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ORIGINAL PAPER

A Case Study of a Community Health Worker Program Located in Low-Income Housing in Richmond, Virginia

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Abstract

We reviewed data from the electronic health data system used by Community Health Workers (CHWs) in the Richmond/Henrico Health District of the Virginia Department of Health from January 1st 2013 to December 31st 2020, to map the Community Health Workers' impact on Social Determinants of Health. We also interviewed the CHWs to obtain demographic information and information about the challenges their communities face. Most referrals were for Healthcare Access (48.7%) and Economic Stability (38.3%), while Neighborhood and Built Environment (0.09%) was the least used referral in the Social Determinants of Health during the time under review. Community Health Workers also carried out 1367 and 565 Blood Pressure and Blood Sugar measurements respectively during the period. The Community Health workers were all women and their education ranged from High School graduate to Master's degree graduate and they served as Community Health Workers for time ranging from 1 to 8 years. We found their answers to the questions on the issue plaguing the community they serve to indicate empathy and understanding of the issues of low-income communities. Having CHWs working as part of the public health system to deliver health promotion and provide referrals for social determinants of health could serve as a model for improving health access and impacting Social Determinants of Health positively for low-income populations across the country.

Keywords Community health workers · Low-income housing · Health inequities · Social determinants of health

Introduction

The COVID-19 epidemic in the US made evident the issue of health inequities in the US, but this issue goes back to the founding of the country. As the pandemic evolved in the summer of 2020, it soon became obvious that there were higher disease rates and higher death rates from COVID-19 in minority populations [1]. These populations already suffer from higher level of disease burden [2] and any intervention that impacts social determinants of health in low income and minority populations would help alleviate the underlying conditions that lead to high disease burden and mortality in minority populations in general. Interventions would also reduce the death from opportunistic diseases like COVID-19 which tend to cause higher mortality in people with such underlying conditions. In Europe, Bartscher et al. [3] showed that increased social capital led to fewer COVID-19 rates and deaths and Community Health Workers have been shown to help poor and disenfranchised communities increase social capital by advocating for their communities and linking the residents in their communities to social services [4–6]. Ballard et al. [7] highlighted how Community Health Workers could be used effectively in the response against COVID-19 and gave examples of how they could be deployed such as distribution of PPE, distribution of home test kits, provision of information on testing and vaccination.

The use of CHWs in academic health centers and in rural communities and their integration into academic and other health facilities has been reviewed in the literature [8, 9], but there are few programs where CHWs are embedded into the public health system and focus on public housing residents.

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There have been reports on the use of CHWs in public housing in NYC and Boston for periods lasting less than a year [10–12]. Our report examines a program in the Richmond/Henrico Health District of Virginia in which CHWs have been embedded into low-income housing for 10 years. In this paper we provide the review of the data in the electronic health records for 7 years (2013 to 2020) from the Community Health Workers program in the Richmond/Henrico Health district of the Virginia Department of Health (VDH), where the CHWs work out of Resource Center offices in Low-Income Housing. Our goal is to map out the external resources that Community Health Workers link to the population they serve, and to begin to understand how CHWs influence factors that deprive low-income populations the social networks that inhibit their ability to thrive.

Method

We reviewed the data available in the electronic data recording system used by the CHWs called CareConnect®. Secondly, we interviewed 9 Community Health Workers who were former or current employees of the program. We obtained approval from William and Mary IRB and VDH IRB in December 2020 and May 2021 respectively, and then conducted the interviews between June 1st and August 30th of 2021. The interviews were conducted using Zoom and were taped and transcribed using the Zoom transcribing application. Each CHW was invited to participate by email and when they accepted the invitation to participate in the study, they were sent an informed consent form through Docusign, and an interview date and time was scheduled. Demographic data from the interviews are presented in this report. The interviews were conducted by one of the researchers with one or 2 undergraduate research assistants and they took approximately 30 to 45 min via zoom. In this paper we report the demographic information of the CHWs and their answer to the question on the major challenge the community they serve faces.

Results

Figure 1, shows the location of the low-income housing communities served by the Community Health Worker program in the Richmond/Henrico Health district of Virginia.

There were 20,166 encounters with clients from January 1, 2013 to Dec 31st 2020, 17,580 were referrals and 2586 were vital signs taken. Table 1, shows the number of referral contacts per year. There were also 1367 Blood Pressure measurements and 565 were Blood sugar measurements carried out by CHWs during the same period. Table 2 shows the category of referrals used in the 7 years under review and the number of referrals for each. Employment/Self Sufficiency was the most used and the 3 top referrals for this category were: Help with Employment Application and Resume with 1,343 referrals, Referral to City Workforce Pipeline with 643 and Referral to Virginia Employment Commission with 110 referrals.

For the second highest referral category, Primary Care Physicians/Specialty, the highest referral was to Daily Planet Southside which is a Safety Net Clinic in the South of Richmond where few other primary care facilities welcome uninsured and underinsured individuals. Daily Planet Southside had 434 referrals within the period under consideration. Other referrals to Primary care providers was 440 referrals and there were 333 referrals to the Resource Center clinics located in the Low-income housing and have weekly visits by a Health Care provider, usually a nurse practitioner. For Housing/Rental Assistance the agency with the highest referral was the Caritas Furniture Bank which is associated with the Catholic church and clients are sent there to obtain furniture for low cost when they move in or need furniture. There were 247 referrals to the Richmond Redevelopment and Housing Authority Resident Assistance.

In Table 3, we map each referral category to one of the five Social Determinants of Health factors, and we found that majority of the referrals were for Healthcare Access and Economic Stability and together they made up a majority of the referrals at 87% of all referrals. Neighborhood and Built environment had the least referrals at 0.9%.

Table 4 shows the medical conditions noted in the client records and High Blood Pressure was the highest recorded condition at 47% of the recorded conditions. Table 5 shows insurance status of clients and the majority were either uninsured or on Medicaid. Majority at 65.5% were unemployed as shown in Table 6.

Nine Community Health Worker were interviewed, 7 were current CHWs in the Richmond/Henrico Health District and two were former CHWs in the Health District. Table 7, provides the demographic information on the Community Health Workers interviewed and their answers to the question of what was the biggest challenges their clients faced. The Community Health Workers were all women, and all were African-American, and one was both African American and Latina. They had served as CHWs for periods ranging from one year to 8 years and their education levels ranged from 3 with High School/GED, 3 with some College, 1 with an Associate's degree, 1 with a College degree and 1 with a Master's degree in Counselling. In response to the question on the biggest challenge their community face, the issue that came up most consistently from the CHWs was "Trust". Many felt that having trust of the community members was the most important factor in their ability to help people in the community. The also articulated the myriad of issues that plague low-income communities ability to thrive.

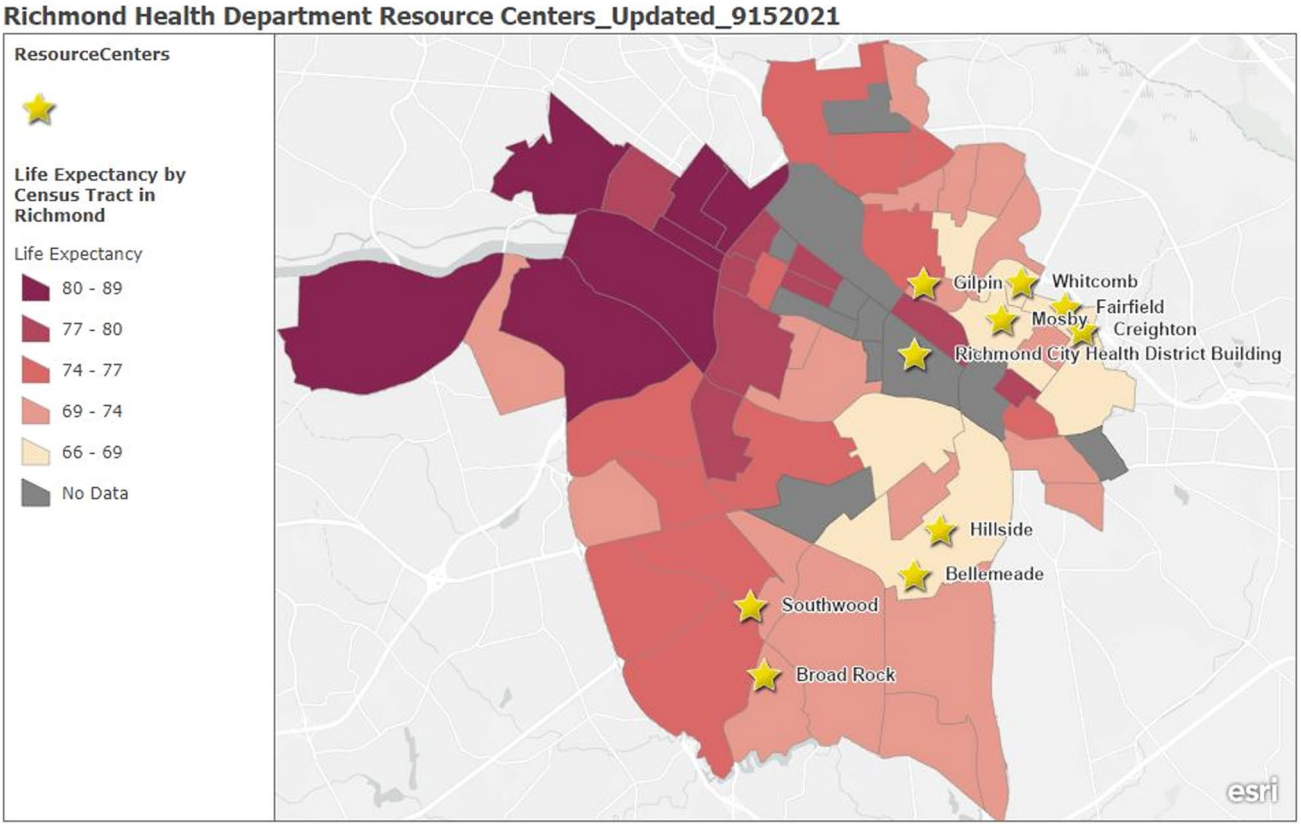

Fig. 1 Life Expectancy by Census Tract for Richmond and Location of Public Housing Communities served by Certified Community Health Workers. The communities the Community Health Workers work in are, North: Gilpin, East: Creighton, Mosby, Whitcomb, Fairfield, South: Hillside, Southwood and Broad Rock

Table 1 Number of referrals by Certified Community Health Workers per year

Year	Number of referrals
2013	579
2014	1641
2015	1558
2016	3929
2017	4047
2018	2738
2019	1853
2020	1235

There were 20,166 client contacts between Jan 1, 2013 and Dec 31, 2020 and 17,580 were referrals

Figure 2 is a diagrammatic depiction of the Community Health Workers as bridges to link low-income housing communities to external resources that improve their social capital and ability to thrive. From the data we found two main functions the Community Health Workers carry out: 1. They serve as bridges to external resources for the low-income housing residents in their communities and thus increase the social capital of individuals and the community as a whole; 2. They provide prevention health services and monitoring of health conditions by providing health checks such as High Blood Pressure measurements and Blood Sugar measurements.

Discussion

The necessity for including CHWs into the health care system for low-income communities has been provided by Pittman et al. (2015) and Lapidos et al. (2019), in that they serve poor, disenfranchised communities in ways the more formal health system cannot [13, 14]. MacCarville et al. (2021) found that CHWs integrated better with communities because they are more accessible to them and have relationships with members of the community and empathize and understand their living conditions [9].

McCollum et al., 2016 found in a review of publications on CHW programs that the programs improved equity in

Table 2 The number of referrals per each referred category from Jan 1, 2013 to Dec 21, 2020

Referral Category	# Referrals
Employment/Self-Sufficiency	2554
Primary Care Physicians/Specialty	2340
Housing/Rental Assistance	1658
Utility, Food, and Clothing Assistance	1145
Insurance Assistance	1079
Food—Clothing—Rent—Utility—Housing	1012
Medical Specialty—Other Health	846
Pregnancy	842
Education	811
Healthy Lifestyle/Nutrition	779
Medical Home	646
Mental Health/Domestic Violence/Substance Abuse	640
Women's Health	600
Maternal and Child Health	393
Dental	373
Leadership and Self-Sufficiency	357
Seasonal/Specialty Event	304
Legal Aid	300
Department of Social Security	227
Early Development/Youth (Over Age 5)	207
Exercise	153
Seniors	76
Virginia Community College System	76
Reentry Assistance	67
Children—Child Education	40
Diabetes Self Management	36
Felony Assistance	10
Financial Literacy	9
Total	17,580

access to health promotion, disease prevention and use of curative services [6]. In our review of the client database, we found that employment assistance had the highest number of referrals. This is an important social determinant of health, and this intervention is important to getting people out of public housing especially since 65% of the clients were unemployed. When we grouped the referrals based on Social Determinants of Health, Healthcare access was the most referred category followed by Economic Stability which includes Employment assistance.

Kangovi et al. (2018) using CHWs in a population living in a high poverty neighborhood whose residents were mainly uninsured or publicly insured as in our data, showed that those who got CHW intervention to assist with management of their chronic health conditions, had improved mental health and less hospitalizations [5]. Our population in this study had 47% rate of High Blood Pressure diagnosis, followed by Depression/Anxiety at 17.5% and Obesity at 16% and the CHWs carried out 1367 blood pressure measurements and 565 blood sugar measurements during the 7-year period under review. Krantz et al. [4] showed that a CHW program in rural Colorado for Coronary Heart Disease (CHD) patients, had statistically more improvement in their CHD risk compared to those not using CHWs. We were not able to measure the direct impact of CHW on health risk since we only had retrospective data but CHWs provided the High Blood Pressure measurements and Blood Sugar measurements at no cost to clients, and it could be seen as an important intervention for a population with both high rates of High Blood Pressure and Diabetes.

Bowen et al. (2016), found that Community health workers with a minimum requirement of high school graduation or GED as in our study, working in public housing in Boston, were able to effectively deliver service, and the same group carried out a study that found residents of public housing in the Boston area accepted and had improvements in weight management, nutrition, and physical activity levels due Community Health Worker intervention [11, 12]. CHWs in our study used healthy lifestyle and nutrition referrals and exercise referrals. Given the high burden of diseases that could be intervened with healthy lifestyle, nutrition and exercise in the population, ways to increase outreach and programming in these areas in ways that would be adopted by community members could be examined.

A 3-month study in New York City Public Housing using Community Health Workers also found that they improved health care access and improved social determinants of health such as reducing food insecurity and improving ability to pay rent on time and improving access to exercise and exercising among residents [10]. In this study we could not determine the effects of specific interventions, but our next step is to interview clients of community health workers to determine how they view the interventions they received from the CHWs. We were able to show that it is possible to embed CHWs into the public health system specifically to serve low-income housing where there are severe effects of social determinants of health, on health outcomes and that such CHWs show empathy and understand the needs of their communities in ways outsiders would not be able to. We feel such interventions would be valuable towards reducing health inequities due to race and income.

The cost-effectiveness of using Community Health Workers has been demonstrated in several studies mainly because they reduce use of more expensive interventions such as emergency rooms and costly medical procedures by focusing on prevention [15–17]. The need to incorporate Community Health Workers into state healthcare systems has been highlighted as a way to improve quality of health care delivery and lower costs [18]. In this paper we show that the external linkages CHWs create are in the realm of the social determinants of health that would impact people

Table 3 Mapping of Each Category to the 5 Social Determinants of Health

Healthcare	Economic Stability	Social and Community Context	Education Access	Neighborhood and Built Environment
Dental (373)	Employment/Self-Sufficiency (2554)	Department of Social Services (227)	Children-Child Education (40)	Exercise (153)
Diabetes Self Management (36)	Financial Literacy (9)	Early Development/Youth (207)	Education (811)	
Healthy Life-Style and Nutrition (779)	Food, Clothing, Rent, Utility and Housing Assistance (1012)	Felony Assistance (10)	Virginia Community College (76)	
Insurance Assistance (1079)	Housing/Rental Assistance (1658)	Legal Aid (300)	Total: 927	
Maternal and Child Health (393)	Leadership and Self-Sufficiency (357)	Re-entry Assistance (67)		
Medical Home (646)	Utility, Food and Clothing Assistance (1145)	Seasonal/Specialty Event (304)		
Mental Health/Domestic Violence/Substance Abuse (640)	Total: 6735	Seniors (76)		
Pregnancy (842)		Total: 1191		
PCP/Specialty (2340)				
Women's Health (600)				
Medical Specialty (846)				
Total: 8574				
48.7%	38.3%	6.8%	5.3%	0.9%

Table 4 Medical Diseases noted in Client Records for Data from Jan 1, 2013 to Dec 31, 2020

Medical Disease	# Clients	%
Asthma	59	8
Cancer	8	1
Depression and/or Anxiety	129	17.5
Diabetes	76	10.3
High Blood Pressure	346	47.0
Obesity	118	16.0
Total	736	100

Table 5 Insurance status of clients serviced by CHWs between Jan 1, 2013 and Dec 31, 2020

Insurance	# Clients	%
Medicaid	578	39.1
Medicaid MCO	13	0.8
Medicare	75	5.1
Private	166	11.2
Unisured	644	43.6
Total	1476	100

Table 6 Employment Status of Clients using services of CHWs from Jan 1, 2013 to Dec 31, 2020

Employment status	# Clients	%
Employed	256	27.7
Self-employed	16	1.7
Student	48	5.2
Unemployed	607	65.5
Total	927	100

living in poverty positively since this is what affects their daily lives and results in compromised health status leading to disease. The CHWs mainly work in effecting Healthcare Access and Economic Stability but they also provide health assessment interventions such as blood pressure measurements and blood sugar measurements. Given that Neighborhood and Built environment had the least number of referrals and factors such as sanitation and availability of outside leisure areas are pervasive issues in public housing, we would encourage more activity in such areas to improve the wellbeing of residents.

While the use of Community Health Workers to serve low-income communities started in low-income countries, it has been proven that they have similar effect in US communities suffering from high poverty rates as occurs with people living in public housing. The next step in our research is to delve into the work of the CHWs from their own perspective and to interview the residents

Table 7 Summary of Years of experience as CHW, Level of education and summary of their opinion on the biggest challenge facing the community they serve in the order they were interviewed

	Age	Years of Experience as a CHW	Highest level of education	Biggest Challenges Clients Have
CHW 1	48	10 years (8 years paid, 2 years volunteer)	High school	Some of the biggest challenges clients face include transportation issues, lack of childcare, financial troubles, low food security, mental illness, and a dearth of youth activities for children aged 16–18
CHW 2	31	6 years	GED	Many community members have struggles involving the social determinants of health in the form of transportation, food and housing security, clothing, and childcare. Childcare and transportation are the largest issues, but also says that substance abuse is very prevalent in the community
CHW 3	44	4 years	Some college	The biggest challenge her community faces is building trust. Gaining the trust of community members is hard, long, and slow process. Additionally, once one CHW gains a client's trust, it doesn't necessarily mean that that client will trust other CHWs
CHW 4	39	4 years	GED	The biggest challenges her clients face are related to safety. She emphasized how important it is that clients feel secure in their community and get fresh air, but said that shootings are frequent and violence has practically become a norm
CHW 5	28	3.5 years	Some college	The biggest challenges my community faces are establishing and maintaining trust. One bad experience can negatively impact someone's trust for a long time, and that makes it very difficult to build personal connections with clients. Personally, she finds the best ways to foster trust are with complete honesty and demonstrations of genuine care
CHW 6	41	3–4 years	Some college	The biggest challenges that my clients face are transportation issues, finding well-paying employment, and access to education and childcare
CHW 7	43	6 years	Master's degree in Counselling	Many challenges that my clients face are community assessments being superficial, negative mindsets, social services operating ineffectively within the community, gaps in the new Medicaid guidelines, a lack of representation in the media, a lack of community leadership, confusion about identity, and an abundance of red-tape put down by the government making it difficult to receive adequate support
CHW 8	42	3 years	Bachelor's degree	The biggest challenges the community faces revolve around trust. Community members grew distrustful after years of empty promises made by people saying they could help them. Now CHWs have to overcome these trust issues. She says that one of the most difficult parts of her job is getting people to actually show up to events and let CHWs help them
CHW 9	39	1 year	Associate's degree	There's a major lack of care and concern for the community as various issues such as food shortages, a ubiquitous presence of mold and mildew, and a lack of proper garbage disposal systems remain unaddressed. Ultimately, she believes the biggest problem in her community is people not being heard

Fig. 2 Diagram of Profile of the Communities, Community Health Workers and the External Resources they link Community members to

they have worked with, to determine the results of the CHW interventions. In this study we have mapped out how Community Health Workers embedded into Public Health programming to impact health outcome in low-income communities through interventions on social determinants of health. We believe such interventions are valuable to reducing the impact of poverty on health outcomes and getting people out of poverty. CHW programs should be a strategy used nationally by public health departments. COVID-19 has shown the need to better deliver public health to minority populations and lower income populations. Community Health Workers as part of the public health system are lower cost health personnel that are culturally aware and trusted assets to a community; they are

able to respond appropriately with sensitivity and empathy to issues raised by the communities they serve. The Community Health Workers in this study were all minority women serving predominantly minority public housing communities. We feel such approach would induce mutual trust and understanding between community residents and health workers since the CHWs would understand and use the appropriate messaging to enable their client take-up positive steps to improve their health. Their answers to the questions on the biggest challenges faced by the community they serve, indicated empathy and understanding of the issues plaguing low-income communities. They increased the social capital of their clients and communities by linking them to external resources and they also provide valuable preventive health services. Social capital as defined by Putnam (2000) involves the ability to provide bridges to external resources and having communities, especially low-income ones, be able to access resources they would otherwise not know how to access is a significant intervention especially because increase in social capital improves health [19]. By providing linkages to external resources for jobs, healthcare and the other categories in Table 2, CHWs in Richmond increase the social capital of their clients. And by providing access to health monitoring, preventive healthcare and health management, to a population with high disease burden they serve an important preventive healthcare function.

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Authors Contributions The linkage with VDH was started by IO and she wrote the manuscript. MG wrote the proposal to VDH, managed students working on the project and supervised the GIS map production using publicly available data and she also obtained the IRB approvals. AS developed the questionnaire and trained students on qualitative analyses. CW reviewed the interviews and compiled the table on CHW responses, SO downloaded data from Care Connect and summarized it. PS is the senior CCHW under whose supervision the study was carried out and explained the data in the electronic database. ST gave information on the history of the program and how the program is designed.

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Availability of Data and Materials Interview videos and data are available after obtaining permission from the Virginia Department of Health.

Code Availability Not Applicable.

Declarations

Conflict of interest None for all the authors.

Ethical Approval PHSC-2020-12-03-14655 from William and Mary and Study Number 70042 for Virginia Department of Health.

Consent to Participate Each Community Health Worker signed an informed consent through Docusign before the interview and each acknowledged signing at the beginning of each interview.

Consent for Publication No images of the interviewees will be published or are the videos available for public use. All interviewees accepted that their responses could be used for research purposes as part of the signed informed consent form.

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