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To cite this article: Emery L. Harwell, Catherine E. LePrevost, Leslie E. Cofie & Joseph G. L. Lee (2022) Community Health Workers' Role in Addressing Farmworker Health Disparities, Journal of Agromedicine, 27:4, 391-401, DOI: [10.1080/1059924X.2022.2040069](https://doi.org/10.1080/1059924X.2022.2040069)

To link to this article: <https://doi.org/10.1080/1059924X.2022.2040069>



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Published online: 23 Feb 2022.



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## Community Health Workers' Role in Addressing Farmworker Health Disparities

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### ABSTRACT

Community health workers (CHWs) are uniquely positioned to connect migrant and seasonal farmworkers to health promotion and clinical services. However, research on CHWs' experiences, particularly related to their provision of health education to farmworkers, is limited. To explore CHWs' practices and challenges in conducting health education outreach, we conducted three focus group discussions with farmworker health CHWs (N = 28) in North Carolina in the spring of 2020. We analyzed the focus group transcripts, and we compared the code outputs, thematic code summaries, and memos maintained throughout the analytic process to examine the experiences of CHWs in acquiring and disseminating health information and resources, including use of technology. We identified three themes related to CHWs' experiences providing health information to farmworkers. First, CHWs described short-term preparation, immediately before providing health outreach, and long-term activities, devoted to maintaining and improving their capacity to provide relevant health information to farmworkers. Second, they described their use of health education delivery methods, including open-ended questions, participatory and interactive approaches, and non-verbal aids. Third, participants described their current use of technology and related challenges, as well as the technology needed to enhance health outreach, including internet access. Findings reveal opportunities to improve farmworker health education through professional development for CHWs, identification of preferred methods of health education delivery to farmworkers, and provision of technology to farmworker-serving organizations. Establishing rural internet access and equipping outreach organizations with technology would position CHWs to be maximally effective as they strive to reduce farmworkers' health inequities.

**Abbreviations:** CHW: Community health worker; FGD: focus group discussion; NC: North Carolina.



### KEYWORDS

Community health workers; migrant and seasonal farmworkers; technology; health education

## Introduction

Migrant and seasonal farmworkers experience significant health inequities, compared to non-agricultural workers.<sup>1–5</sup> Farmworkers face occupational hazards, including infectious disease,<sup>6,7</sup> heat illness,<sup>8,9</sup> pesticide exposure,<sup>10,11</sup> and musculoskeletal conditions.<sup>12,13</sup> Furthermore, farmworkers are usually confined to rural, densely populated living quarters where access to food and clean water is sometimes limited.<sup>14–17</sup> Geographical isolation is amplified by unreliable internet access,<sup>18–20</sup> affecting farmworkers' ability to seek out health care and health information.<sup>21</sup> With language barriers and lack of transportation further isolating farmworkers,<sup>22</sup> many rely heavily on the work of community health workers (CHWs) for health services and information.<sup>23</sup>

CHWs are highly integrated into the communities they serve and well positioned to help address the health inequalities faced by farmworkers.<sup>23</sup> CHWs have been a critical part of the farmworker health infrastructure for decades,<sup>24,25</sup> and a recent mapping review identified over 40 papers describing their roles and importance in farmworker health.<sup>26</sup> They provide farmworkers with health evaluations, culturally-sensitive and occupationally-relevant health education, appointments with healthcare providers, and transportation and interpretation services, routinely serving as a link between farmworkers and essential, yet often otherwise inaccessible, services and resources.<sup>27,28</sup> Considering the position of CHWs and their capacity to significantly affect farm

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worker health outcomes, studies involving farmworker-serving CHWs are few, and most instances of CHWs in the literature focused on their role in implementing a study or intervention.<sup>26</sup> Indeed, a recent mapping review found just 15 papers over several decades in which CHWs helped prioritize needs or design interventions.<sup>26</sup> Although some studies have explored farmworker-serving CHWs' beliefs and goals in providing pesticide education specifically,<sup>29,30</sup> we know little about how CHWs conceptualize their central role of providing health education.

Even more limited than studies of CHWs are studies that investigate the use of technology in farmworker health.<sup>31</sup> Several recent papers address the role of internet access, digital equity, and telehealth delivery in the context of the COVID-19 global public health emergency, finding the critical importance of internet access and digital literacy for farmworkers.<sup>32,33</sup> Earlier research has examined different approaches for delivery of information to farmworkers and availability of technology for receiving information,<sup>18,34,35</sup> programs to increase access to the internet and improve health literacy,<sup>36</sup> or strategies for using technology in research with farmworkers.<sup>37</sup>

Given that CHWs are uniquely positioned as intermediaries between a farmworker population facing serious health inequities and a network of resources that may contribute to alleviating these inequities, we sought to address the gaps in our understanding of CHWs' experiences, particularly related to their provision of health education and information to farmworkers. Specifically, we explored CHWs' processes, practices, and challenges in conducting health education outreach and assessed the needs of CHWs, with a special focus on technology. Thus, the goal of this study was both to examine the experiences of CHWs in acquiring and disseminating health information and to conduct a technology needs assessment to identify opportunities to reduce farmworker health disparities.

## Methods

### Design

This study is part of a larger project funded by the National Library of Medicine to address health

disparities experienced by migrant and seasonal farmworkers. The project focuses on increasing knowledge and access to health education resources among both farmworkers and the CHWs who engage with farmworkers. A specific aim is to provide professional development opportunities and technology resources to CHWs. In February 2020, we conducted three focus groups discussions (FGDs) with CHWs in North Carolina (NC) to explore CHWs' experiences providing health education to farmworkers and to assess unmet technology needs.

### Recruitment

During February 2020, using a convenience sampling approach, we invited CHWs to participate in FGDs through announcements on CHW organization listservs and at their events, as well as through direct phone calls and emails. All participants had current employment at outreach or community health organizations that serve migrant or seasonal farmworker populations. In total, 28 CHWs participated out of an estimated 60 farmworker-serving CHWs working in NC each growing season. Reflecting the population density of farmworkers and farmworker-serving organizations in NC, two FGDs were held in eastern NC and one in western NC. The discussions were conducted at neutral, geographically central locations. Participants were compensated with \$25 gift cards, and the project was approved by the lead university's institutional review board (UMCIRB #19-001817).

### Data collection

Drawing from our prior experiences engaging farmworker-serving CHWs in research and providing professional development for CHWs, we developed a semi-structured focus group guide in English, translated the guide into Spanish using a professional translator, and asked our project advisory panel that included CHWs and students from farmworker families to review the guide. It contained three main sections: preparation for health education outreach, delivery of health education, and technology related to health outreach. A native Spanish speaker fluent in English who has facilitation experience used the guide to facilitate

the 60-minute FGDs. At the beginning of each FGD, participants indicated their language preferences; two FGDs were conducted in Spanish and one in English. The first author, who was an undergraduate research assistant trained in focus group methodology, accompanied the facilitator to all FGDs to manage the audio recording and take notes, including capturing participants' non-verbal responses. Each FGD was audio recorded, and the audio files were later transcribed by the facilitator, who removed all potentially identifiable details about participants. Audio recordings from FGDs conducted in Spanish were directly translated into English during transcription. The facilitator and project team members participated in debriefing sessions after each FGD and after reviewing the transcripts from all three FGDs. The number of FGDs was sufficient to draw conclusions and achieve saturation of themes.<sup>38,39</sup>

### Data analysis

The transcripts were analyzed with NVivo 10 by the first three authors. Team members developed a preliminary codebook by consensus, using both deductive codes derived from the focus group guide and inductive codes from a close reading of all transcripts.<sup>40</sup> The first and third authors coded the transcripts using the codebook, and the first three authors met regularly to refine the codebook and conduct coding quality checks to ensure coding reliability. The first author developed thematic code summaries for key codes, and the first three authors analyzed relevant themes by developing matrices based on the code outputs and thematic code summaries. Team members also maintained memos throughout the analytic process to establish an audit trail and facilitate data interpretation.<sup>41</sup> Examination of the code summaries and matrices enabled the team to compare the experiences of CHWs in acquiring relevant health related information and resources, their process of preparing and disseminating health information to farmworkers, and their need for additional information and technology resources to improve farmworker health.

## Results

Table 1 presents the personal characteristics of the participants of the three FGDs. Participants self-identified primarily as being of Latinx ethnicity (93%) and female (71%). Most participants had completed high school or some college (54%) as their highest level of educational attainment. More (79%) participants were from eastern NC (ENC) than were from western NC (WNC, 21%).

In exploring participants' roles as CHWs, we identified three general themes related to the process of providing health information to farmworkers. First, CHWs described preparation for health outreach as a process that included two main components: short-term and long-term preparation. Second, they described their use of health education delivery methods, including open-ended questions, participatory and interactive health education, and non-verbal aids. Third, participants described their current use of technology and related challenges, as well as the technology needed to enhance health outreach, including internet access. We provide illustrative examples of verbatim quotations for each theme below and additionally in Table 2.

**Table 1.** Personal Characteristics of Community Health Workers (N = 28) Participating in Focus Group Discussions, North Carolina, February 2020.

Personal Characteristic	Response Category	Percentage
Gender Identity	Male	28.6%
	Female	71.4%
Highest Education Level	Some High School	3.6%
	High School Diploma (or equivalent)	32.1%
	Some College, no Degree	21.4%
	Associate's Degree	14.3%
	Bachelor's Degree	17.9%
	Master's Degree	7.1%
Self-Identified Race	Professional Degree	3.6%
	White	50.0%
	Black	3.6%
	More than one	3.6%
Self-Identified Ethnicity	Unknown	42.8%
	Hispanic or Latino	92.8%
NC Region	Not Hispanic or Latino	7.2%
	Eastern (FGD1 and FGD 2)	78.6%
	Western (FGD 3)	21.4%

## Preparation for health outreach

CHWs described engaging in activities in the short-term, a few hours before going out to provide health outreach to farmworkers, and long-term activities that enabled them to maintain and improve upon their capacity to provide relevant health information to farmworkers. One CHW succinctly distinguished between short-term and long-term preparations: “There are two different types of preparation ... the preparation of the day, to be able to go out ... and do the outreach [and] ... preparation that one does day-to-day in educating oneself” (Participant 3 (P3), Focus Group 3 (FG3), WNC).

*Short-term preparation* typically consisted of organizing boxes with “health education [materials], ... blood pressure monitors, equipment to check glucose” (P5, FG1, ENC); meeting with coworkers “before going out into the field ... to maintain communication [about observed needs]” of farmworkers (P8, FG1, ENC); and coordinating with medical providers “to see when they will be available [for patient visits]” (P5, FG3, WNC). While short-term preparation tended to look very similar across discussions, one of the eastern NC FGD participants reported that, in addition to education materials, they also “prepare toiletry bags ... donations ... to take out” to farmworker camps (P4, FG2, ENC).

*Long-term preparation* encompassed activities that CHWs engaged in to expand their own knowledge of health topics, improve skills related to health education delivery, and prepare materials for the upcoming season. Across all discussions, CHWs indicated that they attended webinars and in-person trainings; “gather[ed] information ... before the season to have it prepared” (P1, FG2, ENC); created new materials like “a pamphlet ... with basic information and topics that are important every year” (P9, FG1, ENC); and met with coworkers and “with ... different organizations ... [that] inform [CHWs] about the health programs that they offer” so they can “pass this information to [farm]workers” (P4, FG3, WNC). Frequently, participants emphasized the importance of staying

**Table 2.** Themes, Subthemes, and Representative Quotations from Analysis of Focus Group Discussions with Community Health Workers, North Carolina, February 2020.

Themes/subthemes	Representative Quotation(s)
Health outreach preparation	
<i>Short-term preparation</i>	“We also carry a lockbox which carries our materials, health education materials and also the patients’ information and that’s pretty much – so we prepare the day before but then hours before we go, and we’re at the clinic.” (P6, FG2, ENC)
<i>Long-term preparation</i>	“Yes, that happens during the off-season ... which is when we don’t do so much outreach. That’s the time we take the advantage to do trainings, webinars ... We invite people that we know have the knowledge and the capacity to come and train us as well. So we are always working for resources amongst ourselves.” (P2, FG1, ENC)
Health education methods	
<i>Open-ended questions</i>	“Okay, when I do outreach, we have to do a health assessment, but I don’t use it as a questionnaire. I use it more like into a conversational tool. How I give that – when I give that health education, it’s based on the question that I’m asking. So, if the person is concerned about diabetes, I stop my questionnaire and I just go ahead and start explaining to them. Sometimes it takes a little bit longer but the end, it’s worth the time.” (P2, FG2, ENC)
<i>Interactive and participatory methods</i>	“There have also been roleplaying or skits at the camps, like theater plays, but small. We do this with the same workers, we give them roles, you’re this, you’re that. So we do the role-playing. So, if we’re talking about pesticides, how to eat healthy, what happens if you exercise, then we’ll make a theater play and they act. It’s super fun. What you have to do if this happens. So for them it’s super fun, and they like it a lot.” (P4, FG1, ENC)
<i>Non-verbal aids</i>	“So, for instance we have one about handwashing, but we have our kit so that they can learn how to wash their hands and how to do it right. And they are seeing how it’s done if they don’t do it right. So that’s also something, to engage their attention in a different way, that’s not just with papers.” (P2, FG3, WNC)
<i>Technology use in health education</i>	“We use hotspots as well and I’ve had that happen where sometimes the wifi cards don’t work in that location, so we have to kind of go back to the paper charting and the paper pamphlets rather than showing anything on the tablets and stuff. But I feel like if there was a way to, like, download that information and that you can have access to it whenever you don’t have online services then that would help.” (P4, FG2, ENC)

“updated, to see what’s new and what ... [they] need to transmit to the workers” (P6, FG1, ENC). Participants described much of this work as occurring during the off-season when CHWs are not visiting farmworker camps. However, they noted that some of these activities are not exclusive to the off-season.

### **Health education methods**

We identified multiple methods of delivering health education that CHWs perceived as facilitating farmworkers’ learning and retention of health information. CHWs reported posing open-ended questions to encourage farmworker participation in the education process and to accurately gauge the health needs of farmworkers. Additionally, participants described interactive and participatory methods of delivering health education, such as games and group discussions. Finally, CHWs discussed implementing non-verbal aids, such as posters, videos, songs and skits, and toolkits or models.

*Open-ended questions* were used by some CHWs to guide farmworkers to discuss their health needs and to assess how much health information farmworkers had retained from prior education. Several CHWs across the FGDs described visiting labor camps at the beginning of the farming season to conduct health assessments that include open-ended questions. One participant explained: “Open-ended questions can help ... inform us of the symptoms [farmworkers might be experiencing] and be able to identify the circumstance and the type of information that we can provide to the person” (P2, FG2, ENC; P4, FG1, ENC). Other participants mentioned that, during their health education sessions, they used this strategy of asking questions to elicit participation from farmworkers in order to gauge their information retention from previous years or visits and empower seasoned farmworkers to act as peer educators (P3, FG1, ENC; P5, FG2, ENC).

*Interactive and participatory methods* were used by most study participants across all FGDs as the primary means of delivering health education. Participants initiated participatory activities at the very beginning of their interaction with farmworkers; they reported using games “to break the ice

and ... make [farmworkers] feel comfortable” (P4, FG2, ENC). CHWs expressed that this type of initial interaction helps set the tone for how health education will be delivered and builds trust between CHWs and farmworkers. One activity that participants frequently described was a “beach ball” or “cabbage” game that engages small to large groups with questions about relevant health topics. Questions are written on the ball or on sheets of paper rolled up into the “cabbage,” spreading the responsibility of responding among group members as the ball is tossed or the cabbage is passed around. Other interactive strategies mentioned by CHWs included small plays or skits about common health topics, such as “pesticides, how to eat healthy, [and] what happens when you exercise,” to engage farmworkers. Another participant mentioned the use of songs in which “they change the lyrics to provide health education” (P8, FG1, ENC).

CHWs perceived interactive and participatory approaches to be “more engaging than a pamphlet, or even than a video sometimes ... If [farmworkers] are there, engaged, that’s when they learn more.” (P5, FG3, WNC). One participant observed that “for them [farmworkers] it’s super fun ... they like it a lot” (P4, FG1, ENC). This method of health education delivery was described as helping CHWs be effective even when their time with farmworkers is limited by the irregularity of farmworkers’ schedules (P2, FG1, ENC).

*Non-verbal aids.* Participants frequently asserted the value of non-verbal aids in engaging farmworkers in health education. They perceived that farmworkers were able to visualize and interact with the health education materials, which subsequently enabled them to actively engage with CHWs. One participant explained, “If you have charts or [other visual aids] ... you have the interest of them coming up to you or asking more questions instead of you just standing there reading something” (P8, FG2, ENC). To maintain this form of farmworker engagement, participants mentioned that they change non-verbal aids from year to year.

Participants across all FGDs regarded toolkits and models as some of the most effective non-verbal aids. One CHW (P2, FG3, WNC) elaborated, “we have one about handwashing ... so

that they can learn how to wash their hands and how to do it right.” Another CHW reported using portion control plates in “talking about portion sizes” (P4, FG2, ENC). Several participants also indicated that they used food labels to teach farmworkers how to read the nutritional value of food and medication labels to help them identify appropriate over-the-counter medications for common complaints. In the view of one FGD participant, farmworkers were very receptive to these educational aids like food labels: “They pay attention . . . because it’s exactly what they eat, so it’s very impactful for them . . . They want to know more” (P2, FG2, ENC).

### **Use of technology in health education**

CHWs across all FGDs reported currently using technology to support their delivery of health education to farmworkers. They described their *current technology use* as consisting of audio-visual equipment to play health education videos, covering topics like STDs and the effects of high sugar diets (P2, FG2, ENC; P3, FG3, WNC). They also used smartphones and messaging apps to maintain communication and share health information with farmworkers (P1, FG3, WNC; P5, P2, FG1, ENC). Tablets were used during visits to labor camps to carry out telehealth appointments (P1, FG1, ENC). Multiple participants reported introducing applications from government agencies and non-profit organizations that farmworkers could use in their own time to assess occupational risks and find additional health information resources (P7, FG2, ENC; P1, FG3, WNC).

Participants also revealed *challenges* they face in providing health education to farmworkers and identified specific *technological solutions* that would address those challenges. The challenges they discussed related to geographical variations in farmworker populations, limited health resources relevant to farmworkers, and unreliable internet connection in labor camps. In their view, each of these challenges could be addressed through access to improved technological resources.

*Geographical variation.* The geographic distribution of labor camps in different parts of the state created unique problems for CHWs, who

offered tailored solutions based on their locations. CHWs in agriculturally dense eastern NC typically encountered much larger camps with sometimes hundreds of farmworkers, while CHWs in western NC engaged with fewer farmworkers living in small camps, often isolated by the mountainous terrain. In eastern NC, participants reported serving camps that sometimes have “a hundred [farmworkers]” and where it is “difficult to hear all the way at the back” (P9, FG1, ENC). These CHWs suggested that access to a megaphone would improve their outreach. Similarly, others suggested speaker systems with a microphone for “group activities or showing something to a bigger group” (P4, FG2, ENC). Some CHWs who had not used projectors in their work commented that such technology would be useful to them (P2, P5, P10, FG2, ENC). In western NC, where camps are less populous, participants reported that tablets would help facilitate their work in serving multiple farmworkers at a time: “I can leave you with the tablet and go and do the [health assessment] questionnaire with the other guy, and when you finish your video, I can see you again.” (P3, FG3, WNC). All participants from this part of the state also discussed how valuable new charting software would be so that they could perform offline health assessments on the tablets that would sync with their organizations’ systems when they returned to the office (all FG3, WNC participants).

*Limited health resources relevant to farmworkers.* Participants across all FGDs reported the lack of Spanish-language resources relevant to farmworkers on common health topics. They agreed that their work would be improved by an application or online location where farmworkers could find culturally-sensitive and occupationally-relevant games, videos, infographics, and other resources about health topics (P10, FG1, ENC; P7, FG2, ENC; P1, FG3, WNC). Participants also suggested that a dedicated repository for farmworker-serving CHWs, perhaps integrated into an application for farmworkers, would improve their ability to find and share new information with other CHWs as they engage in long-term preparation (P4, FG1, ENC; P2, FG2, ENC).

*Poor internet access/connectivity.* CHWs across all FGDs consistently encountered obstacles regarding internet connection at labor camps.

Participants discussed the lack of existing broadband and cellular services in camps and their experiences with hotspots in the past, which skewed mostly negative (P9, FG1, ENC; P1, FG2, ENC; P11, FG1, ENC). Participants reported that different hotspot models and carriers did not always function at each of the camps that CHWs visited and that they would lose valuable time with farmworkers troubleshooting the hotspots. Many participants noted the potential value of downloadable, offline resources (accessible through the previously suggested applications) to work around the unreliable internet connection. Participants maintained, however, that widespread and permanent internet access is preferable and necessary in the long term.

## Discussion

This study's findings detail the experiences of CHWs as they provide critical health information and services to migrant and seasonal farmworker populations as an approach to mitigating farmworkers' health inequities. The findings support previous suggestions that CHWs are in the unique position to affect farmworker health outcomes<sup>27</sup> and suggest opportunities to support CHWs and their organizations as part of a larger effort to reduce health disparities for a highly marginalized community.

Study participants' descriptions of short- and long-term preparations for health education provide insight into the extent to which CHWs plan and execute their assumed responsibilities of addressing the health needs of farmworkers within the context of the agricultural growing season. During peak season, CHWs are constantly engaged with their patient base, through site visits and scheduling appointments, but also through continuous research on emerging issues and preparation to accommodate the needs of farmworkers as they arise. During the off season, their short-term preparation mostly subsides as CHWs focus more on continuing their own education, networking with colleagues, and adjusting their strategies for the next season as they reflect on the preceding year. As evidenced by our own correspondence and interactions with CHWs as part of this project, and as described in previous studies

with CHWs in NC,<sup>42</sup> farmworker-serving CHWs are busier and therefore harder to reach during the agricultural growing and harvesting season, from late spring through early fall in NC. Future research efforts involving CHWs, as well as professional development programming for CHWs, should consider the temporal nature of CHWs' interactions with farmworkers, as well as their preparation processes for engaging with farmworkers. As previously suggested,<sup>42</sup> involving CHWs in the planning and implementation of research projects serves to preemptively address potential challenges related to timing that could impede the successful completion of a project.

In terms of their health education delivery methods, participants across all FGDs lauded the value of health education that was not strictly didactic, but rather incorporated farmworkers into the process with participatory activities and audio-visual materials. CHWs reported that these methods produced high levels of engagement among farmworkers, which CHWs said translated to deeper understanding and better information retention. Previous research on health education interventions among farmworkers is limited<sup>31</sup> – and mostly focused on maternal and child health, nutrition, and pesticides.<sup>35,43,44</sup> Our findings contribute to this work by highlighting the roles of CHWs in selecting and implementing health education approaches and materials. The popularity and support for interactive methods among study participants suggests a more specific focus for both future research around health interventions and, perhaps more importantly, professional development opportunities for CHWs related to interactive techniques and the production of new health education materials.

CHWs reported that technology is increasingly relevant for health outreach, providing new avenues for delivering health education and connecting farmworkers with resources. Current literature in this area is particularly limited, with only 9 papers identified over the past 20 years relating to farmworker health and technology.<sup>31</sup> A third of these addressed using technology to deliver information,<sup>18,34,36</sup> but none explored use of technology by CHWs. Our findings reveal that CHWs are both currently using technology and seeking new technologies to enhance their



delivery of health education and information. We found that reliable internet access in farmworker housing was by far the most common concern shared by participants with regard to technology, though more specific needs emerged by geographical region. For example, CHWs in eastern NC needed megaphones, projectors, and speaker systems to engage large groups of farmworkers in interactive health education, and CHWs in western NC requested tablets to provide individualized health information. FGDs served as a technology needs assessment, and study findings have guided provisioning of technology to farmworker-serving organizations through our health disparity resources project. We distributed prioritized technology (e.g., tablets, megaphones, projectors, and speaker systems) to 12 organizations across the state, including migrant and community health centers, local health departments, and non-profits. Technology provision and utilization in farmworker health education present additional opportunities for CHW professional development.

The extent to which farmworker health outreach is suffering from a lag in rural internet infrastructure and dearth of technological resources for outreach organizations has been made abundantly clear during the COVID-19 pandemic.<sup>32</sup> Prevented from carrying out their usual outreach visits, CHWs have had to rely heavily on direct messaging applications to maintain contact with farmworkers and on telehealth appointments to connect farmworkers to health providers. The issue of weak or non-existent connections in labor camps, which participants had described as challenging pre-pandemic, has become of critical importance for farmworker health. Further, the availability of laptops, tablets, and smartphones in sufficient numbers in farmworker camps is essential for accessing health information, health education, and telehealth appointments. Through the pandemic, farmworkers have been thrust back into isolation from which CHWs typically offer some reprieve, thus limiting their ability to access reliable information and resources not only about the pandemic but the myriad other health topics upon which CHWs educate and inform. Expanding rural internet access and supplying outreach organizations (and

farmworker housing) with the technological tools necessary for CHWs to maintain contact with farmworkers in the short-term and enhance health education in the long-term is a serious public health need.

### **Study limitations**

A strength of this study is that it provided real-time information on the experiences of CHWs, which informed the development of additional health education resources and provision of much needed technology resources (e.g., WIFI hotspots, megaphones, projectors, speaker systems, and tablets) to aid their outreach to farmworkers. There are, however, limitations of this study. As our participants were CHWs in NC, the findings may not necessarily be generalizable to the experiences of CHWs in other states. Additionally, FGDs took place in February 2020, when CHWs were aware of COVID-19 but not the profound impact it would have on their work. Therefore, we are unaware of how CHWs processes and practices changed during the pandemic, although their expressed need for internet access and technology pre-pandemic underscores the critical importance of these resources during the pandemic. While an additional limitation may be that the FGD recordings were transcribed directly from Spanish to English, the transcription was performed by the FGD facilitator, who specializes in conducting and transcribing FGDs and who had direct knowledge of the context of each discussion. Additionally, farmworkers were not included in this specific study, and future research that includes farmworkers' perspectives on the roles of CHWs and their provision of health education would be valuable.

### **Conclusion**

Findings from our FGDs reveal opportunities to improve farmworker health education through professional development for CHWs, identification of preferred methods of health education delivery to farmworkers, and provision of technology to farmworker-serving organizations. Outlining the health outreach preparation process

and correlated seasonal schedule supports findings from previous studies of CHWs and offers a general temporal framework for future research involving CHWs, as well as scheduling professional development opportunities. Identifying methods of health education delivery shapes our understanding of CHW preferences in terms of types of educational materials and invites a comparative approach for future research on educational strategies employed by CHWs. Our findings related to technology demonstrate a serious need for universal internet access, regionally specific needs assessments, and solution-oriented research. Supporting CHWs directly, and incorporating their expertise into farmworker health research, bears great potential for improving health outcomes for farmworkers as one of the most marginalized populations in the United States. Establishing rural internet access and equipping outreach organizations with technology would position CHWs to be maximally effective as they strive to reduce health inequities faced by farmworkers.

## Acknowledgments

The authors sincerely thank the participating community health workers and partnering community organizations and express their appreciation for Jamie Bloss's review of an earlier version of the manuscript.

## Disclosure statement

C.E. LePrevost and J.G.L. Lee are unpaid members of the governing board of the NC Farmworker Health Program, Office of Rural Health, NC Department of Health and Human Services.

## Funding

Research reported in this publication was supported by the National Library of Medicine of the National Institutes of Health under Award Number G08LM013198. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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## References

1. Frank AL, Liebman AK, Ryder B, et al. Health care access and health care workforce for immigrant workers in the agriculture, forestry, and fisheries sector in the southeastern US. *Am J Ind Med.* 2013 Aug;56(8):960–974. doi:10.1002/ajim.22183.
2. Thompson CD Jr, Wiggins MF, editors. *The Human Cost of Food: Farmworkers' Lives, Labor, and Advocacy.* Austin, TX: University of Texas Press; 2002.
3. Hu R, Shi L, Lee D-C, et al. Access to and disparities in care among migrant and seasonal farm workers (MSFWs) at U.S. Health Centers. *J Health Care Poor Underserved.* 2016;27(3):1484–1502. doi:10.1353/hpu.2016.0107.
4. Arcury TA, and Quandt SA, editors. *Latinx Farmworkers in the Eastern United States: Health, Safety, and Justice.* 2 ed. New York, NY.: Springer; 2020.
5. Arcury TA, Grzywacz JG, Sidebottom J, et al. Overview of immigrant worker occupational health and safety for the agriculture, forestry, and fishing (AgFF) sector in the southeastern United States. *Am J Ind Med.* 2013 Aug;56(8):911–924. doi:10.1002/ajim.22173.
6. Oren E, Fiero MH, Barrett E, et al. Detection of latent tuberculosis infection among migrant farmworkers along the US-Mexico border. *BMC Infect Dis.* 2016 Nov 3;16(1):630. doi:10.1186/s12879-016-1959-3.
7. Ramírez-Ortiz D, Rojas P, Sánchez M, et al. Associations of self-silencing and Egalitarian attitudes with HIV prevention behaviors among Latina immigrant farmworkers. *J Immigr Minor Health.* 2019 Apr;21(2):430–433. doi:10.1007/s10903-018-0773-y.
8. Kearney GD, Hu H, Xu X, et al. Estimating the prevalence of heat-related symptoms and sun safety-related behavior among Latino farmworkers in Eastern North Carolina. *J Agromedicine.* 2016;21(1):15–23. doi:10.1080/1059924X.2015.1106377.
9. Derickson A. “A widespread superstition”: the purported invulnerability of workers of color to occupational heat stress. *Am J Public Health.* 2019 Oct;109(10):1329–1335. doi:10.2105/AJPH.2019.305246.
10. Arcury TA, Laurienti PJ, Talton JW, et al. Pesticide urinary metabolites among latina farmworkers and nonfarmworkers in North Carolina. *J Occup Environ Med.* 2018 Jan;60(1):e63–e71. doi:10.1097/JOM.0000000000001189.
11. Suratman S, Edwards JW, Babina K. Organophosphate pesticides exposure among farmworkers: pathways and risk of adverse health effects. *Rev Environ Health.* 2015;30(1):65–79. doi:10.1515/reveh-2014-0072.
12. Snipes SA, Cooper SP, Shipp EM. “The Only Thing I Wish I Could Change Is That They Treat Us Like People and Not Like Animals”: injury and discrimination among latino farmworkers. *J Agromedicine.* 2017;22(1):36–46. doi:10.1080/1059924X.2016.1248307.

13. Hamilton ER, Hale JM, Savinar R. Immigrant legal status and health: legal status disparities in chronic conditions and musculoskeletal pain among Mexican-Born farm workers in the United States. *Demography*. 2019 Feb;56(1):1–24. doi:10.1007/s13524-018-0746-8.
14. Keim-Malpass J, Spears Johnson CR, Quandt SA, et al. Perceptions of housing conditions among migrant farmworkers and their families: implications for health, safety and social policy. *Rural Remote Health*. 2015 Jan-Mar;15(1):3076.
15. Cason KL, Nieto-Montenegro S, Chavez-Martinez A, Lee N, Snyder A, et al. *Dietary Intake and Food Security among Migrant Farm Workers in Pennsylvania. Unpublished technical report.* Joint ERS Food and Nutrition Research Small Grants Program: Washington, DC; 2003.
16. Grauel K, Chambers KJ. Food deserts and migrant Farmworkers: assessing food access in Oregon's willamette valley. *J Ethnobiol*. 2014;34(2):228–250. doi:10.2993/0278-0771-34.2.228.
17. Weigel MM, Armijos RX, Hall YP, et al. The household food insecurity and health outcomes of U.S.-Mexico border migrant and seasonal farmworkers. *J Immigr Minor Health*. 2007 Jul;9(3):157–169. doi:10.1007/s10903-006-9026-6.
18. Arcury TA, Jensen A, Mann M, et al. Providing health information to latino farmworkers: the case of the affordable care act. *J Agromedicine*. 2017;22(3):275–281. doi:10.1080/1059924X.2017.1319314.
19. Sandberg JC, Spears Johnson CR, Nguyen HT, et al. Mobile and traditional modes of communication among male latino farmworkers: implications for health communication and dissemination. *J Immigr Minor Health*. 2016 Jun;18(3):522–531. doi:10.1007/s10903-015-0299-5.
20. Price M, Williamson D, McCandless R, et al. Hispanic migrant farm workers' attitudes toward mobile phone-based telehealth for management of chronic health conditions. *J Med Internet Res*. 2013 Mar 30;15(4):e76. doi:10.2196/jmir.2500.
21. Arcury TA, Quandt SA. Delivery of health services to migrant and seasonal farmworkers. *Annu Rev Public Health*. 2007;28(1):345–363. doi:10.1146/annurev.publhealth.27.021405.102106.
22. Hendrix GJ. Sidebar: North Carolina's migrant farmworkers-an essential community less seen. *N C Med J*. 2021 Sep-Oct;82(5):341–342. doi:10.18043/ncm.82.5.341.
23. Lambar EF, Thomas G. The health and well-being of North Carolina's farmworkers: the importance of inclusion, accessible services and personal connection. *N C Med J*. 2019 Mar-Apr;80(2):107–112. doi:10.18043/ncm.80.2.107.
24. Warrick LH, Wood AH, Meister JS, et al. Evaluation of a peer health worker prenatal outreach and education program for Hispanic farmworker families. *J Community Health*. 1992 Feb;17(1):13–26. doi:10.1007/BF01321721.
25. Watkins EL, Harlan C, Eng E, et al. Assessing the effectiveness of lay health advisors with migrant farmworkers. *Fam Community Health*. 1994;16(4):72–87. doi:10.1097/00003727-199401000-00010.
26. Bloss JE, LePrevost CE, Zahra AG, et al. Advancing the health of migrant and seasonal farmworkers in the U. S.: identifying gaps in the existing literature, 2021. *Health Promot Pract*. 2021 September 22: 152483992110333. doi:10.1177/15248399211033308.
27. American Public Health Association. Community health workers. <https://www.apha.org/apha-communities/member-sections/community-health-workers>. Published 2018 [cited 2018 October 16].
28. C3 Project. The community health worker core consensus (C3) project: 2016 recommendations on CHW roles, skills, and qualities 2016. <https://sph.uth.edu/dotAsset/55d79410-46d3-4988-a0c2-94876da1e08d.pdf>.
29. LePrevost CE, Blanchard MR, Cope WG. The pesticide risk beliefs inventory: a quantitative instrument for the assessment of beliefs about pesticide risks. *Int J Environ Res Public Health*. 2011 Jun;8(6):1923–1935. doi:10.3390/ijerph8061923.
30. LePrevost CE, Blanchard MR, Cope WG. Personal goals and perceived barriers of farmworker pesticide trainers: implications for workplace safety and health. *J Agric Saf Health*. 2014;20:267–282.
31. Bloss J, Firnhaber G, Lee J, et al. Migrant and seasonal farmworker health research mapping review bibliographies: UNC dataverse; 2020:V1. doi:10.15139/S3/JNW5XE.
32. Lee JGL, LePrevost CE, Harwell EL, et al. Coronavirus pandemic highlights critical gaps in rural Internet access for migrant and seasonal farmworkers: a call for partnership with medical libraries. *J Med Libr Assoc*. 2020 Oct 1;108(4):651–655. doi:10.5195/jmla.2020.1045.
33. Tutor Marcom R, Freeman Lambar E, Rodman B, et al. Working along the Continuum: North Carolina's collaborative response to COVID-19 for migrant & seasonal farmworkers. *J Agromedicine*. 2020 Sep 12: 1–4. doi:10.1080/1059924X.2020.1694821.
34. Anger WK, Stupfel J, Ammerman T, et al. The suitability of computer-based training for workers with limited formal education: a case study from the US agricultural sector. *Int J Train Dev*. 2006;10(4):269–284. doi:10.1111/j.1468-2419.2006.00260.x.
35. Kilanowski JF. Anticipatory guidance preferences of Latina migrant farmworker mothers. *J Pediatr Health Care*. 2013 May-Jun;27(3):164–171. doi:10.1016/j.pedhc.2011.08.004.
36. Mendez IM, Pories ML, Cordova L, et al. A pilot project to increase health literacy among youth from seasonal farmworker families in rural eastern North Carolina: a qualitative exploration of implementation and impact. *J Med Libr Assoc*. 2019;107(2):179–186. doi:10.5195/jmla.2019.560.
37. Kilanowski JF, Trapl ES. Evaluation of the use of audio-enhanced personal digital assistants to survey

- Latino migrant farmworkers. *Res Nurs Health*. 2010;33(2):156–163. doi:10.1002/nur.20369.
38. Guest G, Bunce A, Johnson L. How many interviews are enough? An experiment with data saturation and variability. *Field Methods*. 2006;18(1):59–82. doi:10.1177/1525822X05279903.
  39. Carlsen B, Glenton C. What about N? A methodological study of sample-size reporting in focus group studies. *BMC Med Res Methodol*. 2011 Mar 11;11(1):26. doi:10.1186/1471-2288-11-26.
  40. Gibbs GR. *Thematic Coding and Categorizing. Analysing Qualitative Data*. Thousand Oaks, CA: Sage; 2007:38–55.
  41. Saldaña J. *Writing Analytic Memos about Narrative and Visual Data. The Coding Manual for Qualitative Researchers*. 3 ed. Thousand Oaks, CA: Sage; 2015:43–66.
  42. LePrevost CE, Walton AL, Thomas G, et al. Engaging outreach workers in the development of a farmworker health research agenda. *Environ Res*. 2018 Aug;165:19–22. doi:10.1016/j.envres.2018.03.041.
  43. Rojas P, Ramírez-Ortiz D, Wang W, et al. Testing the efficacy of an HIV prevention intervention among latina immigrants living in farmworker communities in South Florida. *J Immigr Minor Health*. 2020 Aug;22(4):661–667. doi:10.1007/s10903-019-00923-4.
  44. Khan KM, Evans SS, Bielko SL, et al. Efficacy of technology-based interventions to increase the use of hearing protections among adolescent farmworkers. *Int J Audiol*. 2018 Feb;57(2):124–134. doi:10.1080/14992027.2017.1374568.