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Abstract. Vaccination rates against COVID-19 are lower in rural areas across the country, including SC. This paper highlights the work conducted by Clemson Cooperative Extension Service in SC to increase rural access to COVID-19 testing and vaccine services. Extension Agents engaged in clinical and community partnerships to coordinate COVID-19 vaccine and testing clinics in rural and underserved communities. Agents established 204 test clinics and 220 vaccination clinics. The total number of people tested and vaccinated was 9,331 and 2,037, respectively. The success of this project shows Extension agents can be instrumental in bridging the gap between clinical resources and rural communities.

INTRODUCTION

Throughout the COVID-19 pandemic, rates of COVID-19 remained high, even after vaccines became available. COVID-19 vaccination rates are lower in rural areas than in urban areas (Saelee et al., 2022). According to the Centers for Disease Control and Prevention (CDC), as of January 31, 2022, only 58.3% of rural residents had received their first dose of the Moderna or Pfizer vaccines or a single dose of the Johnson & Johnson vaccine, compared to 64.1% of urban residents. Furthermore, only 52.1% of rural residents have completed their vaccination series compared to 66.2% of urban residents (Saelee et al., 2022). In South Carolina, 58% of rural South Carolinians have received their first dose, while 64.1% of urban South Carolinians have received their first dose (Saelee et al., 2022). The barriers to receiving a COVID-19 vaccine for those living in rural communities are plentiful. Commonly cited barriers to vaccination include distance to healthcare, transportation, trust, and perception (Fisk, 2021; French, 2020).

Rural citizens live on average 10.5 miles from their nearest hospital. As a result, individuals living in these areas must travel an average of 17 to 34 minutes to reach the nearest hospital. Compared to urban citizens, the average distance is around 4.4 miles or 10 to 19 minutes to reach the nearest hospital (Lam et al., 2020). In recent years, rural hospital closures have increased, which has increased the distance and travel time to the nearest hospital for many individuals.

According to a case study on the impact of hospital closures in Kansas, Kentucky, and South Carolina by Wishner et al. (2016), respondents in rural communities with a recent hospital closure in each state stressed the importance of having better public transportation systems. Respondents also mentioned that transportation was a significant barrier to receiving care, especially for the elderly, as they often must rely on others for transportation (Wishner et al., 2016). In addition to access and transportation barriers, trust is another barrier to vaccination. According to Kennedy et al. (2022) with the Pew Research Center, Americans' trust in scientists and medical scientists has been decreasing since the start of the COVID-19 pandemic. In December 2021, only 29% of Americans reported a "great deal" of confidence in medical scientists, an 11% decrease from November 2020 (Kennedy et al., 2022). More specifically, 21% of rural residents report that they will "definitely not" get a COVID-19 vaccine compared to only 8% of urban residents. This reluctance to get a vaccine is even lower among rural parents, as 53% say they will "definitely not" vaccinate their children ages 12-17, compared to only 20% of urban parents who reported they would "definitely not" vaccinate their children 12-17 (Sparks et al., 2021).

Organizational attempts to promote COVID-19 testing and vaccination have been successful since the start of the COVID-19 pandemic. French et al. (2020) list several guidelines for proactive and successful COVID-19

vaccination promotion that an Extension-clinical partnership would be adept at achieving. French et al. (2020) claim that any health agency promoting COVID-19 vaccination must understand community values and norms. Through their direct work within the community, Extension agents can understand community values in a way that will enable them to promote the vaccine and understand specific areas that should be targeted, such as impoverished and secluded areas. French et al. (2020) also state that COVID-19 vaccine-promoting organizations must compete with structural and economic factors that enable vaccine hesitancy, such as cost and lack of transportation. To overcome these barriers, organizations should facilitate interdisciplinary partnerships to increase access which in turn will increase confidence and demand for the vaccine (French et al., 2020). Extension agents are fully equipped with the knowledge of community values and connections with other community stakeholders that will allow them to promote the COVID-19 vaccine across different platforms in civil society.

Extension agents have a well-known and trusted presence in rural communities throughout the country, which puts them in a unique position to work within their community. Previous collaborations between Extension and clinical partners led Kaufman et al. (2019) to describe Extension agents as “bee-like,” cross-pollinating between groups and extending best practices and their already established trust within the community to other outside collaborators (Kaufman, et al., 2019). This unique and trusted position would enable Extension agents to bring COVID-19 vaccination and testing services and vaccination education to their constituents. Dr. Jay Butler, CDC’s Deputy Director for Infectious Diseases, even noted that since Extension agents are “recognized and trusted messengers in their communities... [Agents] can play an important role in building COVID-19 vaccine confidence and increasing vaccine access within the communities they serve.” (United States Department of Agriculture National Institute of Food and Agriculture [USDA-NIFA]). The utility Extension agents can have in increasing access to COVID-19 testing and vaccination services can significantly be amplified when partnering with a clinical organization.

Extension-clinical-community collaborations have been described through previous work in South Carolina (White et al., 2021) and throughout the country (Bencivenga et al., 2008; Kaufman et al., 2017). The pandemic offered a further rationale for these collaborations (Frenchet et al., 2020; Kennedy et al., 2022; Lam et al., 2020; Saelee et al., 2022; Sparks et al., 2021).

The Health Extension for Diabetes (HED) program facilitated by the Clemson Extension system in South Carolina brings practice-tested diabetes support and self-management classes to South Carolinians. Through an Extension-clinical partnership, Extension agents can provide

evidence-based information and connect participants with clinical resources and expertise for out-of-scope questions (White et al., 2021). In rural Appalachia, the Indiana County Cancer Coalition (ICCC) developed community, clinical, and Extension partnerships to work through local food pantries to promote, educate, and enroll participants in their no-cost mammogram screening program in their community (Bencivenga et al., 2008). In New Mexico, the Health Extension Regional Officers program (HEROs) was created to facilitate community engagement in clinical and translational research that allowed clinical partners to connect to diverse populations and adapt study proposals to better suit the needs of the communities, as well as build trust in a previously unfamiliar community (Kaufman et al., 2017). The Extension-clinical partnership can be especially beneficial to rural communities as Extension agents can help bridge the gap between populations and access to health resources. By partnering with Extension services, clinical organizations can bring access to health resources for those living in rural communities. In addition, Extension-clinical partnerships increase reach within communities that may not otherwise be reached.

The success of previous Extension-clinical and Extension-clinical-community partnerships shows that these partnerships can be successful in increasing access to health resources and aiding clinical organizations in building trust among different communities (Bencivenga et al., 2008; Kaufman et al., 2017; White et al., 2021). This success should apply to communicable disease prevention and overcoming the clinical access barriers and public medical science mistrust the COVID-19 pandemic has highlighted within rural communities.

Clemson University Cooperative Extension Service leveraged partnerships with community and health organizations throughout the state to bring COVID-19 testing and vaccination clinics to rural and underserved communities in the Upstate and Midlands of South Carolina. The primary aim of the paper is to outline a successful Extension-Clinical-Community partnership including partnership roles and barriers, for the adaptation in other communities for vaccination and health initiatives.

METHODS

Clemson Cooperative Extension in South Carolina has a strong network of partners including a formal collaboration between Extension, a large state health system, and a university-led mobile health center. The partners worked together to leverage CARES Act funding to facilitate COVID-19 testing and vaccination clinics throughout the state of South Carolina. One of the primary goals for implementing COVID-19 testing and vaccination clinics in South Carolina was to reach individuals who may not

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otherwise have access to testing and vaccination, such as individuals who are traditionally underserved in rural areas or in areas considered distressed or at-risk based on the zip code classification as outlined by the Distressed Communities Index or DCI. The DCI assigns an index score to every zip code and county across the United States based on seven metrics, including median household income, poverty rate, and high school graduation rate. Based on the index score, a community is assigned to one of five tiers (distressed, at-risk, mid-tier, comfortable, or prosperous) (The Spaces Between Us, 2021).

Methods for reaching underserved populations included strategic planning of COVID-19 clinics based on the geographical need of testing or vaccination clinics, including a moving 7-day average of COVID-19 cases, low COVID-19 vaccination rates, and county or zip code designation based on the DCI, community rurality with presumably less access, and a concentration of high-risk populations. This strategy allowed for areas that may be more disadvantaged within an area with high case counts and low vaccination rates to be prioritized in scheduling clinics.

Once Extension agents identified target areas, agents connected with potential community partners and stakeholders such as county officials, faith-based organizations, community centers, schools, housing authorities, and existing community partners were contacted

to assess the need for services in their community. Using Extension agents, as previously described as a trusted community resource, was essential to establishing clinics. Extension agents also worked with community partners to identify appropriate clinic host sites and coordinated with an identified site point of contact (POC). It was important that Extension agents carefully chose the community partners and POCs who were community champions or individuals who would be recognized in the community as reliable and trusted individuals, thereby increasing clinic participation. The POCs often helped to increase participation by assisting in clinic promotion or guiding Extension agents to the most effective methods for promotion. By effectively working with the community POCs, Extension agents could extend reach in underserved areas.

Another essential implementation strategy included effective collaboration with the community partners for establishing clinics and effective collaboration and communication with the clinical team and associated healthcare system. Extension agents also served as a liaison between the community POC and clinical team for clinic scheduling logistics. The clinical team provided the personnel and resources necessary for increasing access to testing and vaccination during the clinics. Table 1 further outlines specific roles for effective Extension-clinical-community partnerships for COVID-19 clinics.

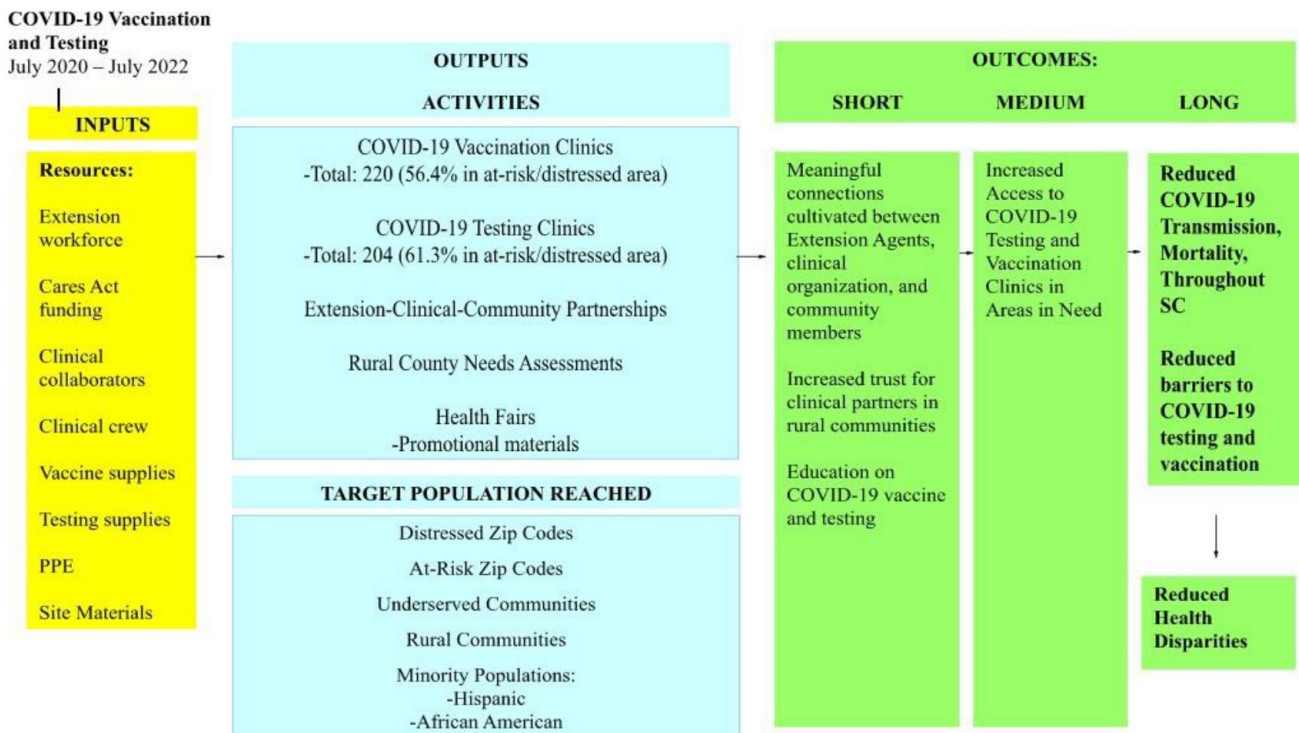


Figure 1. Logic model of COVID-19 vaccination and testing.

Table 1. Overview of Extension-Clinical-Community Partners' Roles

Partner	Partner Description	Duties
Extension	Cooperative Extension arm of a Land-Grant University	<ul style="list-style-type: none"> • Identify areas in need • Outreach to community members to evaluate need/demand • Communicate and coordinate with clinical partners and community POC's to schedule clinics • Promote clinics • Educate the community on COVID-19 prevention
Clinical	Local healthcare system or healthcare facility	<ul style="list-style-type: none"> • Provide clinical infrastructure • Provide staff testing and vaccination sites • Provide testing and vaccination supplies • Educate patients
Community POC	Reliable, trusted individual within the community	<ul style="list-style-type: none"> • Identify appropriate clinic locations • Promote clinics within the community

RESULTS

As of August 2022, 204 testing and 220 vaccination clinics were established. There have been 125 testing clinics (61.3%) and 124 vaccination clinics (56.4%) held in zip codes considered at-risk/distressed (Table 2). The total number of people tested and vaccinated was 9,331 and 2,037, respectively (Table 2). Over 100 different community contacts were established throughout the state to host clinics. Clinics were established using faith-based organizations; community centers such as civic centers, recreation centers, youth centers, and town halls; housing sites such as local housing authorities, apartment complexes, and group homes; education centers such as universities, libraries, and adult education centers; businesses; and others (Table 3).

Promotional outreach efforts included the distribution of flyers through social media marketing strategies to reach 152,287 people (Table 4).

DISCUSSION

By partnering with community stakeholders, Extension agents could schedule clinics within communities in need, over half of which were located in at-risk or distressed areas. Therefore, barriers related to transportation in rural communities were addressed. Through the clinical partnership, Extension agents could schedule clinics with no cost associated with the community members helping to decrease barriers related to cost in particularly disadvantaged communities. These two aspects demonstrate Extension's ability to compete with structural and economic factors to overcome vaccine hesitancy, as French et al. (2020) described.

The Extension-clinical approach to establishing COVID-19 clinics successfully implemented clinics in areas that may not otherwise have access, thereby increasing reach for testing and vaccination. Testing and vaccination efforts can reduce COVID-19 transmission and mortality (Rannan-

Table 2. Total Clinics and People Reached July 2020 through July 30, 2022

	Number of clinics	Number of people who received services	Number of clinics held in an at-risk or distressed area
Testing Clinics	204	9,331	125
Vaccination Clinics	220	2,037	124
Totals	424	11,368	249

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Table 3. Breakdown of COVID-19 Clinic Locations (sites where testing and vaccination held at the same time only counted once, 8 in total) July 2020 through July 30, 2022

Location of COVID-19 Clinic	Number of clinics held	% of clinics/ location
Faith-based organizations	163	38.4%
Community Centers	57	13.4%
Housing	14	3.3%
Education Centers	112	26.4%
Businesses	32	7.4%
Other	38	9.0%

Table 4. Promotional Reach July 2020 through July 30, 2022

Number of flyers posted to social media	Number of flyers posted in Spanish	Number of people reached through boosting posts
307	28	152,287

Eliya et al., 202; Suthar et al., 2022). In a study by Rannan-Eliya et al. (2021) about the impact of PCR testing and the rate of transmission of COVID-19, the testing intensity was associated with a decrease in incidence, cumulative cases, and deaths (Rannan-Eliya et al., 2021). In a study conducted by Suthar et al. (2022) on COVID-19 case surveillance and vaccination data in the U.S., increased COVID-19 vaccination coverage was associated with decreased COVID-19-related mortality (Suthar et al., 2022).

Through working with over 100 community stakeholders to host COVID-19 vaccine and testing clinics, Extension agents and community POCs were able to use their knowledge of community values and norms to promote the COVID-19 testing and vaccination clinics to increase reach and awareness of services, highlighting another key guideline for successful vaccine promotion as described by French et al. (2020). In addition, by working with clinical partners, Extension agents could extend their trust within the community to clinical partners to not only allow clinical partners access to previously underserved areas but also allowing community members to receive clinical education within their community on COVID-19 testing and vaccines.

LIMITATIONS

There were a few notable limitations to this initiative. While more than half of testing and vaccination clinics reached the target site population of underserved, rural, and distressed/at-risk areas, there were times when clinics had to be scheduled based on availability and the willingness of organizations to

host a clinic. This limitation was due to fluctuating demand for COVID-19 testing and vaccination services impacted by the emergence of COVID-19 variants and subsequent surges in cases. There were also limitations in scheduling clinics due to travel time and staffing. The clinical team was limited to traveling up to 3 hours away, influencing clinic hours. This resulted in fewer late afternoon or evening clinic hours, potentially hindering access for individuals working during regular business hours. In addition, there were limitations in staffing clinics for weekend sites, which limited the number of weekend sites provided for those who worked during the week.

IMPLICATIONS

Extension has an established record of trust and a history of creating strong relationships with individuals in rural communities and extending that trust to clinical partners (Kaufman et al., 2019; USDA-NIFA, 2021). Much like Extension-clinical partnerships previously described to bridge the gap to preventative services for chronic disease (Bencivenga et al., 2008; Kaufman et al., 2017; White et al., 2021), the work described in this paper suggests that the Extension-clinical-community partnership can be used to successfully increase access to communicable disease prevention and education. Testing and vaccination clinics were facilitated based on trust between Extension agents, community members, and partners. The work done by Extension agents in South Carolina shows that agents can help decrease vaccine hesitancy because they can be successful resource navigators against common barriers, including structural and social barriers, as described by French et al. (2020). By targeting rural, underserved, and at-risk/distressed areas, Extension agents can be instrumental in extending trust to clinical groups in areas where populations may be distrustful of medical science, especially concerning COVID-19 (Kennedy et al., 2022; Sparks et al., 2021).

CONCLUSIONS

This initiative aimed to connect Extension, clinical, and community personnel to effectively establish COVID-19 testing and vaccination clinics within areas in need, such as at-risk/distressed zip codes and rural/underserved communities. Extension agents successfully fostered Extension-clinical partnerships and then extended that partnership with their already established community connections to grow trust for the clinical group and the COVID-19 vaccine. These community collaborators are now strong partners of Extension, and these partnerships will provide future opportunities for health and wellness activities in hard-to-reach communities. The results of the activities described in this paper confirm that Extension-clinical-

community relationships can collectively impact and address health disparities related to COVID-19 by bridging the gap between clinical services and at-risk/distressed communities in South Carolina.

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