

Community Health Worker Return on Investment Study Final Report

May 31, 2017

Prepared by

Elizabeth Christiansen, Ph.D.
Kelly Morning, M.P.H.

Center for Program Evaluation
School of Community Health Sciences
University of Nevada, Reno

Submitted to

Community Health Worker Program
Chronic Disease Prevention and Health Promotion Section
Division of Public and Behavioral Health
Nevada Department of Health and Human Services



Acknowledgements

Special thanks and acknowledgements are extended to the following organizations and individuals for their contributions to the Community Health Worker Return on Investment study.

- Health Plan of Nevada, United HealthCare Services, Inc.
 - June Young, RN, BA, CCM, Director, Medical and Clinical Management – Nevada Market
 - Ritchie Duplechien, Community Operations Consultant/Manager
 - John Attea, Healthcare Economics Consultant
 - Tracy Chen, Healthcare Economics Consultant
- Division of Public and Behavioral Health, Nevada Department of Health & Human Services
 - Jennifer Bonk, MS, Manager, Chronic Disease Prevention and Health Promotion (CDPHP) Section
 - Michael Lowe, PhD, LT, US Public Health Service, Centers for Disease Control and Prevention (CDC), State Assignee Epidemiologist
 - Masako Horino, MPH, RD, Health Systems Manager, CDPHP
 - Amanda Santos, MPH, Community Health Worker Program Coordinator, CDPHP
 - Allen Pai, DrPH, Evaluation Manager, CDPHP
- Nevada Public Health Foundation
 - Rota Rosaschi, Executive Director
 - Christy Works, MPH, Health Information Officer
- Center for Program Evaluation, School of Community Health Sciences, University of Nevada, Reno
 - Kelly Morning, MPH, Evaluation and Research Coordinator
 - Helen See, MPH, Graduate Research Assistant

Table of Contents

Acknowledgements.....	1
Introduction	3
Background	3
Problem Statement.....	4
Study Objective	5
Methods	6
Results	6
Demographic Data	6
Health Care Utilization	8
Medical and Prescription Costs	9
CHW Program Costs.....	15
Return on Investment Calculation	16
Discussion.....	16
Strengths	17
Limitations.....	17
Recommendations	18
References	20
Appendix	22

Community Health Worker Return on Investment Study Final Report

May 2017

Introduction

Background

Community Health Workers (CHWs) are “frontline public health workers who are trusted members of and/or have an unusually close understanding of the community served” (American Public Health Association, 2009). CHWs are a vital connection between individuals and health care systems. By closing a gap of not only professional shortages, but also cultural understanding, a CHW can provide access to care and understanding of complex health issues. A CHW’s job description can include a wide variety of tasks, including advocating for individuals, families, and communities; serving as home health aides; becoming health educators; organizing street outreach; coordinating community events; and, navigating patients through a complicated system.

CHWs are employed by an array of agencies, including hospitals, health centers, managed care facilities, and specialty vendors to assist with activities such as Medicaid enrollment or chronic disease management (Centers for Disease Prevention and Control [CDC], 2016). Non-health care agencies also employ CHWs for prevention programs. By understanding the community, knowing about health issues, and sharing available resources, CHWs have been recognized as a positive addition to address health and social issues experienced among at-risk populations. Whether it is people living in poverty, lacking insurance, or engaging in risky behaviors, CHWs have been successful at promoting positive health practices (Chang, Findley, Hicks, Matos, & Reich, 2014). CHWs have been successful in a variety of health promotion and disease prevention efforts including programs and interventions related to chronic diseases such as diabetes and cardiovascular disease (Lujan, Ostwald, & Ortiz, 2007; McCloskey, 2009; Balcazar, Alvarado, Cantu, Pedregon, & Fulwood, 2009).

CHW programs also have been associated with cost savings in a variety of Return on Investment (ROI) studies (Rush, 2012). ROI is a method of calculating the economic effectiveness of programs. ROI is calculated by dividing the value of the benefits of the program by the cost of the program. A positive ROI is greater than one and indicates that economic value gained from the program was greater than the cost of implementing the program. A study conducted by Whitley, Everhart, & Wright (2006), found an ROI of 2.28: 1 in a CHW program that worked with an underserved population facilitating access to care, knowledge, and health behavior. This means that for every \$1 spent on the CHW program, \$2.28 was saved on medical costs. Another ROI

study conducted by Johnson et al. (2012), found reductions in both claims and payments when a CHW program was implemented to target high utilizers in a Medicaid managed care organization in New Mexico. Other studies have found positive ROI for CHW programs related to asthma, diabetes, and cardiovascular disease, as well as health promotion interventions (Beckham, Kaahaaina, Voloch, & Washburn, 2004; Fedder, Chang, Curry, & Nichols, 2003).

In recent years, the Nevada Division of Public and Behavioral Health (DPBH) has taken the initiative to promote the CHW profession in the state. DPBH launched a CHW pilot program in 2013, training 14 CHWs from around the state and placing them in six different community coalitions. CHWs performed a variety of tasks through their placements in the coalitions, including collecting data for a Latino Health Needs Assessment, enrolling individuals in Affordable Care Act coverage, and connecting individuals to health care providers and other community resources. Since the pilot program ended, some of the coalitions elected to hire CHWs to continue serving their communities. Additionally, CHWs or similar positions with varying titles are found at a variety of agencies, organizations, and health care providers throughout the state. The state has collaborated with the Nevada System of Higher Education to offer CHW trainings, has started work on a professional organization of CHWs, and is investigating possibilities for Medicaid reimbursement of some CHW services.

Problem Statement

In 2016, the United Health Foundation ranked Nevada 35th in the nation based on 15 health indicators (United Health Foundation, 2016). Nevada had the lowest public health funding of all 50 states at \$34 per person and ranked 46th for number of active primary care physicians (United Health Foundation, 2016). Nevada ranked 45th in the nation for lack of insurance, with 13.8% of Nevadans without health insurance. Nevada ranked 32nd among states for premature death (years lost per 100,000 population) and 39th for cardiovascular deaths (United Health Foundation, 2016). The leading causes of death in Nevada in 2013 were heart disease, cancer, chronic lower respiratory diseases, accidents, and stroke (CDC, 2017a). Diabetes was the 10th leading cause, while kidney disease was the 11th leading cause. Diabetes is found in 9.7% of the Nevada population and asthma in 8% (CDC, 2017b). Chronic obstructive pulmonary disease (COPD) is found in 6.6% of Nevada's population, skin cancer in 5.6%, other cancers in 6%, coronary heart disease in 3.9%, myocardial infarction in 4.2%, and kidney disease in 3.3% of Nevada's population (CDC, 2015).

Health Plan of Nevada (HPN), a managed care organization, experienced a membership growth of 134% in the Las Vegas area since 2012, with the majority of the growth among those uninsured prior to the Medicaid expansion. Issues common to many of those members include chronic conditions, such as diabetes, limited knowledge or awareness of medical and community

resources, socio-economic instability, substance abuse issues, mental health issues, high utilization of Emergency Rooms, lack of medical follow-up, and difficulty navigating the health care system (Tibaldi, Young & McMahon, 2015). In response to this growth of underserved members, HPN launched a pilot CHW program designed to “simplify the member experience and promote wellness” in order to (1) “keep the member actively engaged with primary and specialty care by removing barriers to medical care;” (2) “decrease avoidable urgent or emergent care and admissions by managing care transitions;” and (3) “create a positive experience and relationship with the member and/or caregiver” (Tibaldi et al.,2015).

HPN hired three CHWs who started working with eligible members in Las Vegas, Nevada in December 2015. CHWs had contact with members on a weekly basis until discharge from the CHW program. Contact methods varied and included phone calls, in-person meetings in office, home or other setting, texting, and emails. CHWs provided members with a variety of services including education on the insurance plan; information about health resources; assistance accessing a primary care provider; providing materials to obtain the resources and care they need; teaching members how to access resources and care themselves; assistance accessing treatment specialists unique to their health concerns; assistance with obtaining outside resources from nonprofits and other agencies; assistance in accessing the Medicaid transportation system; and, advocating for the member as needed. CHWs worked with members for 30-60 days with average length in the program of approximately 30 days. Each member was assigned to a CHW based on their zip code of residence and typically worked with the same CHW throughout the intervention period, except in cases of CHW vacation or resignation. The three CHWs enrolled an average of 110 members into the program per month during the study period, with an average of 37 members enrolled per CHW per month.

Study Objective

For several years, the state of Nevada has been interested in conducting a ROI study on CHWs. In 2015, the state collaborated with HPN to collect data from their planned pilot CHW program. The Center for Program Evaluation at the University of Nevada, Reno, which conducted the evaluation of the CHW pilot program, was contracted to conduct the ROI study using HPN’s data in 2015. The objective of this study was to assess the financial impacts of embedding CHWs within a managed care organization. Four research questions guided the study: (1) Do CHW services reduce overall medical costs for super-utilizer clients with three or more ER visits in six months? (2) Do CHW services reduce the number of acute admits, acute readmits, Emergency Room visits, and urgent care visits? (3) Do CHW services increase primary care provider visits? (4) What is the impact of CHW services on prescription costs?

Methods

The study setting was at HPN locations in Las Vegas, Nevada. HPN is a managed care organization owned by United HealthCare Services, Inc. Members eligible for CHW services included HPN members who were *super-utilizers* (three or more ER visits in six months). Eligible members were selected to receive services from a CHW for 30 to 60 days. A pre- and post-intervention design was employed to compare Medicaid health care utilization costs for super-utilizer members in the 90 days prior to receiving CHW services to the costs in the 90 days after the start of receiving CHW services. The following variables were tracked: medical costs by service type, pharmacy costs, emergency room visits, primary care provider visits, urgent care visits, acute admissions and readmissions, chronic disease status, and demographic variables.

The ROI study covered a 17-month period from September 2015 to January 2017, allowing for the three-month delay from the time of service until the billing cycle was completed and the pre-intervention and post-intervention periods of 90 days each. The CHW pilot program was in place for 14 of those months—from December 2015 to January 2017.

The sample for the analysis included members who began working with a CHW between December 2015 and October 2016, and had activity in the HPN system in the three months prior to their initial assessment with a CHW. Pre-CHW intervention data included the health care utilization and costs for 90 days prior to the initial assessment with a CHW, while the post-CHW intervention data included the health care utilization and costs for 90 days after the initial assessment with a CHW. Therefore, each member had a unique six-month study period depending on his or her enrollment data with the CHW pilot program.

A ROI analysis was conducted in which the value of the net benefits of the program along with the costs (investment) of the program were calculated. The total medical costs were compared from the pre-CHW intervention to the post-CHW intervention. The difference in medical costs from pre- to post-CHW intervention was divided by the costs of the CHW program to determine the impact of the program. CHW program costs included in the analysis were training, CHW salary and benefits, mileage reimbursement, cell phone reimbursement, work phones, computer, percentage of supervisors' salary and benefits (manager and RN), and CHW program marketing.

Results

Demographic Data

HPN supplied data for 1,517 members for the study period. Of those, 80 had no pre-CHW utilization or cost information in the system, so they were excluded from the ROI analysis. Data from 1,437 HPN members was included in analyses of health care utilization and cost data. The mean age of study participants was 40.8 years, ranging from 0 to 65 years. Primary language was

English for 94% of participants, and Spanish for 6%. The majority of participants were female (64%), compared to 36% male. White participants comprised nearly half the sample (48%), with 23% black and 19% Hispanic participants (Table 1). Members represented 158 different zip codes, the majority of which were in southern Nevada. Seven chronic disease indicators were tracked for participants. The most frequent chronic disease noted in participants was diabetes, with 18% having that disease (Figure 1). Asthma, cancer, and COPD were the other most common chronic diseases. The majority of participants (66%) had none of the seven chronic diseases, while 26% had one of the seven chronic diseases, 7% had two diseases, and 2% had three to five of the diseases.

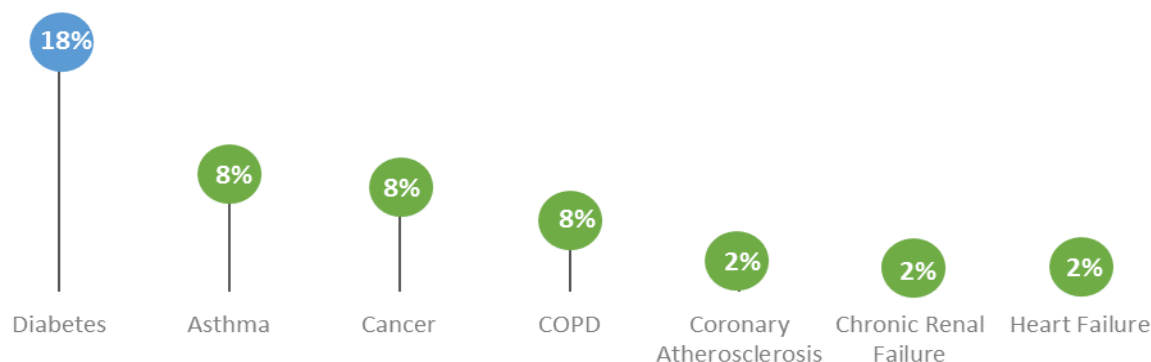
Table 1

Participant Demographic Data

Age range	#	%
0-17 years	121	8.4%
18-25 years	107	7.4%
26-35 years	269	18.7%
36-45 years	300	20.9%
46-55 years	374	26.0%
56-65 years	266	18.5%
Sex	#	%
Female	917	63.8%
Male	520	36.2%
Primary Language	#	%
English	1343	93.5%
Spanish	87	6.1%
Other	7	0.5%
Race/Ethnicity	#	%
American Indian or Alaskan Native	19	1.3%
Asian or Pacific Islander	38	2.6%
Black	331	23.0%
Hispanic	277	19.3%
White	693	48.2%
Other	79	5.5%

Figure 1

Of the seven chronic diseases tracked, the largest percentage of study members had **diabetes**.

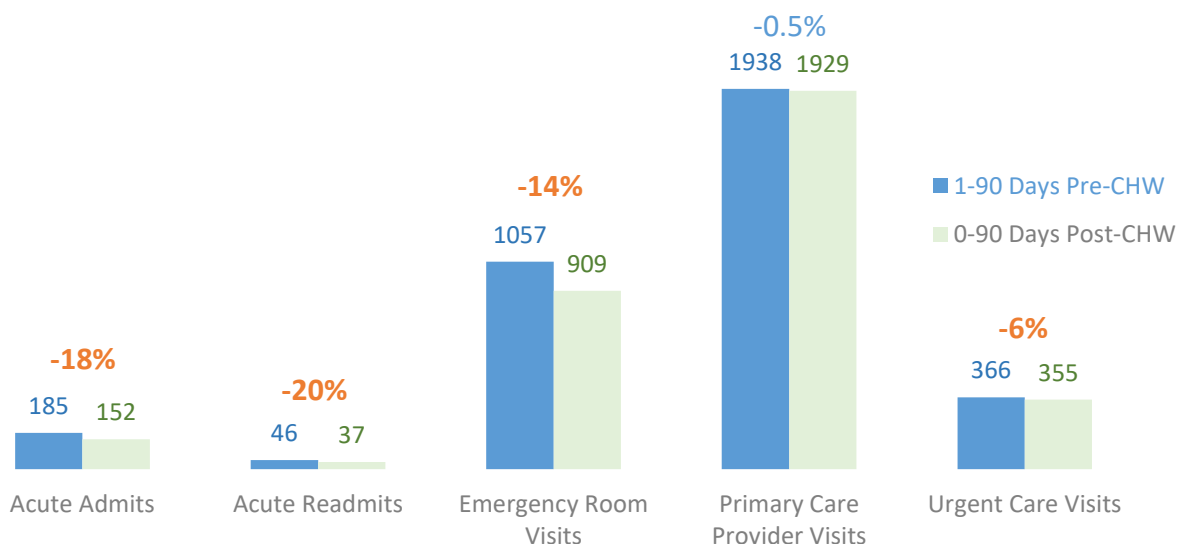


Health Care Utilization

The number of admissions, readmissions, urgent care visits, and primary care provider visits were compared pre- and post-CHW intervention. The number of acute admissions visits, acute readmissions, emergency room visits, urgent care visits, and primary care provider all decreased from the 90 days pre-CHW intervention to the 90 days post-CHW intervention (Figure 2). The greatest percent reduction was found for acute readmits, acute admits, and emergency room visits. Urgent care visits were reduced slightly. Primary care provider visits were similar at pre- and post-intervention. Since emergency room and urgent care visits are more expensive than primary care visits, reductions in those visits will have a greater impact on reduction of medical costs compared to primary care visits.

Figure 2

The number of acute admissions, acute readmissions, emergency room visits, and urgent care visits **decreased** from pre- to post-CHW intervention.



Medical and Prescription Costs

Medical and prescription costs were analyzed per member per month (PMPM) across the preliminary data available (inclusive of costs incurred between September 2015 and January 2017). Both medical costs PMPM and prescription costs PMPM were lower post-CHW intervention compared to pre-CHW intervention (Figure 3). Figure 4 shows decreasing trends in costs from the 90 days pre-intervention to the 90 days post-intervention. Medical costs PMPM were the lowest in the 60-90 days post-intervention, compared to the other 30 days periods both pre- and post-intervention (Figure 4).

Figure 3

Mean medical and prescription costs per member per month **decreased** from pre- to post-CHW intervention.

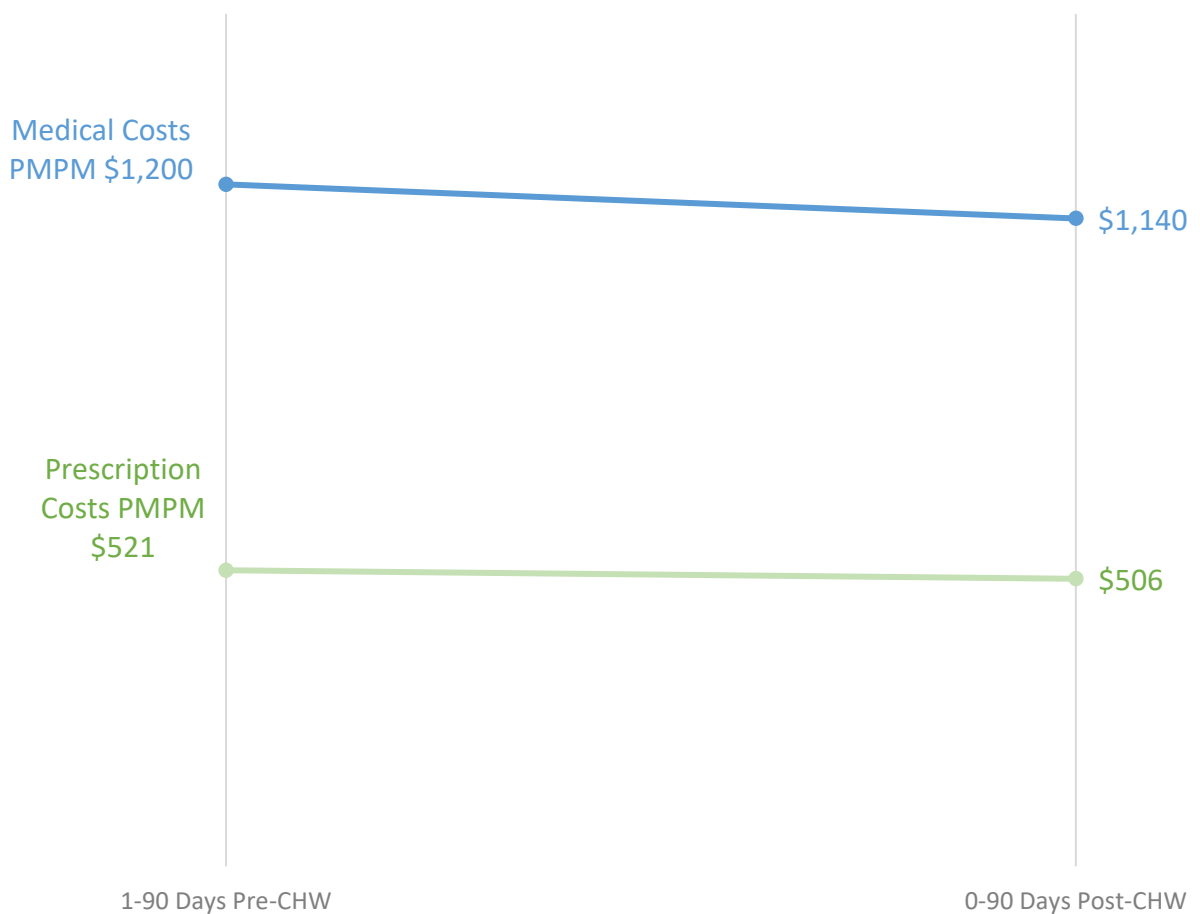
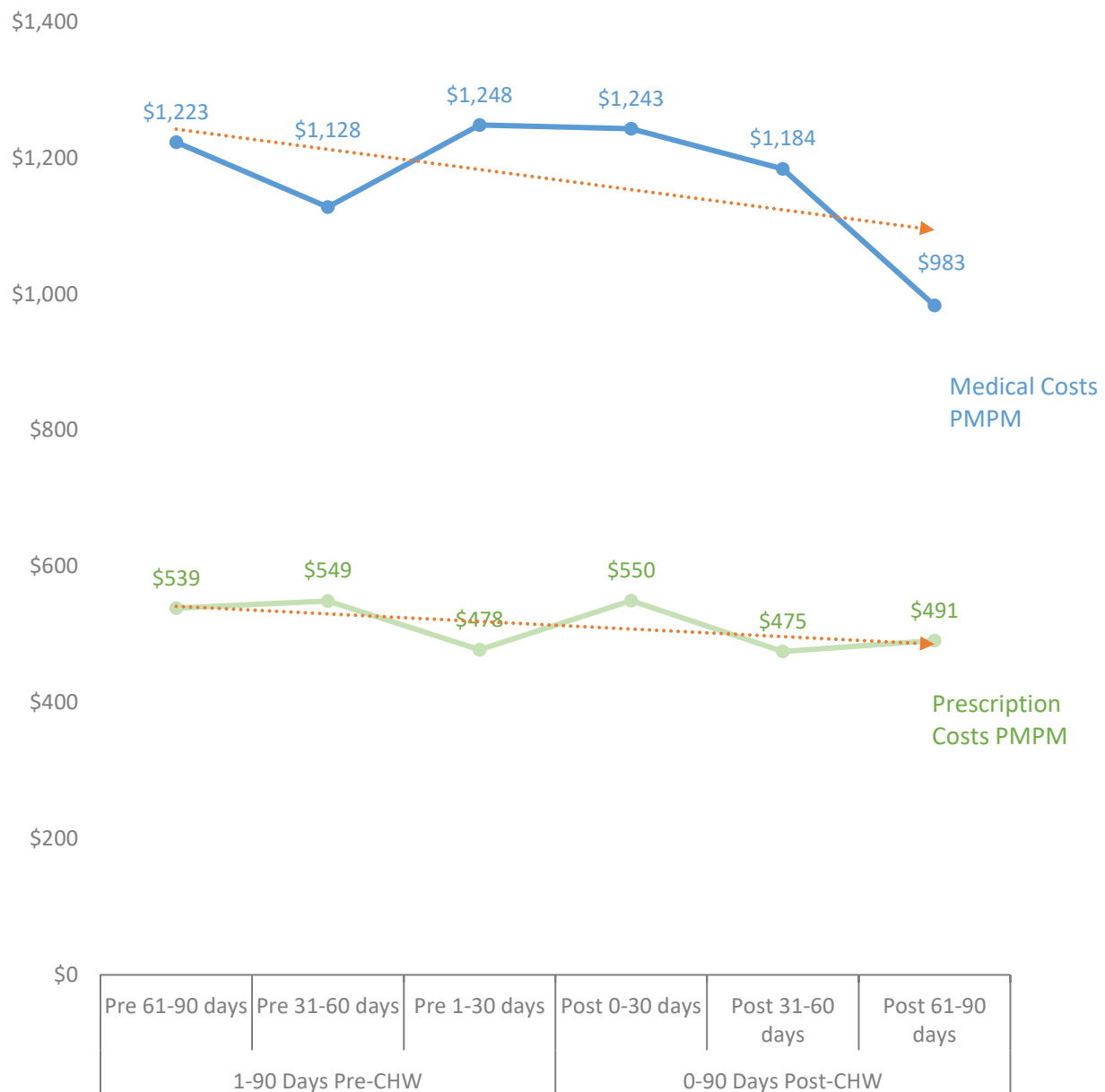


Figure 4

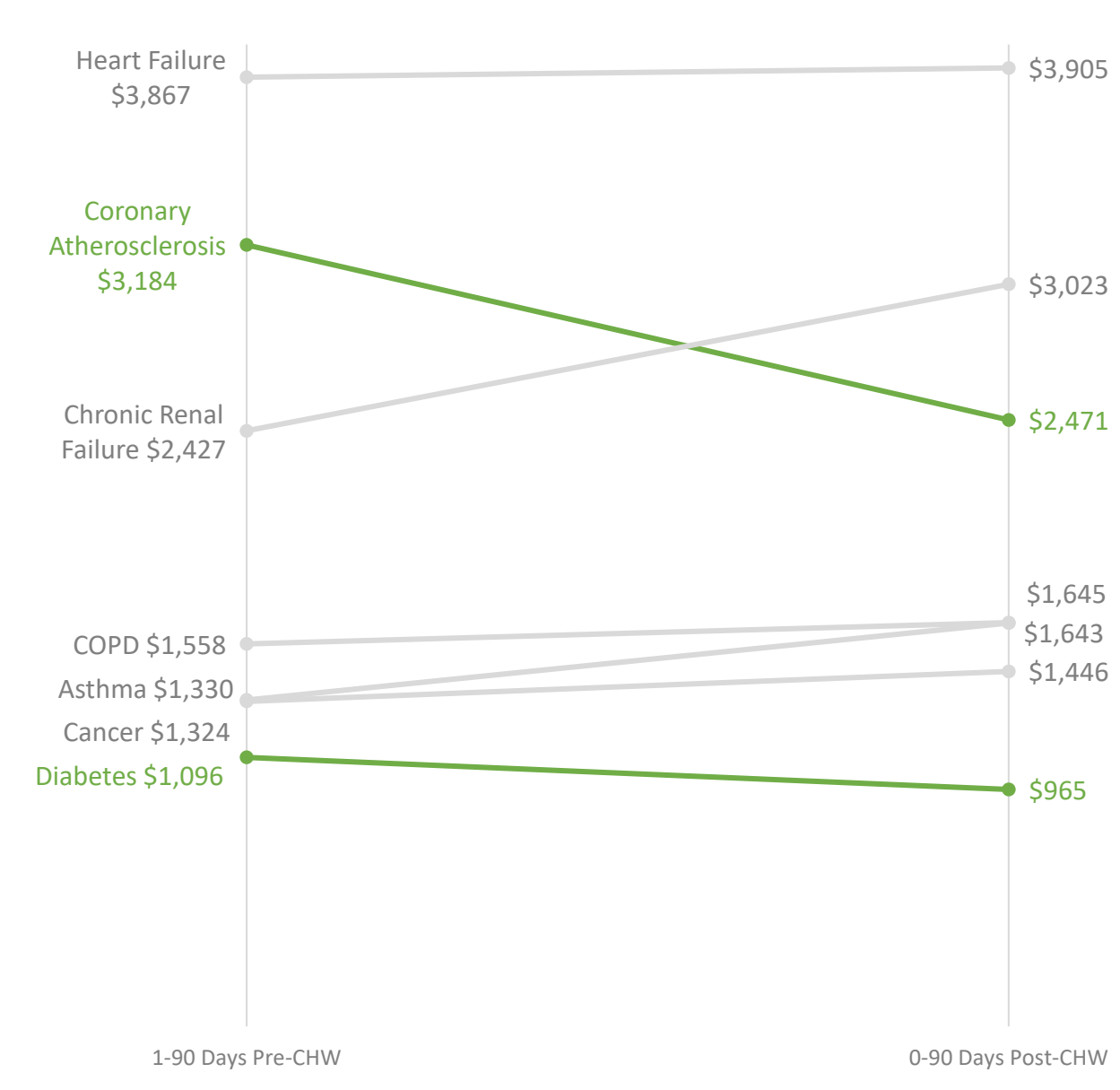
Mean medical and prescription costs per member per month followed a **decreasing trend** in the 90 days pre- and post-CHW intervention.



When comparing pre- and post-intervention medical costs PMPM by chronic disease status, coronary atherosclerosis and diabetes both had PMPM reduction in medical costs (Figure 5). For the other chronic diseases, there was an increase in the PMPM medical costs from pre- to post-intervention.

Figure 5

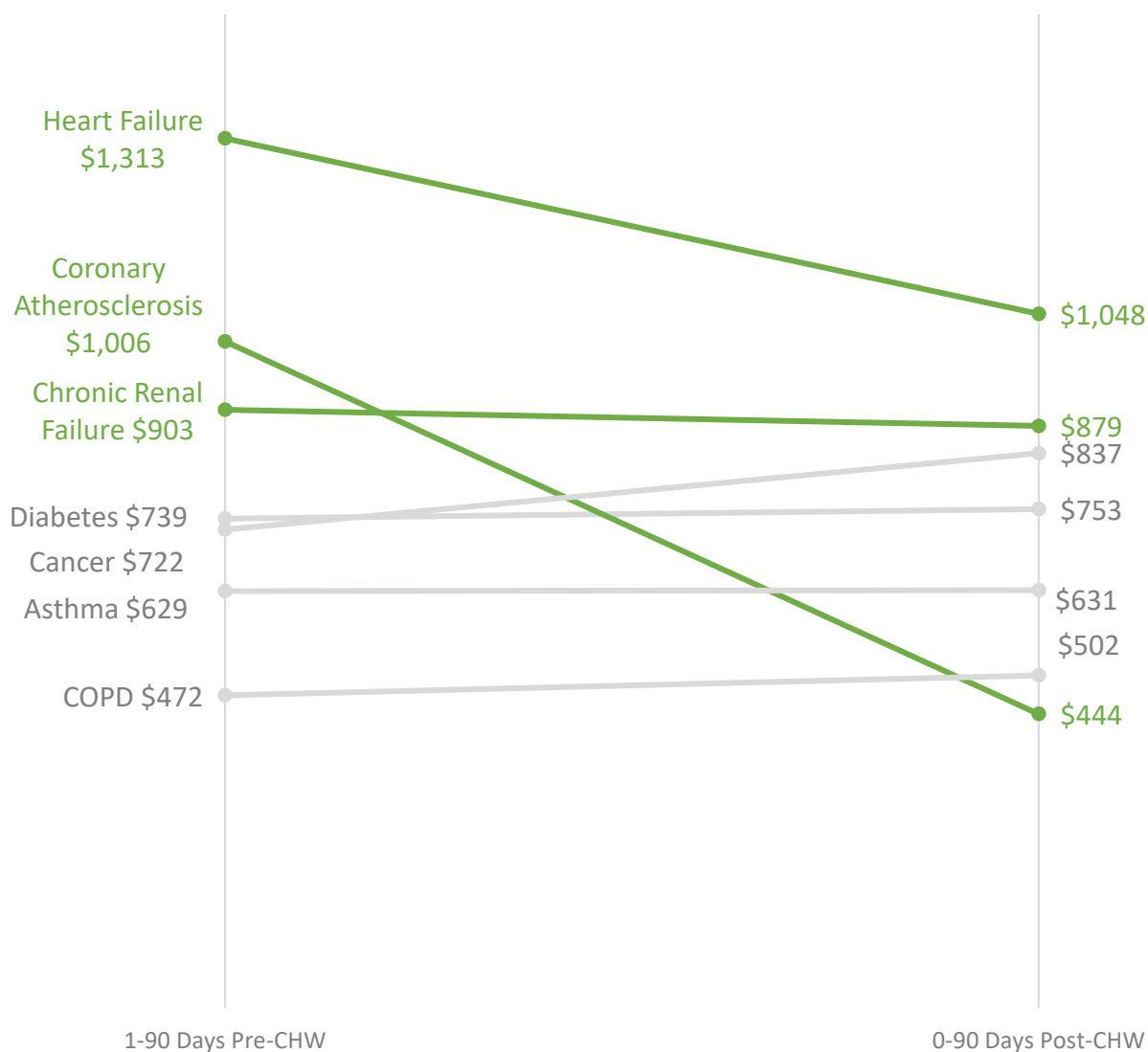
Mean per member per month medical costs **decreased** post-CHW for members with diabetes and coronary atherosclerosis.



There was a decrease in PMPM prescription costs from pre- to post-CHW intervention for heart failure, chronic renal failure, and coronary atherosclerosis (Figure 6). An increase in PMPM prescription costs from pre- to post-CHW intervention was found for COPD, asthma, cancer, and diabetes.

Figure 6

Mean per member per month prescription costs **decreased** post-CHW for members with heart failure, coronary atherosclerosis, and chronic renal failure.



Medical costs by category are listed in Table 2, comparing 90 days pre- and post-CHW intervention. These costs represent paid claims data from September 2015 through January

2017. Total paid medical claims decreased from pre- to post-intervention. Categories with the greatest dollar amount decreases in paid claims from pre- to post-intervention included physician office, acute care, physician inpatient, skilled nursing facility, and physician outpatient. The greatest percent decrease from pre- to post-intervention was for skilled nursing facility. Categories with the greatest dollar amount increases in paid claims included long-term acute care and mental health services. The greatest percent increases were for laboratory and long term acute care. Total paid pharmacy claims costs also were lower in the 90 days post-intervention than the 90 days pre-intervention. Overall, total medical paid claims plus total pharmacy paid claims decreased by \$503,384 from pre-CHW intervention to post-CHW intervention, representing an 8% decrease in paid claims.

Table 2

Total paid medical and pharmacy claims decreased by 8% from 90 days pre- to 90 days post-CHW intervention.

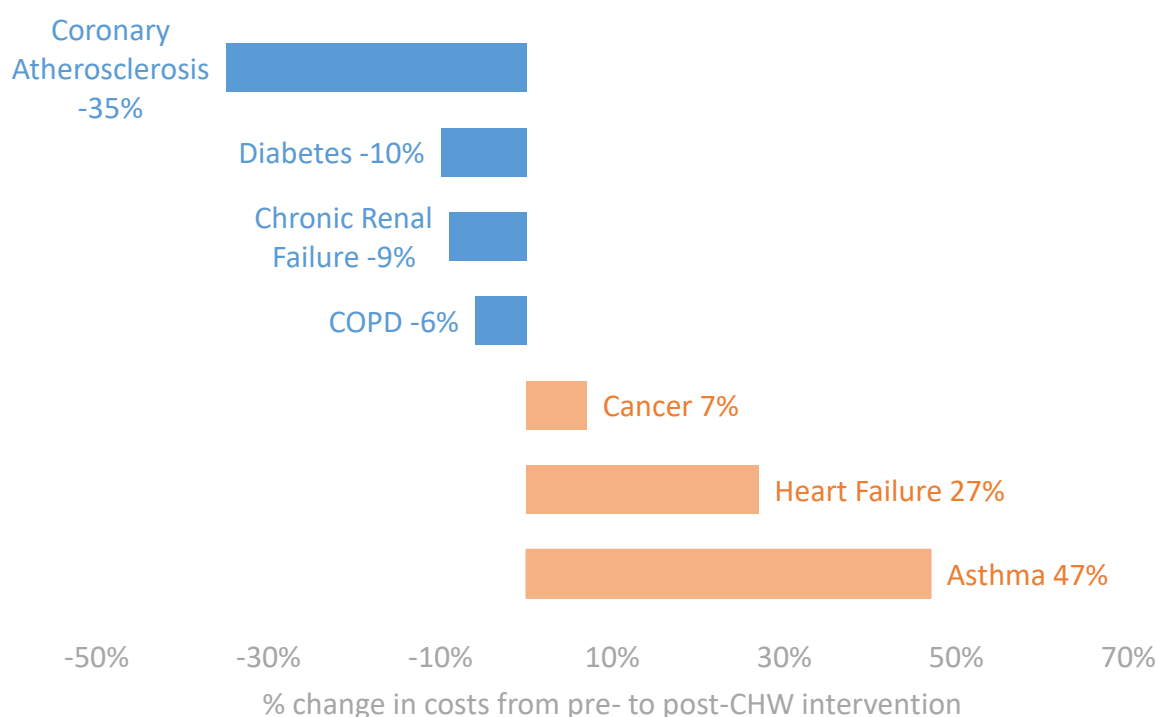
	Amount Paid		Change from	% change from
	90 Days Pre	90 Days Post	Pre to Post	Pre to Post
Acute Care	\$1,059,891	\$954,100	-\$105,792	-10%
Ambulatory Surgical Center	\$105,728	\$83,234	-\$22,495	-21%
Ambulance Air	\$0	\$0	\$0	0%
Ambulance Land	\$117,132	\$101,477	-\$15,655	-13%
Cat Scan MRI	\$3,564	\$0	-\$3,564	--
Dialysis	\$38,194	\$56,945	\$18,752	49%
Emergency Room	\$241,534	\$215,156	-\$26,378	-11%
Home Health Durable Medical Equipment	\$160,034	\$131,354	-\$28,679	-18%
Home Health	\$74,875	\$96,275	\$21,400	29%
Home Health Infusion	\$0	\$13,871	\$13,871	--
Laboratory	\$2,373	\$7,743	\$5,370	226%
Long Term Acute Care	\$54,600	\$158,600	\$104,000	190%
Mental Health Services	\$286,545	\$331,718	\$45,173	16%
Observations	\$183,563	\$174,074	-\$9,489	-5%
Outpatient Surgery	\$58,408	\$44,174	-\$14,234	-24%
Other Paid	\$26,804	\$32,657	\$5,853	22%
Physician Inpatient	\$422,464	\$342,763	-\$79,701	-19%
Physician Outpatient	\$430,284	\$372,152	-\$58,132	-14%
Physician Office	\$955,707	\$793,130	-\$162,578	-17%
Skilled Nursing Facility	\$183,966	\$118,264	-\$65,701	-36%
Total Paid Medical*	\$4,405,665	\$4,027,686	-\$377,979	-9%
Total Paid Pharmacy	\$1,912,655	\$1,787,250	-\$125,405	-7%
Total Paid Medical plus Pharmacy	\$6,318,320	\$5,814,936	-\$503,384	-8%

*Total Paid Medical excludes Vision, Maternity, and Pharmacy Costs

When comparing paid claims from pre- to post-CHW intervention by chronic disease status, members with coronary atherosclerosis had the greatest reduction in both medical costs and pharmacy cost compared to other chronic diseases (Figure 7). Members with diabetes also had reductions in both medical and pharmacy costs. Members with chronic renal failure and those with COPD had reductions in medical costs and overall costs, but increases in pharmacy costs from pre- to post-CHW intervention. Members with cancer, asthma, or heart failure had increased costs for both medical and pharmacy claims from pre- to post-CHW intervention.

Figure 7

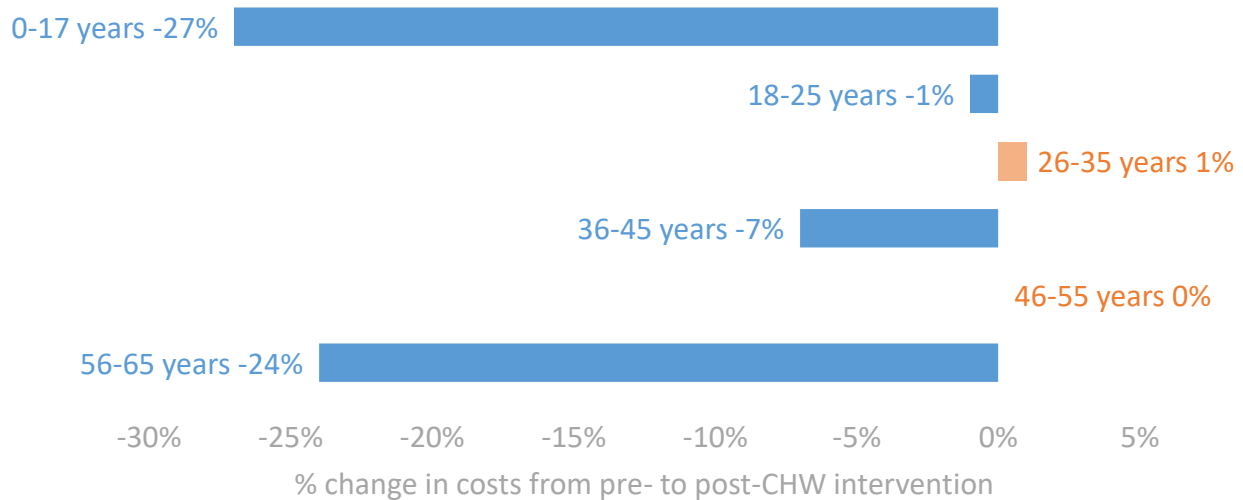
Total medical and prescription costs decreased from pre- to post-CHW intervention for members with coronary atherosclerosis, diabetes, chronic renal failure, and COPD.



With respect to members in different age groups, members between the ages of 0 and 17 years had the greatest reduction in overall costs (-27%) from pre- to post-CHW intervention compared to other age groups (Figure 8). Members aged 56-65 years had a 24% reduction in costs from pre-intervention to post-intervention, while members aged 36-45 years had a 7% reduction in costs. Members aged 18-25 years had a 1% reduction in costs overall. Members aged 46-55 years had no change in costs overall from pre- to post-CHW intervention, while members aged 26-35 years had a 1% increase in costs overall.

Figure 8

Total medical and prescription costs decreased from pre- to post- for members aged 0-17 years, 36-45 years, and 56-65 years.



CHW Program Costs

Personnel costs included salary and benefits for three CHWs and a percentage of salary and benefits for a manager (75%) and a RN (25%). Other program costs included mileage reimbursement, cell phone allowance, costs for work phones and computers, CHW training, and marketing for the CHW program. The total cost for 14 months of the CHW program was \$278,331, with an average monthly cost of \$19,881.

Table 3

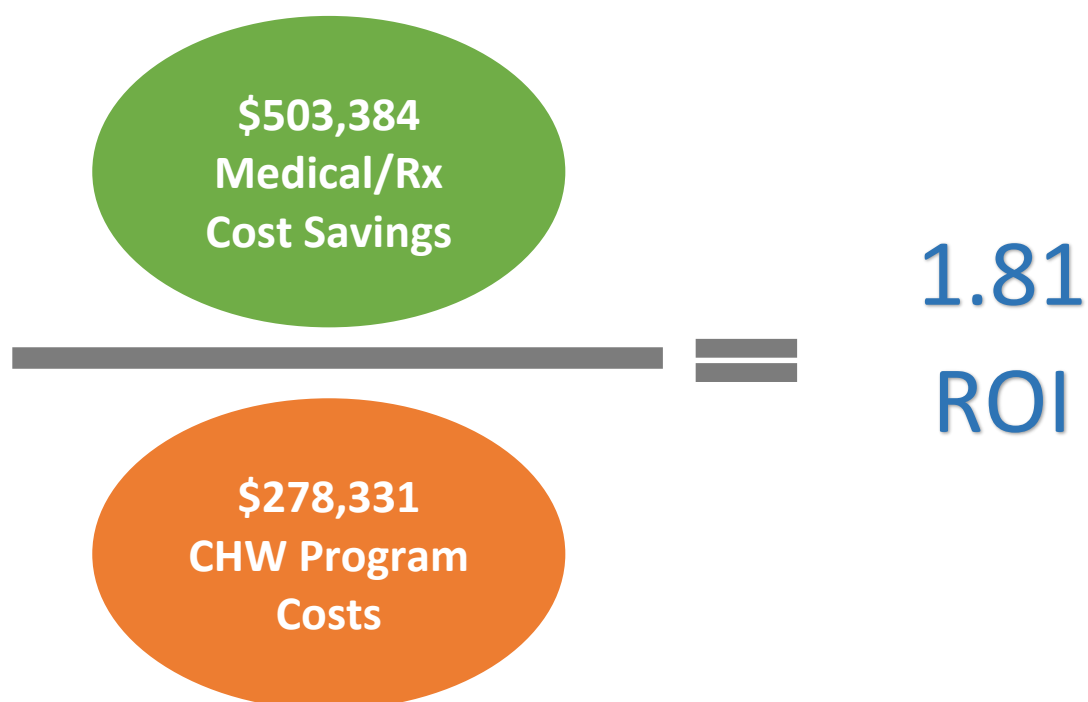
CHW program costs totaled \$278,331 for 14 months.

Program Cost Type	Program costs over 14 months
CHW salary and benefits	\$122,500
CHW training	\$13,722
CHW mileage	\$10,113
CHW cell phones	\$3,150
CHW work phones	\$620
CHW computers	\$2850
75% of Manager and 25% of RN salaries and benefits	\$123,509
CHW program marketing	\$1,867
Total Program Costs	\$278,331

Return on Investment Calculation

The Return on Investment (value of the benefits divided by the costs of the program) was calculated by dividing the \$503,384 savings from the CHW intervention period by the \$278,331 cost of the CHW program for the 14-month intervention period, yielding a benefit cost ratio of 1.81:1. In other words, for every \$1 HPN invested in the CHW program, HPN saved \$1.81 in medical and pharmacy costs.

Return on Investment



Discussion

This ROI study has demonstrated that employing CHWs to work with managed care super-utilizer members can be effective in reducing both medical and pharmacy costs and in reducing the number of acute admits, acute readmits, and urgent care visits. A meta-analysis of CHW intervention studies reported 41% of the studies included in their analysis found reductions in ER use, urgent care use, and hospitalizations (Jack, Arabadjis, Sun, Sullivan, & Phillips, 2017). In this study, CHW services did not increase the number of primary care visits overall for super-utilizer members—the number of visits was nearly the same pre- and post-CHW intervention. Jack et al (2017) found mixed results among the CHW intervention studies analyzed—half of the eight

studies found increases in primary care visits with the CHW intervention, while half found no changes (Jack et al., 2007). The CHW intervention was most effective in reducing costs for members with diabetes, coronary atherosclerosis, chronic renal failure, and COPD. Many other CHW programs also have found positive results working with individuals with diabetes (Fedder et al., 2003; Jack et al. 2017; Lujan et al., 2007; McCloskey, 2009). The CHW intervention in this program did not reduce costs for members with cancer, asthma, or heart failure. Other studies have found positive results employing CHWs to work with asthma patients (Beckham et al. 2004; Jack et al. 2017). It could be that a longer CHW intervention period and tracking results for longer than three months post-intervention is needed to see positive results in this program's members with asthma. The CHW intervention was most effective in reducing costs for members aged 0-17 years, 56-65 years, and 36-45 years; it did not reduce costs for members aged 46-55 years or 26-35 years.

Besides the financial cost savings associated with the CHW program, HPN CHWs noted a variety of other benefits during a group phone interview. CHWs mentioned connecting members to health care providers, medical supplies and equipment, transportation, and other community resources. Other benefits they noted were improved health behaviors and health outcomes, as well as how beneficial it was for members to have someone to connect with them on a regular basis.

“A lot of members feel stigmatized for being on Medicaid. I get to remove small portions of the stigma by going in and meeting with members who feel shamed for being on government assistance. I’m there to show them what is available and not pass judgment on them.” –HPN CHW

Strengths

This study benefits from highly accurate claims data for study participants. HPN has a strong system for collecting and tracking claims data. The study design allowed for the lag between service data and reconciliation of the claim in the database. Another strength of the design is the use of the participants as their own controls. Initially a comparison group from within the HPN participant population was considered; however, HPN administrators and data analysts were not confident it would be an equivalent comparison group.

Limitations

One of the limitations of this study is the short 30- to 60-day intervention period for HPN members to receive CHW services. Typically, CHWs work with clients for a longer time in order

to allow more time for the intervention to succeed. Changes in health and behavior often are not evident in data for months or years following interventions. The work of CHWs relies on developing a rapport with clients in order to more effectively help them make better health decisions and change their behavior over time. Another limitation is the short duration of the study overall. It would be beneficial to have 9-12 months of data for the ROI for a randomized control trial or 18-24 months—9-12 months’ pre- and 9-12 months’ post-intervention—if using clients as their own control groups.

Recommendations

In a group phone interview, HPN CHWs provided suggestions for improving the program including continuing to expand partnerships with other resources in the community and requiring at least two CHW visits with super-utilizer members. Other suggestions included working with the health care professionals and case managers in hospitals to assist with patient follow-up after discharges; hiring more CHWs to allow more time to be spent with members; and, hiring CHWs who focus specifically on the homeless population.

“Sometimes members are so happy to have information. I have a lot of members that don’t speak English, so when I’m able to give them all the resources and information, they are very happy. It’s being able to not just help them in their health care, but they have someone to connect with them. That’s what we do every day.” –HPN CHW

Based on the ROI results, it is recommended the CHW program continue and expand to other service areas, as the intervention has been effective in reducing costs for super-utilizer members enrolled in the program. Based on past studies of CHW program implementation, it is recommended the length of time members work with CHWs be extended for even greater cost savings and improved health outcomes for the members (Fedder et al., 2003; Whitley et al., 2006). To maximize the benefits of the CHW program, longer intervention periods could be implemented for members with diabetes, coronary atherosclerosis, chronic renal failure, and COPD, as costs were reduced among members with these chronic diseases. Other groups on which to focus more intensive CHW services are members in the age groups of 0-17 years, 36-45 years, and 56-65 years. Another recommendation is cost and utilization data tracking continues for members enrolled in the CHW program to facilitate future studies with longer pre- and post-intervention periods to examine the impact of the program over a longer time. The positive results of this ROI should encourage other managed care organizations, health insurance providers, community-based organizations, hospitals, clinics, health care centers, and health care

providers to embed CHWs within their organizations in order to improve health outcomes and reduce medical costs. Given this CHW program's success in reducing medical costs, even with a relatively short intervention period, expanding Medicaid reimbursement to include more services provided by CHWs seems warranted (Families USA, 2016). This study bolsters previous studies' evidence of the value CHWs add to the health care system.

References

- American Public Health Association. (2009). *Support for Community Health Workers to Increase Health Access and to Reduce Health Inequities (Policy Statement 2009-1)*. Available <http://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2014/07/09/14/19/support-for-community-health-workers-to-increase-health-access-and-to-reduce-health-inequities>
- Balcazar, H., Alvarado, M., Cantu, F., Pedregon, V., & Fulwood, R. (2009). A promotora de salud model for addressing cardiovascular disease risk factors in the US-Mexico border region. *Preventing Chronic Disease*, 6(1), A02.
- Beckham, S., Kaahaaina, D., Voloch, K., & Washburn, A. (2004). A community-based asthma management program: Effects on resource utilization and quality of life. *Hawaii Medicine Journal*, 63, 121–126.
- Centers for Disease Control and Prevention (CDC). (2016). *Promoting Policy and Systems Change to Expand Employment of Community Health Workers*. [Accessed on May 31, 2017]. Available at: http://www.cdc.gov/dhdsp/pubs/chw_elearning.htm.
- CDC. (2017a). *CDC WONDER*. [Accessed on May 31, 2017]. Available at: <http://wonder.cdc.gov/ucd-icd10.html>.
- CDC. (2017b). *BRFSS Prevalence & Trends Data* [online]. [Accessed April 21, 2017]. Available at: <https://www.cdc.gov/brfss/brfssprevalence/index.html>.
- Chang J, Findley S, Hicks A, Matos S, & Reich D. (2014). *Community Health Worker Integration into the Health Care Team Accomplishes the Triple Aim in a Patient-Centered Medical Home, A Bronx Tale*. [Accessed on May 31, 2017]. Available at: http://www.chwnetwork.org/media/175442/a_bronx_tale.pdf
- Families USA. (2016). *How States Can Fund Community Health Workers through Medicaid to Improve People's Health, Decrease Costs, and Reduce Disparities*. [Accessed on May 31, 2017]. Available at: http://familiesusa.org/sites/default/files/product_documents/HE_HST_Community_Health_Workers_Brief_v4.pdf
- Fedder, D. O., Chang, R. J., Curry, S., & Nichols, G. (2003). The effectiveness of a community health worker out-reach program on health care utilization of west Baltimore City Medicaid patients with diabetes, with or without hypertension. *Ethnicity and Disease*, 13(1), 22–27.
- Jack, H.E., Arabadjis, S.D., Sun, L., Sullivan, E.E., & Phillips, R.S. (2017). Impact of Community Health Workers on Use of Healthcare Services in the United States: A Systematic Review. *Journal of General Internal Medicine*, 32(3), 325-344.

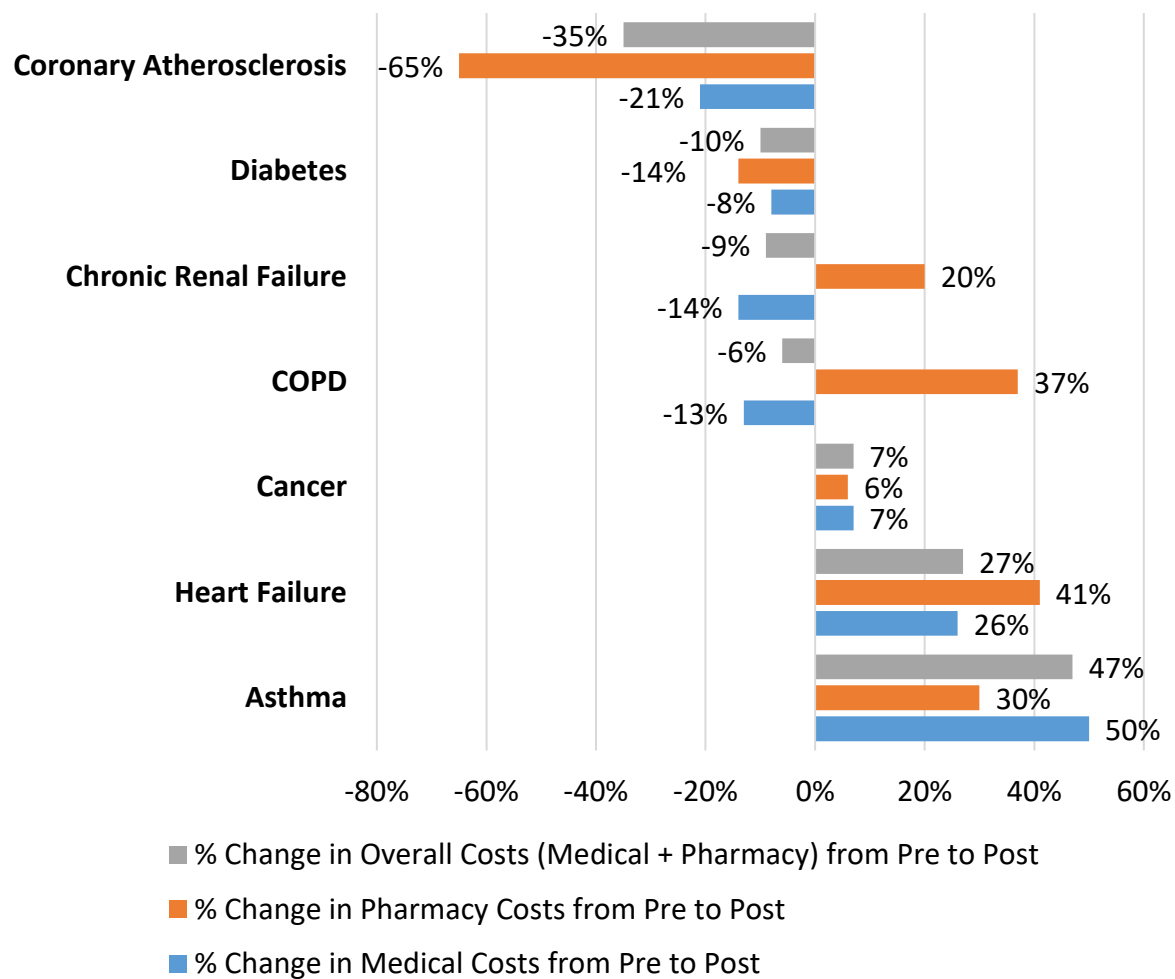
- Johnson, D., Saavedra, P., Sun, E., Stageman, A., Grovet, D., Alfero, C., Maynes, C., Skipper, B., Powell, W., & Kaufman, A. (2012). Community health workers and Medicaid Managed Care in New Mexico. *Journal of Community Health*, 37(3), 563-571.
- Lujan, J., Ostwald, S. K., & Ortiz, M. (2007). Promotora diabetes intervention for Mexican Americans. *Diabetes Education*, 33(4), 660-670.
- McCloskey, J. (2009). Promotores as partners in a community-based diabetes intervention program targeting Hispanics. *Family & Community Health*, 32(1), 48-57.
- National Association of Chronic Disease Directors (2009). *A Practical Guide to ROI Analysis*. [Accessed on May 31, 2017]. Available at: <http://c.ymcdn.com/sites/www.chronicdisease.org/resource/resmgr/services/roi-1.pdf>
- Rush, C. (2012). Return on Investment From Employment of Community Health Workers. *Journal of Ambulatory Care Management*, 35(2), 133-137.
- Tibaldi, L., Young, J., & McMahon, C. (2015). The Future of Our Underserved Members in Nevada: Overview of the Patient Protection and Affordable Care Act (PPACA) and the Community Health Worker. *Health Plan of Nevada*. Presentation given in Reno, NV, September 29, 2015.
- United Health Foundation. (2016). *America's health rankings Nevada*. [Accessed on May 31, 2017]. Available at: <http://www.americashealthrankings.org/>.
- Whitley, E. M., Everhart, R. M., & Wright, R. A. (2006). Measuring return on investment of outreach by community health workers. *Journal of Health Care for the Poor and Underserved*, 17(1), 6-15.

Appendix

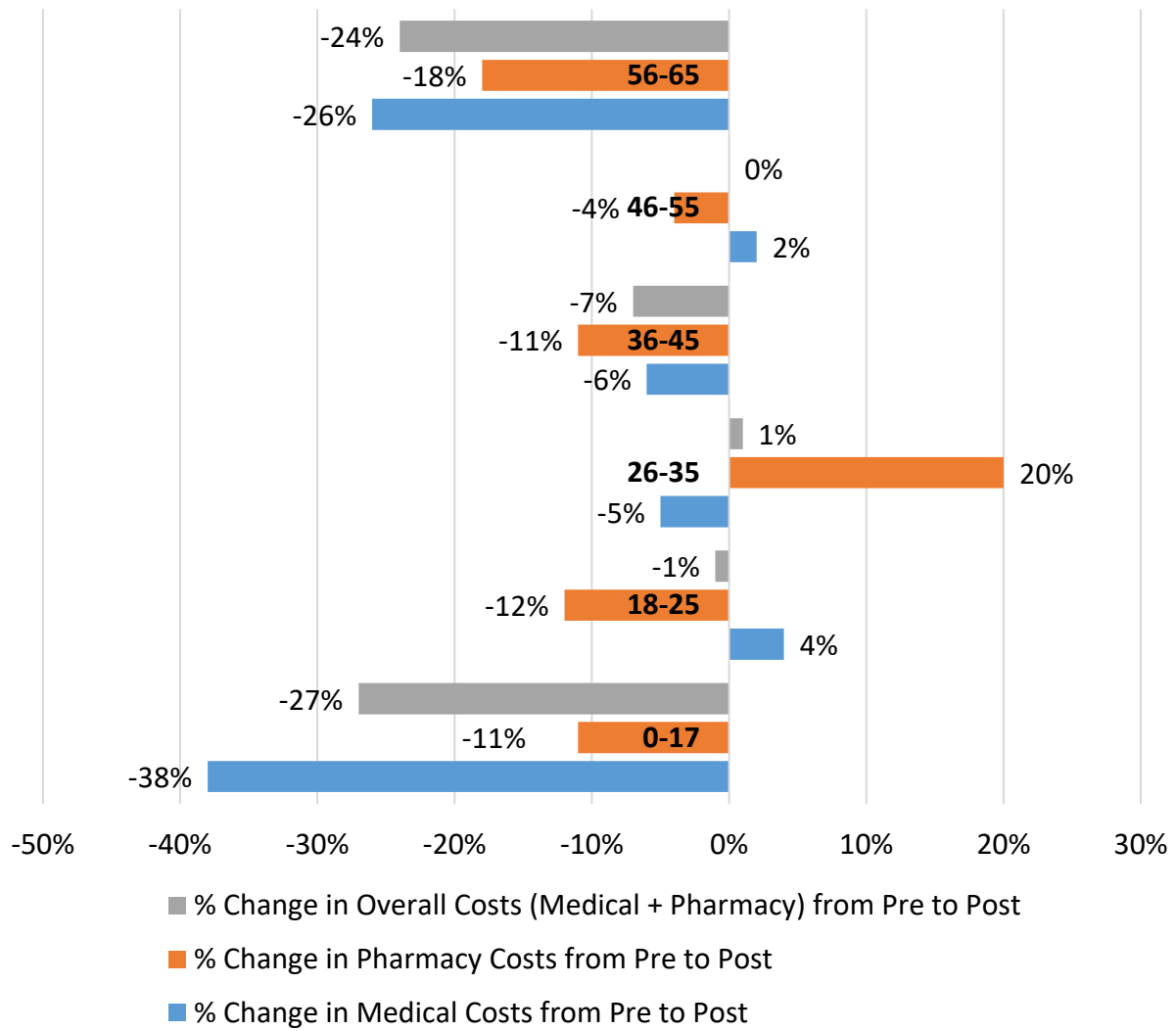
Comparison of Number of Admits, Readmits and Visits Pre- and Post-CHW Intervention

	1-90 Days Pre-CHW	0-90 Days Post- CHW	% change from Pre to Post
Acute Admits	185	152	-17.8%
Acute Readmits	46	37	-19.6%
Emergency Room Visits	1057	909	-14.0%
Primary Care Provider Visits	1938	1929	-0.5%
Urgent Care Visits	366	355	-3.0%
Total Visits	3592	3382	-5.8%

Percent Change in Costs from Pre to Post-CHW Intervention by Chronic Disease



Percent Change in Costs from Pre to Post-CHW Intervention by Age Group



Changes in total costs per member per month from pre- to post-chw intervention by zip code in Southern Nevada

