occupational health and safety was more of a gray area. The scientific partners were concerned that their interpretation of such situations would not match that of the community collaborators who were more action oriented.

The scientific partners wanted to participate in a research experience in which their knowledge and expertise were respected. They had thought out the design of the study, a group randomized controlled design, so hypotheses concerning the efficacy of different interventions could be tested. They wanted to be able to carry out the research so that the hypotheses-testing outcomes were similar to those of research that was not based on a community partnership. They wanted to complete a research project feeling they had participated in worthwhile research that helped to solve a problem in the community. Beyond that they wanted to see the research produce results that could be defended to scientist peers. They needed to publish in peer-reviewed journals as a reality of their jobs but also as a way of validating results and disseminating information beyond a single community. Finally, the academic partners were used to one research project building to another, so they wanted to produce a collaborative arrangement on which future work could be built. They recognized that most academic scientists have more research ideas than they have time and energy to research, and focusing research and building on past research can be an avenue for personal and professional advancement.

Clarifying these goals and respecting each other's goals helped the partners accomplish the specific tasks required to achieve the aims of the study. This clarification was an ongoing process. Early in the PACE project we had lengthy discussions in most of our early project meetings to clarify these goals. The community members in particular asked questions about what the scientists wanted to do, how they wanted to do it, and why they wanted to do it. We have continued these discussions to clarify our goals across the life of our project. As new aspects of the project were implemented, we discussed what, how, and why activities needed to be completed. Occasionally, incidents occurred that reminded us that communication between the scientific and community collaborators is always subject to breakdown as goals of the two groups clash. For example, when health-promoter training sessions were being conducted for workers from the intervention residence sites, several farmworkers arrived who were not expected by the scientific partners. Upon investigation after the training, the scientists learned that these workers were actually residents of control

sites who had been invited to attend by a staff member of the community group! In scientific terms this meant contamination of the control sites—they had received a part of the intervention. However, from the perspective of the community group, training was a resource to be shared broadly. This incident brought home to the scientific partners how foreign to nonscientists the concept of testing health education methods through a scientific design must be, and how scientists must work to communicate the reasons for organizing projects in particular ways.

Operationalizing a Model for Broad Community Involvement

The process of building collaboration brought with it the realization that PACE needed a process for involving community members in the research that recognizes that different members of the community desire different levels of involvement and that this involvement can come in different forms. Whereas some community members expect to be involved in planning and executing the project plan, others only want to be informed about study goals and results. In PACE we recognized there are many modes for including community members in participatory research, and including several different modes ensures that a broad range of community views and knowledge are considered (2).

We refer to the PACE model of community-based participatory research as a multidomain, multimode model (Table 1). All

community participation in a research project can be fit into one of three domains: consultation, strategic planning, and implementation. Consultation is simply the act of telling community members about the research and asking for their reaction and input. In strategic planning, community members are partners in shaping and deciding what should be done and how it should be done. Community members who actually do parts of the research—selecting and recruiting participants, designing data collection tools, collecting data, analyzing data, and reporting results—are implementing the project.

The modes of community participation, that is, how community members are actually involved in each domain, can be numerous. In PACE, the partners found it important to use several different modes to involve as many community members as possible in each of the three domains. Although many community-based participatory projects have an advisory committee, PACE deliberately created additional modes as opportunities for community participation. For example, PACE used community forums to provide information to the community and gain feedback. Forums were town meetings organized by the community partners. Along with a meal provided by the project, the PACE staff members presented current plans and asked for comments from community residents. The presentations varied from skits to more standard oral presentations. These forums provided a reality check on the directions in which the project was heading and caused some significant modification of

plans. For example, an early plan to train lay health providers was modified when community members objected on the grounds that they all wanted to receive expert rather than lay training in pesticide safety. Presentations to community groups kept particular sectors informed. These presentations included those to meetings of healthcare providers and to groups serving farmers (e.g., Cooperative Extension and Farm Bureau).

A final mode of involvement was employing farmworker community members as research staff. This resulted in community involvement in the actual implementation of PACE research activities. Two members of the community organization received training and participated in the formative data collection and analysis. When the pesticide safety education program was implemented, four community members participated in delivering the direct worker program, and six community members participated in delivering the safety promoter program. Ten community members were hired and trained as members of the evaluation survey interview teams. This project has produced a number of refereed journal articles, reports, and conference presentations. Community members coauthored 8 of 13 journal articles (2,5,27,37–41), 4 of 6 reports (36,42–44), and 7 of 14 conference presentations.

Developing Cultural Sensitivity

The PACE partners recognized that a successful research collaboration requires developing cultural sensitivity. This had two sides: scientists

Table 1. PACE community participation model: specific activities by modes and domains and their outcomes.^a

Modes of interaction	Domains of participation			Outcomes of multidomain participation
	Consultation	Strategic planning	Implementation	
Partnership with a CBO	Frequent meetings of CBO staff and university staff	CBO and staff collaborate on original research design CBO and staff collaborate to fine-tune design during conduct of project	CBO and staff share responsibility for formative data collection and interviews CBO and staff develop intervention	CBO staff receive training and become identified with PACE Research protocol reflects balance of community needs and scientific design Research accomplished by community members
AC	Staff and CBO inform AC about project activities	AC advises CBO and staff on data collection and implementation strategies		Research plan matches scientific design needs and community concerns
Community forums	CBO leads presentation and discussion of project in community, with staff support	Small-group breakout sessions for planning and evaluation of intervention materials		Wider community is involved in designing intervention
Public presentations	Project staff and CBO present information on project at meetings of existing organizations			A broad base of stakeholders are informed and have input
Formative data collection	Farmworkers complete in-depth individual and group interviews			Experiences and opinions of multiple farmworkers are considered in intervention design
Outcomes of multimode participation	Wide range of community segments are informed about project Input is received from a full range of community members and representatives	Community is involved in planning project and has a stake in its outcome	Community actively participates in conduct of research	Broad-based involvement of community in research after 1 year of multimode, multidomain activities

Abbreviations: AC, advisory committee; CBO, community-based organization. ^aData from Arcury et al. (2).

needed to become sensitive to the cultures of a specific community, and community collaborators needed to become sensitive to the culture of research and science. This process required acknowledging that partners in community-based participatory research had different skills and strengths, as well as different styles. Developing cultural sensitivity allowed collaborators to anticipate, appreciate, and sometimes learn to tolerate these differences and to build upon each partner's strengths. In PACE, for example, the community members had a style for conducting a meeting, often allowing time for socializing and paying little attention to official starting and ending times, that differed from the corporate style of university-based researchers. Valuing this approach allowed community members to feel comfortable and increased the information shared at meetings. Scientists, on the other hand, had the skills needed to communicate study results to community, scientific, and policy audiences. Although the publication of study results was foreign to most community members, community members cooperating in and supporting the scientists' work in the professional dissemination of results allowed the scientists to get needed recognition for their work and authenticated community members' perceptions of local issues.

Developing a mutual cultural sensitivity in PACE had several elements. The first was accepting cultural (and personality) differences. The academic partners had to realize that project tasks were accomplished but often on a time schedule different from their own. They had to accept others' not being on time, even if they themselves were, and value the fact that the study tasks were being accomplished.

The second element in developing cultural sensitivity was spending time in the field and spending time with each other. The PACE participants came to recognize the importance of face-to-face interaction. Community organization partners were asked to come to a meeting on a university campus about once per month. The scientific staff were at the offices of the community-based organization at least once each week. During peak periods scientific staff lived in motels and spent days at a time working directly with community members. They agreed that community-based participatory research was not a long-distance, but a face-to-face activity. Partners socialized with each other. Academic partners took their children to weekend meetings in the community, and community members brought their children to meetings at the university. They visited each other's homes for social events; they shared meals. Although the partners did not live near each other in terms of physical space, spending time together in a variety of settings brought them nearer to each other in social space.

The third element in developing cultural sensitivity was appreciating the other partner's strengths. The PACE partners found that both sides needed to be realistic about the strengths of the different partners and to value these strengths. For example, in writing, academic partners did not expect community partners to write a paper. Academic writing was not a skill that they had developed nor should have been expected to develop. However, discussing writing ideas at meetings before the writing process began, then sitting down together and reading drafts of papers and safety educational materials were effective ways to obtain comments from community partners. This face-to-face interaction improved the content of written materials. The input of community members brought out the community perspective. It also helped the academic researchers understand what idioms and words were most effective in communicating the community's views.

Community partners had a detailed knowledge of the local community—where migrant labor camps were located, the appropriate way to approach the residents of these camps to enlist their participation, and which growers would be most amenable to working with the PACE project. Without this detailed knowledge, it would have been much more difficult to conduct this research project.

Conclusions

Together, the three elements of goals clarification, implementing broad community involvement, and cultural sensitivity produce a model of the community-based participatory research process that leads to a project that is successful for community members, for scientists, and for those who sponsor these projects. PACE has been successful because community members have gained information and skills that are transferable to other topics and can be used to address a number of health issues. Since the PACE project developed the idea of community forums, the community organization has been asked to conduct these for a number of other organizations and agencies, providing additional farmworker input into programs designed to assist them. PACE has produced a culturally appropriate pesticide safety educational program for farmworkers (5,36). Participation in the project has brought the community-based organization needed funds to remain an actor in this arena.

From the perspective of the academic partners, PACE has been successful because partners have been able to work on a project that is scientifically and ideologically important. Scientists have been able to use what they learned to develop a culturally appropriate safety education program (5). They have been able to document the causes of health disparities among farmworkers (26,37). Publications

of findings in peer-reviewed research journals have been used by community organizations and other advocacy groups to gain recognition for their positions. These publications have also been used by researchers and organizations in other communities as a starting point to investigate health and health disparities among minority occupational groups and by policy makers at the state and national levels who wish to address these issues with data instead of undocumented opinions.

The process of developing and sustaining the partnership described here was part of the original plan for the PACE project. Because the investigators understood that the content and procedures would evolve as the partnership matured, they stated in the original proposal that using "a participatory approach results in a research proposal with considerably more specificity of process and less specificity of content than a more conventional research proposal" (45). In retrospect, we can identify how the interactions of the community and academic participants led to significant decisions in the content and conduct of the intervention. These are detailed elsewhere (5) but include three significant aspects of the intervention. The first is substituting a combination of trainings by experts and lay field safety promoters for the lay health advisor format originally advocated by the academic scientists. The final training style took into account the values of farmworkers and the reality of turnover of residents in farmworker camps. The second decision was to focus on dislodgeable pesticide residues, rather than spills and airborne drift as major exposure sources. This came about as a result of academic partners critically analyzing the way farmworkers discussed pesticide exposure (27). The third decision was to incorporate ideas of control and empowerment through a Freireian approach to health education (46). This fit within the overall PRECEDE-PROCEED planning framework but was specific to the philosophy and practices of the community partners.

The lessons learned in PACE extend the existing literature on partnerships to include migrant and seasonal farmworkers, a population difficult to study. Many of the barriers to collaboration cited in more established communities (7,8,47) were found in PACE, including the demands on time and conflicts over resources.

The results speak to several of the paradoxes described by Silka (48) in her analysis of university–community collaborations. One paradox is the question of whether partnerships are robust or fragile. In the case of PACE we have identified factors we found to bolster the partnership, clarifying goals and increasing cultural sensitivity of both partners. A second paradox is whether partnerships

should be planned or should be allowed to evolve. In PACE we found the relationship underwent a variety of transformations as the partnership matured. These reflected the recognition of barriers that in hindsight seem obvious but that were not made explicit at the beginning of PACE. Based on our experience, subsequent partnerships will be more deliberately and realistically planned but with flexibility still needed. A third paradox highlighted by Silka is whether partnerships represent collaborations between organizations or between individuals. The experience of the PACE partners seems to demonstrate that organizations have the more significant and conservative role. Much of the character of the organizations is fixed. The culture, resources, and orientation to power structures, all cited as barriers to collaboration in PACE, cannot be expected to change significantly over time. Thus they have a major impact on the nature of the partnership, regardless of the individuals involved. Although different individuals can bring distinct talents to a partnership or be disruptive to it, a certain amount of self-selection takes place. Individuals from both universities and communities who do not find their goals met tend to disengage from the partnership.

The PACE project differs from most other community-based projects because of the community with which the researchers have attempted to form a partnership. Farmworkers in North Carolina, in contrast to Florida and the West Coast, do not follow the traditional migrant streams, and the majority do not have home bases in the United States. Unlike many other minority populations at risk from environmental hazards, they do not constitute a spatially distinct community. Nevertheless, PACE provides a case study with experiences similar to those of communities and universities that have formed partnerships in the past. The solutions devised in PACE and the lessons learned should provide insights for other communities and researchers contemplating partnerships to resolve public health issues in the future.

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