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A Handwashing Educational Toolkit: The Product of a Dynamic Partnership Among a Student, Faculty Member, and Community Organization

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Abstract

Pesticide exposure represents a significant occupational health hazard for farmworkers, and handwashing is one strategy to reduce exposure via the dermal route. After learning about recent research findings regarding the lack of handwashing utilized by North Carolina farmworkers in the field, the North Carolina Farmworker Health Program approached the student and faculty member who conducted the research to partner and improve handwashing education, with the goal of reducing pesticide exposure among farmworkers. The resulting handwashing educational toolkit was the product of a participatory development project that engaged farmworker health outreach workers with university partners in every stage—from needs assessment to method and message selection and, ultimately, educational material development and evaluation. This promising project serves as a model for a sustainable partnership among a student, faculty member, and community organization and underscores the importance of respect, equality, and distributed power in collaboratively responding to a community-identified need.

Keywords: university-community partnership, sustained collaboration

Pesticide exposure is associated with both acute and long-term adverse health effects. In the short term, pesticide exposure can cause irritation of the respiratory tract, skin, and eyes. Pesticide poisoning occurs when a person has been exposed to high levels of pesticides over a short period of time and may result in nausea, vomiting, diarrhea, headache, and dizziness. Long-term effects of lower level exposure include certain cancers, neurological problems, and reproductive issues (Hoppin & LePrevost, 2017). Even if farmworkers do not directly apply pesticides, they can be exposed to pesticides through breathing vapors and dusts from pesticide drift into unintended areas (inhalation); through the skin or eyes when handling treated plants and soil or touching contaminated equipment and clothing (dermal/ocular exposure); and through eating, drinking, and other hand-to-mouth behaviors with unwashed hands (ingestion; Krieger, 2010).

The dermal route of exposure is most significant for agricultural workers (Krieger, 2010). Scenarios whereby farmworkers may experience dermal exposure include being sprayed directly with pesticides, not washing hands after touching items containing pesticide residues, wearing pesticide-contaminated clothing, and using inadequate pesticide protective clothing and equipment while working. Furthermore, the skin covering some parts of the body is more likely to absorb pesticides because of its highly vascular nature and reduced skin thickness (e.g., the genitals, underarms, scalp, and forehead; Feldmann & Maibach, 1970). One recommended strategy for minimizing dermal exposure to pesticides is handwashing (Curwin, Hein, Sanderson, Nishioka, & Buhler, 2003).

The vast majority of farmworkers in North

Carolina receive pesticide training by video (Arcury, Quandt, Austin, Preisser, & Cabrera, 1999; Walton, LePrevost, Wong, et al., 2016). In a study where 94% of participants reported having received video-based training (Walton, LePrevost, Wong, et al., 2016), the video used was found to devote only 1% of training time to handwashing behaviors (Michigan State University Extension, 1994). Hands-on and face-to-face pesticide education may be provided by a farmworker health outreach worker as an alternative or a supplement to video-based training. Farmworker health outreach workers, who are employed by organizations such as nonprofits and migrant and community health centers, provide pesticide education as a part of their delivery of health and education services. Lessons on health and safety topics that are more engaging have been found to increase knowledge gains and decrease negative health outcomes (Burke et al., 2006). Therefore, face-to-face training provided by farmworker health outreach workers, when it is hands-on, may promote handwashing practice and reduce worker pesticide exposure.

A Land-Grant University Focused on Agricultural Safety and Health

As a land-grant university, North Carolina State University extensively conducts outreach and engagement through the North Carolina Cooperative Extension network. The Extension Toxicology Program, one of only four such programs among major land-grant colleges and universities in the United States, is housed in the Department of Applied Ecology. Since its inception in 1990, the Extension Toxicology Program has had a strong record of providing objective, science-based information, particularly related to pesticides and agromedicine, to the residents of the state and nation through innovative educational programming, demonstration projects, applied research, and peer-reviewed Extension educational and research publications. With its long-standing presence in the state, the Extension Toxicology Program and its faculty have established partnerships at the community, local, state, and national levels. A particular focus of the Extension Toxicology Program has been professional development for farmworker health outreach workers and the creation of crop-specific pesticide training materials for farmworkers (LePrevost, Storm, Asuaje, & Cope, 2014).

Collaboration Among a Student, a Faculty Member, and a Community-Based Organization

In summer 2014, the first author (AW), as a doctoral student at the University of Utah, conducted a multimethod observational study to understand the pesticide protective behaviors of Latino migrant and seasonal farmworkers in North Carolina. The second author (CL), a faculty member of the Extension Toxicology Program at North Carolina State University, with more than 10 years of experience working with the agricultural community, served as a member of AW's dissertation committee. In addition to providing content expertise, the second author leveraged her community presence and credibility to share her local networks with the student, making it possible for the first author to gain access to the community of interest more quickly and to be regarded with some level of trust. One of the seminal findings of this multimethod dissertation study was that farmworkers significantly overreported washing their hands before eating and drinking in the field, which could contribute to pesticide exposure through both dermal and ingestion routes (Walton, LePrevost, Wong, et al., 2016).

In fall 2015, the first author (AW) began to disseminate findings from her dissertation study not only in academic journals (Walton, LePrevost, Linnan, Sanchez-Birkhead, & Mooney, 2017; Walton, LePrevost, Wong, Linnan, & Mooney, 2017; Walton, LePrevost, Wong, et al., 2016) but also back to the farmworkers who had participated. Drawing from her own contacts and experiences within the agricultural community, the second author (CL) again suggested local and state organizations and audiences who might best utilize the findings from the dissertation study to effect change in farmworker behavior and resulting pesticide exposure. One such audience were the attendees of the North Carolina Community Health Center Association (NCCHCA) Special Populations Health Workgroup meeting. At the time, the fifth author (AL) was working as the Community Development and Special Populations Coordinator for the NCCHCA. It was through the Workgroup meeting that staff from the North Carolina Farmworker Health Program (NCFHP), including the fourth author (MJR), first heard about the dissertation study.

The North Carolina Farmworker Health Program (NCFHP) is a statewide Migrant

Health Voucher Program within the Office of Rural Health in the North Carolina Department of Health and Human Services. NCFHP works with local agencies, including eight funded sites, to provide care throughout the state to meet the needs of geographical areas with localized densities of farmworkers. They provide enabling services, including outreach, case management, and health education. In 2016, NCFHP sites served more than 10,000 farmworkers in the state, including providing nearly 2,200 health education encounters.

After learning about the dissertation study finding related to the underutilization of handwashing by farmworkers in North Carolina, staff at the NCFHP reviewed their existing handwashing educational materials and methods. Finding the existing methods to be heavily didactic without visual or interactive components, NCFHP was concerned that their handwashing education did not make an impression on farmworkers. Subsequently, the fourth author (MJR) approached the first and second authors (AW and CL) to partner to improve handwashing education. NCFHP provided funds for the first and second authors to collaborate with the NCFHP sites to improve handwashing education provided by farmworker health outreach workers. The first author engaged in this collaboration as an independent contractor while working as a postdoctoral fellow at the University of North Carolina at Chapel Hill, and the second author participated through her Extension and service responsibilities as a faculty member of the Extension Toxicology Program at North Carolina State University. The NCFHP medical director, who is third author (GT), joined the collaboration as a liaison between NCFHP and the university partners (i.e., first and second authors).

Goal of the Collaboration

The overarching goal of the ongoing collaboration is to improve educational materials focused on handwashing and, ultimately, reduce pesticide exposure among farmworkers in North Carolina. Specifically, the university partners desire to translate research findings into safer practice among farmworkers in the field, and NCFHP seeks to examine and maximize the effectiveness of their handwashing materials and methods to reduce adverse health outcomes among the farmworkers they serve. An underlying goal of this collaboration is to cultivate an equitable and meaningful relationship between the partnering universities and NCFHP that extends beyond the current effort.

A Participatory Development Process: Engagement of Farmworker Health Outreach Workers

Farmworker health outreach workers at NCFHP-funded sites participated in every stage of the collaboration to improve NCFHP's handwashing education materials and methods—from needs assessment to method and message selection and, ultimately, educational material development and evaluation. First, the university partners conducted three focus groups at NCFHP-funded sites across the state to learn how farmworker health outreach workers currently delivered handwashing education, including the extent to which handwashing education was prioritized by the outreach workers, when and how often handwashing education was offered to farmworkers, what educational methods and materials were used by the outreach workers, and the topics addressed. During these focus group discussions, participating farmworker health outreach workers identified the methods that would be most effective as well as those that would be the most practical for implementation. They also shared the kind of information and training they would need to improve their delivery of handwashing education. During the focus groups, university partners presented a menu of methods for handwashing education. Participating farmworker health outreach workers described the advantages and disadvantages of each method and indicated their preferred methods. To afford all farmworker health outreach workers at the eight NCFHP-funded sites across the state the opportunity to provide input on handwashing education, the university partners subsequently distributed an online survey in which respondents prioritized methods and messages for handwashing education that had been identified during the three focus groups. Specific results from focus groups and the online survey are not reported here as they were collected specifically for educational material development, and IRB approval was not sought.

A Handwashing Educational Toolkit

The culmination of analysis of focus group and survey findings was the develop-

ment of a toolkit consisting of a set of complementary pesticide residue activities, one-on-one and group discussion questions, and fluorescent tracer supplies for farmworker health outreach workers to provide handwashing education to farmworkers. For each pesticide residue activity, the university partners created a training guide in English and Spanish detailing the learning objective, supplies needed, step-by-step instructions to carry out the activity, questions to facilitate discussion (one-on-one or group), and background information for the farmworker health outreach workers. Fluorescent tracer supplies came from a national supplier in premade boxed kits (less than $100 each) containing an ultraviolet flashlight, a bottle of fluorescent tracer gel, and a bottle of fluorescent tracer powder. The gel and powder, which are visible only under ultraviolet light, were used to simulate pesticide products and residues. The handwashing educational toolkit was cost-effective and easily replicable.

Adapted from a curriculum designed to educate pesticide applicators (University of Washington PNASH, 2007), the three pesticide residue activities in the toolkit included a handwashing challenge in which farmworkers examine the effectiveness of their current handwashing practices; a demonstration of how pesticide residues may transfer from hands to cell phones and, eventually, the face; and a simulation of invisible pesticide residues on fruits and vegetables that may be consumed when eating produce directly from the fields or that may contaminate hands and clothing during crop maintenance. In selecting these activities and designing the corresponding training guides, the university partners leveraged the information provided by the farmworker health outreach workers during focus groups and the follow-up survey, as well as the university partners' own expertise. Specifically, focus group and survey participants identified a hands-on activity using fluorescent tracer as a preferred method for handwashing education, and information provided during focus groups about what farmworker health outreach workers needed to know to provide handwashing education shaped the content included in the background information section of the training guide. The selection of the pesticide residue activities was informed by messages prioritized by farmworker health outreach workers, as well as the experience of the first author (AW) from her dissertation study of farmworkers' behavior in the field. She often observed farmworkers eating, drinking, and using cell phones without washing their hands. With expertise in informal science education and pesticide toxicology, the second author (CL) contributed curriculum development expertise and pesticide content knowledge.

Dissemination of the Toolkit to Farmworker Health Outreach Workers

During April and June 2016, the university partners introduced the toolkit to the farmworker health outreach workers affiliated with NCFHP. In two NCFHP professional development workshops, the university partners reported back findings from the focus groups and survey, introduced the toolkit components, and modeled handwashing education using the toolkit. In total, 71 farmworker health outreach workers became trained in using the toolkit through these workshops.

A Shift in Ownership in Dissemination and Evaluation of the Toolkit

In June 2017, one year after the university partners provided the initial workshops modeling the use of the handwashing educational toolkit, NCFHP staff presented the toolkit to a new cohort of farmworker health outreach workers in a third workshop. NCFHP staff have since undertaken the design and dissemination of an online survey of farmworker health outreach workers to assess toolkit effectiveness. In consultation with the university partners, the community partner has developed a survey that asks respondents to reflect on the handwashing educational toolkit and describe how often they have used it, its strengths, barriers to its use, recommended changes, perceived effectiveness of the individual activities, and farmworkers' feedback during its use. The extent to which the NCFHP has taken ownership of the toolkit, as evidenced by their training of new farmworker health outreach workers and evaluation of toolkit effectiveness, is an important measure of impact of the collaboration for both the university and community partners.

Next Steps in Evaluation and Refinement of the Toolkit

While the community partner is conduct-

ing an evaluation of the toolkit effectiveness from the perspective of the farmworker health outreach worker, the university partners are seeking extramural funding to evaluate the efficacy of the toolkit as part of an educational intervention. The intervention would entail engaging farmworker health outreach workers who are not familiar with the toolkit in a professional development session to introduce the handwashing educational toolkit and underlying concepts of handwashing significance and best practices. In the proposed intervention evaluation, data would be collected from both farmworker health outreach workers and farmworkers before, during, and after the professional development session and subsequent implementation of the toolkit. The university partners have particular interest in the impact of professional development and toolkit implementation on farmworker health outreach workers' knowledge of concepts related to handwashing, self-efficacy in delivering handwashing education, and their use of learner-centered practices. They are also interested in the extent to which use of the toolkit by farmworker health outreach workers results in a change in knowledge, skills, and observed handwashing practice among farmworkers.

Toolkit refinement will occur in two phases: the first based on feedback from farmworker health outreach workers collected through the NCFHP survey and the second based on data collected by the university partners through the evaluation of the educational intervention. Feedback collected from the NCFHP survey of farmworker health outreach workers will inform the first phase of revisions to the toolkit. Potential revisions based on the types of feedback requested through the survey include the addition or deletion of individual pesticide residue activities, one-on-one or group discussion questions, and background information in the training guide. A revised toolkit would then be used in the intervention evaluation study led by the university partners, the findings of which would inform further refinement of the toolkit to maximize changes in knowledge, skills, and behaviors of both farmworker health outreach workers and farmworkers. In addition to efficacy data, the university partners will assess ease and practicality of use to inform broader implementation of the handwashing education intervention.

Fostering Sustained Collaboration

Beyond refinement of the toolkit and evaluation of the handwashing education intervention, the university and community partners have a commitment to sustained collaboration. Through the development and evaluation of the toolkit, the partners have gained a greater understanding of the expertise that each brings to the collaboration, as well as each partner's role within her organization and the organizational milieu. This understanding has afforded additional opportunities to work together. For example, the first author (AW) has referred nursing students to volunteer at a migrant health care clinic under the direction of the third author (GT), with the hope of a more formal clinical placement opportunity between a university and a community partner. Further, the collaboration among the coauthors has expanded from a narrow focus on handwashing education to a broad initiative to unite researchers, farmworker health outreach workers, and farmworkers to improve farmworker health. To this end, the coauthors have engaged farmworker health outreach workers in setting research priorities (LePrevost, Walton, Thomas, & Lipscomb, 2018). This effort has provided opportunities to share research findings and lessons learned from the collaboration with both discipline-specific and transdisciplinary engagement audiences (LePrevost, Walton, Thomas, & Lipscomb, 2017; Walton, LePrevost, Lipscomb, & Thomas, 2018).

Reflections From the Community Partners

After hearing the results of first and second authors' (AW and CL's) research on the actual practices of farmworkers regarding handwashing, the third and fourth authors (GT and MJR) and their colleagues at NCFHP felt that action was required to provide higher quality education to farmworkers to help them change their practices and decrease their exposures to pesticides. Although not many aspects of a farmworker's occupation are within his or her control, handwashing before eating, smoking, or using the bathroom is more often achievable. Because NCFHP includes a coalition of experienced farmworker health outreach workers, the organization was able to connect the university partners with those actually doing the daily work of educating farmworkers and allow them to work together to develop best practices in

handwashing education. NCFHP posits that farmworker health outreach workers' active role in the development of the toolkit has made them more invested in its success as an educational tool. At one of the initial trainings of farmworker health outreach workers, 100% of the participants ranked the delivery of the handwashing toolkit as excellent, and the majority ranked it as their favorite activity of that day. The participants commented on the practicality of the toolkit, as well as its being visual and interactive, and how much they were looking forward to incorporating it into their health education. In 2018, 72% of the farmworker health outreach workers reported implementing the handwashing educational toolkit to train farmworkers in the 2016 and 2017 growing seasons. The handwashing educational toolkit has since been incorporated in the annual summer training for all new farmworker health outreach workers. Furthermore, the ongoing collaboration will connect the university partners with the farmworkers who will participate in the evaluation of the toolkit as part of an educational intervention.

It is important for community partners to have ongoing, long-term dialogue with researchers and intervention designers. By sustaining communication and the working relationship with the university partners, the team at NCFHP felt like an equal partner and empowered to initiate an evaluation of the toolkit with farmworker health outreach workers in 2017. Beyond the initial design phase, community partners should continue to actively engage university partners in the evaluation and adaptation of educational materials so that the educational materials become a usable product that is continually updated to reflect changing outreach worker and farmworker needs.

Lessons Learned: The Student Perspective

It is only in hindsight, and now in a faculty role, that the first author (AW) can fully appreciate the value and modeling of mutuality and reciprocity that the second author (CL) shared during the dissertation process (Jaeger, Sandmann, & Kim, 2011). As a faculty member, the second author demonstrated a genuine respect for the skills and experiences that the first author brought as a student (with training in public health and community health education and the skills of a nurse clinician), and that respect led to both a personal and a reciprocal relationship (Crisp & Cruz, 2009). Encouraging faculty to model mutuality, respect, and reciprocity has been described before as a best practice for faculty working with students to do community-engaged research (Jaeger et al., 2011), but seeking opportunities for distributed power with one's mentor can also be a responsibility of the student.

Additionally, in her faculty role, the second author shared her professional networks and knowledge of local resources with the first author as a student. This provision of visibility to students is also a documented role of faculty mentors (Crisp & Cruz, 2009). From the retrospective perspective of the student, mutual sharing of connections, including the student's connections shared with the faculty mentor, are valuable. Students should be empowered to seek reciprocity to create meaningful relationships with their faculty mentors and to gain experience that will serve them in community-based work.

Coursework cannot adequately prepare students with all of the skills that they need to conduct community-based research (Jaeger et al., 2011). In this case, the process of dissemination of dissertation results through design, conduct, and analysis of focus groups and surveys came after the dissertation work. Learning extended beyond the structure of the university and presented the opportunity to continue to gain and refine skills that built on those developed through the dissertation process. The dissertation findings were transformed into practical solutions that served the needs of the community partner and made this work more impactful for both the student and the community.

Working together on this project also enabled the relationship between the first and second authors to begin to transition from student and faculty member into one of faculty colleagues through a process vastly different from the dissertation and in an environment in sharp contrast to the university. At the end of the experience, the first and second authors had not only a product that they had cocreated with the community partner but also a strong working relationship as faculty colleagues from two different disciplines at two different universities. Working together has allowed them to leverage the perspectives and resources afforded by their individual disciplines and institutions.

Much as Jaeger et al. (2011) argue that it is important for faculty to model for students how to interact with community partners in dissertation studies, faculty modeling of successful mentoring relationships built on mutuality and reciprocity is essential for students who will become faculty. The first author has had the opportunity to critically reflect on the relationships she seeks to create with her own students. She aims to have colearning, distributed power, and sharing of resources and networks at the core of those relationships.

Best Practices for University Partners to Promote Early and Sustained Engagement

Because the NCFHP first approached the university partners, the project clearly addresses an internally identified need that is a priority for the community partner (Minkler, 2004). This project, which emerged from the common goal of improving farmworker health through handwashing education, demonstrates early and sustained engagement (Earle-Richardson, Sorensen, Brower, Hawkes, & May, 2009). Thus far, sustained collaboration between the university and community partners owes its success to multiple strategies that have been previously identified as characteristics of successful community research collaborations, including understanding each other's goals, playing to each other's strengths, dedicating time to the project and the collaboration, integrating community knowledge, co-learning, and remaining flexible (Arcury, Quandt, & Dearry, 2001; Israel, Schulz, Parker, & Becker, 1998). Partnering with the community from the outset ensures that the products of the project are responsive to the community's needs, that NCFHP has shared ownership of them, and that their use will be sustained.

Conclusions

As the partners prepare for project evaluation, it has been valuable to reflect on what has made this collaboration successful thus far. Grounded in respect and equality with a shared goal of improving farmworker health and responding to a community-identified need, the partners have cultivated a collaboration that is meaningful, ongoing, and dynamic. A foundation based on distributed power promises sustainability not only of the project but of the partnership.

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