

Photovoice in the Red River Basin of the North: A Systematic Evaluation of a Community–Academic Partnership

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A community-academic partnership was formed in Minnesota's Red River Basin for a 1-year planning grant preceding a larger intervention to reduce pesticide exposure among children. Photovoice, developed by Dr. Caroline Wang, was used by mothers to document pathways to pesticide exposure for their children along with other health and safety concerns. An evaluation of the partnership was conducted for mothers, and for the research team of local stakeholders and academics. Surveys consisting of structured and open-ended questions elicited information on the perception of the process and short-term outcomes. Questions were created based on objectives of the Photovoice project, satisfaction, and principles of community-based participatory research (CBPR). A high percentage of study participants and researchers indicated that the objectives of the effort had been met, the principles of CBPR had been realized and they were satisfied with the benefits of participation. A need for more thorough planning was identified related to long-term dissemination of knowledge generated. The evaluation provides insight on the strengths and weaknesses of the project, demonstrates to team members and funders that formative and summative outcomes were met, and serves as a model for community-academic partnerships utilizing Photovoice as one CBPR method.

Keywords: evaluation; community-academic partnerships; community-based participatory research; CBPR; Photovoice; pesticide exposure; children

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Community-based participatory research (CBPR) is an egalitarian partnership that engages citizens, local stakeholders, and academics in all phases of the research process. Community members committed to improving local conditions offer their expertise and insights to identify place-based questions, adapt research methods to be culturally appropriate to their neighborhoods, serve as liaisons between the researchers and the community, and translate research findings into action to improve health and quality of life.

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Because CBPR is grounded in a real-world context, it offers the promise of identifying important problems and implementing solutions that directly benefit members of a community (Cook, 2008; Israel, Eng, Schulz, & Parker, 2005). Through CBPR, participants gain knowledge, skills, and awareness and develop new relationships; these resources empower community members and build the capacity to set future goals and meet challenges aimed at creating positive social change (Israel et al., 2005; Minkler & Wallerstein, 2003). Successful CBPR projects also enable investigators to gain insight into the community dynamics and the context for a research project, build meaningful relationships with communities, and learn how to translate research into practice.

During the past 10 years, CBPR has grown in acceptance and recognition as a potent tool with the potential to unearth and alleviate the root causes of health disparities (Satcher, 2005). In a report from the Institute of Medicine, "Who Will Keep the Public Health Healthy?" CBPR is identified as one of eight core public health domains necessary in educating public health professionals (Committee on Educating Public Health Professionals for the 21st Century, 2003). Grants for CBPR partnerships have been awarded by several government agencies, including the Centers for Disease Control and Prevention, the National Institute of Environmental Health Sciences, and the National Institute of Health. In addition, a commitment to CBPR through funding mechanisms has been made by philanthropic organizations, such as the Ford Foundation, the W. K. Kellogg Organization, the Annie E. Casey Foundation, the California Endowment, and the Aspen Institute. Although support from these sectors has been estimated at \$45 million per year, this funding is minuscule compared to the billions of dollars available for traditional research approaches (Minkler, Blackwell, Thompson, & Tamir, 2003). Evaluation that demonstrates the achievement of CBPR goals is imperative to facilitate continued acceptance and growth of this method among funders (Cook, 2008).

This article describes the evaluation of a community-academic partnership developed in the agricultural region of the Red River Valley in Minnesota and North Dakota. The partnership was designed to conduct a needs assessment of mothers' perceptions of their children's exposures to pesticides as part of a 1-year planning grant addressing the reduction of children's exposures to pesticides and a subsequent grant application for an intervention project.

The project arose from an established relationship between the University of Minnesota's Regional Sustainable Development Partnerships (UM Partnerships) and local stakeholders in the region. The UM Partnerships is a

citizen-driven program that engages UMN researchers to address community-articulated needs and links citizens to their land grant university. One of the regional UM Partnerships is located at a UMN coordinate campus at Crookston, Minnesota; it serves the citizens of the Red River Basin.

Located in northwestern Minnesota and eastern North Dakota, the Red River Basin is one of the major wheat, sugar beet, soy, and potato growing regions of the United States. The Minnesota portion of the basin spans more than 37,100 square miles (Minnesota Pollution Control Agency, 2010) and has a population base of more than 150,000 people, with 25% under age 18 (UM Partnerships, 2003).

Residents in the Red River Basin had expressed both concern and lack of information about pesticide exposure. In 2004, a survey and focus group data collected by the Environmental Resource Center revealed that more than 50% of the area's residents believed that pesticide exposure may cause birth defects and cancers, and 70% of residents said, when asked about the relationship between pesticides and health, that "most of us do not know the level of risk." The high level of health concern, combined with the large number of people uncertain of the risk stimulated a desire by the UM Partnerships to collaborate with faculty researchers and work with communities on issues of pesticide use and exposure, especially as it affects pregnant and preconception women and small children who are at the greatest risk, but whose opinions were not captured in surveys.

The perception of risk is based on high pesticide use in the Red River Basin, with 66% of its area planted in crops (Red River Basin Commission, 2009). Conventional farming practices for these crops include the application of pesticides. Exposure to nonpersistent, nonvolatile organic compounds (e.g., organophosphate and carbamate pesticides, herbicides, pyrethroids, and other pesticides) in utero and postnatally is hypothesized to increase the risk of asthma, thyroid disease, and type 2 diabetes and reduce neurobehavioral and cognitive skills (Landrigan et al., 1999; National Institute for Child Health and Human Development, 2007; Whyatt et al., 2005; Young et al., 2004).

The needs assessment used Photovoice methodology, as developed by Dr. Caroline Wang. Photovoice is an innovative CBPR methodology that places cameras in the hands of members of vulnerable populations and enables them to record the experience of their everyday lives. The process of Photovoice includes a commitment to bring the visual voices of participants to policy makers to stimulate critical dialogue for the purpose of improving conditions that directly affect their lives (Wang & Burris, 1997).

Photovoice is grounded in an emancipatory education process devised by Paulo Freire, and consistent with principles of feminism and traditions of documentary photography. Freire empowered community members to increase their awareness and bring about meaningful change through a foundation of reflection and critical dialogue (Freire, 1970). Feminism has sought to include the voices of those who have been systematically excluded into mainstream policy discourse (Backer, Costello-Nickitas, Mason, McBride, & Vance, 1998). Within the field of documentary photography, a tradition exists of showcasing photos taken by members of marginalized groups to depict their experiences with the intention of catalyzing social change (Hubbard, 1991, 1994). As a method, Photovoice borrows from these approaches and is well suited for conducting community needs assessment, community asset mapping, and participatory program evaluation (Wang, 1999).

Although most Photovoice studies published in peer-reviewed journals include the direct benefits yielded from the projects, few articles have been published that have focused solely on systematic evaluation. In a review of the literature, which consisted of entering "Photovoice" into the databases of Ovid Medline, CINAHL, and PsycINFO, fewer than 50 published primary studies using this method were identified during the past decade, with most of these studies published during the most recent 4 years. Although this method appears to be gaining in the frequency of usage, of those articles, only two focused solely on evaluation.

Foster-Fishman, Nowell, Deacon, Nievar, and McCann (2005) conducted a qualitative evaluation of a Photovoice effort to see if the method achieved the goal of empowerment among 16 community participants. By enabling citizens to be experts on their lives, encouraging deep reflection, and providing a safe environment to share diverse perspectives, participants reported a range of benefits conducive to becoming social change agents, including enhanced awareness, skills, relationships, and a sense of community ownership and commitment. A second evaluation was performed during a Photovoice project conducted with a First Nation in Western Canada to assess the ethical effectiveness of the method in working with an indigenous population. The evaluation consisted of participant questions related to whether participants liked the process of Photovoice and participants' rationale. These questions followed participants' presentations of their photographs. Participants indicated satisfaction related to balancing power, developing a sense of ownership in the research, cultivating trust, building capacity, and using a culturally sensitive methodology (Castleden, Garvin, & First Nation, 2008).

For this project, three groups of six to eight women raising children at increased risk from pesticide exposure were recruited by local stakeholders. The groups included low-income mothers enrolled in the Women Infants and Children supplemental nutrition program living in farming communities near the Minnesota-Canadian border; Native American mothers on a reservation surrounded by farms in central Minnesota; and new American immigrants predominantly from East Africa, associated with an Immigrant Development Center serving the Fargo, North Dakota-Moorhead, Minnesota area. Women took pictures of how their children were being exposed to pesticides as well as other health and safety concerns during the peak growing season of 2007. The Photovoice effort consisted of two workshops lasting 3 hours each. Objectives included the following:

1. creating awareness among pregnant women and mothers about the potential health effects of pesticides and exposure pathways,
2. enabling mothers to record their concerns related to pesticide exposure and other environmental issues for themselves and their children in photographs,
3. discussing with women their awareness of and access to locally grown foods as one strategy to decrease consumption of trace amounts of pesticides,
4. fostering dialogue about these issues with mothers through group discussion of photographs, and
5. engaging decision makers in the results of these discussions by exhibiting participant photos.

Workshop 1 was a session that included training about (a) adverse health effects of pesticides and routes of exposures, (b) an introduction to Photovoice, (c) the ethics of using the camera (Wang & Redwood-Jones, 2001), (d) strategies for taking well-composed pictures, (e) and hands-on instruction in using 35-mm cameras (Figure 1). Mothers were instructed to take photos in response to the following questions:

1. How do you get exposed to pesticides?
2. Does your family get exposure to pesticides? How?
3. Does your family have access to locally grown foods through gardening or purchasing?
4. If yes, where do you find your food? If no, what barriers prevent you from getting such foods?
5. Do you worry about any other important health or safety issues for your children?

Workshop 2 was held 4 to 6 weeks later to provide the women sufficient time to take photographs. At this meeting, the women discussed the meaning of their photos in the context of their lives. The goals of this session were to (a) encourage conversation about issues



FIGURE 1 New American Immigrant Mothers and Grandmothers Practice Taking Pictures With Digital Cameras as Part of the Photovoice Training in Workshop I.

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through photographs and group discussion and (b) to document and reflect upon community strengths and weaknesses. Participants showed and narrated the meaning of their photos while the following probing questions were explored: (a) Why did you select this photograph? (b) What do you see here? (c) What, if anything, would you like to change about this situation? (d) Which photos are most important to you and why? Following the narratives, a facilitated group discussion occurred in which members identified the most important themes of the photos, what they mean in their lives, why the problems or assets exist, what, if anything, they would like to see changed in their community, and how they would like to see these changes implemented.

The purpose of this article is to present a systematic evaluation of the impact of this Photovoice study conducted in the Red River Basin (RRB) during the summer of 2007. Consistent with recommendations by Gibson, Gibson, and Macaulay (2001), members of the research team identified their personal and professional goals for participation. A conscious effort was made to meet the goals of all stakeholders during the process of this project. The degree to which members attained these goals was one question included in the

evaluation survey. The evaluation used surveys with structured and semistructured questions to assess the achievement of both process and outcome objectives.

► METHODS FOR EVALUATION

Questionnaires were developed for two levels of partners—study participants and research team members. The surveys elicited information about demographics, objectives, and satisfaction. Mothers were asked five questions related to objectives and satisfaction that were based on a 4-point Likert-type scale from *strongly disagreed* (1) to *strongly agreed* (4). Two open-ended questions inquired how the information gained through this project will change their behaviors and what was most valuable for them in this experience. Co-researchers were asked seven questions constructed with 4-point Likert-type scale responses based on CBPR principles; each question was followed by an open-ended question for additional detail. Mothers filled out the surveys at the end of the second workshop. The research team was interviewed individually over the phone during the summer of 2008 by a graduate student. The interviewer was trained in conducting professional interviews, which were performed with a uniform script for each team member. Construct validity instruments were developed for surveys administered to study participants and co-researchers. Construct validity is the degree to which an instrument measures the abstract concept of interest (Polit & Beck, 2004). Principles of CBPR were adopted from peer-reviewed literature and used to measure constructs. For each question, the instrument explicated the principles of CBPR being measured (Becker, Israel, & Allen, 2005; Gibson et al., 2001; Israel, Schulz, Parker, & Becker, 1998; Tables 1 and 2). Excel software was used to capture demographic information and evaluation responses. Open-ended questions were analyzed by identifying themes within each question; matrices were created as part of the process of data analysis to facilitate a systematic approach toward thematic identification and discussion (Miles & Huberman, 1994). Results for mothers were analyzed according to each cultural group, and collectively.

► FINDINGS

Participant Mothers

All mothers either agreed or strongly agreed that participating in Photovoice assisted them in (a) gaining a greater awareness of possible health problems associated with pesticide exposure; (b) increasing their awareness of how they and their children can become exposed to pesticides; and (c) increasing their awareness of the benefits

TABLE 1
Construct Validity for Mothers' Evaluation Questionnaires

<i>Question</i>	<i>Workshop Objective/CBPR Principle</i>
1. My participation in this Photovoice project has helped me become more aware of possible health problems associated with pesticide exposures	Objective: To learn about the health effects of pesticides and how families may be exposed to pesticides in their usual daily lives Principle: CBPR promotes learning new awareness, knowledge, and skills that are relevant to the lives of participants.
2. My participation in this project has helped me become more aware of how my family and I can get exposed to pesticides	Objective: To become aware of pathways to pesticide exposure with targeted awareness of which pathways are relevant to one's own children and family members Principle: CBPR promotes learning new awareness, knowledge, and skills that are relevant to the lives of participants
3. Will your participation in Photovoice change your home practices to prevent pesticide exposure? If yes, how will you change your home practices to prevent pesticide exposure?	Objective: To discuss how what one learns may apply to one's own family's life Principle: CBPR facilitates participant development of relevant knowledge, skills, and action to promote health and well-being.
4. As a result of my participation in this Photovoice project, I have become more aware of the health benefits of eating locally and organically grown, fresh fruits and vegetables.	Objective: To become aware of eating organic, locally grown foods as one strategy to reduce family exposure to pesticide residue through ingestion. Principle: CBPR facilitates participant development of knowledge and skills that are relevant to the lives of participants.
5. Participating in this project has been valuable to me.	Objective: To empower others to make positive changes that benefit their lives Principle: CBPR promotes the development of knowledge, skills, and action to promote positive change.
6. If there was an opportunity to work with the University of Minnesota Regional Sustainable Development Partnership and your local project recruiter again on a project related to sustainable agriculture or gardening, would you be interested in being contacted about possible participation?	Objective: To bring about benefits from this Photovoice project, which may empower mothers to try additional efforts that promote the health and wellness of their families Principle: CBPR promotes the development of knowledge, skills, and action to promote positive change

NOTE: CBPR = community-based participatory research.

of eating locally grown, organic produce as one strategy to reduce the intake of pesticide residues (Figure 2). All of the women agreed or strongly agreed that participating in this Photovoice project was valuable. Only one mother did not agree that participation increased her awareness of the health benefits of eating locally and organically grown produce. She was already aware of the potential for exposure to pesticide residues through dietary ingestion; as such, the participant had implemented protective changes that included preparing and eating organic foods and nutritious native plants before participating in this research project. To see more photos on the impact of this project, go to <http://redriverkids.blogspot.com>.

Themes identified from open-ended questions asking how the mothers intended to change their home practices as a result of this project included (a) preventing children's exposure to aerial drift of pesticides, (b) reducing household chemical exposures associated with cleaning and pest control products, (c) improving nutrition and



FIGURE 2 Photovoice Assisted Mothers in Increasing Awareness of How They and Their Children May Become Exposed to Pesticides, as Depicted in This Image of Pesticide Fog Drifting Toward Toys
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TABLE 2
Construct Validity for Evaluation of Partners' Evaluation Questionnaires

<i>Question^a</i>	<i>Construct: CBPR Principle(s)</i>
1. The team of co-researchers worked effectively in the phases of planning.	CBPR aims for equitable collaboration in all aspects of the research project among partners; as such, evaluation of process is as important as is evaluation of outcome
2. The team of co-researchers worked effectively in the phases of implementation.	CBPR aims for open communication, resolution of conflict, and trust between members to foster effective collaboration.
3. The team of co-researchers worked effectively in the phase of disseminating knowledge.	
4. Through my participation in this Photovoice effort, I have made a meaningful contribution to families in the Red River Valley of Minnesota and North Dakota.	CBPR seeks to empower members to create positive change to promote citizen well-being that is relevant to their community
5. I have learned new knowledge and skills that will enhance my future work in my community as a result of my participation in this Photovoice project.	CBPR builds on strengths among community members, which include learning new knowledge and skills to enrich future community work by members
6. My personal goal(s) for participating in this Photovoice project were met through my participation.	CBPR theory holds that all members have personal objectives for participating in addition to major project goals; attaining personal objectives promotes the member's ability to create meaningful change and enhances satisfaction with the process and outcome of the group effort
7. I would recommend Photovoice to others as a tool for community needs assessment	CBPR unifies knowledge and skills to promote health and well-being along with the action of social change; the process and outcome of CBPR benefit member participants and citizens in the community

NOTE: CBPR = community-based participatory research.

a. Each question was followed by an open-ended question to elicit the rationale of a response.

reducing dietary pesticide exposure, and (d) improving pesticide literacy (Figure 3). One mother conveyed a sense of pride about her membership in Community Supported Agriculture, viewing this practice of buying local produce as improving family nutrition and reducing dietary pesticide exposure (Table 3). Themes articulated by mothers related to the most valuable benefit of their participation included increased awareness and information about pesticide exposure, learning through interaction with others, and community networking.

Co-Researchers

Of the 10 research team members, all agreed or strongly agreed that (a) the team worked effectively in the phases of planning and implementation, (b) they had met their personal and professional goals through participating, (c) they had made a contribution to families in the RRB, and (d) they would recommend Photovoice as a tool for community needs assessment (Table 3). All but one partner agreed or strongly agreed that they learned new knowledge and skills to enhance



FIGURE 3 Photovoice Assisted Mothers in Increasing Awareness of Protective Measures They Can Take to Reduce Pesticide Exposure to Their Families by Washing Conventional Fruit Before Consumption

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TABLE 3
Photovoice Evaluation by Co-Researchers (N = 10)

<i>Question and Group</i>	<i>Strongly Disagree, %</i>	<i>Disagree, %</i>	<i>Agree, %</i>	<i>Strongly Agree, %</i>	<i>Total, %</i>
1. The team of co-researchers worked effectively in planning this project.	0	0	50	50	100
2. The team of co-researchers worked effectively in implementing this project.	0	0	30	70	100
3. The team of co-researchers worked effectively in disseminating knowledge generated from this project ^a	0	0	60	30	100
4. I have made a contribution to families in the Red River Valley of Minnesota and north Dakota through my participation in Photovoice.	0	0	80	20	100
5. As result of my participation in Photovoice, I have learned new knowledge and skills that will enhance my future work.	0	10	20	70	100
6. My personal and or professional goals for participating in this Photovoice effort were met through my participation in this needs assessment.	0	0	20	80	100
7. I would recommend Photovoice to others as a tool for community needs assessment in the future.	0	0	40	60	100

NOTE: Scale: *strongly disagree* = 1; *disagree* = 2; *agree* = 3; *strongly agree* = 4.

a. One co-researcher indicated she could not respond to this question because she entered the project 9 months after it began.

their future work. Themes identified from open-ended questions included process and outcome strengths and weaknesses.

Process strengths included overcoming long-distance communication barriers through technology; working respectfully to create a successful partnership with multiple talents between local stakeholders and academics, sharing data so it could be brought back to the community for future usage; and cultivating a strong sense of group cohesion. Examples from quotes follow.

There were challenges in communication because of distance. We were able to overcome some communication issues [through] technology. The collaboration was inspiring, but challenging.

Between community members, field staff, and the graduate student, there was a high degree of mutual respect. The Photovoice was the best combination of grassroots-generated knowledge and university academic-based knowledge, and I think we brought this together in a good way.

I was amazed with how generous [the academics] were with allowing [us] to share the data. First you taught me about Photovoice, and then you embraced the intent of Photovoice by keeping it situated in the community—bringing the data back to the community so we can take these photos and share the exhibit with the people.

Outcome strengths included learning a new methodology for research and health promotion outreach; building partnerships to bring more resources back to the RRB; and empowering members of the community and building community capacity.

We use a lot more pictures now—at health conferences if you have those photos up, people understand what you’re talking about . . . the words don’t mean much, but the pictures do.

Part of my goal was to build stronger community–university partnerships; we were successful in bringing more university resources to the Red River Valley.

I now have an area that I am passionate about. It gives me a focus area on how I want to educate the community.

Weaknesses addressed issues of process and included: a need for greater planning related to budgeting, long-term dissemination of the results, and participant attrition.

There was a need for more comprehensive planning on budgeting, since the initial grant did not fully cover the cost of implementing the project.

I wish we could have followed through with [participant no shows]. I think it's normal anytime there's a group of people that meet once, and several weeks later gets together again—they're going to miss that second meeting. I don't know that there's a way to fix that unless you start with eight [participants] when you want six.

The process of dissemination is still ongoing; we are continuing to take the Photovoice exhibit to different audiences around the region and the state. Maybe our team hasn't updated each other about dissemination. There's a question of team cohesion and information sharing that we can improve . . . because we are no longer a team.

► DISCUSSION

The findings indicate this Photovoice effort was successful in empowering citizens, and the research team. Evaluation results from the mothers' perspective indicate the primary objective of the Photovoice project were met—increasing awareness of children's pesticide exposures, to enable mothers to voice their concerns, and to provide them with tools to more effectively protect their children. The project resulted in a series of compelling photographs and quotes from the participants about the way they perceived that their families were exposed to pesticides, and their health and safety concerns about these exposures. There were also images and quotes that conveyed the participants' perspective on their community's assets, such as how they protected their children from exposures, and resources they used, such as Community Supported Agriculture and organic community gardens.

Evaluation results from the research team's perspective indicate their primary objective was also met—the findings from the Photovoice needs assessment were parlayed into a successful grant proposal for a 3-year educational intervention to reduce pesticide exposure to children, addressing the mothers' primary concerns, and bringing more resources to the community to promote children's health. The research team members felt the process of working together had been respectful and

many of the co-researchers reported learning Photovoice as a needs assessment methodology, which they could use again in their work.

Opportunities for taking the Photovoice findings and the exhibit are still emerging. However, not all co-researchers have been updated about these opportunities as the grant funding has ended and the research team has no natural venue for regular communication. In retrospect, the group might have been better served to establish communication protocols at the outset of the project, both for publications and presentations. One relatively simple approach might have been to post information on the UM Partners website as an effective manner to keep partners and citizens apprised.

This was a relatively simple evaluation, and given it was a 1-year planning grant, the project was unable to assess long-term outcomes. Another limitation to this evaluation was the potential for social desirability bias influencing the positive feedback from the study participants and co-researchers. However, the evaluation appraised the responses of both study participants and co-researchers in relation to process and short-term outcomes. For the mothers, open-ended questions generated insight into how they will use the knowledge gained and what was most important to them about their participation. The feedback enabled the research team to propose a subsequent intervention that was tailored to the mothers' interests and served each of the three communities, and the intervention was funded. For the researchers, open ended questions provided nuanced insight into the process and outcomes of all phases of this project. It allowed the academics on the project to assess the degree to which local stakeholders' and co-researchers' needs were met and the project's potential for future collaborative efforts.

► CONCLUSION

This article has highlighted the evaluation of a Photovoice effort that took place in the RRB in the summer of 2007. Surveys were administered to mothers and the research team using structured and semistructured questionnaires. Questions were based on Photovoice objectives and principles of CBPR. The instruments were easy to administer, participation was high, and insights were gained into the strengths and weaknesses of this endeavor. Although most published articles include tangible benefits of this method, little has been published documenting systematic approaches to evaluation that includes process and short-term outcome from the perspective of both citizens and local stakeholders. This evaluation serves as a practice model for others incorporating Photovoice as one CBPR approach. The evaluation generates information and insights into the strengths and

weaknesses of the effort and can be used to improve future partnerships and to demonstrate the achievement of formative and summative outcomes to funders. Group websites can be a valuable means to keep partners and citizens connected to the project and informed of arising venues for showcasing the Photovoice findings after the conclusion of the effort, and for linking short-term and intermediate outcomes to long-term policy changes.

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