Designing Information Flow with Diverse Community Health Workers to Improve Public Health Situational Awareness During COVID-19

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ABSTRACT

Community health workers (CHWs) play a vital role in connecting communities, healthcare systems, and crisis response authorities. During a public health crisis, minority populations face increased disease and economic burdens, making adherence to health guidelines challenging. Despite numerous efforts to mitigate these impacts, the effectiveness is greatly compromised by communication gaps between communities and health authorities. Our study strategically employs the collaboration of CHWs and simple technology (Zoho Forms) to bridge gaps and enhance information flow between diverse hard-to-reach communities and public health authorities. We emphasize the unique contributions of CHWs to disaster response and the benefits of equipping CHWs with simple technology for effective communication during a public health crisis. Our work improved COVID-19 guidelines adherence, reducing infection spread while addressing critical mental health and resource needs within the communities served.

Keywords Community Health Workers (CHWs), COVID-19, Information Management, Public health Crisis Response, Simple Technology, Diverse Communities

CoRe Paper – Disaster Public Health and Healthcare Informatics
Proceedings of the 21st ISCRAM Conference – Münster, Germany May 2024
Berthold Penkert, Bernd Hellingrath, Monika Rode, Adam Widera, Michael Middelhoff, Kees Boersma, Matthias Kalthöner, eds.

INTRODUCTION

Efficient disaster management and response are dependent on effective information sharing and coordinated actions (Aung & Whittaker, 2012; Frassl et al., 2010; Iakovou & Douligeris, 2001). These coordinated efforts require the quick assembling of response teams/systems made up of multiple cross-agency collaborations, to facilitate work distribution, increase response tempo, and, in public health crises, ensure the effective dissemination of critical information among diverse sections of the population (Castillo et al., 2018). Integrating community health workers (CHWs) as both key actors and information brokers between minority or marginalized communities and traditional public health response agencies is an important task during events like the recent COVID-19 pandemic. CHWs are uniquely positioned because they are embedded in communities that may be difficult for traditional response agencies to reach because of cultural, linguistic, and logistical barriers (Stevenson et al., 2022). However, CHWs are typically not considered part of the public health crisis response infrastructure, are not integrated into disaster planning, and are personally unfamiliar with communication and coordination protocols. A challenge faced by authorities during disasters is ensuring that the needs of individuals from minority populations/communities are adequately met as these populations are often reported to bear a greater burden during disasters (Hanson, 2021).

As of July 2023, Milwaukee County has reported 347,383 COVID-19 cases, and 2,532 deaths (USAFacts, 2023). At the onset of the pandemic, predominantly black and Latino communities in Wisconsin bore most of the burden of reported cases (Wisconsin Department of Health Services, 2020; The COVID Tracking Project, 2021). Studies conducted in Milwaukee County reported a high burden of COVID-19 infections among racially marginalized groups. In addition, several studies across the United States have consistently reported racial disparities in the incidence, mortality, and economic hardship related to COVID-19 (Alcendor, 2020; Park, 2021). In response to these disparities, the Milwaukee Health Department initiated a STOP-COVID-19 initiative in 2020 during the peak of the pandemic. The initiative was aimed at preventing the spread of COVID-19 in Wisconsin communities, particularly within racially diverse communities, and addressing the psychological needs of high-risk populations where traditional risk communication strategies may prove ineffective. As a result, a 3-tiered strategy was employed to rapidly improve guidelines in these communities as well as meet their economic and psychological needs by 1) Increasing public awareness of key infection control information using culturally tailored messages, 2) Leveraging local media to implement culturally adapted micro-campaigns for risk reduction, and 3) Addressing psychological and wellness needs by leveraging community strength through CHWs. Identifying ways to optimize response operations with CHWs as a specific type of human-in-the-loop challenge offered specific practical, political, and ethical problems given the emphasis of the effort to ensure culturally adapted public health interventions in four distinct communities. Rapidly and equitably integrating CHWs into the Public Health response framework tested institutional abilities to manage high volume communication, making quickly deployed “off-the-shelf” or “lowest common denominator” technologies key to effective management of this process.

Here, findings are presented from a partnership involving the city of Milwaukee Health Department (MHD), the Medical College of Wisconsin (MCW), and Community Health Workers from four communities of color - African American, Hispanic, Hmong/SE Asian, and Native American working to rapidly form an ad-hoc organization to flexibly respond in culturally and linguistically adapted ways. These efforts required the rapid deployment of simple communication strategies to ensure that the frontline CHWs were able to move crucial, hyper-local information to traditional response agencies in a way that respected the unique contributions of these workers. Throughout this effort, rather than developing new technologies or deploying complicated mobile technologies, we focused on identifying off-the-shelf technology tools that were easily adapted and well understood by even the least technologically oriented personnel within the response team. For example, in other COVID-19 logistics efforts, we augmented Google Sheets by flowing information out of Sheets to SQLite for some processing, and then flowing the information back to the same Sheet so that all agency representatives could engage with the data (Franco et al, 2021). With the CHWs, we also focused on a lowest common denominator technology, in this case using Zoho Forms with some workflow logic to capture quick operational snapshots from each CHW that were then shared with the lead CHW for that community as well as with the Health Department and Medical School partners. The formal response agencies used this information to nuance the delivery of public health information, and food and financial relief; and focus staff and political actors' attention on the needs of these communities in ways that would have left the “on the ground " or residents’ voices out of the process.

PUBLIC HEALTH DISASTERS

The onset of an infectious disease outbreak is considered a public health emergency, necessitating the establishment of new protocols and the implementation of strategies and methodologies to address the swift changes caused by the outbreak (Maciel et al., 2020). The consequences of such outbreaks are highly potent and extend beyond the infected individual(s), subsequently encompassing the entire population, economies, public health systems, and social interaction (Hu & Qiu, 2020). An example is seen in the most recent infection outbreak (COVID-19), originating in Wuhan City, China in December 2019, resulting in widespread fatalities, reduced quality of life, economic hardship, reduced global trade and travel, as well as constrained social interactions (Bhaumik et al., 2020). Within the context of disease outbreaks of high magnitude like the COVID-19, Ebola, and H1N1 viruses, effective emergency management hinging on efficient systems and the harmonious working together of both internal and collaborative governmental bodies are essential components for implementing containment measures within the framework of emergency management (Hu & Qiu, 2020). Some of the key contributors to this collaborative emergency management approach include the state Department of Health, hospitals, community clinics, NGOs, businesses, healthcare workers (including doctors, nurses, microbiologists, and CHWs), and most importantly the individuals that make up the population (Palafox et al., 2020).

Disaster Communications

During disasters, effective risk communication is vital to addressing public fears, stigmas, informed decision-making, and adherence to established guidelines (Porat et al., 2020). Risk communication and community engagement (RCCE) are those processes and methodologies used to systematically consult and dialogue with communities at most risk of infection, or those whose cultural, religious, or ethical practices impact risk (Adebisi et al., 2021). Furthermore, the chains of communication during disasters are multifaceted, for example, during the COVID-19 pandemic, the World Health Organization's (W.H.O.) guidelines on risk communication encouraged a two-way dialogue/communication pattern with communities, the public, and stakeholders that ensure that information is accurately tailored to their specific circumstances (World Health Organization, 2020). In addition to this, a community-based participatory approach (CBPR) is required, one that allows individuals free access to information on potential risks and provides them with the right to participate in the disaster response process (Nylund, 2022).

COMMUNITY HEALTH WORKERS (CHWs)

According to the International Labor Organization (ILO), community health workers (CHWs) play a vital role in providing health education, support, and referrals encompassing diverse services. Their responsibilities extend to assisting individuals, families, and communities in adopting preventive health measures and facilitating access to appropriate healthcare and social services (Bezbaruah et al., 2021). Particularly, CHWs drawn from marginalized communities occupy a unique position as trusted sources of health information (Ayodele et al., 2024). Their status as members of the communities they serve grants them invaluable insight into cultural norms and health-belief models. The credibility of CHWs serves as a crucial link between communities and healthcare organizations, wrestling in heightened community health literacy and improved access to essential resources through their coordination efforts (Wennerstrom et al., 2013; Scheib & M. Brinton Lykes, 2013).

CHWs have received increasing attention as they may play a pivotal and distinct role in the disaster response framework (Nicholls et al., 2014). The Centers for Disease Control and Prevention (CDC) defines CHWs as "frontline workers who are trusted members or individuals who have a good understanding of the communities they serve" (CDC, 2022). CHWs are an essential part of public health disaster management processes, serving as a bridge between communities and the resources they need. Their main responsibilities involve building trusting relationships between communities and stakeholders, eliminating barriers to access, and lending a voice to issues affecting the communities they serve (U.S. Department of Health & Human Services, 2019). The inclusion of CHWs in disaster management, however beneficial, is plagued with its unique challenges in that CHWs have limited knowledge of official language, might have trust issues with large institutions same as the population they serve, and are oftentimes not considered as formal employees. In addition, CHWs differ from traditional medical or public health crisis responders as they bring a different skill set, community social capital/relationships/connections, and responsibilities to the crisis response team (Pinto et al., 2020).

Role of CHWs in Public Health Disaster Management

During disease outbreaks of high magnitude such as the COVID-19, Ebola, and H1N1 viruses, the alignment of both internal and collaborative governmental bodies are essential components for implementing containment measures within the framework of emergency management (Hu & Qiu, 2020). While numerous studies have demonstrated the efficacy of CHWs in reducing the burden of chronic diseases such as diabetes and hypertension in minority and underserved populations (Nassar et al., 2013; O'Connor et al., 2020), a lack of information exists on the use, management, and information flow between CHWs and public health systems in widespread disaster events, such as a pandemic. Even less is known about how CHWs interact with technology in the context of crisis events.

The importance of CHWs in disaster preparedness stems from the personal ties they have to the communities they serve, and thus their ability to educate and recruit help, monitor the effectiveness of interventions, and fill in gaps in health service (Boyce & Katz, 2019). Previously, CHWs were mobilized to identify the healthcare and social needs of individuals during Hurricane Sandy. CHWs were effective in setting health goals for patients with chronic medical conditions, identifying community resources, and counseling patients (Russell et al., 2018). Similarly, during the 2017 Peru floods, CHWs were trained to support mental health interventions by conducting screenings for depression and domestic violence and connecting individuals to the necessary support services (Contreras et al., 2018). They also implemented activities that allowed children to relieve stress while building emotional management skills and forums to encourage community participation. The post-disaster interventions exposed the inadequacies of the health systems in addressing the needs of those marginalized communities and the role CHWs can play in bridging those gaps.

Employing CHWs provides several key operational advantages within a public health disaster management framework. Based on our observations working with about 12 CHWs as a fundamental institutional healthcare approach to managing COVID-19 (Franco et al., 2023; Stevenson, 2023), we found several essential characteristics exhibited by CHWs when viewed through the lens of crisis logistics, actions, information flow, and situational awareness:

1. **Autonomous by nature** - Each CHW functions as a largely autonomous agent within their community, operating independently throughout most of their work, only occasionally checking in to provide information and take directives. While this is both good and bad - if carefully selected, they don't require much instruction about what to do and can make independent decisions without creating a burden for these decisions on traditional crisis response managers for most tasks. On the other hand, because the crisis is rapidly unfolding, and their check-ins are relatively infrequent there may be substantial delays in information transfer, redirection of high-level activities, etc (Malcarney et al., 2017).
2. **Hub and Spoke** - Outside of a crisis context, CHWs typically operate in a hub and spoke model of organization, with each CHW reporting to a central command element independently – this model is a key strength, as it relies on high levels of trust between CHWs and the command element from the healthcare system. This relationship is, in a perfect world, fairly mutual – such that the CHW is regarded with respect even though they are very different from the traditional healthcare system. This respect is demonstrated through non-hierarchical access directly into the healthcare system.
3. **High Community Trust** - Benefiting from high levels of community trust, CHWs possess valuable insight into the community's experiences and needs. This trusted position enables them to identify areas where the public health system may fall short in addressing the community's needs.
4. **High Quality, Difficult to Obtain Information Flow** - Because the community trusts them, they can provide direct, unfettered views of things on the ground (remote sensing) that can be sent back to the public health agency in the form of text message updates, photographs, brief videos (Baker et al., 2024, Taylor et al., 2017).
5. **Culturally Competent Information Flow & Sense Making** - CHWs are excellent at translating or transliterating complex, linguistically, and culturally opaque information for the public health response agency. They have a unique ability to convey intricate details in a manner that aligns with both public health agencies and the community's language and cultural context, thereby enhancing the effectiveness of information flow and sense-making in response efforts (Griffith et al., 2023).
6. **Trusted Asset Logistician** - CHWs can distribute essential supplies like personal protective equipment (PPE), food, diapers, baby formula, and monetary donations or gift cards to individual households that had COVID-19 positive household members and needed to isolate to prevent workplace infection

spread and were in financial need - in part because they have were trusted with these tasks before the pandemic, and because they have hyper-local networks through which the assets can be channeled, etc.

However, despite their numerous benefits, CHWs frequently encounter challenges while performing their duties, some of which include:

1. **Excessive Autonomy:** Sometimes, the heightened level of autonomy CHWs possess raises concern that their initiatives could run counter to or do not assist the public health agencies' primary goals.
2. **Loss of Shared Situational Awareness in transition to Hierarchical Structure** – Even though we wanted to preserve the hub and spoke model and they are largely autonomous, the complexity of the COVID-19 response meant that the formal response structures were rapidly overwhelmed by information and asset requests from the CHWs. We had to switch to a hierarchical model in a respectful, culturally competent way. However, this meant that we then lost direct insights into what was happening on the ground because the information from most of the CHWs was being filtered through a lead CHW for each community — this became in the crisis response literature a "shared situational awareness" problem. Critical information available to a CHW lower in the hierarchy might be filtered out before reaching the Public Health Department.
3. **Coordination Challenges**- Coordination problems arise in the identification and resolution of needs across diverse communities. This often involved understanding the intersections of hyperlocal networks among CHWs and determining how these shared networks can be leveraged for more effective collaboration and response, while also respecting boundaries and not moving past the level of trust the CHW developed.
4. **Safety and security of CHWs in the field:** In utilizing the help of CHWs for crisis response, there is a paramount concern around guaranteeing their safety and security in the field.
5. **Mental Health of CHWs:** Additional concerns also revolve around acknowledging and addressing the mental health and well-being of CHWs as they perform these crucial tasks (Johnson et al., 2022).

Balancing the multifaceted role of CHWs in public health disaster management necessitates striking a balance between the strengths and weakness of the CHW model at the interface with formal response structures, thereby necessitating a need for cultural tailoring, strengthened supervisory systems, and a continuous communication and feedback loop to ensure that the positive impacts of CHWs in disaster management prevail while addressing potential pitfalls to maximize their effectiveness.

OFF-THE-SHELF HEALTH INFORMATION SYSTEMS IN DISASTER MANAGEMENT

Over the years, the integration of technological tools in disaster management has yielded significant benefits. These tools have been used in forecasting, hazard monitoring, disaster mapping, emergency response, and information coordination, all of which collectively contribute to a comprehensive framework for addressing and mitigating the impact and damages caused by disasters (Rathore, 2016; Eguchi et al., 2008). Dating back decades, major public health disasters have utilized the strategic deployment of advanced technological tools as an intricate component for effective response and recovery efforts exemplified by historical events such as Hurricane Andrew in 1992, and the 1994 Northridge earthquake. During these disasters, Geographical Information Systems (GIS) played a pivotal role by providing visual and geospatial information for efficient response. Similarly, the aftermath of the World Trade Center attacks saw the utilization of technological tools for conducting damage assessment, and facilitating recovery operations (Eguchi et al., 2008). In more recent instances, the Ebola outbreak in Sub-Saharan Africa, and the ongoing COVID-19 pandemic have further underscored the benefits of technological tools in designing, planning, and implementing best practices for infection control, the provision of response to affected individuals and communities (Whitelaw et al., 2020).

While many of these events have reported the use of sophisticated and advanced technology, simple off-the-shelf technology has also been beneficial for disaster management, most importantly for disaster communication and management (Gómez, 2010). A study led by Kavota et al., 2020 analyzing social media adoption and its usefulness in disaster management found that user adoption was driven by perceived ease of use and advantages including data accessibility and flexibility. Further, their study concluded that of the approximately 3.848 billion active social media users in the world, 3.256 billion of these access social media via their smartphones (Kavota et al.,

2020). Other key advantages of using social media during disasters include bi-directional communication, increased awareness of rapidly changing conditions, and geolocation of users. For example, people impacted by Hurricane Sandy in 2012 posted upwards of 800,000 hurricane images using #Sandy, each of which documented visual evidence of changing conditions and showed the geographic location where the picture was taken (Sakurai & Murayama, 2019). These events both summarize the impactful role of simple technology and underscore the significance of accessible tools, and social networks in disaster communication and management.

METHODOLOGY

This research is presented as a practice based, in-depth case study (Kuhlicke, 2013; Kankanamge, Yigitcanlar & Goonetilleke, 2020). When the COVID-19 crisis struck, we rapidly shifted toward a response footing, interestingly moving some of us with extensive crisis research backgrounds, but little practical crisis response experience in responder roles. Thus, the case study is grounded in an action research approach (Landgren, 2010; Lempinen & Rajala, 2014). Because the authors were forced to switch roles from researcher to responder, we were in effect designing information systems on the fly to solve problems as they came up (Cross, 1982). Wearing both hats, the response work took precedence. Data collection was therefore primarily opportunistic instead of dictated by a predetermined research question or hypothesis. By shifting back to a research perspective and reconstructing the complete case study after the fact to be reported to the crisis management research community, we were allowed an opportunity to reflect and capture as much of this process and the learnings from it as possible. This event reconstruction approach allowed us to pause and understand these additional elements for the first time as a group, and we worked to ensure that each of the authors on the response team was satisfied that the telling of the events accurately represented their understanding within the overarching effort as best as possible. This approach afforded us a much more comprehensive view of the actions taken and paints a picture of the complexity encountered by response teams in completely improvised settings (Zhang & Mendonça, 2020). Notably, this perspective includes only the healthcare and public health agency perspectives, not those of the CHWs, which are presented elsewhere (Stevenson, et al. 2023).

RESULTS

The onset of the Covid-19 pandemic brought multiple challenges to CHWs including the need for quick action, ever-evolving information, and large-scale impact throughout the community. Our previous work with CHWs used a dedicated supervision model, however, the COVID-19 pandemic required a significantly larger reach and therefore we moved to a cascade system.

STOP COVID-19 Community Health Workers

During COVID-19, we sought to provide CHW support to four communities of color in Southeastern Wisconsin, specifically within African American, Hispanic, Hmong/SE Asian, and Native American communities. The overall STOP COVID-19 project and the CHW program embedded within this public health crisis response effort are detailed elsewhere (Franco et al., 2023; Stevenson et al., 2023). Each of the four communities of color served was designated one CHW lead and 1-3 additional CHWs reporting to each lead. As such, technology was recognized as a critical means of communication between our 4 teams of CHWs, their respective team leads, and project leadership. In this project, CHWs were short-term employees of the City of Milwaukee through the STOP COVID-19 grant, and data provided here was administratively gathered as part of this paid role. The information was used to manage the overall crisis response.

Zoho CHW Impact Form

The form used in the STOP COVID-19 Initiative was labeled “CHW Impact Form”, this allowed all CHWs and Team Leads to submit weekly progress reports and issues/ needs (DS Table 1). Zoho online forms utilize a ‘drag and drop’ builder allowing for rapid creation and customization of the form. The data entry burden was minimized using checkboxes and predefined options that were defined through rapid collaborative design processes (Klein et al., 2003) with the CHWs, while also providing several areas for free-form entry. At the onset of the project the form captured immediate issues, agencies served, family services provided, community education/ outreach,

and team activities. Following vaccine availability in February 2021, additional questions were added to capture vaccine compliance, concerns, and education within the four communities.

Although not unique to Zoho Forms, we selected this option over more basic tools like Google Forms because Zoho has built-in form logic, which allows data elements used in the form to act on form submission. Upon form submission, a PDF report was automatically emailed to the respective CHW Team lead and project leadership at MHD and MCW. This ensured direct communication by CHWs reached all levels of leadership unfiltered, and facilitated response to community needs while reducing overall volume of communication. While the same types of conditional logic can be accomplished through other projects or scripting language augments to Google Forms, we had limited access to a programmer and elected to use the programmer's time for a more complicated logistics management effort (Franco, et al., 2021).

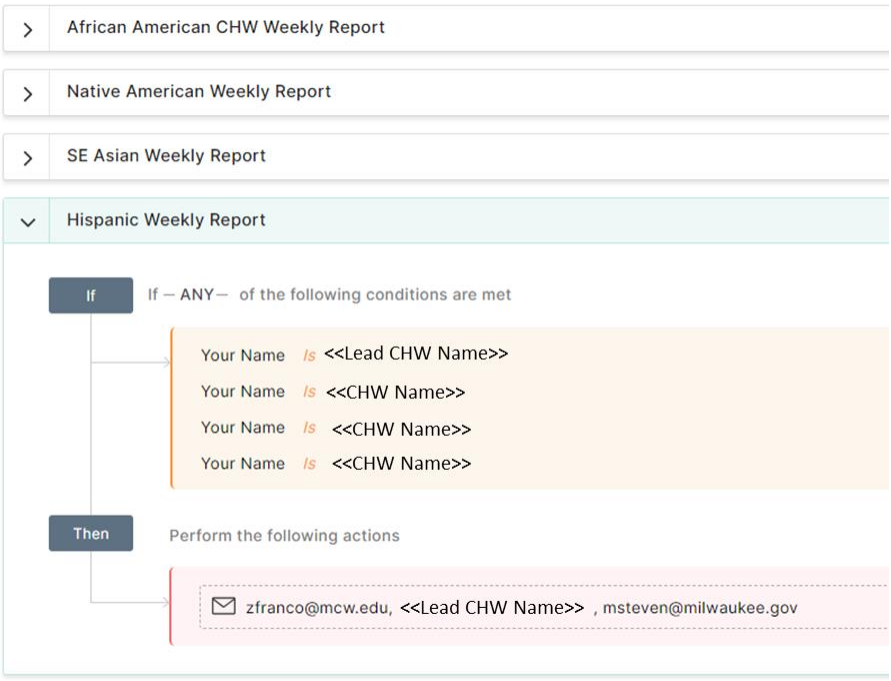

Figure 1. Data Entry by CHWs Automatically Triggers &Generates Situational Reports Sent to Leadership at MHD and MCW via Zoho Forms.

CHW Social Information Context & Overwhelm

Notably, we observed that the CHWs were operating in a very different information environment, working directly with residents in their neighborhoods through things like private Facebook groups, individual and group SMS Text, and Facebook Live to broadcast information about things like food pantries (notably these FB live events were often narrated in the CHWs primary language), and older technology approaches like phone trees and phone check-in lists. One of the CHWs reported that their team was contacting hundreds of households a week by voice phone call check-in. Importantly, the Zoho form approach created a single channel of information for the command layer of this project from the CHWs. The intensity of communication from the lead CHWs, who had direct phone and text access to the project managers, alone threatened to overwhelm the command layer (Rao et al. 2017, Misra et al. 2020). We were forced to push most synchronous upward communication from the CHWs to the lead CHW for their population group, adhering to a hierarchical model. However, the Zoho form allowed unfiltered information from the CHWs to still reach the program staff and be evaluated and actioned asynchronously. In addition to the Zoho forms, a Facebook group for all CHWs (regardless of population served), lead CHWs and program staff to view operationally related photos asynchronously.

Responses

CHWs submitted 150 responses to the form over a one-year period between August 2020 and August 2021 spanning the height of the pandemic into the early vaccination and recovery phase. Hispanic CHWs returned 62 community updates, African American CHWs 34, Native American 42, and SE Asian 12. The low numbers for the SE Asian community likely reflect the tenuous connection we had to this community beyond the lead CHW, although information provided by three SE Asian CHWs was provided.

COMMUNICATION FLOW BETWEEN CHWs AND STAKEHOLDERS:

CHWs were asked to complete the Impact Form at least once a week, whereupon submission, the form was sent automatically to CHW Leaders, the Public Health Department, and MCW (see Figure 1).

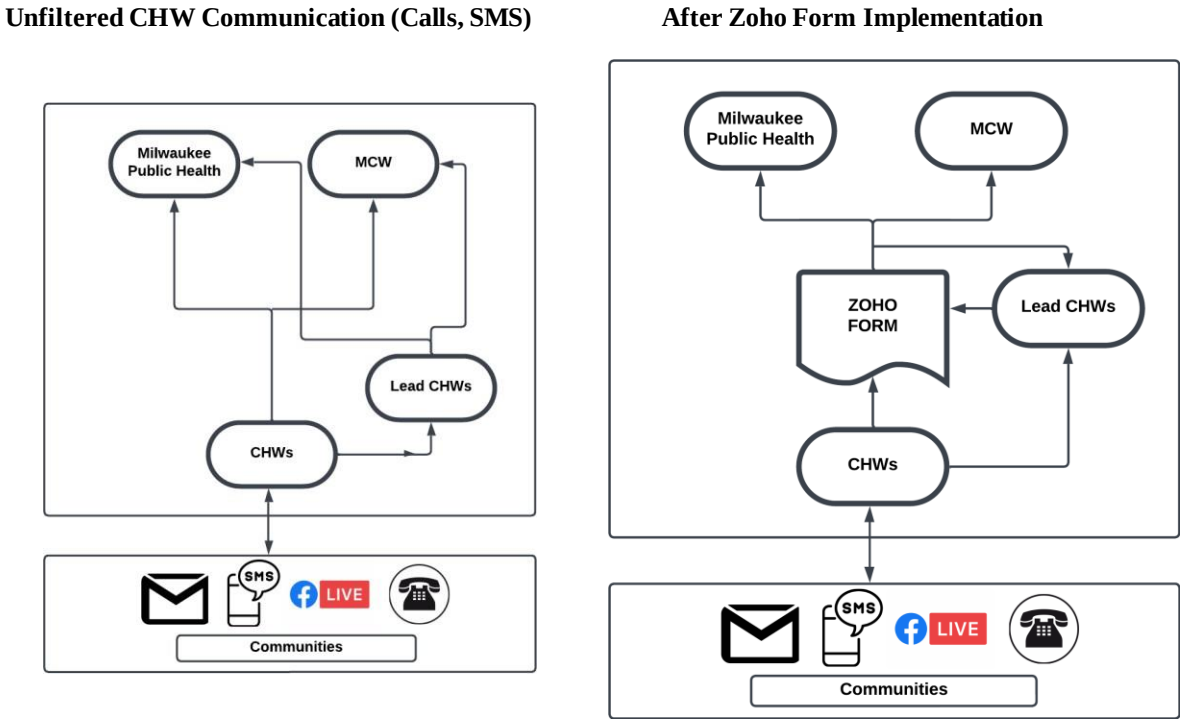

Figure 2. Weekly updates using simple ZOHO Form and submitted automatically to Milwaukee Public Health, Medical College of Wisconsin (MCW), and the Lead Community HealthCare Workers.

Below, we provide a detailed summary of key efforts implemented across these communities based on information obtained from Zoho Forms.

DS Table 1. CHW-Generated Reports from Zoho Forms for Agencies Served

ZOHO FORM DATA FIELD	EXEMPLAR INFORMATION
Agencies Served	
Agency Types Served this Week? (check all that apply): Church, Social Service agency, Clinic, Food Pantry, Homeless Shelter, School, Other - Please describe	**Other agencies reported included:** • Community leadership programs • Other Native American Tribes (e.g. • Stockbridge-Munsee Tribe) • Home Health agencies • Local newspapers • Financial services companies • Check cashing locations • Retail cell phone stores • Culturally specific food stores • Cultural/spiritual events (Unity Fire, Sobriety Fire) • Consulates • Voting drives • Toy drives
Notes on Agencies served/ Number served (free text) *Any impact information you think would be helpful for us to know about, questions that came up from agencies, etc?*	**Native American (09/04/2020)** *I dropped off a total of over 300 masks at the Potawatomi Foundation Leadership Program and the Southeastern Oneida Tribal Services, as well as some posters and COVID-19 information. At the Water Walk Milwaukee 2020 I passed out masks and cards with COVID-19 information. Finally, at the Natives in MKE Photo Campaign 2020, I passed out masks, distributed food, and gave out support resources.* **African American (09/07/2020)** *Met with NAACP and discussed the distribution of masks and resource information at a voter registration event 9/19/20.* *Met with the American Legion Post in Kenosha to assist in distributing masks at an event in Kenosha.* *delivered Pampers to Mexican Fiesta, along with masks to <Native American CHW>* *Contacted United Way for essential COVID-19-related supplies, United Way will be delivering items to Dryhootch on Brady St. hygiene kits, (diapers, masks, sanitizer, and other essentials) I will be contacting CHW leads for distribution of items this week. Working with Feeding America to process food orders for CWH leads.*

DS Table 2. CHW-Generated Reports from Zoho Forms for Families Served

ZOHO FORM DATA FIELD	EXEMPLAR INFORMATION
Families Served	
Types of Family Services Provided This Week? (check all that apply): COVID-19 information, Mental Health Resources, Food, Masks, Household Goods, Advice/ Personal Support, Referral to government services (e.g. rent, support etc.), Support to Families with COVID-19 positive in households, Phone calls with families, Coordinating with other CHWs or agencies, Other - Please specify	• Transportation assistance • Christmas gifts for children • CHW generated live stream family support event. • Assistance editing job resumes. • Diapers, wipes formula • Referral to immigration, criminal, and family lawyers • Cancer screening • Feminine sanitary products
Notes on families served/ number served (free text) Any impact information you think would be helpful for us to know about, questions that came up from families, etc?	Hmong Community *The Hmong community is having to cope and grieve non-traditionally and I am coping a family through losing a loved one. Also, I am working with families to get them access to food pantries and culturally specific foods.* *09/11/2020* *I am continuing to work with a teen who lost his dad due to COVID-19. The entire family is having a hard time coping and I am making referrals and being another source of support. I am also receiving more food donations. I am individually dropping them off at family's homes.* *09/18/2020* *I am doing regular check-ins with a family. The mom is on her way to recovery but they mentioned to me how even after COVID, things do not go back to normal. The community puts a stigma on them as if catching coronavirus was a curse. People are afraid of their families even after they have recovered from COVID-19. She has physical limitations that were not there before covid such as tiredness from just going up the stairs, breathing still hurts, and physical tiredness. The youth I am working with is finding support through opening up to friends and family again. I think sometimes talking to close friends and family isn't always the best option, so talking to me has been helpful.*

DS Table 3. CHW-Generated Reports from Zoho Forms on Community Empowerment

ZOHO FORM DATA FIELD	EXEMPLAR INFORMATION
Community Education/ Outreach/ Other	
Notes on Community Education, Outreach, and Coordination (free text)	
Team and Learning Activities	
Types of team activities? (check all that apply): Assisted another team member, attend a conference/ presentation, Attended a training	
Notes on Team and Learning Activities (free text)	**Hmong (9/18/2020)** <Native American CHW lead> needed another mask for this cultural art project and so I assisted him in that. I made masks at Mexican Fiesta with <Hispanic CHW Lead), <Native American CHW>, and <Hispanic CHW>. I also met with <Hispanic and African American CHW leads> at <Organization Name> and picked up some supplies for distribution. <African American CHW lead> has been helpful in getting materials to me and the team. My team and I are getting ready to put kits together to distribute. Kits will include Health Department masks, hand sanitizer, latex gloves, and the COVID info card.

***Mental Health Support**:* A MH webinar was conducted across all 4 communities to provide training to CHWs enabling them to act as a MH first response worker within their communities. Guidance on accessing MH support, and referrals to government-owned facilities were also provided to the CHWs, hence equipping them with the necessary tools to address the MH crisis on the go.

COVID-19 Support: CHWs were able to identify resource gaps within their communities that could prevent infection spread, and through their active reporting via the Zoho forms, efforts were made to distribute face masks, provide tailored information on COVID-19 testing and masking protocols across all 4 communities. The CHWs also created awareness and dispelled rumors and negative societal stigma associated with the virus.

Facilitation of Local Community Support Teams/ Systems: Aside from their commitment to reporting first-hand information to leadership (MCW, Milwaukee Public Health Department & CHW Leads), the CHWs through the data collected helped in facilitating outreach work between local churches and the communities they serve. As a result of these efforts, churches, and other non-profits were able to meet the resource needs of individuals financially constrained due to the pandemic by providing food pantries, rental support, clothing, and hygiene supplies.

DISCUSSION

Our study provides an in-depth narrative of the pivotal role CHWs play in navigating the complex terrain of public health crisis response, particularly within diverse communities. We have underscored the role of communication and information management during public health crises while highlighting the various tiers of partnerships and

communication efforts employed by health departments to obtain information from hard-to-reach populations. Adding to the significance of CHWs in public health crisis response, a distinction to our approach is the strategic integration of simple technology as illustrated by the use of Zoho forms in our study. Our approach emphasizes the need to look beyond conventional technological solutions requiring expertise and infrastructure for information management during a crisis. The dynamic integration of CHWs and Zoho forms during the Stop-COVID-19 efforts across four diverse communities in Milwaukee proved beneficial for on-the-go crisis management efforts. Equipping the CHWs with this simple technology was a crisis response strategy that transcended the barriers of complex tech adoption. Furthermore, in keeping the tools simple, we were able to empower CHWs and streamline information flow thereby establishing a robust infrastructure for the disaster response frameworks within these diverse communities.

While the simplicity of the technology used in our study was a strength of our COVID-19 crisis response efforts, we however acknowledge the potential challenges that may arise concerning data security and privacy (Kim et al., 2017). In terms of data privacy and security concerns, while Zoho forms as a security component to ensure data safety and privacy, we however, think it is additional efforts must be made to ensure CHWs are informed on additional measures they must take to ensure the data they collect within the communities they serve are properly secured, in addition to this, CHWs must also assure communities from which this information are obtained about the safety of their health information to avoid mistrust and potential loss of the life-long partnership already established between CHWs and the communities they serve.

CONCLUSION

In healthcare systems, Community health workers have been proven to provide substantial and indispensable support for routine care activities, disease management, and infection prevention during public health crises. Including their roles with additional support for crisis reporting and information management will further enhance crisis management efforts by public health authorities. Our study, centered on leveraging the use of Zoho forms as a simple technology during the Stop COVID-19 efforts in collaboration with Milwaukee's public health department, academic partners at the Medical College of Wisconsin, and community leaders in tandem with CHWs, demonstrated significant benefits in communities mostly impacted and in dire need of resources. While we can say that our study successfully met its objectives within the target communities, we, however, emphasize the need for a continuous commitment to identifying and enhancing public health communication and information management within these communities during public health crises and beyond. We emphasize the importance of leveraging CHWs and empowering them with simple technologies like Zoho forms, to facilitate their work. Further work should begin to explore strategies to consolidate the role of CHWs as essential contributors to public health crisis response frameworks. In addition, incorporating user-friendly and quick reporting tools for information management, reporting, and distribution, while upholding privacy, ease of use, and confidentiality should be considerations for their uptake and impact.

Our study advocates for a continuous commitment to securing and strengthening the role of CHWs and integrating accessible technologies into the frameworks of efficient public health crisis management.

ACKNOWLEDGEMENT

This work was wholly supported by the Advancing a Healthier Wisconsin COVID Rapid Response Grant, *Stop COVID-19.*

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