



Evaluation of the Return on Investment (ROI) of Community Health Worker Integration in the Care of Individuals

Prepared by the Center for Applied Research and Evaluation (CARE) in Partnership with the Center for Community Health Alignment (CCHA)

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Introduction & Methods

Introduction

According to the National Association of Community Health Workers (CHWs), a CHW is a frontline public health worker who is a trusted member of and/or has an unusually close understanding of the community served [1]. CHWs are typically members of care delivery teams and address upstream factors, including social determinants of health (SDoH) [2]. They often guide individuals to implement lifestyle changes, while also helping providers within health and social systems better understand and serve community members [2]. Although there are a variety of CHW models based on the services they provide and the individuals and communities they serve [3], the cornerstone of each program depends on trained CHWs that have relationships with the communities they serve to act as bridges between health and social service systems and marginalized communities [4]. Specifically, CHWs across South Carolina (SC) have been described as “trusted messengers” that provide a variety of supportive services to populations with high health-related social needs such as medication management, housing, transportation, program/benefit applications, health system navigation assistance, coordinating clinical services, home-visits, monitoring chronic disease management, and providing social support and health education [5].

Studies have associated CHWs with filling population health gaps by helping to connect vulnerable populations to health and social service resources in the community [6] and improving the quality and cultural competence of service delivery [7,8]. Evidence from previous CHW interventions have resulted in reduced chronic illness, improved medication adherence, greater patient engagement, and better community health accompanied by a return on investment (ROI) of more than \$2 for every dollar invested [9,10,11].

Study objective

The aim of this project is to estimate the return on investment (ROI) of CHW integration in systems of care in SC. Results of this study will contribute to the development of the regional evidence-base for the effectiveness and sustainability of the CHW workforce.

Methods

Site selection

The study settings were locations with health and social service organizations in SC where participants were eligible to receive CHW services. The following selection criteria were used to identify five organizations to participate in the pilot:

- Represent a healthcare system, health clinic, community-based organization (CBO), non-profit organization, or a managed care organization (MCO);
- Employ CHWs, or either had identified and planned to transition a current employee, or had identified an individual into a CHW position;
- Have one staff member who was assigned as the primary contact for the pilot and responsible to oversee that the project’s activities were completed in a timely manner;
- Have the ability to collect and report financial data and SDoH data;
- Have the ability and commitment to participate in trainings and technical assistance for CHWs and CHW supervisors provided by a team of experienced CHWs at the Center for Community Health Alignment (CCHA).

Organizations were given two options for data collection and reporting- the first option was to use the ROI calculator [12], and the second option was to collaborate with the CCHA and the Center for Applied Research and Evaluation (CARE) at the Arnold School of Public Health at the University of South Carolina on both financial and health outcomes that are most relevant to the population(s) served, health issues, and SDoH in which the grantee focused its efforts. Selected organizations were awarded funds to cover initial and ongoing costs. After the initial proposal submission, an ad hoc review panel represented by various health systems and CCHA and CARE staff interviewed the applicants to determine the awarded sites based on selection criteria.

Data collection

The study protocol was approved by the University of South Carolina's Institutional Review Board. Participating organizations obtained necessary waivers and consent forms for all program participants. CARE evaluators established Data Use Agreements with each participating organization. Prior to analysis, participating organizations transferred deidentified data to CARE evaluators every six months. Data for this study included clinical health outcomes data; CHW services and activities; health care utilization; and cost/revenue data, in addition to limited patient/client characteristics. Additionally, the site contact was asked to provide program updates and challenges in progress reports for CCHA and CARE staff to review.

At participant enrollment, CHW teams screened for SDoH. Each site implemented a slightly different CHW model that served diverse populations with unique health challenges and needs; therefore, each site's in-take assessments and indicators were slightly different. Further, the SDoH indicators used to assess the same or similar health related needs (e.g., housing) were different per site. At one site, the indicator for housing was 'Where are you living currently?' and response categories included options such as 'Shelter or boarding home' and 'On streets/abandoned building/in my car;' while at another site, the indicator for housing was, 'What are your current living arrangements?' and response categories included 'Friends or family,' 'Shelter,' and 'Homelessness.'

Participating organizations gathered data from various sources, including case management platforms, electronic health records, and the SC Department of Revenue and Fiscal Affairs Office. Specific information about data and sources is in the results section for each site. Data was submitted every six months for up to 18 months post enrollment. If issues emerged, sites were encouraged to contact CCHA for needed technical assistance and CARE for needs related to data collection (i.e., defining information that was needed, guidance on completing documents, reporting logistics, etc.). In addition, on each progress report, site contacts had an opportunity to request any needed support from CCHA or CARE.

Data analysis

Researchers at CARE analyzed the data to describe patient or client participation in CHW programs, CHW activities, and outcomes. Methods used to estimate the impact of CHW interventions on patient health outcomes and cost of care included pre-post comparisons and comparisons to a similar non-intervention group. Economic benefits associated with improved outcomes and decreases in healthcare costs were compared to program costs to calculate program ROI and cost to benefit ratio. CHW program costs were reported from each pilot site, including CHW salary and benefits, percentage of supervisors' salary and benefits, mileage reimbursement, cell phone allowance, costs for work phones and computers, CHW training, and marketing for the CHW program [11].



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Results

Results

Out of nine organizations that responded to the RFP, the ad hoc review panel selected five organizations to participate based on the requirements. However, due to incomplete data from one of the sites, four sites were included in the analysis to determine patient utilization and cost. See Table 1 for the number of CHWs participating in the program intervention, population served, and ROI results per grantee organization.

Table 1. Number of CHWs participating in program intervention, population served, and ROI results

Organization	# of CHWs	Population served	ROI results
AccessHealth Spartanburg	1	Patients who were uninsured with at least one chronic disease (i.e., hypertension, diabetes, heart disease, chronic obstructive pulmonary disease (COPD), human immunodeficiency virus/ acquired immunodeficiency syndrome (HIV/AIDS), renal disease) or behavioral health issue and participants that have social health needs	For every \$1 invested in the CHW program, it saved \$9.72 in averted costs
BirthMatters	3	Pregnant mothers with low incomes up to 24 years of age	For every \$1 invested in the CHW program, it saved \$2.12 in averted costs
Prisma Health Upstate	5	Patients who were low-income and uninsured and were enrolled in the AccessHealth programs in the Upstate region	For every \$1 invested in the CHW program, it saved \$6.17 in averted costs
Tandem Health	1.4	Population that was dually eligible for Medicare/Medicaid with uncontrolled hypertension/diabetes, or multiple emergency department (ED) visits within the past 12 months	For every \$1 invested in the CHW program, it saved \$0.66 in averted costs

AccessHealth Spartanburg

Site description

The mission of AccessHealth Spartanburg (AHS) is to improve access to health care for the uninsured residents of Spartanburg, Union, and Cherokee Counties. At the time of the study, AHS employed nine CHWs who managed participants with at least one chronic disease, to reduce non-emergent ED visits and avoidable hospital admissions. CHWs provided services for its Healthy Outcomes Program (HOP), a state funded program that targets the most medically complex uninsured participants to reduce non-emergent ED visits and avoidable hospital admissions. Specifically, CHWs coordinate participants’ healthcare and connect them to community resources through a network of 24 community partners. CHW services included office visits, phone calls to participants, resource referrals, and home visits.

Sample

The target population was participants who were uninsured with at least one chronic disease (i.e., hypertension, diabetes, heart disease, COPD, HIV/AIDS, renal disease) or behavioral health issue, and participants that have social health needs (e.g., transportation, food security, housing and living conditions, education, and financial stability). AHS provided data at time one (T1), seven months to 12 months post enrollment (time two, T2), and 13 months to 18 months post enrollment (time 3, T3).

A total of 492 participants enrolled in the program between March 2, 2020, and August 31, 2020. Of the 492 new enrollees, only 75 participants received services from one full-time CHW to comprise the intervention group for the study. Of the total, participants were primarily from Spartanburg County (86% of the non-intervention group and 83% of the intervention group) and were served for an average of 16.2 months. Of the 492 participants, 212 participants were discharged from AHS during the course of the study. Of these, 30 participants were enrolled for less than six months; 35 were enrolled for six-12 months; 147 were enrolled 12-18 months; and 280 were enrolled for at least 18 months. Of the participants that were discharged, the average follow-up time was 11.1 months. At the close of the study, one participant had been discharged for less than six months, 211 had been discharged that were enrolled for at least six months. Across both the intervention and the non-intervention groups, the most common reason for leaving the AHS program was failure to recertify with AHS (49% of the non-intervention group and 44% of the intervention group). Other reasons for being discharged included not meeting eligibility criteria (i.e., obtained health insurance coverage or over the income limit).

Intervention

Of the 492 new enrollees, 417 were not assigned to a CHW and 75 were assigned to a CHW. A participant was assigned a CHW if they had two or more unplanned hospital admissions or ED visits in the last year and two or more chronic conditions, including any behavioral health diagnosis. AHS focused on management of chronic illnesses and participants' social health needs. Throughout data collection, CHW services included office visits, phone calls, home visits and resource referrals to address needs related to housing, transportation, behavioral health, food security, vision, and medication access.

Health related social needs

Participants' SDoH information was collected at T1. Participants in the intervention group, compared to the non-intervention group, were *more likely* to have low health literacy skills, medication access issues, mental health or substance abuse treatment, inpatient services, and ED visits related to mental health, have been incarcerated or released in the past year, low social support, and been homeless. Further, the intervention group was less likely to own or rent a home. For a full summary of SDoH data collected by study group, see Table 2.

Table 2. SDoH indicators by study group at enrollment to six months post-enrollment

SDoH indicator	No CHW (Non-intervention group) (n=417)	CHW (Intervention group) (n=75)
Low health literacy	311 (75%)	61 (81%)
Medication access issues	327 (76%)	61 (82%)
History of mental health treatment	82 (20%)	32 (43%)
Inpatient mental health services in past year	0 (0%)	11 (15%)
ED visit related to mental health in past year	0 (0%)	17 (23%)
Incarcerated or released in past year	0 (0%)	2 (3%)
Lack of social support	24 (6%)	6 (9%)
Housing		
Living with friends or family	121 (29%)	27 (36%)
Own or rent	250 (60%)	32 (43%)
Homeless	26 (6%)	9 (11%)
Shelter	5 (1%)	2 (3%)
Other	15 (4%)	5 (7%)
Food access issues	50 (12%)	9 (12%)
Substance abuse		
Current user	4 (1%)	3 (4%)
Past user	46 (11%)	21 (26%)
Never used	293 (70%)	48 (64%)

CHW activities

CHW services included office visits, phone calls, home visits and resource referrals. Most participants received phone calls and very few received home visits due to COVID restrictions. Most resource referrals were provided during T1. The most common type of resource the CHW provided was prescription assistance followed by vision. Housing referrals were the least common. Resource referrals were the most common services the CHW provided compared to other CHW services in each category at all three time points.

Progress reports

Due to COVID, enrollment into the AHS program was paused for a month and the program experienced temporary furloughs and staff turnover over the subsequent months. Due to COVID restrictions during that time, CHWs were still not able to conduct home visits and accompany individuals to doctor appointments; therefore, communication with individuals was primarily conducted by phone. Further, CHW activities focused on providing education on COVID vaccinations.

Healthcare utilization outcomes

The South Carolina Department of Revenue and Fiscal Affairs provided data related to ED visits, inpatient admissions, length of stay, and total cost for participants in the intervention group that were served from September 2019 through August 2021. As shown in Table 3, during the pre-enrollment period, participants served by the CHW had much higher rates of ED usage, inpatient admissions, longer lengths of stay, and a greater cost of care compared to those not served by CHWs.

Since the pre-enrollment period (T0) was fall/winter, the most appropriate comparison point is T2 (fall/winter). At that time, the group served by the CHW showed a larger decrease in rates of ED visits than the group not served by CHWs. Additionally, while participants served by the CHW showed a

decrease in rates of inpatient admissions, inpatient days, and average cost at T2, those not served by CHWs showed an increased rate of those types of utilization.

Table 3. Utilization data over T0 pre-enrollment and T2 post-enrollment with percent change

	T0: 6 months pre-enrollment		T2 Enrollment 7-12 mos		Change	
	No CHW n=417	CHW n=75	No CHW n=417	CHW n=75	No CHW n=417	CHW N=75
ED visits/participant	0.42	1.43	0.37	0.81	-12%	-43%
Inpt admit/participant	0.03	0.31	0.07	0.16	133%	-48%
Inpt day/participant	0.33	1.59	0.35	1.45	6%	-9%
Cost/participant	\$894	\$5,508	\$1,377	\$3,331	54%	-40%
Annualized cost	\$1,788	\$11,016	\$2,754	\$6,662	54%	-40%

* Total costs include all ED and inpatient costs and were estimated using 2020 Healthcare Cost and Utilization Project (HCUP) costs to charge ratios.

Return on investment

AHS program managers agreed with the estimated annual program cost of \$79,523 per employed CHW (i.e., salary and benefits, percentage of supervisors’ salary and benefits, mileage reimbursement, cell phone allowance, costs for work phones and computers, CHW training, and marketing for the CHW program) based on a review of the literature [11]. The actual cost per participant was subtracted from the projected cost per participant to determine the total amount saved. Assuming an increase in overall cost of 54% as observed at T2 in the group not served by CHWs, the projected annual cost for care for the CHW group would have been \$16,965 per participant. Actual costs at T2 were \$6,662 per participant so estimated annual savings were \$10,303 per patient per year. **Therefore, for every \$1 invested in the CHW program, it saved \$9.72 in averted and future costs.**

Table 4. ROI calculations

ROI calculations	
Annual CHW program costs	\$79,523
Annual CHW patient load*	75
Annual cost per patient	\$1,060
Savings per patient per year	\$10,303
Benefit:Cost	\$9.72:\$1.00

BirthMatters

Site description

BirthMatters provides community doula support to young, low-income, expectant families in Spartanburg. BirthMatters doulas are CHWs who provide skilled and supportive services to families from early pregnancy through the infant’s first birthday, including during labor and delivery, at no cost to participants.

Sample

The priority population were Medicaid- eligible pregnant individuals, 25 years old and younger, in Spartanburg County. BirthMatters provided data at enrollment to delivery (T1), delivery to three months post-delivery (T2), and three months post-delivery to six months post-delivery (T3). A total of 87

participants were enrolled between October 3, 2018 and June 2, 2021 and were served for an average of 15 months. Of the 87 participants, 82 had data at three months post-delivery and 79 had data at six months post-delivery.

Intervention

At the time of the study, BirthMatters employed three dual doula/CHWs that developed mutual, trusting, and nurturing relationships with participants during their pregnancy. The SDoH focus areas of BirthMatters included access to health services, housing, mental health, intimate partner violence, and health equity based on racial disparities of infant/maternal mortality. They also focused on supporting participants' reproductive life plans by helping them identify and acquire their postpartum family planning method of choice.

Health related social needs

BirthMatters collected SDoH related information at enrollment (Table 5). While the majority of participants (98%) had regular prenatal care, the proportion of the sample that reported not having safe housing was 19%, and 17% reported a history of abuse. Anxiety (33%) and depression (29%) were the most commonly reported mental health issues, and the majority of participants (66%) needed access to community services.

Table 5. SDoH indicators at enrollment

SDoH indicators	n= %
In need of safe housing	30 (19%)
History of abuse	15 (17%)
Attending regular prenatal care	84 (98%)
Mental health history	
Depression	25 (29%)
Anxiety	28 (33%)
Bipolar Symptoms	5 (6%)
PTSD	4 (5%)
Suicidal Ideation	5 (6%)
Suicide Attempt	8 (9%)
Self-Harm	5 (6%)
Other	13 (15%)
No Concerns	28 (33%)
Community services needed	
Education	5 (6%)
Substance abuse	3 (4%)
Housing	15 (17%)
Employment	8 (9%)
Other	18 (20%)

CHW activities

Doula/CHWs provided a number of services to address identified needs including home visits, family planning, depression screening and referrals for mental health, partner violence, and housing. On average, doulas provided 18 home visits with each participant prior to delivery, 13 home visits in the first three months post-delivery, and nine home visits between three months post-delivery and six months post-delivery. Additionally, doula/CHWs discussed long-acting reversible contraception (LARC)

with families an average of two times pre-delivery, two times in the first three months post-delivery and once between three months and six months post-delivery.

Data indicate that doula/CHWs were effective in supporting their participants to meet some of their SDoH needs. While 34% of participants were not in a permanent, stable housing situation at enrollment, only 8% still needed permanent housing by six months postpartum. Doula/CHWs assisted 12 participants to move from temporary to permanent housing during their pregnancy and postpartum. Similarly, doula/CHWs' focus on partner violence had positive results- the percentage of participants who needed help with partner violence decreased over time. Table 6. displays these SDoH indicators by time.

Table 6. CHW activities and SDoH indicators

CHW activities and SDoH indicators	T1: Enrollment- Delivery n=87	T2: Delivery- 3 months n=82	T3: 3 months- 6 months n=79
Average # of home visits each participant received	18	13	9
Housing			
Participants in permanent housing	57 (66%)	67 (84%)	71 (92%)
Participants in temporary shelter	14 (16%)	2 (3%)	2 (3%)
Participants needing referral to a housing CBO	14 (16%)	9 (11%)	3 (4%)
Partner violence			
Participants referred to internal therapist	19 (22%)	9 (11%)	6 (8%)
Participants with no need identified	65 (76%)	67 (84%)	69 (90%)

Regarding mental health outcomes, the percentage of the participants that doula/CHWs referred to BirthMatters' internal therapists decreased over time, but the number of participants with no mental health needs identified stayed the same. Of the 87 participants served, 87% were screened for depression pre-delivery, with 25% (or 22 participants) having scores indicating at least mild levels of symptom severity. At T2, 82 participants were screened for depression (82% of all participants served) with 30% (or 26 participants) having scores indicating at least mild levels of depressive symptom severity (Table 7). T3 mental health screening data was unavailable.

Table 7. Mental health outcomes

Mental health outcomes	T1: Enrollment- Delivery (n=87)	T2: Delivery- 3 months (n=82)	T3: 3 months- 6 months (n=79)
Mental health			
Participants referred to internal therapist	48 (56%)	39 (49%)	28 (36%)
No need identified	36 (42%)	35 (44%)	36 (51%)
Depression screenings completed	76 (87%)	71 (82%)	--
Depression severity			
No depression or minimal depression	65 (75%)	61 (70%)	
Mild	19 (22%)	21 (24%)	
Moderate	2 (2%)	4 (5)	
Moderately severe	1 (1%)	1 (1%)	
Severe	0 (0%)	0 (0%)	

Progress reports

The main findings from the progress reports were that enrollment into the BirthMatters program was described as, “steady” for all reporting periods and that COVID did not negatively impact the number of individuals enrolled.

Maternal and child health outcomes

BirthMatters focused on measuring and tracking data related to reduction of repeat pregnancy and improved rates of maternal/infant health outcomes, including healthy birth weight, reduction in NICU admissions, infant mortality, and preterm birth. 22% of participants who gave birth had a cesarean section, 92% of newborns were normal weight with an average birth weight of 6 lbs. 13 oz or 3090 grams, and 10% of newborns were admitted to the NICU at delivery. There was one infant inpatient admission at three months post-delivery and one admission at six months post-delivery. 90% of mothers were breastfeeding at three months post-delivery and 52% continued breastfeeding at six months post-delivery. 66% of participants were using some form of contraception at three months post-delivery and 69% at six months post-delivery with 34% and 33% using long-acting reversible contraception (LARC) at three months and six months post-delivery, respectively.

Outcomes for participants served by the BirthMatters program were compared to historical data from individuals giving birth in Spartanburg County between 2013 and 2016 who were under the age of 24 and insured by Medicaid (Table 8). Because the data was based on historical data, the percentages are projected, meaning they are expected outcomes if there was not an intervention; therefore, the historical data provides a comparison group to better understand the impact of the BirthMatters program. For the comparison group, the average rate of cesarean section was 26.6% with an additional cost of \$7,866 per birth. Additionally, the average rate of NICU admission was 11.8% with a cost of \$50,197 per admission. The average breastfeeding rate in SC was 66.8% and the cost savings per breastfed newborns was estimated at \$11,258. A previous study among women enrolled in SC Medicaid estimated the percentage using LARC at approximately 11% [13]. It has also been estimated that for every dollar spent on LARC, \$7.09 is saved [14]; the average cost of LARC in Spartanburg County is \$943 so estimated savings per LARC would be $\$7.09 * \$943 = \$6,686$.

Table 8. Estimated savings due to clinical outcomes

Outcome	BirthMatters N=79		Comparison group N=79		Estimated savings	Total costs/savings
	%	N	%	N		
C-section	21.5	17	26.6	21	4.0 averted * \$7,866	\$31,464
NICU	10.1	8	11.8	9.3	1.3 averted * \$50,197	\$65,256
Breastfeeding	89.9	71	66.8	52.8	18.2 more * \$11,258	\$204,896
LARC	34.2	27	11	8.7	18.3 more * \$6,686	\$122,354
Total saved	--	--	--	--	--	\$423,970
Total saved per client (=Total Saved/# of participants)					--	\$5,367

Return on investment

The return on investment (value of the benefits divided by the costs of the program, which includes salary and benefits, percentage of supervisors’ salary and benefits, mileage reimbursement, cell phone allowance, costs for work phones and computers, CHW training, and marketing for the CHW program) was calculated by dividing the \$5,367 per person annual savings from the CHW intervention period by

the \$2,527 per person annual cost of the CHW, yielding a benefit cost ratio of 2.12:1. **Therefore, for every \$1 invested in the CHW program, it saved \$2.12 in averted and future costs.**

Table 9. ROI calculations

ROI calculations	
Estimated annual program costs	\$156,668
Estimated annual patient load	62
Estimated annual cost per patient	\$2,527
Estimated savings per client per year	\$5,367
Benefit:Cost	\$2.12:\$1.00

Prisma Health

Site description

Prisma Health is the largest not-for-profit health organization in SC, serving more than 1.2 million patients annually. Prisma Health Upstate (PHU) began incorporating CHWs into their service delivery in 2015 with the goal of improving health outcomes for patients who are low-income and uninsured and enrolled in the AccessHealth program.

Sample

For this study, PHU provided data for the patient population that is currently enrolled in the AccessHealth programs in the Upstate region. Data were collected at five time points: six months pre-enrollment (T0), one to six months post enrollment (T1), seven - 12 months post enrollment (T2), and 13 - 18 months post enrollment (T3), and one to six months after being discharged (T4). The patient population was 148 patients who were enrolled in the program between May 18, 2020, and October 19, 2020. Of these patients, 86 patients were enrolled for less than 6 months, 37 participants for 6 - 12 months, 22 participants for 12 - 18 months and 3 participants for 18 months or longer for an overall average of 5.9 months.

Intervention

At the time of the study, PHU employed five CHWs. Their SDoH focus areas included access to health care services, connection to community resources (i.e. food insecurity, housing availability, financial assistance, etc.), health literacy, social support and advocacy, and access to education, employment, and training opportunities (Table 10).

Health related social needs

The PHU team collected SDoH and self-reported healthcare utilization data using the AccessHealth Comprehensive Report. As displayed in Table 10., housing was by far the most common need among patients.

Table 10. SDoH needs

SDoH needs	n= %
Stable housing	135 (91%)
Safe housing	135 (91%)
Need PCP	87 (59%)
Medical home	64 (43%)
Transportation need	50 (34%)
Help reading	46 (31%)
Inpatient admissions/surgery (self-reported)	39 (26%)
Medication access	34 (23%)
Preventive screenings	19 (13%)

CHW activities

The main CHW activities included phone calls, transportation arrangement, patient education, social support, discussion of community resources, identifying access to food, providing utility assistance and health care services. In general, CHW activities decreased over T1, T2, and T3 (Table. 11).

Progress reports

Due to COVID, CHWs at Prisma Health were no longer able to provide home visits during the entire study period and were only able to communicate with patients by phone. CHWs were also directed to staff COVID testing sites at least one to two times a week, which pulled them away from their regular job duties. CHWs at Prisma Health also experienced high turnover during the study. At the beginning of the study there were five CHWs employed, and during the year, two resigned. The following year, two more CHWs were hired, but during the last three months of the study, four CHWs resigned.

Table 11. CHW activities

Percentage of AccessHealth patients that received CHW services	T1: 0-6 months (n=148)	T2: 7-12 months (n=148)	T3: 13-18 months (n=148)
Transportation	23 (16%)	18 (12%)	18 (12%)
Patient education	26 (18%)	21 (14%)	13 (9%)
Social support	55 (37%)	40 (27%)	23 (16%)
Community resources	41 (28%)	33 (22%)	20 (14%)
Access to food	21 (14%)	18 (12%)	7 (5%)
Utility Assistance	11 (7%)	4 (3%)	2 (1%)
Healthcare services (eye, dental, mental, etc.)	11 (7%)	6 (4%)	9 (6%)

Clinical and healthcare utilization outcomes

The health outcomes tracked and monitored through this pilot consisted of patient utilization data including ED visits, inpatient discharges, primary care and specialty care visits, total cases, and total costs saved (Table 12). Clinical outcomes, healthcare utilization, and healthcare cost data were tracked using PHU's electronic health record system. Data indicate decreases in average number of ED visits, inpatient admissions, and specialty care visits per patient, and an increase in primary care visits at six months post discharge relative to six months pre-enrollment. Total cost of care also decreased at six months post discharge compared to six months pre-enrollment.

Table 12. Healthcare utilization outcomes

Avg Per Pt	T0: 6 months pre-enrollment (n=148)	T1: 0-6 months (n=148)	T2: 6-12 months (n=148)	T3: 13-18 months (n=148)	T4: 1-6 months post discharge (n=148)	6-month change (n=148)
ED visits	1.5	1.1	0.95	0.65	0.74	-0.76
Inpatient admissions	0.34	0.15	0.17	0.10	0.11	-0.23
Specialty care	5.59	4.31	3.51	2.26	2.82	-2.77
Primary care	2.14	3.86	3.15	2.08	2.78	0.67
Total cost	\$8,804.23	\$5,467.68	\$4,724.95	\$4,053.95	\$4,382.63	--
Annualized data	\$17,608	--	--	--	\$8,765	--
Annual savings	--	--	--	--	\$8,844	--

For those participants in which clinical data were available. based on the change from T0 to T4, there was a decrease in total cholesterol levels, systolic and diastolic blood pressure levels, and Body Mass Index (BMI) levels, and a slight increase in hemoglobin A1C (HbA1C) (Table 13).

Table 13. Clinical outcomes

	T0: 6 months pre-enrollment	T1: 0-6 months	T2: 6-12 months	T3: 13-18 Months	T4: 1-6 months post discharge	6-month change
HbA1C	6.84	7.36	6.77	7.04	6.92	1.16
Total Cholesterol	203	188.46	178.05	167.58	166.16	-18.15
Systolic BP	135.33	125.1	127.8	131.07	125.48	-7.28
Diastolic BP	83.67	78.66	77.29	80.1	76.51	-8.56
BMI	33.45	29.88	29.91	31.29	31.03	-7.23

Return on investment

The return on investment (value of the benefits divided by the costs of the program, which includes salary and benefits, percentage of supervisors’ salary and benefits, mileage reimbursement, cell phone allowance, costs for work phones and computers, CHW training, and marketing for the CHW program) was calculated by dividing the \$8,844 per person annual savings from the CHW intervention period by the \$1,434 per person annual cost of the CHW, yielding a benefit cost ratio of 6.17:1. **Therefore, for every \$1 invested in the CHW program, it saved \$6.17 in averted and future costs.**

Table 14. ROI calculations

ROI calculations	
Estimated annual program costs	\$551,983
Estimated CHW team’s annual patient load	385
Estimated annual cost per patient	\$1,434
Estimated savings per client per year	\$8,844
Benefit:Cost	\$6.17:\$1.00

Tandem Health

Site description

Tandem Health is a Federally Qualified Health Center (FQHC) and an accredited patient-centered medical home providing comprehensive, personalized healthcare services to the Sumter community regardless of their ability to pay.

Sample

Tandem Health chose to focus on a population that was dually eligible for Medicare and Medicaid (n=41) with uncontrolled hypertension and diabetes, or multiple ED visits within the previous 12 months. Patients were enrolled between June 2020 and February 2022. Nine patients were enrolled for less than six months, ten for six-12 months, 11 for 12-18 months, and 11 for longer than 18 months. Six patients had been discharged at the close of the study. Of those, three had been discharged for less than six months and three had been discharged for at least six months.

Intervention

One full time CHW and one part time CHW (1.4 full time equivalent) provided health education, self-management skills, and linkages to community support services to increase their control of chronic diseases and better use of available resources. Tandem Health CHWs addressed the following SDOH in targeting this specific population: low income, lack of health literacy, access to medication, and food insecurity.

Health related social needs

CHWs captured SDOH data using the Institute of Families and Societies (IFS) Assessment Tool at enrollment to six months (T1). A total score was based on responses to a social determinants scale, with higher scores indicating higher vulnerability. There were four categories to measure the social environment: education (that ranged 1 – 4), economic stability (that ranged 1 - 16), and social/community (that ranged 0 - 15). Other scales were health and healthcare (that ranged from 0 - 17) and physical/built environment (that ranged from 0 - 2). The IFS tool also indicates whether a patient should receive a referral for social services, pharmacy assistance, mental health services, and substance abuse services. Total scores on the IFS tool range from 2 - 54 with higher overall scores, within each range, indicating greater vulnerability.

Table 15 lists the average social determinants scores for Tandem’s participant population, as well as the percentage of participants that had recommended referrals per referral type. CHWs identified social service needs for most of the patients (88%), including pharmacy assistance for 24% of patients, mental health services for 22% of patients, and substance abuse treatment for 5% of patients.

Table 15. SDoH indicators

SDoH indicators	Score	Score range
Social environment		
Education	3.12	1-4
Economic stability	6.15	1-16
Social/community	2.85	0-15
Health and healthcare	7.32	0-17
Physical/built environment	.09	0-2
Referrals	N=41	%
Social services	36	87.8%
Pharmacy assistance	10	24.4%
Mental health services	9	22%
Substance abuse services	2	4.9%

CHW activities

The most common CHW activities were phone calls and office visits, which decreased across T1, T2, T3. Due to COVID, there were only two home visits during the first six months of the study. Specifically, CHWs made resource referrals for food security (95%), housing (22%), transportation (22%), and health education (15%) to address social needs (Table 16).

Progress reports

COVID restrictions impacted CHWs' activities throughout the time period; over the entire study there were only seven home visits. One of the CHWs only worked two days a week, and in addition to their limited availability to patients, a portion of their time was spent scheduling COVID vaccinations. Another challenge noted was that some patients were ambivalent towards returning phones calls and following through with their care plans.

Table 16. CHW activities

CHW activities	T1:	T2:	T3:
	1-6 months (n=41)	7-12 months (n=32)	13-18 months (n=22)
Phone calls	35 (85%)	15 (47%)	9 (41%)
Office visits	38 (93%)	30 (94%)	21 (96%)
Referrals	Participants who received referrals		
Food security	39 (95%)		
Housing	9 (22%)		
Transportation	9 (22%)		
Health education	6 (15%)		

Clinical and healthcare utilization outcomes

The Tandem team collected clinical outcomes and healthcare utilization data from patient electronic health records (Tables 17 and 18). The percentage of patients visiting the ED decreased from 40% pre-enrollment to 28.6% at T3. The average number of ED visits also declined from pre-enrollment (mean = 1.6) to T3 (mean = 0.5). The percentage of patients with inpatient admissions increased from 15% pre-enrollment to 19.1% at T3, but the average number of admissions decreased. Primary care attendance increased from 67.7% pre-enrollment to 71.8% at T3. Data from the 2015-2017 Medical Expenditure Panel Survey were used to estimate change in healthcare spending associated with changes in healthcare utilization for the US, dual eligible, high-need adult population [14]. Clinical data suggested a decrease in systolic and diastolic blood pressure and a slight increase in HbA1c levels.

Table 17. Utilization Outcomes

N=41 Avg Per Pt	T0: 6 months pre- enrollment	T1: 1-6 months	T2: 7-12 months	T3: 13-18 months
Primary care visits	2.0	2.3	2.1	2.1
Primary care show rate	67.7	86.1	81.4	71.8
ED visits	1.6	5.5	4.6	0.5
Inpatient admissions	0.2	0.28	0.26	0.17

Table 18. Clinical Outcomes

Avg Per Pt	T0: 6 months pre- enrollment	T1: 1-6 months	T2: 7-12 months	T3: 13-18 months
HbA1C	6.84	7.36	6.77	7.04
Systolic BP	135.33	125.1	127.8	131.07
Diastolic BP	83.67	78.66	77.29	80.1

The increase in utilization of primary care and decrease in ED visits and inpatient admissions provided an annual savings of \$2,265 per person (See Table 19).

Table 19 . Economic Benefits

	Utilization change from T0-T3	Cost change from T0-T3	Net economic benefit from T0-T3
Primary care visits	0.05	\$243	-\$12.15
ED visits	-1.08	-\$679	\$733.32
Inpatient admissions	-0.03	-\$13,719	\$411.57
Total	--	--	\$1,132.74
Annualized savings	--	--	\$2,265

Return on investment

The return on investment (value of the benefits divided by the costs of the program) was calculated by dividing the \$2,265 per person annual savings from the CHW intervention period by the \$3,416 per person annual cost of the CHW, yielding a benefit cost ratio of .66:1. ***In other words, for every \$1 invested in the CHW program, it saved \$0.66 in averted and future costs.***

Table 20. ROI calculations

ROI calculations	
Estimated annual program costs	\$140,044
Estimated annual patient load	41
Estimated annual cost per patient	\$3,416
Estimated savings per client per year	\$2,265
Benefit:Cost	\$0.66:\$1.00

Additional Study Site

An additional study site was selected to participate in the study; However, they lacked the staff resources to complete the data collection necessary to conduct the analysis. The site was a public substance abuse service provider that focused on reaching males with at least one in-patient hospital stay or ED visit in which drug or alcohol abuse was the primary or secondary diagnosis. Additionally, the target population included males at risk of developing chronic diseases like hypertension or diabetes. During this pilot opportunity, the site developed a peer-to-peer CHW model based on input from individuals with lived experiences to address barriers to improve their engagement in preventive health. The site addressed the following SDOH in targeting this specific population: education, housing, employment, transportation, and health literacy. During the study period, they reported that the county's overdose deaths were more than twice the amount in 2020 compared to 2019, attributed to the COVID pandemic. Issues among the individuals served were described as "complex with multiple social and emotional factors complicating recovery."



03

Discussion

Discussion

This ROI study demonstrated that CHWs, integrated across study sites, were associated with reduced healthcare utilization costs and several positive clinical outcomes. Three of the study sites, AccessHealth, Prisma Health, and Tandem Health, examined utilization rates of the ED, inpatient admissions, and primary care. At these sites, by the end of the study, there was a reduction of costly ED visits and inpatient admissions, and an increased utilization of primary care services. While primary care costs did increase at Tandem Health, these findings indicate that participants that engaged with CHWs were better able to connect with appropriate healthcare services, which overall saved and averted future costs.

AccessHealth Spartanburg showed the highest ROI. As displayed in Table 2, individuals that were assigned to the CHW intervention group had a higher number of health-related social needs compared to the non-intervention group without CHWs. If the non-intervention and intervention groups had study populations with similar levels of social needs, there may have been an even higher level of ROI for the site.

While BirthMatters didn't collect healthcare utilization data, their population showed a decrease in c-section procedures and NICU admissions, and higher rates of breastfed infants and participants that chose to use long-acting reversible contraception.

These study findings support previous study findings that CHWs are a critical link between communities and health systems, and there is strong evidence that they are effective in contributing to improved health and lower healthcare costs among vulnerable populations [11,14]. However, these findings need to be interpreted with caution as some outcomes are due to seasonal utilization, and although each study site had a positive benefit to cost ratio, savings in health care costs do not necessarily accrue to the program funder. For example, if a community health center employed a CHW, which resulted in savings in hospital care, the community health center does not benefit from those savings.

All sites indicated that COVID related impacts were the most challenging issue facing the work of CHWs as part of their care model (Table 21), as this study was conducted during the period of strictest COVID precautions, including the state of emergency declaration. All sites reported not being able to conduct home visits or conducting a very limited number of home visits with the individuals they served. Study sites also reported staff turnover, which put an additional strain on the CHWs' capacity to address individuals' health related social needs. Further, CHWs' activities changed from addressing health related social needs to providing COVID related services to community members. AccessHealth also reported enrollment was paused for a month, as processes were put into place to enroll clients remotely, and CHWs were furloughed for three months, both of which negatively impacted the number of individuals enrolled in the program. Also, during that time, CHWs were not able to coordinate needed referrals and services as they had prior to COVID.

Table 21. Covid related challenges by organization

Organization	COVID related challenges
AccessHealth Spartanburg	<ul style="list-style-type: none"> - Enrollment into the AHS program was paused for a month, as processes were put into place to enroll clients remotely - All CHWs were furloughed for three months - CHWs unable to coordinate needed referrals and services - CHWs unable to conduct home visits and accompany individuals to doctor appointments - CHWs’ activities changed from addressing individuals’ health related social needs to providing education on COVID vaccinations - Staff turnover
BirthMatters	<ul style="list-style-type: none"> - Doula/CHWs were unable to conduct home visits for nine months (March-December 2020) due to COVID. - Doula/CHWs were only able to provide virtual birth support for five months (March-August 2020).
Prisma Health Upstate	<ul style="list-style-type: none"> - CHWs were unable to provide home visits during the study - CHWs’ activities changed from addressing individuals’ health related social needs to staffing COVID test sites up to twice a week - Staff turnover
Tandem Health	<ul style="list-style-type: none"> - Very limited number of home visits - CHWs’ activities changed from addressing individuals’ health related social needs to scheduling COVID vaccinations - Staff turnover

Despite the COVID related challenges, the results of this study supported findings from previous studies that have demonstrated integrating CHWs can be a cost-effective strategy to address health inequities, which are driven largely by SDoH [15,9]. Future recommendations also include leveraging policies and resources to increase access to affordable and supportive housing, transportation, and mental health services, as indicated as the most commonly reported health related social needs across study sites.



04

Strengths and Limitations

Strengths and Limitations

The strengths of this study included the accuracy of the healthcare utilization data provided by the South Carolina Department of Revenue and Fiscal Affairs Office, which has a rigorous system for tracking and analyzing claims data. Another strength was that participants were tracked for up to 18 months, which revealed patterns of healthcare utilization, health outcomes, and CHW activities over time to better understand the added economic and health benefits of implementing a CHW model. Also, this study included comparison groups or comparisons to a similar non-intervention group across sites, which demonstrated a positive association between CHWs involvement and reduced costs of providing care for populations with high levels of health-related social needs. This study also underscores the importance of the partnerships between the partner sites and CCHA, who would provide timely technical assistance based on the sites' requests and the CARE evaluation team, who would provide continuous quality improvement based on the submitted progress reports, which was used to inform decisions.

These findings, however, should be interpreted in light of several limitations. This study took place during the height of COVID; therefore, CHWs' roles to address individuals' health related social needs were diminished, as they were required to engage with individuals over the phone rather than in-person during home visits, and their roles were re-directed to include COVID related tasks. A future ROI study would be needed to determine if the amount of averted costs are greater now that COVID is endemic and CHWs have returned to their usual pre-pandemic roles.

Another limitation includes the variety of CHW models included in the study; participants at each site were identified and recruited according to different guidelines. Also, demographic data was not collected at each site in effort of reducing the sites' burden to meet study requirements; therefore, participants' characteristics may not have been representative of the larger population or of those in comparison groups. It is also possible that positive outcomes attributed to the interventions were due to other factors outside the study (e.g., policies, other available resources, economy, etc.). Further, most study sites used SDOH assessment tools focused on their programmatic needs, which allowed for questions to be tailored to specific populations to help identify resources and reduced sites' administrative burden. However, each site's operational definitions of SDOH and outcomes were varied. It is recommended that future studies that examine SDOH addressed by CHWs come to a consensus on defining SDOH indicators and select validated and standardized SDOH screening tools. This would benefit organizations to not only be able to identify needs and resources on an individual level but would also allow for data to be aggregated and then leveraged for advocacy and to inform policy priorities on a state or national level.



05

Concluding Thoughts

Concluding Thoughts

Through CHW integration, this study demonstrated financial cost savings for organizations in South Carolina despite program related challenges due to COVID. Results of this study will contribute to building the regional and national evidence base for the effectiveness of CHWs and need for sustainable financing models for this workforce. Furthermore, along with the favorable economic ROI, there is a social return; although this is difficult to measure, from the participants' perspective, it extends beyond financial value. However, as indicated in recent findings [5], funding and sustainability of CHW roles are a challenging aspect of integrating CHWs into organizations. Subsequently, CHWs' ability to promote public health and well-being has been hindered by inadequate, short-term, fractured funding [14]. From the mounting evidence that the integration of CHWs reduces healthcare costs while improving health outcomes, the extent that sustainable funding streams are made available to support CHWs will determine if this innovative and cost-effective strategy can be implemented at scale.

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