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Role and Effectiveness of Community Health Workers Among Underserved US Populations

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**Role and Effectiveness of
Community Health Workers among Underserved US Populations**

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Abstract

The role of the Community Health Workers (CHWs) in the health care system has great value both domestically and internationally. CHWs have training in healthcare; they are members of the community in which they serve. They have in depth understanding of the barriers to health care the community faces; they can speak the same language, and can promote and improve health status, quality of care and assist managing chronic disease. This paper focuses on the role and documented effectiveness of CHWs in terms of quality, health care services, cost health services, as well as health behaviors and knowledge about the health care system among underserved populations. Sixty-five peer reviewed articles and publication were analyzed and compiled data for this study. The majority of studies indicate that CHW programs can improve access to health care, outreach and enrollment into public benefits, increase culturally competent health education, and reduce the cost of using the health care system. In addition, CHWs help patient overcome obstacles to health care, assist in managing of chronic disease by providing culturally appropriate health education, ongoing social support, home visits and follow up which improve the management of chronic disease among racial and ethnic minority populations. In conclusion, CHWs improve and positively impact underserved communities and assist minority populations overcome barriers to health care, improve self-care of chronic disease and reduce overall health care costs.

Keywords: Community health workers, lay health advisors, patient navigators, and promotoras.

Role and Effectiveness of Community Health Workers among Underserved US Populations

The community health worker (CHW) model has been part of the health care delivery system around the world for decades in the areas of HIV education, immunization programs, chronic disease campaigns, and high-risk outreach initiatives among underserved populations. They have primarily experienced poor health due to their racial or ethnic background; religion, gender, age, socioeconomic status; sexual orientation or gender identity; mental health, cognitive, sensory, or physical disability or other characteristic (Health Resources and Services Administration [HRSA], 2007; Deitrick et al., 2010; Adler & Stewart, 2010).

Since the Alma-Ata Declaration of 1978, the World Health Organization (WHO) recommended CHW interventions as a key strategy for delivering the basic health care services to underserved populations (Wiggins & Borbon, 1998; HRSA, 2007). In the United States, CHWs are recognized as key members of the public health and primary care workforces that address the growing inequality in the burden of adverse health conditions that exist among underserved populations (HRSA, 2007; Brownstein, Hirsch, Rosenthal, & Rush, 2011; American Public Health Association [APHA], 2009). Large, prominent organizations such as American Public Health Association, American Association of Diabetes Educators, and Centers for Disease Control and Prevention recognize and support the contribution of CHWs and recommend their participation in community-based interventions (APHA, 2002; Centers for Disease Control and Prevention [CDC], 2004; Norris et al., 2006; HRSA, 2007).

CHWs are paraprofessionals with training in healthcare. They are members of the communities in which they serve, therefore, they have an understanding of the community's strengths and needs, can speak the same language, and can easily incorporate culture to promote health and health outcomes within their communities (Rosenthal et al., 1998; Ro, Treadwell, & Northridge, 2003; Brownstein et al., 2005; Norris et al., 2006; Brownstein et al., 2007; Rhodes,

Foley, Zometa, & Bloom, 2007; Ingram, Sabo, Rothers, Wennerstrom, & De Zapien, 2008; Rosenthal et al., 2011). CHWs carry out a variety of health promotion, case management and service delivery activities at individual and the community level. Generally, they serve as a primary link between their communities and health care providers to increase access and utilization of health care and prevention services. They also provide informal counseling, social support, and referral to health and services resources, cultural mediation and culturally appropriate education. They promote healthy living through disease prevention and behavior change, community advocacy, community capacity building, delivery of direct health care services and increased attendance at appointments and adherence to medication regimens (Witmer, Seifer, Finocchio, Leslie, & O'Neil, 1995; Rosenthal et al., 1998; Swider, 2002; Norris et al., 2006; HRSA, 2007; Viswanathan et al., 2009; Spencer, Gunter, & Palmisano, 2010; Ayala, Vaz, Earp, Elder, & Cherrington, 2010; Peretz et al., 2012). Depending on their roles CHWs have different job titles, including community health advisors, lay health workers/advisors, patient navigators, promotoras, promotoras de salud (in Latino/Latina populations), community health representatives, community health outreach workers, peer health educators and natural helpers and lay health advocates (Witmer et al., 1995; Rosenthal et al., 1998; Swider, 2002; Ro et al., 2003; Whitley, Everhart, & Wright, 2006; Norris et al., 2006; Brownstein et al., 2007; HRSA, 2007; APHA, 2009; Viswanathan et al., 2009; Spencer et al., 2010; Rosenthal et al., 2011).

According to the CHW National Workforce Study conducted by the Health Resources and Service Administration in 2007, more than 120,000 community health workers are on the job in neighborhoods, schools, homes, work sites faith and community based organizations health departments, clinics, and hospitals throughout United States in 2005 (HRSA, 2007; Goodwin &

Tobler, 2008). These workers mainly work in short term grant-funded projects. Some are volunteers, while others are paid employees (HRSA, 2007; Rosenthal et al., 2010; Spencer et al., 2010). CHWs have varying levels of job-related education and training and some certification programs offered at community college or academic institutions (Wiggins & Borbon, 1998; Keane, Nielsen & Dower, 2004; HRSA, 2007; APHA, 2009; Spencer et al., 2010).

Although CHWs have become an important component of the health care delivery services both domestic and internationally, their documented effectiveness within the health care system is still being explored. Recent studies have indicated that CHW interventions play a great role in improving health status, quality of care and management of chronic disease conditions (such as diabetes, asthma and cancer) by connecting their community to health care and social services and by empowering the community to manage their health. In addition to educating their neighbors about screening and early detection of the disease, CHWs mobilize and create positive change towards health behavior, self-care skills and enhance compliance with treatment regimens and follow-up care (Witmer et al., 1995; Love, Gardner, & Legion, 1997; Swider, 2002; Andrews, Felton, Wewers, & Heath, 2004; HRSA, 2007; Brownstein et al., 2007; Cornell et al., 2009; Ayala et al., 2010; Zahn et al., 2010; Saad-Harfouche et al., 2011).

It is known that CHW programs can improve access to health care, outreach and enrollment into public benefits, increase culturally competent health education, and reduce the cost of using the health care system, such as the number of emergency and hospitalization visits. However, their effectiveness in reducing health disparities has been less investigated, and more evaluations are needed for CHW interventions in the United States (Fedder, Chang, Curry, & Nichols, 2003; Flores et al., 2005; Whitley et al., 2006; Keane et al., 2004). A number of studies suggest that CHW programs have improved access to primary and prevention care, reduced

emergency department overcrowding and are cost-effective (Fedder et al., 2003; Norris et al., 2006).

Statement of Purpose

The purpose of this study is to examine the role and documented effectiveness of community health workers in terms of improving quality, health care services, cost, behavioral outcome, and increasing knowledge about the health care system among underserved populations. This review will have the additional purpose of providing background information about CHWs needed to write NIH grant proposals among the Somali community living in Columbus.

The specific research questions examined are as follows:

Aim 1: What are the roles of community health workers in addressing health disparities among underserved populations in the United States?

Aim 2: What is the documented effectiveness of community health workers in terms of health quality, health care services and costs, as well as health behaviors and knowledge about the health care system among underserved populations?

Methods

This paper focuses on the role and documented effectiveness of CHWs in terms of quality, health care services, cost health services, as well as health behaviors and knowledge about the health care system among underserved populations. The term “role” is defined by this study to describe job descriptions and duties that CHWs carry out in communities and within the health care system. While the term “effectiveness” highlights the evidence that demonstrates the value of CHWs among underserved populations and positive outcomes related to CHW interventions. This review is based on peer reviewed articles and other research publications that

were retrieved through online databases including PubMed, PsycINFO, EBSCO Academic Search Premier, Google Scholar, the Cochrane Review, and other pertinent publications, such as the American Journal of Public Health (AJPH), the Centers for Disease Control and Prevention (CDC), Health Resources and Services Administration (HRSA), and the US Department of Health and Human Services (DHHS). In addition to the database searches, additional internet searches were referenced in the course of compiling data for this study. All included studies were conducted in the US, and most were published between 1990 and 2012, excepting several articles included for historical reference. All CHW interventions articles primarily described services designed for underserved populations, such as Hispanic, African American, Asian American, Native American and migrant workers. The following search terms were used: community health workers, community health advisors, lay health workers, lay health advisors, patient navigators, community health representatives, *promotoras*, *promotoras de Salud*, community health outreach workers, peer health educators, natural helpers, and lay health advocates.

The literature search identified 440 publications and abstracts for initial review as noted in Table 1. A total of 200 full text articles were retrieved. Of these, 65 studies met inclusion criteria and were included in this review. Twelve studies addressed Aim 1, ten addressed Aim 2, and the other 43 addressed both aims. The articles that were unable to describe the role and effectiveness of CHWs and were not conducted within the United States were excluded. Duplicate studies and review articles were eliminated.

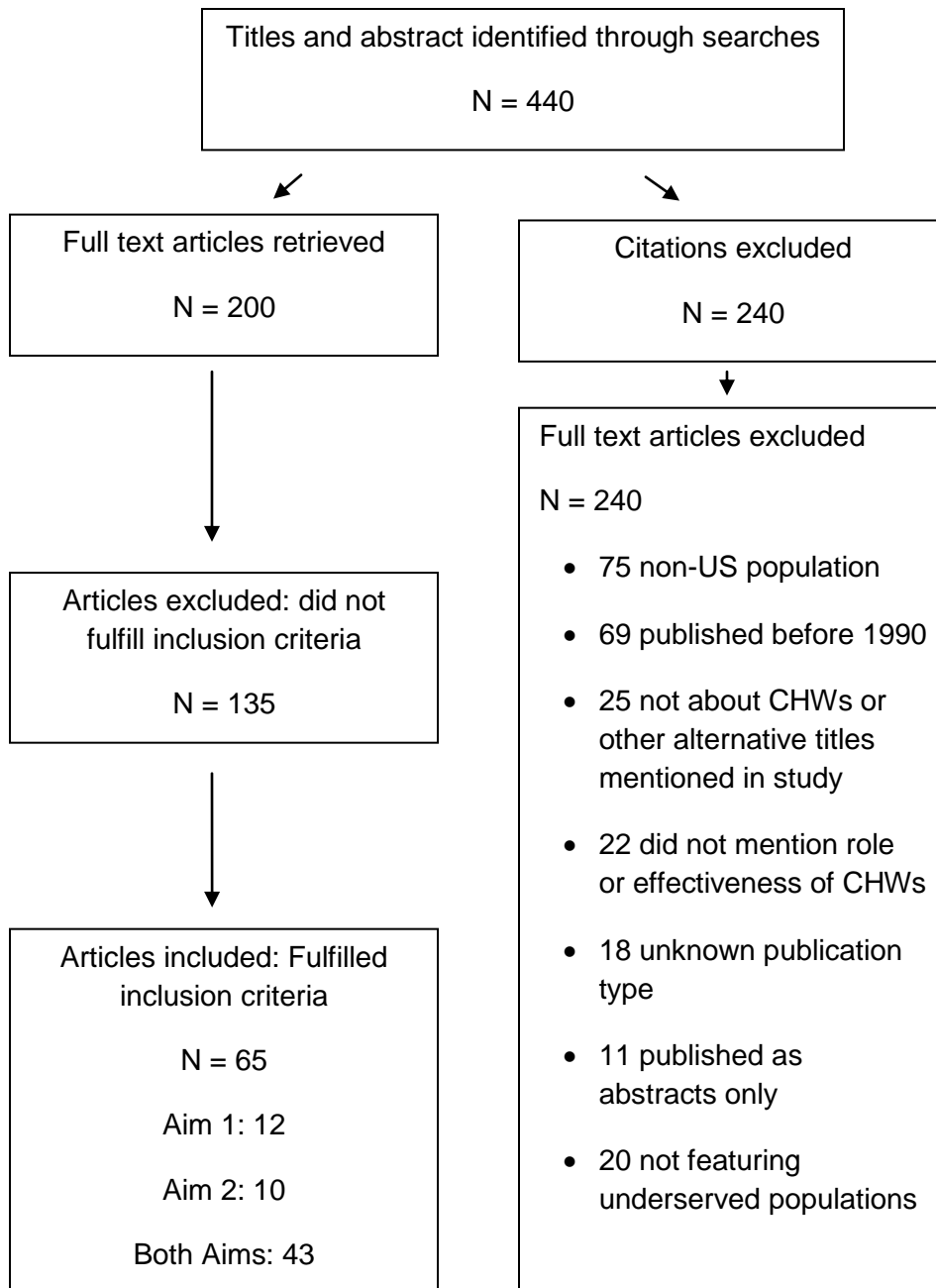


Figure 1. Results of Literature Search

In addition, the National Community Health Advisor Study conducted by Annie E Casey Foundation in 1998 and the Community Health Worker National Workforce Study conducted by HRSA in 2007 were used for this review. The key inclusion criteria were:

- 1- Studies mentioning the role of CHWs and/or studies focusing on the outcome or documented effectiveness of CHWs.
- 2- Studies conducted within the United States.
- 3- Studies were published between 1990 and 2012.

Many studies used the community-based participatory research (CBPR) model, which is an approach that involves community members and other stakeholders in all aspects of the research process. This approach can build community resources, facilitate collaboration among all parties and integrate knowledge and actions that improve health (Rosenthal et al., 1998; Kim, Koniak-Griffin, Flaskerud, & Guarnero, 2004; O'Brien, Squires, Bixley, & Larson, 2009; Cornell et al., 2009; Spencer et al., 2010; Peacock, Issel, Towsell, Chapple-McGruder, & Handier, 2011; Wingood et al., 2011). Several studies used randomized controlled trials cohorts, or systematic reviews and qualitative studies, but some papers in this review suffered from poor research, design, and a lack of control group (Battaglia, Roloff, Posner, & Freund, 2006; Ell et al., 2009; Donelan et al., 2010). Most of the CHW programs focused on chronic disease prevention and management, such as cancer, asthma, blood pressure and diabetes management (Levine et al., 2003; Krieger, Takaro, & Song, 2005; Postma, Karr, & Kjeckhefer, 2009; Norris et al., 2006; Brownstein et al., 2007; Thompson, Horton, & Flores, 2007; Ferrante, Chen, & Kim, 2007; Babamoto et al., 2009).

This study uses evidence-based public health practice as an appropriate use of the best available scientific evidence to support making decisions about care of the communities and populations health (Brownson, Fielding, & Maylahn, 2009). Using evidence-based practice is important when creating criteria to determine which studies and intervention could include the review as shown in Table 1.

Table 1

Typology for Classifying Interventions by Level of Scientific Evidence

| Category | How Established | Considerations for the Level of Scientific Evidence | Data Source Examples |
|----------------|---|--|--|
| Evidence-based | Peer review via systematic or narrative review | Based on study design and execution External validity Potential side benefits or harms Costs and cost-effectiveness | Community Guide Cochrane reviews Narrative reviews based on published literature |
| Effective | Peer review | Based on study design and execution External validity Potential side benefits or harms Costs and cost-effectiveness | Articles in the scientific literature Research-tested intervention programs (123) Technical reports with peer review |
| Promising | Written program evaluation without formal peer review | Summative evidence of effectiveness Formative evaluation data Theory-consistent, plausible, potentially high-reach, low-cost, replicable | State or federal government reports (without peer review) Conference presentations |
| Emerging | Ongoing work, practice-based summaries, or evaluation works in progress | Formative evaluation data Theory-consistent, plausible, potentially high-reaching, low-cost, replicable Face validity | Evaluability assessments Pilot studies NIH CRISP database Projects funded by health foundations |

Source: Brownson et al., 2009

Using the Brownson, Fielding, and Maylahn (2009) framework, the key evaluation criteria were based on the level of scientific evidence used for each study:

- 1- *Strong evidence* - scientific peer reviewed studies, evidence obtained through randomized controlled trials, cohort or case control analysis studies, studies using research tested intervention programs, studies that found greater improvements on an outcome measure or effectiveness of the CHW work, including cost-effectiveness.
- 2- *Weak evidence* - Studies that are not peer reviewed, have reliance on self-reported data, and unmeasured difference between intervention and control group, CHW interventions were combined with any other intervention and were not cost-effective. The outcomes of CHW's studies were grouped as access, disease managements and cost-effectiveness as detailed in an effective section.

Role of Community Health Workers (Aim 1)

What is a Community Health Worker?

Internationally and across the United States, members of the community reach out to their fellow community members through education and provide direct services because they are known and respected by the community; these liaisons reportedly serve as guides to the health care system. They provide cultural linkages, cost-effective health services, and contribute to clinician-patient communication, increasing the likelihood of patient follow-up in order to promote health and prevent diseases to underserved communities who lack an access to adequate health care (Witmer et al., 1995; Swider, 2002; Rhodes et al., 2007; Balcazar et al., 2011). CHWs are currently known by many names including community health advisors, lay health advisors, lay health workers, patient navigators, *promotoras*, *promotoras de salud*, community health outreach workers, natural helpers, peer health educators, and community health representatives (Wiggins & Borbon, 1998; Swider, 2002; Andrews et al., 2004; Whitley et al., 2006; Norris et al., 2006; Brownstein et al., 2007; HRSA, 2007; Viswanathan et al., 2009;

Deitrick et al., 2010; Spencer et al., 2010; Ayala et al., 2010). Although there is no single standard definition for CHW, there is a wide range of descriptions that share strong similarities (Table 2). Perhaps the most comprehensive description is provided by the US Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions (HRSA, 2007) which defines CHWs as:

Lay members of communities who work either for pay or as volunteers in association with the local healthcare system in both urban and rural environments and usually share ethnicity, language, socioeconomic status and life experiences with the community members they serve. CHWs offer interpretation and translation services, provide culturally appropriate education and information, assist people in receiving the care they need, give informal counseling on guidance on health behaviors, advocate individual and community health needs, provide some direct services such as first aid and blood pressure screening (HRSA, 2007, p. 19)

Table 2

Summary of Community Health Workers Definitions

| Study Center | Definition Center |
|--|--|
| Swider, 2002; Nguyen et al., 2010; Ayala et al., 2010 | CHWs are workers who live in the community they serve, are selected by that community, are accountable to the community they work within, receive a short, defined training, and are not necessarily attached to any formal institution. |
| HRSA, 2007; APHA, 2009; Spencer et al., 2010 | CHWs are frontline public health workers who are trusted members of and /or have an unusually close understanding of the community served. This trusting relationship enables CHWs to serve as a liaison between health/social services and the community to facilitate access to services and improve the quality and cultural competence of services delivery. CHWs also build individual and community capacity by increasing health knowledge and self-sufficiency through a range of activities such as outreach, community education, informal counseling, social support, and advocacy. |
| Witmer et al., 1995; Hunter et al., 2004; Norris et al., 2006; Rhodes et al., 2007 | CHWs are community members who work almost exclusively in community settings and who serve as connectors between health care consumers and providers to promote health among groups that have traditionally lacked access to adequate care. |
| Norris et al., 2006; Brownstein et al., 2007 | CHWs are health workers who carry out functions related to health-care delivery, were trained as part of an intervention, have no formal paraprofessional or professional designation, and have a relationship with the community being served. |
| Granillo et al., 2010 | CHWs are community health representatives who are public health paraprofessionals whose role as community health educators and health advocates has expanded to become an integral part of the health delivery system of most tribes. |
| Reinschmidt et al., 2006; Deitrick et al., 2010 | CHWs are natural helpers to whom others naturally turn for advice, emotional support, and tangible aid. They provide informal, spontaneous assistance, which is so much a part of everyday life that its value is often recognized. |
| Deitrick et al., 2010 | CHWs are promotoras who educates, motivates and supports the members of their community in gaining control over their health level. |
| Freund, 2010 | CHWs are patient navigators who offer logistic and emotional support to persons through the cancer care continuum from screening, through diagnostic evaluation and cancer treatment. |
| Martinez et al., 2011 | CHWs are workers who assist individuals and communities to adopt health behaviors while helping to conduct outreach and advocating for individuals and community health needs. |

Note: Unless otherwise noted, all definitions are taken verbatim from the cited articles.

The most salient characteristic widely agreed upon throughout the definitions in Table 2 is that CHWs are members of the community in which they work for; linguistically, ethnically, culturally, socioeconomically and experientially. They are also committed to assist and empower their community through range of activities, such as outreach, advocacy, education and support and can often close the gap between their communities and health care system.

Although community health workers and lay health advisors are current terms of choice for this role in the United States, other associated designations used globally are shown in Table 3. The term CHW will be employed in this study because it is commonly used in several government agencies, such as the Centers for Disease Control and Prevention and the US Department of Health and Human Services (HRSA, 2007).

Table 3

Alternative Titles for Community Health Workers

| Study | Titles | Descriptions |
|--|----------------------------------|--|
| Whitley et al., 2006; Spencer et al., 2010; Ayala et al., 2010 | Community health advisors | Serving various communities / countries |
| Whitley et al., 2006; Norris et al., 2006; Brownstein et al., 2007; Spencer et al., 2010 | Lay health advisors/workers | Various communities/United States |
| Norris et al., 2006; Brownstein et al., 2007 | Patient navigators | Mainly serving cancer patients/ United States / clinical settings, hospitals |
| Brownstein et al., 2007; Babamoto et al., 2009; Spencer et al., 2010 | Community health representatives | Serving Native American nations |
| Whitley et al., 2006; Norris et al., 2006; Brownstein et al., 2007; Babamoto et al., 2009; McCloskey, 2009; Spencer et al., 2010; Ayala et al., 2010 | Promotor(es)/ Promotor(as) | Primarily serving Latino communities in US /Mexico |
| Brownstein et al., 2007; Babamoto et al., 2009; Ayala et al., 2010 | Community outreach workers | Serving various communities United States/ community worksite |
| Spencer et al., 2010; Ayala et al., 2010 | Peer health educators | Serving teens /younger age United States/Mexico |
| Norris et al., 2006; Ayala et al., 2010 | Natural helpers | Serving various communities/ low-income countries/United States |
| Babamoto et al., 2009; Spencer et al., 2010 | Lay health advocates | Serving various communities/United States |

All the above designations typically share a core set of skills, such as that CHWs carry out some form of health care delivery services, were trained in some way in the context of the CHW intervention, and they are assisting and providing care for diverse communities across wide range of health and social problem. However, patient navigator and promotoras services are slightly different from the above terms. For instance, patient navigators are referred to as CHWs who can educate, empower and navigate the community through the healthcare system. Patient navigators mainly work in hospitals and they usually primarily focused on cancer and other chronic diseases by assisting people in overcoming barriers to accessing care services with an emphasis on screening to treatments (HRSA, 2007; Wells et al., 2008; Freund, 2010; Paskett et al., 2006). The term *promotoras and promotoras de salud* has been used in the United States and Latin America to reach Hispanic communities in particular. Promotoras often work within rural border communities to improve the health of migrant and seasonal farm workers and their families. Additionally, promotoras can be community- based; school-based, faith- based and works in clinical settings (Wiggins & Borbon, 1998; HRSA, 2007; Nelson, Lewy, Dovydaitis, Ricardo, & Kugel, 2011).

CHWs often have no formal paraprofessional or professional designation, and do not replace professional health care providers. Instead their experience is in community-related jobs and work where resources are limited and staffing shortages exist (HRSA, 2007; APHA, 2009; Spencer et al., 2010; Deitrick et al., 2010). CHWs have differing educational backgrounds that range from on-the-job training to formal academic institution-based programs that give certification or an associate's degree. For instance, the majority of CHWs who participated in the CHW National Workforce Study have completed high school and had little previous

exposure to the health field, but received training time which ranged from 9 hours to 6 months (HRSA, 2007). While CHWs certification differs among the states, currently seventeen states have some form of training and certification program for CHWs; Alaska, Ohio, Arizona, California, Florida, Kentucky, Massachusetts, Mississippi, North Carolina, New Mexico, Nevada, Oregon, Texas, Connecticut, Virginia, West Virginia, and Indiana (Dower, Knox, Lindler, & O'Neal, 2006; HRSA, 2007; Viswanathan et al., 2009). Of the seventeen states, only Alaska, Indiana, Ohio and Texas have state-sponsored certification programs (HRSA, 2007; Dower et al., 2006).

CHWs can work as either paid employees or as volunteers of local health care systems in rural and urban underserved communities (Witmer et al., 1995; Swider, 2002; HRSA, 2007). Approximately two-thirds of CHWs are wage-earners that receive less than 13 dollars per hour while newly hired are paid more (HRSA, 2007). According to a survey conducted in Massachusetts, Virginia, California, Florida, Maryland and San Francisco, the average yearly income of CHWs ranged from \$8,880 to \$53,794 (HRSA, 2007; Dower et al., 2006). These CHWs were usually volunteers of grassroots organizations, faith-based, local health care providers and university research centers (HRSA, 2007). CHWs can be male or and female workers, but 55% of the individuals who participated CHW National Workforce Study were females between the age of 30 and 50 (HRSA, 2007). Furthermore, CHWs are members of the health care delivery teams who work under the supervision of medical assistance, registered nurses, dental, and social worker or under certified public health nurses. They mostly serve hard-to-reach neighborhoods, schools, homes, worksites, faith and community based organizations, health departments, hospitals and clinics (Swider, 2002; HRSA, 2007; Rosenthal et al., 2010). Although CHW programs are funded by a variety of federal, state and local

government, private and nonprofit organizations, government grants are primary sources for CHW positions across the US agencies (Dower et al., 2006; HRSA, 2007; Spencer et al., 2010). In 2002, more than 80 percent of CHW employers participating in a survey of Minnesota organizations reported, they use government grants to fund their CHWs services (Dower et al., 2006). Other reviews revealed that employing a CHW could be a challenge for employers due to the lack of permanent funding for CHW services, lack of a standard core curriculum for they are not professional in most cases, lack of systemic skills, absence of specific job titles and roles (HRSA, 2007; Goodwin & Tobler, 2008; APHA, 2009; Spencer et al., 2010). Recently, several states including Texas, Ohio, Massachusetts and Minnesota have undertaken important steps to sustain and support the use of CHW practices into states health care systems. For example, Minnesota legislature approved direct Medicaid reimbursement for CHW services and authorized to pay hourly for CHWs who work under supervision of approved providers (HRSA, 2007; Viswanathan et al., 2009; Zahn et al., 2010; Rosenthal et al., 2010).

History of Community Health Workers

Before the development of the modern medical profession, people looked for health care and information from family members, friends, and neighbors whom may have received their training from older relatives. The idea of a “natural helper” or CHW has been traced back to the early 17th century when a critical shortage of doctors in Russia increased the need of lay people known as *feldshers* in medical services. The *feldshers* received training in the field and they went on to provide basic medical care to a marginalized population (Wiggins & Borbon, 1998; HRSA, 2007; Perez & Martinez, 2008; Viswanathan et al., 2009; Spencer et al., 2010). Later in 1949, a similar model started in China. The Chinese Chairman Mao Tse Tung created the *barefoot doctors* program; the program that brought basic primary health care such as

vaccination, nutrition, sanitation, and treatment of minor illness to rural areas where there were no doctors. Although the barefoot doctor's policy has been changed and many of them have become professional doctors, there are more than 1.7 million barefoot doctors available in China since 1977 (Wiggins & Borbon, 1998; Fedder et al., 2003; HRSA, 2007; Perez & Martinez, 2008; Viswanathan et al., 2009; Spencer et al., 2010). In the early 1950's, the *promotora* model grew within Latin communities, Mexico and the United States to address chronic disease, domestic violence and to distribute health resources and bring health care to the poor (Wiggins & Borbon, 1998; HRSA, 2007; Perez & Martinez, 2008; Viswanathan et al., 2009).

In the United States, CHWs were first used by the New York City Health department during the 1960's through a tuberculosis program that involved neighborhood health aides (Andrews et al., 2004; HRSA, 2007; Viswanathan et al., 2009). The federal government started to support CHW programs through the Federal Migrant Health Act of 1962 and the Economic Opportunity Act of 1964 which mandated outreach workers to low- income neighborhoods and migrant worker camps (Wiggins & Borbon, 1998; HRSA, 2007; Perez & Martinez, 2008; Viswanathan et al., 2009). In 1968, the Community Health Representative (CHR) program was established under the Office of Economic Opportunity. It is now one of the oldest and largest lay worker programs in the United States and addresses the needs of American Indian and Alaska Native communities and to improve health knowledge and behavior within those communities. This program continues at present, employing over 1,400 CHRs from over 250 different American Indian and Alaska Native tribes (Wiggins & Borbon, 1998; HRSA, 2007; Viswanathan et al., 2009; Indian Health Services [IHS], 2011).

In 1978, the World Health Organization's (WHO) Alma Ata international Conference stated that the development of national CHW programs is crucial for promoting primary health

care, improving access and strengthening health systems around the world (World Health Organization [WHO], 1978; Wiggins & Borbon, 1998; HRSA, 2007; Viswanathan et al., 2009). In 1980, the “Resource Mothers Programs” were developed for the Virginia Task Force to prevent infant mortality among low-income mothers throughout the United States. This program employed CHW to visit pregnant women and children to their home to improve their health (HRSA, 2007; Viswanathan et al., 2009). In 1989, the Health Education Training Centers program was formed in US–Mexico border region and areas with large immigrant populations (HRSA, 2007).

In 1990, the breast cancer surgeon Harold Freeman and his colleagues established the first patient navigation program at Harlem Hospital in New York after recognizing that most low income patients were diagnosed with cancer at the later stages due to lack of preventive care and screening services (Friedman et al., 2006; Schwaderer & Itano, 2007; Hendren et al., 2010; Freund, 2010). In 1993, the Centers for Disease Control and Prevention (CDC) established the first national database that included CHW programs, training centers, journal articles and research practice information (CDC, 2005; HRSA, 2007). In 1999, Texas became the first state in nation to legislate a state-wide mandatory promotoras training and certification program (Nichols, Berrios, & Samar, 2005; HRSA, 2007).

Beginning in the early 2000s, three states, Alaska, Texas and Ohio established certification program for CHWs (Goodwin & Tobler, 2008; Rosenthal et al., 2010). In 2005, President George W. Bush signed the Patient Navigator Outreach and Chronic Disease Prevention Act which became the most important piece of Federal legislation to address CHW activities (HRSA, 2007; Davis, Darby, Likes, & Bell, 2009). During this period, more than 200 cancer care programs which carried patient navigator service designed to reduce health care

disparities were established across the United States (Hade, 2006; Schwaderer et al., 2007; Pedersen & Hanck, 2010).

In 2007, the Community Health Worker National Workforce Study conducted by Health Resources and Services Administration (HRSA) reported that 600 programs and 120,000 CHWs were active in helping communities across the United States (HRSA, 2007). In the same year, the Minnesota State legislature authorized Medicaid reimbursement for CHWs services. In 2009, the American Public Health Association (APHA) recognized CHWs and issued a policy statement titled “Support for Community Health Workers to Increase Health Access and to Reduce Inequalities” (APHA, 2009). Currently, the Department of Labor Bureau formally created CHWs as an occupation and it was first listed in the 2010 *Standard Occupation Classification* system that defined CHWs as frontline, public health workers who function as liaison between their communities and health and social services delivery systems (HRSA, 2007; Ayala et al., 2010; Rosenthal et al., 2010; Martinez & Knickman, 2010).

Despite the long history of CHWs in health promotion and disease prevention around the world, the CHW workforce has not been well understood and often has not been yet integrated as legitimate providers in the mainstream health care system in the United States (HRSA, 2007).

What Do Community Health Workers Do?

Although CHWs’ function across projects and countries is similar in that they serve as a bridge between patients and healthcare providers, the existing literature indicates that their role varies by location and duration of contact with clients, population served, and health or disease focus (HRSA, 2007; McCloskey, 2009; Viswanathan et al., 2009). According to the CHWs National Workforce Study, the role of CHWs can be grouped into the following seven core services elucidated in Table 4.

- 1) *Bridging the gap between communities and the health and social service systems*
- 2) *Providing culturally appropriate health education and information*
- 3) *Assuring people get necessary services*
- 4) *Providing informal counseling and social support*
- 5) *Advocating for individuals and community needs*
- 6) *Providing direct services and health screen tests*
- 7) *Building individuals and community capacity (HRSA, 2007).*

Table 4 summarizes CHW's roles and descriptions which were also identified by findings combined in this study. These roles could be overlapped in a specific intervention and the following four functions are those most of the literature review identified as key elements of the CHWs role: mediator, educator, support person and navigator (Witmer et al., 1995; Rosenthal et al., 1998; Swider, 2002; Fedder et al., 2003; Andrews et al., 2004; Norris et al., 2006; HRSA, 2007; Brownstein et al., 2007; Viswanathan et al., 2009; Pederson, & Hanck, 2010; Deitrick et al., 2010; Ayala et al., 2010).

Table 4

Summary of Seven Core Roles of Community Health Workers

| Study | Role | Description |
|---|--|--|
| Swider, 2002; Fedder et al., 2003; Andrews et al., 2004; Norris et al., 2006; Brownstein et al., 2007; HRSA, 2007; Dietrick et al., 2010; Pedersen et al., 2010; Ayala et al., 2010 | Serve as cultural broker/ mediator/bridging the gap between the health and social services systems and community members | <ul style="list-style-type: none"> • Connect /individuals to health care system • Bridging cultural and language difference between client and providers • Educate community members about how to use the health care and social service system • Educate medical and /social services providers about community needs and clarify cultural and belief practice • Collect information that inaccessible to clients and social service providers • Interpret and translate medical and other materials into easy language |
| Swider, 2002; Andrews et al., 2004; Norris et al., 2006; Rhodes et al., 2007; HRSA, 2007; Brownstein et al., 2007; O'Brien et al., 2009; Deitrick et al., 2010; Pedersen et al., 2010; Ayala et al., 2010 | Providing culturally appropriate health education and information | <ul style="list-style-type: none"> • Provide health education classes and awareness workshops • Conduct door to door outreach • Teach the community members the concepts of health promotion and disease prevention • Help individuals manage their chronic illnesses |
| Swider, 2002; Fedder et al., 2003; Andrews et al., 2004; HRSA, 2007; Brownstein et al., 2007; O'Brien et al., 2009; Pedersen et al., 2010 | Assuring that people get the services they need | <ul style="list-style-type: none"> • Assessing needs • Make referrals, coordinate services • Motivate and encourage the people to utilize the services • Facilitate patient appointment keeping and follow up • Help compliance with treatment recommendations • Manage paperwork filling |
| Swider, 2002; Fedder et al., 2003; Andrews et al., 2004; Ingram et al., 2005; Norris et al., 2006; Brownstein et al., 2007; HRSA, 2007; Fleury et al., 2009; Deitrick et al., 2010; Pedersen et al., 2010; Ayala et al., 2010 | Providing informal counseling and social support | <ul style="list-style-type: none"> • Provide individual social and health care support /goal setting/ encouragement/ motivation • Organize and facilitate support groups |
| Swider, 2002; Andrews et al., 2004; Brownstein et al., 2007; HRSA, 2007; Pedersen et al., 2010; Ayala et al., 2010 | Advocating for individual and community needs | <ul style="list-style-type: none"> • Act as spokesperson for clients • Help clients to obtain needed health care and protect their rights • Assist to navigate health care systems |
| Fedder et al., 2003; Andrews et al., 2004; Brownstein et al., 2007; HRSA, 2007; Ayala et al., 2010 | Providing direct services | <ul style="list-style-type: none"> • Reach out to medically underserved communities • Link community to the resources and basic needs (, food, housing and employment) • Provide needed basic services(first aid, monitoring BP) • Refer and link to preventive services through health screening and testing |
| Swider, 2002; Fedder et al., 2003; Andrews et al., 2004; Brownstein et al., 2007; HRSA, 2007 | Building individual and community capacity | <ul style="list-style-type: none"> • Identify community and individual needs • Build individual and community capacity to achieve wellness • Help clients to improve their health and change their behavior |

Mediator.

CHWs often act as a liaison between communities with needs and health professionals to facilitate access to services and improve the quality and cultural competence of medical care (Andrews et al., 2004; Norris et al., 2006; Brownstein et al., 2007; HRSA, 2007; Deitrick et al., 2010; Rosenthal et al., 2010). A large number of studies reported that CHWs can overcome and tackle barriers associated with language, cultural beliefs, mistrust that affect underserved communities' ability to access health services and communicate their care provider (Rhodes et al., 2007; Brownstein et al., 2007; McCloskey, 2009; Deitrick et al., 2010; Brownstein et al., 2011). CHWs build the knowledge and confidence of underserved community members by connecting community members the services they need, educating community members about how to use the health care and social services, collecting information that inaccessible to clients, assisting individuals with public health benefits, financial, literacy issues and translating the medical information given by providers into simple language and culturally appropriate ways (CDC, 2004; Rhodes et al., 2007; HRSA, 2007; Schwaderer & Itano, 2007; Brownstein et al., 2011). Evidence shows that promotoras can help minorities who are unable to understand the English language, may not be able to share their health issues with a health care provider, and have difficulty using the health care system. They can facilitate patient-providers communication by assisting before and after health clinic visit, managing medication list and questions, helping to complete administrative tasks, explaining in their language what doctors are trying to say during visit, and providing emotional support after the visit (Nichols et al., 2005; HRSA, 2007; Brownstein et al., 2011; Balcazar et al., 2011). On the other hand, CHWs can educate health care providers and administration about the community's needs, health beliefs and the cultural norms of the particular communities by helping them to build their cultural

competency and assist medical providers in gaining trust and respect of their clients (Witmer et al., 1995; Smedley, Stith, & Nelson, 2002; Brownstein et al., 2011).

Educator.

CHWs also serve as community educators by teaching their community about health issues, providing culturally relevant health education and awareness programs, one-on-one educational classes, making health presentation, organizing health fairs and offering advice and counseling regarding risk behavior (Rosenthal et al., 1998; Swider, 2002; Norris et al., 2006; Brownstein et al., 2007; Rhodes et al., 2007; HRSA, 2007; Fleury, Keller, Perez, & Lee, 2009; Ayala et al., 2010). A study conducted by immigrant Latino workers in the poultry-processing industry in rural western North Carolina shows that lay health programs may play a valuable role in delivering cultural appropriate occupational health education and information (pesticide safety knowledge and behavior) and promoting a safe work place (eye safety) among immigrant farm workers and their families (Grzywacz et al., 2009). In the environmental health/home safety education project conducted by South Central New Mexico in 1999, Forster-Cox, Mangadu, Jacquez, and Corona (2007) examined changes in knowledge and behavior among 367 individual in the US-Mexico border region visited by promotoras to provide culturally appropriate educational materials. This study revealed that the education and support provided by promotoras had a positive effect on individual's knowledge about safe use and storage of pesticides in their home because promotoras gain trust, confidence of their clients which encourage them to achieve safe home environment (Forster-Cox, Mangadu, Jacquez, & Corona, 2007). CHWs teach their communities about health promotion and disease prevention and they can help individuals to manage their chronic disease such as diabetes, asthma, cardiovascular, hypertension, and cancer (Rosenthal et al., 1998; Norris et al., 2006; HRSA, 2007; Spencer et al.,

2011). Recently, the Robert Wood Johnson Foundation identified CHWs as a key component of successful diabetes self-management programs (Zahn et al., 2010). A review of the literature reported that CHWs emphasizes the importance of screening, tests and regular medical check-up in order to increase the likelihood of early detection of health problems (Nguyen et al., 2010). For example, in the North Carolina Breast Cancer screening program, Earp and Flax (1999) found that CHW intervention had positively influenced women's participation of mammography screening and scheduling mammogram appointments.

Navigator.

CHWs play an essential role in conducting outreach, enrollments and navigating community members and individuals through the complex health and social services systems (Martin, Hernandez, Naureckas, & Lantos, 2006; Nguyen, Tankasiri, Kagawa-Singer, Tran, & Foo, 2008). A number of studies reported that CHWs facilitate appointment keeping and increase compliance of treatment regimens, and follow-up through telephone reminders, personal contact, and home visit and by ensuring that patients know the treatment and understand instructions of the prescription (Witmer et al., 1995; Swider, 2002; Hunter et al., 2004; Cherrington et al., 2008; Brownstein et al., 2007; Spencer et al., 2010). For example, the health navigator intervention that focused on breast and cervical-cancer screening among Cambodian and Laotian communities found that CHWs helps the client to schedule or reschedule appointment, remind them of upcoming appointments, provide transportation, interpretation and explains each steps as doctor examines and fill out the medical history paperwork (Nguyen et al., 2008). Case managers or CHWs can take substantial part and be forefront of helping uninsured children and their parents to enroll insurance coverage (Flores et al., 2005; HRSA, 2007).

A randomized controlled intervention used case managers as educator to insure uninsured Latino children and their families into public benefits suggested that case managers assist Latino children and their parent's knowledge about insurance application process and eligibility, the type of insurance information available, and overall system problems (Flores et al., 2005). According to the study of CHWs conducted in the Massachusetts Department of Public Health, the culturally appropriate outreach and enrollment services that CHWs provide by uninsured people can improve access to primary care and quality of cost-effectiveness of care (Rosenthal et al., 2010). Additionally, CHWs can mobilize members of their community to become activists for social justice. For instance, a program entitled "people improving the community's health" the CHWs mobilized community members to be civil participants and problem solvers by improving social connections and building social capital and community's health (Mack, Uken, & Powers, 2006).

Support person.

CHWs empower community members who are facing difficult times and provide support, and informal counseling (HRSA, 2007; Fleury et al., 2009). For instance, CHWs can work closely with target communities by visiting their homes, showing trust and concern by listening to their personal stories, and assisting in monitoring their blood glucose, blood pressure and encouraging them to take their medications, to work out regularly and cook nutritional foods that community members were accustomed to (Norris et al., 2006.; Brownstein et al., 2007; Fleury et al., 2009). A recent study shows that CHW can increase self-efficiency and coping mechanisms among asthma child caregivers through information, assistance and referrals to care (Postma et al., 2009). CHWs also decrease social isolation that is often faced by low income women with young children by helping ways to find health resources, enhancing their self-esteem and self-

sufficiency (Roman, Lindsay, Moore, & Sheomaker, 1999). Evidence suggests that CHWs can successfully engage in community advocacy by encouraging racially and ethnically diverse groups of community members to address health detriment of health, their human rights, and safety (Ingram et al., 2008).

In addition to the general key roles above, CHWs can be an integral part of research teams who can carry out assessment, development of study instruments, project conceptualization, developing the research questions, data methodologies, collecting, analyzing and interpreting data (Andrews et al., 2004; Martin et al., 2006; Rhodes et al., 2007; O'Brien et al., 2009; Nelson et al., 2011; Peacock et al., 2011). CHWs increase participant recruitment and retention of the participants in research process because they ensure research procedures are culturally appropriate for the target population and can explain procedures in terms that the targeted population can clearly understand (Spencer et al., 2010; Wingood et al., 2011). For example, one study using promotoras as a survey collector showed that individuals participating in the survey seemed to openly communicate and trust the promotoras because they speak their native language, share their life experience and have similar values (McCloskey, 2009).

Overall, these roles all indicate that CHW's typically bridge the gap between target communities and health care providers to develop a trusting relationship between the community and service provider. They provide culturally appropriate health education and information. They are also tasked to help individuals and the larger communities' access primary and preventive care, social service resources, identify and address unmet health needs, provide emotional support and finally improve health status and enhance community capacity. Although the exciting literature shows that CHWs perform more than one role, realistically they can't

fulfill all of them in the same program. A clear understanding of CHW responsibilities can help to frame the evaluation of CHW programs.

The Effectiveness of Community Health Workers (Aim 2)

CHWs have been documented as effective in delivering a variety of health services, including educating community members about how to use health care, bridging between health professionals and community members, connecting the community to the services they need, teaching concepts of health promotion and disease prevention, providing support and counseling, and advocating for the community's needs (Swider, 2002; Norris et al., 2006; HRSA, 2007; Rhodes et al., 2007; Brownstein et al., 2007). Outcomes indicators that measure whether CHWs were effective in their work are varied due to heterogeneity in the study design, goals on intervention, amount of training, and settings. Even so, most studies reviewed indicate that the CHWs have contributed to reduce health disparities by increasing access to care services, improving self-management of chronic diseases and decreasing health care costs (Swider, 2002; Andrews et al., 2004; Norris et al., 2006; Rhodes et al., 2007).

Reduce Health Disparities

Recent research indicates that health disparities are caused by poor access to health care and lack of preventive resources, in addition to influence of language/communication barriers, culture beliefs, social, economic, and environmental conditions (HRSA, 2007; Adler & Stewart, 2010; Natale-Pereira, Enard, Nevarez, & Jones, 2011; Robie, Alexandru, & Bota, 2011). A health disparity is defined as “differences that occur by gender, race or ethnicity, education or income, disability, geographic location, or sexual orientation” (Adler & Stewart, 2010, p. 6). Disparities in access to health status and quality health care disproportionately affect underserved and minority populations who are less likely to receive proper and timely treatment and more

likely to suffer negative health outcomes and higher mortality rates (Nemcek & Sabatier, 2003; HRSA, 2007; Paskett et al., 2006). Researchers reported that CHWs have worked with a variety of racial and ethnic populations as a strategy to reduce and eliminate health disparities (Nemcek & Sabatier, 2003; Rhodes et al., 2007; HRSA, 2007; Grzywacz et al., 2009). CHWs are trusted members of the communities they live in, having an intimate knowledge of the community needs, and they often share language, ethnicity, religious beliefs and social characteristics with the target populations. They can provide culturally appropriate health education, primary and preventive care, advocate for community needs, help arrange medical appointments and follow-up services, and offer counseling and social support (Swider, 2002; Nemcek & Sabatier, 2003; Andrews et al., 2004; Brownstein et al., 2005; HRSA, 2007; Grzywacz et al., 2009; Spencer et al., 2010).

Although numerous studies describe that CHW programs have a positive impact in promoting primary and follow-up care for preventive, self-managing, chronic disease, cost-effectiveness, and for changing the knowledge and behaviors of target populations, there still is limited rigorous outcome evaluations of CHW interventions (Swider, 2002; Dohan & Schreg, 2005; Norris et al., 2006; Rhodes et al., 2007). Further research is needed to understand the effectiveness of CHWs.

Increase Access to Health Care

Access to medical care services is often delayed for many ethnic and racial groups due to several barriers such as lack of health insurance, lack of knowledge about healthcare resources, insufficient access to culturally and linguistically appropriate care, shortage of physicians, cultural beliefs regarding treatment, mistrust or fear towards the health care, and language barriers (Ferrante et al., 2007; HRSA, 2007). An emerging body of research shows that CHW

programs can be an effective strategy to increase access to health care for underserved populations (Witmer et al., 1995; Swider, 2002; Andrews et al., 2004; Brownstein et al., 2005; Rhodes et al., 2007). CHWs are trained health care paraprofessionals who visit a client’s home, organizing one-on-one educational sessions, who make telephone calls to remind the client of upcoming appointments, reschedule missed appointments, have face-to-face discussions regarding access and utilization of health care services, provide information and research to their clients, navigate health and social services, link individuals with primary care providers, facilitate disease prevention and support individuals to improve their health (Swider, 2002; Andrews et al., 2004; Norris et al., 2006; HRSA, 2007; Rhodes et al., 2007; Perez, Findley, Mejia, & Martinez, 2006; Spencer et al., 2010).

Table 5

Study Design Structure

| Study Design | Description | Rating Levels |
|-----------------------------|--|----------------------|
| Randomized controlled trail | A study design were individual is randomly assigned to intervention or control group. It is one of the simplest and most powerful in clinical research | 1 |
| Cohort study | A study design in which one or more groups of subjects are studies at one given point in time | 2 |
| Quasi-experimental study | Research design in which there is no random assessment of the subjects | 3 |
| Systematic review | A study design that assessing and evaluating body of literature on particular topic | 4 |

Literature Review

The CHWs studies described were rated on the level of scientific evidence used by each study reviewed. The selection of articles was organized from the strongest evidence to the weakest evidence based on study design (see Table 5), sample sizes (large, small), populations served, and outcome measures. This review examined randomized controlled trials, cohort studies, pre and post quasi-experimental, systemic reviews and qualitative studies. The randomized controlled trials in which individual is randomly assigned to receive either intervention or control group is considered the most reliable evidence in clinical research. However, randomized controlled trials mostly use disease outcomes and it is not necessary to show effectiveness when it applied CHW interventions. The outcomes measures were grouped in terms of access, behavior and knowledge, disease managements and cost-effectiveness.

Although several studies measured more than one type of outcome, access and utilization of health care, and health status were the most prevalent. Approximately forty-five percent of the studies reviewed (n=24) focused on measuring the appropriate use of preventive services (i.e. screening, self-examination, pap testing). Twenty-seven percent (n=15) of the studies measured disease management (i.e. hypertension, diabetes, asthma, cancer), fifteen percent (n=10) measured change in knowledge and behavior in the target community. Five percent (n=4) measured cost effectiveness. Tables 6, 7, and 8 shows a summary of published CHW outcome efficacy studies, and information regarding study design, population served outcome measures and results. Table 6 comprises a summary of the CHWs studies that improve access to health care, Table 7 provides a summary of outcomes of published CHW studies related chronic disease management, and Table 8 contains a summary of cost effectiveness results of CHWs.

Table 6

Summary of Published CHW Outcome Efficacy Studies that Improve Access to Care

| Study | Topic | Design | Participants/ Location | Outcome Measures | Results |
|----------------------|------------------------------------|---|--|---|--|
| Flores et al., 2005 | Health insurance | RCT evaluated whether case managers are more effective than traditional Medicaid /SCHIP outreach and enrollment in insuring uninsured Latino children | 275 uninsured Latino children and their parents | Child obtaining health insurance coverage | Intervention group were more likely to obtain health insurance coverage compared with control group (96% vs. 57%; p<.0001). |
| Russell et al., 2010 | Preventive care | RCT, combined intervention group (interactive tailored computer and lay health advisor intervention) and low dose comparison group | 181 low-income African American women | Mammography stage of adoption and adherence at 6 months of baseline survey | 51% of women in intervention group increased screening compared to 18% of comparison group. Intervention group was three times more likely to get screened than comparison group (adjusted relative risk [RR] = 2.7, 95%; CI = 1.8 to 3.7, p<.0001). |
| Paskett et al., 2006 | Preventive care | RCT, two arms: LHA intervention group received face to face educational program, in person home visits and follow up phone calls; comparison group received invitation letter to obtain mammogram screening | 851 low income women who had not had a mammogram within the past years | Improve rates of mammography screening, knowledge and beliefs about mammogram screening | Women in the LHA intervention group significantly increased mammogram screening compared to the comparison group (42.5% vs. 27.5%, p<.001). |
| Weber et al., 1997 | Preventive care / health care cost | RCT compared the effect of case management intervention vs. usual care | 376 Vietnamese women between 52 and 77 years of age who had not had a mammo-graphy in previous two years | Mammography completion rates | 41% of the women in the intervention group and 14% of control group completed mammography screening. |

| Study | Topic | Design | Participants/ Location | Outcome Measures | Results |
|-----------------------|-----------------|---|--|---|--|
| Phillips et al., 2010 | Preventive care | RCT intervention group received a combination of telephone calls and reminder letters from patient navigators whereas control group received usual care | 3895 minority women: 1817 intervention, 2078 control | Mammogram adherence rates | After the 9-month intervention, mammogram adherence was higher in the intervention group compared with the control group (87% vs. 76%, $p < .001$). |
| Larn et al., 2003 | Preventive care | Pre and post intervention questionnaires, effect of LHWO and ME group to ME group only | 400 Vietnamese-American women to obtain pep tests | Cervical cancer awareness, knowledge and screening | The combined intervention (LHWO+ME) group increased women's knowledge about breast cancer prevention awareness of the importance of pap tests and encouraged woman to obtain pap tests. |
| Mock et al., 2007 | Preventive care | RCT, combined intervention group (LHWO plus ME group) or media -only group. Pre and /post outreach questionnaire | 1005 Vietnamese American Women. Santa Clara County, California LHWO+ME=491 ME=471 | Pap test awareness, knowledge | Combined intervention (LHWO+ME) motivated more Vietnamese American women to obtain their first pap tests than did media -only group (46% vs. 27.1%, $p < .001$). Women in combined intervention group were 2.7 times more likely to become up-to-date than women in the media only. |
| Nguyen et al., 2009 | Preventive care | RCT compared the effect of LHWO and ME group to ME alone group on breast cancer screening | 1100 Vietnamese American women underutilized breast cancer Screening. LHWO+ME=550 ME=550 | Receipt of mammography ever, mammography within two years, clinical breast examination (CBE) ever clinical within two years | The LHWO plus ME group were significantly more effective than ME alone for all outcomes for receipt of mammography ever 84.1% to 91.6%, $p < .001$, for mammography within two years, 64.7% to 82.1%, $p < .001$ for CBE ever 68.1% to 85.5%; $p < .001$ and for CBE within two years 48.7% to 71.6%. |

| Study | Topic | Design | Participants/ Location | Outcome Measures | Results |
|--------------------------|------------------------------------|--|---|---|--|
| Ferrante et al., 2007 | Preventive care / barriers to care | Prospective RCT; 55 in the Intervention group (usual care plus patient navigation); 50 in the control group (usual care) | 105 low income women with suspicious Mammogram in urban university hospital, Newark, New Jersey | Diagnostic interval (in days), patient's satisfaction and change in anxiety. | The results of mean diagnostic interval was higher in intervention group (25.0 days) compared with control group (42.7 days; p=.001) after diagnosis, the mean anxiety levels were lower in the intervention than control group (30.2 vs. 42.8, p<.001). Mean satisfaction score was higher in intervention (4.3) than in control group (2.9, p<.001). |
| Hunter et al., 2004 | Preventive care | RCT two arms, intervention group received postcard reminder and follow up visit by promoters, control group received only postcard reminder in the mail | 103 uninsured Hispanic women aged 40 and elder at the US–Mexico Border | Annual preventive exams | Intervention group were 35% more likely to go screening and more utilizing routine preventive exams than control group. |
| Percac-Lima et al., 2009 | Preventive care | RCT over a 9-months period, those who received intervention group had introductory letter with educational materials; telephone calls from patient navigator; control group received usual care. | 1223 patients (409 intervention group; 814 control group). | Colorectal cancer screening rates | Over a 9-month period, intervention group were more likely to undergo colorectal cancer screening than control group (27% vs. 12%, p<0.001). |
| Corkery et al., 1997 | Diabetes education program | RCT CHW intervention group and non-CHW intervention group | 64 minority patients in New York City hospital clinic | Completion of diabetes education on patient knowledge, glycemic control and patient self-care practices | 80% of CHW intervention patients completed education programs compared with 47% of control patients. Knowledge level and selected self-care practices improved intervention group at baseline (11.7% to 9.9%). |

| Study | Topic | Design | Participants/ Location | Outcome Measures | Results |
|------------------------|-----------------|---|--|--|---|
| Han et al., 2009 | Preventive care | Cohort study compared baseline and post intervention. Post intervention group received in- class education, follow up LHW counseling session via home visits and telephone call and navigation assistance | 100 Korean American women (aged 40 or older) | Breast cancer screening rates | At 6 months follow up, breast cancer screening rates increased compared to baseline (31.9% mammogram receipt, 23% for clinical breast examination, and 36.2% for breast self-examination p<.001). |
| Donelan et al., 2010 | Preventive care | Cohort study patient receiving navigation compared with not receiving patient navigation | 153 patients.72 received navigation services and 181 received non-navigation services | Cancer care, access , and patient satisfaction | Navigated patients were more likely to understand what to expect at their visit than non-navigated patients (79% vs. 60%, p=.003). |
| Battaglia et al., 2006 | Preventive care | Cohort study | 314 inner city women with breast abnormalities | Follow-up after abnormal breast findings | PN improve number of intervention patients receiving timely follow-up (78% vs. 64% pre-intervention, p<.0001). |
| Gabram et al., 2008 | Preventive care | Cohort study evaluated whether outreach and navigation program can impacted stage at diagnosis | 487 female patient, Atlanta, GA | Stage at diagnosis | Outreach navigation services improved female diagnostic stage (stage 0 increased from 12.4% to 25.8%, p<.005). |
| Wang et al., 2010 | Preventive care | Two-arm quasi-experimental study; intervention group got cervical cancer education, and navigation regarding health care; control group received only cervical cancer education and guideline for free screening resource centers | 134 Chinese American. New York City, NY. 80 of them received intervention group while other 54 in control group | Cervical cancer screening rates | 12-month post intervention data showed improvement intervention group screening rates compared with control group rates (70% vs. 11%, p<.001). |

| Study | Topic | Design | Participants/ Location | Outcome Measures | Results |
|----------------------|----------------------------------|---|------------------------------------|---|--|
| Nguyen et al., 2010 | Cancer knowledge | A pilot study, pre and post survey | 81 Chinese American | Knowledge of colorectal cancer screening rates | Knowledge of colorectal cancer rates were limited at pre intervention and increased by post intervention (39% to 82%, p<.0.002). |
| Carroll et al., 2010 | Preventive care/barriers of care | Qualitative study, exit interview with patients who participated in RCT vs. patient navigation services | 35 newly diagnosed cancer patients | Patient navigation functions and how impacts patient's perception of care | Navigated patients received emotional support, information about cancer, assistance with problem solving and logistical aspects of cancer care coordination. |

NOTE: CHW, community health worker; RCT, randomized controlled trail; CHIP, State Children's Health Insurance Program.; LHAs, lay health advisors; LHWs, lay health workers; LHWOs, lay health workers outreach; PN, patient navigator; ME, media education; BCE, breast cancer education; vs., versus.

Use of Preventive Care

The studies summarized in Table 6 suggest that CHWs have great potential to improve access to health care services for individuals who have fewer enrollments in funded insurance plans (public or private), and limited understanding of health services prevention and treatment adherence and lack of knowledge about chronic disease (Flores et al., 2005; Paskett et al., 2006; Han, Lee, Kim, & Kim, 2009; Russell et al., 2010; Nguyen et al., 2010). In this review, twenty studies examined the effectiveness of CHWs in improving health insurance enrollment (Flores et al., 2005; Perez et al., 2006), reducing disparities in cancer screening (Paskett et al., 2006; Russell et al., 2010; Han et al., 2009; Mock et al., 2007; Nguyen et al., 2009; Larn et al., 2003), increasing health knowledge and promoting behavior change (Norris et al., 2006; Nguyen et al., 2010). Twelve studies reported beneficial results showing that CHWs are effective in increasing access to health care services. The remaining eight studies have inconclusive conclusion about the exact impact of CHW intervention due to concurrent use of other intervention, absence of control group, high attrition rates, lack of comparable instruments, and small sample size.

CHWs interventions can be an effective agent for improving the health and healthcare of underserved children through education, linkages or referrals to the resources and services (Flores et al., 2005; Perez et al., 2006). Flores and colleagues (2005) compared effects of community-based case management on 275 uninsured Latino children and their families in two communities in Boston. Half the children received traditional Medicaid and the State Children's Health Insurance Program (SCHIP) outreach and enrollment while the intervention group received community-based case management. There was no baseline difference between the two groups with regard to ages, education, marital status, ethnicity, annual combined family income, and English proficiency. The outcome was measured by the standardized telephone interview

method and follow-up contacts one year after study enrollments. The outcome measure was the child obtaining health insurance coverage. The results showed the intervention group was more likely to obtain health insurance coverage compared with control group (96% vs. 57%; $p < .0001$). The results also showed parents of children in the intervention group were more likely to report being “very satisfied” with the process of obtaining health insurance for their child than the control group (80% vs. 29%; $p < .0001$). The authors concluded that use of CHWs have prompted uninsured children and families to enroll in public and private funded insurance because CHWs assisted in decision making regarding health insurance coverage, advocated and served as a liaison between family and health care providers. Furthermore, the CHWs explained insurance program eligibility requirements, completing the child’s insurance paperwork with the parent and submitting the application for the family (Flores et al., 2005). Similar positive results were reported by a program evaluation of the Northern Manhattan Community Voices Collaboration, which trained CHWs who target low-income communities in New York City. The authors reported that 30 CHWs facilitated health insurance enrollment for 30,000 children over a 3 year period (Perez et al., 2006).

CHWs have been improving mammography screening rates and reduced barriers to screening among underserved populations. For example, Russell and colleagues (2010) conducted a RCT (strongest study design) to test the efficacy of a combined interactive computer program and LHA intervention to increase mammography screening in African American women. The intervention group received a range of services including information on accessing mammography screening, referral, advice, education and emotional support. In contrast, the comparison group obtained a culturally appropriate guide about breast cancer, mammography screening, and showed a significantly greater rate in mammography screening compared to the

comparison group, 51% vs. 18%, $p < .0001$ (Russell et al., 2010). Another RCT conducted in Robeson County, North Carolina focused on 851 rural low-income women rates of mammography use 12-14 months after intervention. The women in this study who utilized the health advisor (LHA) intervention had a higher rate of mammography screening compared to those in the control group (42.5% vs. 27.3%; $p < .001$). In addition, knowledge about the mammography, mammography utilization and barriers to obtaining breast cancer screening were improved in LHA intervention group (Paskett et al., 2006). Both above studies support the hypotheses that women who received the LHA intervention would have higher mammography screening rates and mammography adoption than the comparison group after follow-up of abnormal results.

Similar positive results are found in two randomized control trials that targeted inner-city minority women engaged in a primary care setting who did not have mammogram screening in previous two years. In the first of these studies Weber and Relly (1997) showed improved completion rates of mammography screening in the intervention group (who received case management) compared to the rate among women in the control group 41% vs. 14%; $p < .001$. The other study has a similar outcome and showed improvement among the intervention group that received a combination of telephone calls and reminder letters from the patient navigator compared with control group 87% vs. 76% respectively, $p < .001$ (Phillips et al., 2010). The above findings support the benefit of using CHWs as one approach to reduce cancer health disparities because CHWs can encourage the proper use of screening and follow-up among underserved women who did not have mammography screening in past years by providing culturally appropriate health education, home visits, one-on-one sessions, telephone calls and postcard reminders.

Three similar RCT studies that examined the effectiveness of lay health workers outreach (LHWO) and media education (ME) among low-income Vietnamese American women to promote cervical and breast cancer screening, found that the combination of LHW intervention plus ME produced a large (significant) increase in pap testing rates, change in self-reported receipt ever of mammography, and helped nearly half of the women obtain their first pap tests, mammography screening, and clinical breast examination within the next 12 months compared to women who received ME alone. Though the findings from all three studies in Table 6 indicate that LHWOs' cultural and linguistic competence, cancer knowledge, social relationship with participants, and ability to teach women specific information about cancer-screening benefits and ME education most likely played an important role in helping ethnic-minority women to obtain pap tests as well as mammography and clinical breast examination, these studies did not examine the LHWO initiative alone more research is needed in this area (Larn et al., 2003; Mock et al., 2007; Nguyen et al., 2009).

Another RCT study conducted at an urban university hospital in Newark, New Jersey who serves low-income minority population with over 50% African American and 30% Hispanic patients (Ferrante et al., 2007). This study main outcome measures were the diagnostic interval, change patient anxiety level and patient satisfaction. Subjects were randomly assigned to usual care or usual care plus intervention with patient navigator (PN). The intervention group, PN contacted by phone and then met in person and asked to participate in the study within one week of their abnormal mammography. PN assisted patients with the scheduling an appointment, provided with emotional and social support, connected with resources and facilitated application for financial assistance, interaction and communication with health care team. Women randomized to control group received physician's notification of suspicious mammogram results

and scheduling appointment with breast clinic. Results in Table 6 show the woman in the intervention group had shorter diagnostic intervals, lower mean anxiety index, and higher mean satisfaction scores than control group (Ferrante et al., 2007). Despite the fact that this study has all the strengths of a randomized control trial, the low enrollment rate among eligible participants also excluded a high proportion of minority patients who did not speak English due to lack of a bilingual PN.

Another randomized controlled trial (RCT) examined the effectiveness of the promotora model in improving compliance with routine preventive exams among uninsured Hispanic women aged 40 and older, who live in a rural area along the US-Mexico border (Hunter et al., 2004). The study found that the promotora arm (intervention group) who received home visits in addition to reminder postcards were 35% more likely to go for rescreening and utilizing more routine preventive exams, compared to the postcard arm (control group) who received the reminder postcard only. In this study, the promotora is defined as a bilingual women who comes from the community, has experience regarding breast and cervical cancer educational programs and provides home visits, follow up services through telephone reminders, personal contacts, referrals and social support, facilitates appointment scheduling and rescheduling if appointment are missed (Hunter et al., 2004).

Cohort studies (second strongest design) that examined patient navigator effectiveness in increasing breast cancer screening outcomes for 102 Korean American women after 6 months intervention. Rates of breast cancer screening receipts were improved by 31.9% mammogram receipt, 23% for clinical breast examination, 36.2% for breast self-examination compared with baseline ($p < .001$). Although this study lacked a control group for comparison, the strong health education messages tailored with cultural sensitive and appropriate language delivered by CHWs

can improve Korean immigrants' barriers to obtaining health knowledge and utilizing recommended cancer screening tests (Han et al., 2009). Similar cohort study examined racial and ethnic minority patients enrolled in a navigator program and non-navigated patients referred to a hospital for follow-up of abnormal mammography. This study showed that patients in the navigator program were more likely to understand what to expect at their visit, and received more assistance with appointment reminders, transportation and feel welcome than non-navigated patients compared to non-navigator patients (Donelan et al., 2010).

Another two cohort studies focused on breast cancer screening with urban minority women, showed that PN improve early-stage cancer detection rates and can increase in the number of patients receiving timely follow-up after abnormal breast cancer screening (Battaglia et al., 2006; Gabram et al., 2008). In discussing these findings, authors of both studies determined that all women who participated in this study were benefited from the PN intervention because PN can encourage screening, diagnostic procedure and treatment completion among urban women by providing cultural education, contacting over the phone, meeting in person and assisting in overcoming barriers to follow-up.

A quasi-experimental study (third strongest design) evaluating Asian immigrant woman from four community-based organizations in New York City, two communities were assigned the intervention, while the other two were served as control. Women in the intervention group (n=80) received education sessions delivered by Chinese community health educators, interaction with a Chinese physician and navigation assistance including assistance with appointment scheduling, transportation and medical interpreter services during clinic visits. Control group participants (n=54) received educational materials on general health and cancer, and information about screening locations. Cervical cancer screening behaviors were assessed at

12 months post intervention. In the intervention group, 70% of women had obtained screening whereas 11% of control group had abstained screening by 12 months interval (Wang, Fang, Tan, Liu, & Ma, 2010). Although the results of this pilot study were highly promising, both intervention and control groups have no difference in knowledge about cervical cancer risk factors and symptoms following education.

Similarly, a pilot study measure pre and post intervention survey data regarding knowledge about colorectal cancer among Chinese Americans. The results showed (Table 6) that culturally and linguistically appropriate health education sessions, and follow-up telephone calls after each session made by lay health workers outreach assist participants to obtain screening and increase their knowledge about the known risk factors of colorectal cancer (Nguyen et al., 2010). This study was limited by use of self-reported data, small sample size and lack of control group.

In addition, systematic reviews (fourth strongest design) support the effectiveness of LHAs in chronic disease education, treatment and prevention, Norris and colleagues (2006) reviewed eighteen studies focused on minority population in the US that reported promising benefits in increasing access to health care services, improving participant knowledge about diabetes and self-care and positive behavior change. Another systemic review of outcome of effectiveness of CHWs by Swider (2002) showed preliminary support for CHWs in increasing access to cancer screening and follow-up visits for chronic conditions, but the health knowledge outcome and behavior changes were found inconclusive in this study.

A qualitative study (weakest design) examined at how navigation impacts African American women's perception of cancer care. The findings stated that the PNs were effective in keeping clients in program because PN offers emotional support, assistance with problem

solving and information needs, gets through the system of breast cancer care and help patients throughout the cancer treatment period (Carroll et al., 2010). In this study, reliability and validity of the results may raise questions due to self-report data and cognitive difficulty or other memory problem that several participants may experience when they were remembering specific details about navigation expectation.

Improving Barriers to Health Care

Evidence reveals that language barriers, social stigma, transportation and lack of information are major barriers preventing people accessing necessary health care. CHWs can be a solution to these problems. CHW help patient overcome obstacles to health care by providing culturally appropriate health education, information and support in a community's primary language. CHW help patients scheduling appointments, and coordinating transportation. As member of communities they serve, CHW establish trust with their patients, bridging the gap between patients and their providers (Corkery et al., 1997; Friedman et al., 2006, HRSA, 2007; Percac-Lima et al., 2008; Hendren et al., 2010).

As Percac-Lima et al. (2008) reported on a RCT of patient navigator in an urban community center serving recent immigrants from Somalia, Bosnia, Latinos and Central America, there is evidence that the culturally tailored intervention delivered by CHWs can improve colonoscopy rates for low-income and ethnically and linguistically patients (27% vs. 12% respectively, $p < .001$). During the 9-month study period, PN assists underserved patients and their families in overcoming barriers to care by providing culturally and linguistically appropriate education and information about the illness, helping with schedule appointments, transportation, and insurance coverage, supporting and helping individuals to obtain colorectal

screening and building trust with cancer care providers and help with health literacy issue (Percac-Lima et al., 2008).

In recent diabetes management program conducted with an inner-city Hispanic population reported that participants assigned to a bicultural CHW intervention had an 80% program completion rate compared with a 47% completion rate to the participants without the intervention. Finding supports the idea that CHW acted as a liaison between patients and providers, served as interpreter, reminded patients of upcoming appointments and provided cultural appropriate education and information most likely played an important role in helping medically underserved communities and minority populations in overcoming barriers to obtaining regular and quality health care (Corkery et al., 1997). Nash, Azeez, Viahov, and Schori (2006) study also revealed that the use of PN resulted in substantial decline in broken appointments for screening and diagnostic colonoscopy in one month and keeping appointments of colonoscopy increasing by nearly 3-fold.

Even though some of these above studies documented some limitations such as lack of randomization, use of self-report data, limiting generalizability of the results to other population and lack of cost analysis, adapting CHW concept for prevention is extremely important element for incorporate into future programs designed for underserved population.

Improving Self-management of Chronic Diseases

Besides evidence of CHW effectiveness in improving access to health services, literature review also provided evidence that CHW can play role in the management of chronic conditions by providing culturally appropriate health education, outreach, counseling, and social support. They also assist of self-care skills for disease management, adherence to appointment keeping and compliance with treatment regimens (Brownstein et al., 2005; Brownstein et al, 2007;

Corkery et al., 1997; Babamoto et al., 2009; Peretz et al., 2012). In this section, the outcome related to chronic disease managements were grouped in disease conditions including hypertension, diabetes, asthma, and cancer. The selection of articles also organized from the strongest evidence to the weakest evidence based on study design as shown in Table 5. Chronic disease managements were measured in fifteen studies and the results were mostly showed positive with improvements tied to the education and medical assistance delivered by CHW, as outlined in Table 7.

Table 7

Outcome of Published CHW Studies Related to Chronic Disease Management

| Study | Topic | Design | Participants / Location | Outcome Measures | Results |
|-----------------------|---------------------|---|--|--|--|
| Krieger et al., 1999 | Hypertension | RCT. intervention group who received follow-up services including referrals appointment reminder later and control group | 421 low income neighborhood in Seattle, Washington. 209 intervention group and 212 control group. | BP control | 65.1% of intervention group participants completed a medical appointment within 90 days of referrals compared with 46.7% of the control group. |
| Babamoto et al., 2009 | Diabetes | RCT, CHW group .case management group and standard provider care group | 189 Hispanic patients newly diagnosed with type 2 diabetes | Diabetic self-management | The participant in CHW group had improved self-care behavior and decreased BMI when compared with standard provider care. |
| Spencer et al., 2011 | Diabetes/ knowledge | RCT, two groups compared. intervention group received CHW services and control group who received usual care | 164 African American and Latino Adults with type – two diabetes in Detroit, Michigan | Hemoglobin A1c levels | The intervention group improved mean HbA1c value of 8.6% at baseline, and 7.8% at 6 months compare no change in mean HbA1c among the control group. |
| Thompson et al., 2007 | Diabetes | Pre/ post test pilot study. | 142 Mexican American immigrant population in Oakland, California | Diabetic management education | Culturally self-management education that CHW provide improves A1c, LDL, and BP in Mexican American population. |
| Beckham et al., 2008 | Diabetes | Descriptive cohort study. comparing HbA1c readings of greater than 10.0% of participants with diabetes with and without CHW intervention | 116 Native Hawaiian/ Samoan population | HbA1c level | Participants who received CHW intervention had a -2.2, (1.8%) mean reduction in HbA1c, compared with those without CHW intervention .02 (1.5%). |
| Krieger et al., 2009 | Asthma | RCT, participants received asthma education and support from nurses (nurse only group), and participants received nurses and home visits delivered by CHWs (nurse plus CHW group) | Three hundred nine children, age three to thirteen with asthma | Asthma symptom- free days, and use of urgent health services | The number of symptoms-free days increased in 1.9 days in CHW + nurse group compare to nurse only group 1.2 days. Also urgent services use was decreased 27.2% in nurse +CHW group than 17.6% in nurse only group. |

| Study | Topic | Design | Participants / Location | Outcome Measures | Results |
|------------------------|-------------------|---|---|--|--|
| Primomo et al., 2006 | Asthma | Pre/post intervention, baseline and follow-up surveys | 60 caregivers whose children received AOW services | Quality of life, use of asthma management plans, medication use, health care utilization home environmental behavior changes | AOW improved caregivers and their children's quality of life, use of asthma management plans at follow-up as compared with baseline (93% vs. 31%) and reduce asthma trigger in the home environment. |
| Martin et al., 2006 | Asthma/ knowledge | Pilot study | 103 low-income communities | Asthma knowledge, environmental home triggers, asthma severity | Improve asthma research and participant's recruitment. |
| Ferrante et al., 2007 | Cancer | RCT intervention group and control group | 105 urban minority women. University Hospital, Newark | Time to diagnosis after a suspicious mammogram, anxiety, satisfaction | Rate of timely diagnostic resolution reduction, lower anxiety level and increase patient satisfaction. |
| Christie et al., 2008 | Cancer | RCT, intervention group who received patient navigation services; control group who received usual care | 21 patients, community health center | Completion of colonoscopy screening | Intervention group were more likely to complete colonoscopy screenings than the control group (54% vs.13%, p=0.085). |
| Battaglia et al., 2006 | Cancer | Cohort study | 314 patients, major Academic Center, Boston, MA | Timely follow up after abnormal breast cancer findings | Patient receiving timely follow-up were improved, post-intervention 78% vs. pre-intervention 64%, p<.0001. |

NOTE: CHW, community health worker; AOW, Community outreach worker; RCT, randomized controlled trail; vs., verses; HbA1c, Glycated hemoglobin; LDL, cholesterol; BP, blood pressure; BMI, body max index.

Hypertension.

CHWs are important public health care teams that strengthen underserved communities understanding of blood pressure management, adherence to treatment for the control of hypertension, recommendations, and self-management skills (Witmer et al., 1995; Brownstein et al., 2005; Brownstein et al., 2007). A study conducted by Krieger, Collier, Song, and Martin (1999) in low-income residents in Seattle, which participants were randomized to usual care or outreach and tracking intervention delivered by CHWs. The intervention group received educational materials, blood pressure measurements, referrals, transportation help, appointment reminders letters and follow-up visits whereas usual care group received only advice to see health care providers for follow-up care. The results showed that 65.1% of the intervention group had completed medical appointments within 90 days of referrals compared to 46.7% of usual-care group (Krieger, Collier, Song, & Martin, 1999). This outreach initiative showed that not only CHWs can be an effective tool in delivery of outreach and tracking services among clients with hypertension, but it emphasized the importance of identifying and educating those who experience more difficulties accessing health care.

In a similar randomized controlled trial (RCT) that examined the efficacy of home visits by trained CHWs in low-income African Americans in Baltimore, MD with high prevalence of hypertension. Patients who received one CHW home visit and those who received five home visits without CHW did equally well in improving blood pressure control over a 40-month study period (Levine et al., 2003).

A systematic review that examined the effectiveness of CHWs in care for people with hypertension, Brownstein and colleagues (2007) found positive outcome for improving participant's self-management of hypertension, continuity of care, adherence to medication and

appointment keeping. The results of this study reported that outreach education, ongoing social support and counseling that provided by CHWs who share demographic and cultural characteristics to the community members they serve were influential to the success of their program.

Diabetes.

Several research studies suggested that CHWs were able to reach effectively and educate the underserved populations to improve diabetes self-management, medication adherence and reduce complication of diabetes (Beckham, Bradley, Washburn, & Taumua, 2008; Babamoto et al., 2009). A randomized controlled trial (RCT) evaluated the relative effectiveness of an intervention delivered by CHWs among Hispanic individuals with newly diagnosed type 2 diabetes in three inner city health centers (Babamoto et al., 2009). Participants were randomly assigned to the usual clinic practice group received practitioners care only or CHW intervention group received culturally appropriate diabetes education classes, follow-up telephone calls, assistance in problem solving and social support. The participants in CHW group achieved a great improvement in self-care, medication-taking behavior, and decrease emergency department visits compared with control group. In this study, there were no differences across the mean A1c between groups (Babamoto et al., 2009).

Spencer and colleagues (2011) used a RCT design similar to Babamoto et al. (2009) that measured HbA1c reading levels among low-income African Americans and Latino adults with type 2 diabetes. Subjects were randomly assigned intervention group or control group. All participants in this study received free information regarding healthy eating habits, physical activity, and diabetes care education. However, CHW intervention group received additional diabetes education classes tailored into their culture and home visits that improve patient

provider communication skills. The results in Table 7 showed that the participants in intervention group improved mean HbA1c value of 8.6% at baseline, and 7.8% at 6 months compare no change in mean HbA1c among the control group. The results also show intervention group made greater improvements in self-reporting diabetes understanding than control group (Spencer et al., 2011). The findings of this study support CHWs as health advocate that can assist in patient setting specific goals, help communication between provider and their own communities and also improve diabetes self-care knowledge and behavior.

The cohort study in Native Hawaii and Samoan population that examined intervention comparing CHW diabetes case-management, including home visit, self-management education plus a multidisciplinary team, including family practice, internal medicine, nutritional therapy and traditional Hawaiian healing with multidisciplinary team alone (Beckham et al., 2008). The results reported that the CHW intervention provides greater benefit in decreasing mean hemoglobin A1c (HbA1c) as compared with usual care, -2.2 vs. 0.2 (Beckham et al., 2008). Although study investigators didn't reported behavioral outcome such as participant satisfaction with diabetes care, self-management behavior, CHW services proved to be the key led positive impact on diabetes managements that improve HbA1c among Hawaiian and Samoan population.

Together studies demonstrated that culturally appropriate diabetes education, social support, referrals, follow-up telephone contact and home visits led by CHWs may enhance diabetes self-management among racial and ethnic minority populations.

Asthma.

Several studies have shown that CHWs can reduce barriers to obtaining asthma services and improve asthma self- management skills in low income children and their families (Fisher et al., 2009; Krieger, Takaro, Song, Beaudet, & Edwards, 2009; Martin et al., 2006). The Seattle

King County Healthy Homes Program that tested in-home asthma self-management support from CHWs to clinic nurse education among 309 low income children aged 3 to 13 years with asthma. Participants were randomly assigned intervention group who received an asthma education from nurse plus home visit intervention from CHW with control group received only the nurse asthma information booklet. This study measured free asthma symptoms days for children in the past two years, caretaker's perception use of health services, and use of urgent care services in prior of three months. The results reported that the intervention group (nurse+ CHW) had 24 more free asthma symptoms days per year compared with control group (nurse only) at baseline. In addition, there was small deference between two groups in the use of urgent care, and caretaker's quality of life, but in home asthma education by CHWs yield additional benefit to control asthma in intervention group (Krieger et al., 2009).

A pilot study that assessed CHWs asthma intervention and their effectiveness in reducing asthma triggers in low-income Latino children and their families. CHWs home visit for asthma education were reported reductions in home asthma triggers for both caregivers and their children with asthma. The authors of this study suggested that CHWs culturally competent asthma in home education, assistance to practice proper techniques of use asthma inhalers, and referral for medical care would lead to improve asthma medication usage, knowledge and reduce environmental home triggers for children and their families (Martin et al., 2006).

Similar results were obtained from a retrospective study that evaluated the effectiveness of outreach workers home-based asthma education program for children with asthma. Primomo, Johnston, Diblase, Nodolf, and Noren (2006) found that outreach worker services can help caregivers to control their child's asthma and reduce triggers in their home. Both studies strength is limited due to the lack of a control group, self-reported data and small simple size, but

CHW interventions incorporating home visits, asthma education, and social support could identify ways to minimize asthma triggers and improve asthma management in low-income child and member of families.

Cancer.

Despite improvements in overall medical knowledge and technologies, diagnosing cancer in a timely manner and continue follow-up and treatment in cancer remains a challenge in racial and ethnic minority patients (Dohan & Schrag, 2005; Wells et al., 2008). Patient navigators (PNs) are able to provide cancer patients and their families for basic knowledge about cancer and how to find resources for prevention, screening, treatment survivorship and self-care strategies (Wells et al., 2011). A prospective randomized controlled trial of 21 patients in Settlement Health, New York found that patients receiving patient navigation intervention were more likely to complete colonoscopy screenings than the control group (54% vs.13%; $p=0.085$). In this study, PN assisted patients with scheduling and rescheduling missed colonoscopy appointments organized and coordinated the transportation services and explained procedures to patient in their language (Christie et al., 2008).

Another study that examined the benefit of a patient navigator after suspicious mammograms in urban minority women found reductions in mean diagnosis resolution between the intervention group and control group (25 days vs. 42.7 days; $p=.001$), the mean anxiety levels were dropped women in the intervention group after diagnosis compared with women in the control group (30.2 vs. 42.8; $p<.001$) and patient satisfaction were also improved women in intervention group (Ferrante et al., 2007). Although this study used small sample size and conducted in university hospital setting that serve poor minority patients, patient navigator

services can improve timely diagnostic resolution, reduce anxiety levels and increase patient satisfaction.

A recent cohort study review of patient navigation intervention for inner-city minority women with breast screening abnormalities found improvement the rate of timely diagnostic follow-up during the intervention period compared with women in the comparison group (78% vs. 64%; $p < .0001$). These results suggested that daily patient assistance, advocate and cancer education provided by patient navigator can improve cancer care barriers among underserved population (Battaglia et al., 2006).

The findings of above studies indicated that patient navigators can overcome barriers that limit access to screening, and treatment completion by encouraging patient to keep appointments, follow doctor orders, assisting for completing medical paperwork, providing cancer care education and psychological or emotional support.

Reducing Health Care Costs

In addition to improved health care access, there are few studies showing that CHW intervention is an effective tool for reducing the cost of health care by reducing emergency room visits and hospitalization to less costly primary care (Fedder et al., 2003; Brownstein et al., 2005; Whitley et al., 2006). Studies that related outcome measures and cost-effectiveness results of CHW are shown in Table 8.

Table 8

Outcome of Cost-effectiveness Results of Community Health Workers (CHW)

| Studies | Topic | Design | Outcomes Measures | Results |
|----------------------|--------------------------|--------------------------------|---|--|
| Weber et al., 1997 | Mammography | RCT | Rate of Mammography use | A total of CHW intervention cost savings per additional mammography equivalent to \$11,591 per year of life |
| Fedder et al., 2003 | Diabetes management | Retrospective comparison study | Total of emergency department (ED) visits, hospital and Medicaid reimbursement | The savings in Medicaid health services were \$2,245 per patient per year. |
| Whitley et al., 2006 | Primary care utilization | Pre/ post intervention | Clients emergency room utilization, reimbursements for cost of health care services delivery by CHW | Clients received CHW services had increased primary care visits and decreased their inpatient and urgent care use. The overall program saved \$2.28 per \$1 spent on the CHW intervention, for a total annual saving of \$95,000 per year. |

From the studies that identified the cost effectiveness of CHWs, few studies showed reduction in health care costs. Fedder and colleagues (2003) examined study data from 117 low income African American Medicaid patients with diabetes and hypertension who received CHW home-based outreach in West Baltimore City. The results showed a 38% reduction in emergency room visits, 30% decrease in hospital admissions and 27% of Medicaid patients lowered their cost of care compared to baseline. In addition, results also showed an estimated yearly cost savings of 2,245 per patient per year, and 117 patients were saved an estimate of

\$262,080 per year. The authors reported that the CHWs visited each patient twice a month, called them weekly, provided education about primary care and referral information, helped patients to keep medical appointments and encouraged patient to apply for Medicaid (Fedder et al., 2003).

A study in Denver, Colorado compared medical utilization of 590 underserved men before and after they were connected with CHW. The investigators found that patients who received CHW services had increased primary care visits and decreased their inpatient and urgent care use. The overall program saved \$2.28 per dollar (\$1) spent on the CHW intervention, for a total annual saving of \$95,000 per year. Results for this study clearly demonstrate that CHW intervention can be cost-effective with underserved communities by providing cultural appropriate health education resources materials, assisting clients in keeping appointments, helping navigation referrals, and assistance of understanding the importance of primary care and enrollments in government funded insurance plans (Whitley et al., 2006). Though there is no clear methodology to evaluate cost effectiveness of the CHW intervention, CHWs can make contribution in improving patient's health outcomes and lower costs of emergency room.

Overall, the research examining CHWs highlights the importance of their role in reducing many of the health care barriers faced by racial/ethnic minorities as well as other underserved populations. Whether it's increasing access to health care, encouraging families to enroll in publicly and private funded insurance, improving patient self-care chronic management, and reducing the health care costs, all studies mention here indicated that CHWs performance in the health care system is effective.

Discussion

This section discusses findings related to the role and documented effectiveness of community health workers, study limitations and recommendations.

Reflecting on first aim of the studies reviewed here, the authors indicated that CHW programs were implemented throughout many parts of worlds to help underserved populations who face considerable barriers accessing and utilizing regular health care services. This review found that CHWs, who come from the same communities that they live, are known and respected by the community, have the necessary training and share the experiences, culture and the language of the communities they serve. All these factors can play an important role in reducing health disparities as well as accessing and the quality of care among underserved populations in the United States

Although there is much variability in the roles and function of CHWs, the above literature review pointed out seven core roles of the CHW that had a positive effect on individual's health outcomes. An estimate of fifty percent of those articles reviewed, clearly indicated that bridging the gap between communities and health care system is an important function for CHWs. For example, CHWs can facilitate patient-providers communication by interpreting and translating medical and other materials into simple language that clients can easily understand, assisting the client before and after health clinic visit, managing the medication list and questions before the patient meet their doctors, helping to complete paperwork, helping clients to comply with treatment recommendation and facilitating patient appointment keeping and follow-up services.

In addition, a number of studies have suggested that CHWs' play a significant role as educators to members of growing minority communities and their providers. For instance,

CHWs provide culturally appropriate health education and information resources that are not available to their families, friends and neighbors. They conduct door-to door outreach to teach the community members how to use the system correctly and the concepts of health promotion and disease prevention. CHWs can also educate providers about community needs and clarify cultural and health beliefs that can impede medical treatment. Finally, in some studies CHWs were identified as serving as traditional health advisors who provide individual social advice, health care support and referrals.

Reflecting on the second aim of study reviewed, investigators support the idea that the CHWs have contributed to reduce health disparities by increasing access to health care services, improving self-management of chronic diseases and decreasing health care costs. As Table 6 demonstrates, the CHW approach was the most prevalent evidence in the area of increasing access to care. Twelve of twenty studies examining the effectiveness of CHWs reported positive outcome for preventive care, improving health insurance enrollment, reducing disparities in cancer screening, increasing health knowledge and promoting behavior change. For example, Flores and colleagues (2005) concluded that the use of CHWs have prompted uninsured children and families to enroll in public and private funded insurance because CHWs assisted in the decision making regarding health insurance coverage, advocated and served as a liaison between family and health care providers, explained insurance program eligibility requirements, completing the child's insurance paperwork with the parent and submitting the application for the family.

Similarly, CHWs have been improving mammography screening rates and reduced barriers to screening among underserved populations. The findings of several studies (Table 6) support the benefit of using CHWs as one approach to reduce cancer health disparities because

CHWs can encourage the proper use of screening and follow-up care, assisted patients with the scheduling an appointment, provided with emotional and social support, connected with resources and facilitated application for financial assistance, improving clients interaction and communication with health care team. Together these studies suggested that CHW interventions can improve knowledge levels of underserved populations, but future research needs to incorporate measures of cost effectiveness of CHW interventions.

Furthermore, the literature examined CHW effectiveness on the outcome related to chronic disease managements, hypertension, diabetes, asthma and cancer, of the fifteen studies, ten showed positive outcome in care of people with chronic disease as outlined in Table 7. The evidence form studies reported that culturally appropriate education; ongoing social support and counseling, follow-up telephone contact and home visits led by CHWs enhance chronic disease self-management among racial and ethnic minority populations.

In addition, there are few published studies documenting cost effectiveness of CHW interventions (Table 8), but the results of review here reported that health education, system navigation referrals, assistance on understanding the importance of primary care visits, home visits, and follow-up care delivered by CHWs reduce urgent care use, emergency room visits and hospital admission for low income children and their care givers. Overall assessments of CHW interventions suggested promising outcome, and this review could provide a beginning understanding of CHWs role and effectiveness which can reduce health care disparities among underserved communities.

This review has several limitations. First, the selected articles were limited to the United States and published only in certain years. So this review could not study all CHW interventions. Second, undefined job descriptions and lack of clear understanding of CHWs'

role and responsibilities make difficult to evaluate the benefit of CHW interventions. Third, inadequate training and limited skills of CHWs could affect the sustainability of CHW interventions. So development of standardized curriculum and training program awarded certification is necessary for CHW programs. Fourth, there is very few studies presented evidence of the effectiveness of CHW regarding behavioral change and cost analysis. Finally, concurrent use of other interventions, absence of control group, high attrition rates, lack of comparable instruments, and small sample size could limit the exact impact of CHW interventions. Future research is needed to empower policy and practice that promote CHW interventions.

Conclusions

Community health worker interventions have become important strategies that have reached the underserved population, primarily low-income minority group who experience lack of health care access and information resources. No matter the title they use, CHWs are members of the community in which they work for; linguistically, ethnically, culturally, socioeconomically and experientially. They are also committed to assist and empower their community through range of activities, such as outreach, advocacy, education and support and can often close the gap between their communities and health care system. CHW programs have a positive impact in promoting primary and follow-up care for preventive, self-managing, chronic disease, cost-effectiveness, and for changing the knowledge and behaviors of target populations. Several studies have shown that CHWs' encouragement, education and counseling regarding health care access most likely played an important role in helping medically underserved communities and minority population in overcoming barriers to abstaining regular and quality health care.

Although CHW interventions shows greater potential in increasing access to health care, improving self-care of chronic diseases, and reducing health care costs, much still needs to be done to evaluate the effectiveness of CHW programs among underserved communities in the United States.

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Appendix A – Tier 1 Core Public Health Competencies Met

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| Domain #1: Analytic/Assessment |
| Identify the health status of populations and their related determinants of health and illness (e.g., factors contributing to health promotion and disease prevention, the quality, availability and use of health services) |
| Describe the characteristics of a population-based health problem (e.g., equity, social determinants, environment) |
| Recognize the integrity and comparability of data |
| Identify gaps in data sources |
| Describe how data are used to address scientific, political, ethical, and social public health issues |
| Domain #2: Policy Development and Program Planning |
| Gather information relevant to specific public health policy issues |
| Describe how policy options can influence public health programs |
| Explain the expected outcomes of policy options (e.g., health, fiscal, administrative, legal, ethical, social, political) |
| Gather information that will inform policy decisions (e.g., health, fiscal, administrative, legal, ethical, social, political) |
| Identify mechanisms to monitor and evaluate programs for their effectiveness and quality |
| Domain #3: Communication |
| Identify the health literacy of populations served |
| Communicate in writing and orally, in person, and through electronic means, with linguistic and cultural proficiency |
| Solicit community-based input from individuals and organizations |
| Participate in the development of demographic, statistical, programmatic and scientific presentations |
| Apply communication and group dynamic strategies (e.g., principled negotiation, conflict resolution, active listening, risk communication) in interactions with individuals and groups |
| Domain #4: Cultural Competency |
| Incorporate strategies for interacting with persons from diverse backgrounds (e.g., cultural, socioeconomic, educational, racial, gender, age, ethnic, sexual orientation, professional, religious affiliation, mental and physical capabilities) |
| Recognize the role of cultural, social, and behavioral factors in the accessibility, availability, acceptability and delivery of public health services |
| Respond to diverse needs that are the result of cultural differences |
| Describe the dynamic forces that contribute to cultural diversity |
| Describe the need for a diverse public health workforce |
| Participate in the assessment of the cultural competence of the public health organization |
| Domain #5: Community Dimensions of Practice |
| Recognize community linkages and relationships among multiple factors (or determinants) affecting health (e.g., The Socio-Ecological Model) |
| Demonstrate the capacity to work in community-based participatory research efforts |
| Identify stakeholders |
| Collaborate with community partners to promote the health of the population |
| Use group processes to advance community involvement |
| Describe the role of governmental and non-governmental organizations in the delivery of community health services |
| Domain #6: Public Health Sciences |
| Identify prominent events in the history of the public health profession |
| Describe the scientific evidence related to a public health issue, concern, or, intervention |
| Retrieve scientific evidence from a variety of text and electronic sources |
| Discuss the limitations of research findings (e.g., limitations of data sources, importance of observations and interrelationships) |
| Domain #7: Financial Planning and Management |
| Describe the organizational structures, functions, and authorities of local, state, and federal public health agencies |
| Translate evaluation report information into program performance improvement action steps |
| Contribute to the preparation of proposals for funding from external sources |
| Apply basic human relations skills to internal collaborations, motivation of colleagues, and resolution of conflicts |
| Describe how cost-effectiveness, cost-benefit, and cost-utility analyses affect programmatic prioritization and decision making |

| Domain #8: Leadership and Systems Thinking |
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| Incorporate ethical standards of practice as the basis of all interactions with organizations, communities, and individuals |
| Participate with stakeholders in identifying key public health values and a shared public health vision as guiding principles for community action |
| Use individual, team and organizational learning opportunities for personal and professional development |
| Participate in mentoring and peer review or coaching opportunities |