



The New England Comparative Effectiveness Public Advisory Council

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Community Health Workers:

A Review of Program Evolution, Evidence on Effectiveness and Value, and Status of Workforce Development in New England

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Developed by:

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Introduction

To make informed healthcare decisions, patients, clinicians, and policymakers need to consider many different kinds of information. Rigorous evidence on the comparative clinical risks and benefits of alternative care options is always important; but along with this information, decision-makers must integrate other considerations. Patients and clinicians must weigh patients' values and individual clinical needs. Payers and other policymakers must integrate information about current patterns of utilization, and the impact of any new policy on access, equity, and the overall functioning of systems of care. All decision-makers, at one level or another, must also consider the costs of care, and make judgments about how to gain the best value for every healthcare dollar.

The goal of this initiative is to provide a forum in which all these different strands of evidence, information, and public and private values can be discussed together, in a public and transparent process. Initially funded by a three-year grant from the federal Agency for Healthcare Research and Quality (AHRQ), and backed by a consortium of New England state policymakers, the mission of the New England Comparative Effectiveness Public Advisory Council (CEPAC) is to provide objective, independent guidance on how information on comparative effectiveness can best be used across New England to improve the quality and value of health care services. CEPAC is an independent body composed of clinicians and patient or public representatives from each New England state with skills in the interpretation and application of medical evidence in health care delivery. Representatives of state public health programs and of regional private payers are included as ex-officio members of CEPAC. The latest information on CEPAC, including guidelines for submitting public comments, is available online: cepac.icer-review.org.

The Institute for Clinical and Economic Review (ICER) is managing CEPAC and is responsible for developing evidence reviews for CEPAC consideration. ICER is an academic research group based at the Massachusetts General Hospital's Institute for Technology Assessment. ICER's mission is to lead innovation in comparative effectiveness research through methods that integrate evaluations of clinical benefit and economic value. By working collaboratively with patients, clinicians, manufacturers, insurers and other stakeholders, ICER develops tools to support patient decisions and medical policy that share the goals of empowering patients and improving the value of healthcare services. More information about ICER is available at www.icer-review.org.

ICER has produced this evidence review and policy analysis to support CEPAC deliberations. Building upon initial research conducted by AHRQ, the U.S. Health Resources and Services Administration (HRSA), and various state-based initiatives, the goals of this review are to 1) document the evolution of community health worker (CHW) programs within New England as well as nationally; 2) summarize the evidence on CHW program impact on health outcomes and costs and identify program components associated with success; 3) examine the potential budgetary impact of implementing CHW programs; and 4) provide insights from policy experts on potential best practices in CHW implementation. This report is part of an experiment in enhancing the use of evidence in practice and policy, and comments and suggestions to improve the work are welcome.

1. Background

1.1 The Role of the Community Health Worker

Disparities across racial and socioeconomic lines in the utilization of health care services and in patient outcomes continue to plague healthcare systems in the U.S. (AHRQ, 2008; Smedley, 2003; Children's Defense Fund, 2006). Policies to address health care disparities have varied, including steps to increase access to health insurance coverage at both the state and federal levels, policies aimed at increasing the diversity and numbers of primary care practitioners, and a multiplicity of programs aimed at coordinating care across settings and provider types, including disease management, case management, and multi-disciplinary clinics (Smedley, 2009).

One health care role that has gained increasing attention in recent years is that of the community health worker (CHW). It is estimated that there are currently 120,000 CHWs working in the U.S. today in a variety of healthcare settings, communities, and clinical contexts (Rosenthal, 2010). The role has become prominent enough that the U.S. Department of Labor created a Standard Occupational Classification for CHWs in 2009, as defined below:

Assist individuals and communities to adopt healthy behaviors. Conduct outreach for medical personnel or health organizations to implement programs in the community that promote, maintain, and improve individual and community health. May provide information on available resources, provide social support and informal counseling, advocate for individuals and community health needs, and provide services such as first aid and blood pressure screening. May collect data to help identify community health needs. Excludes "Health Educators." (Bureau of Labor Statistics, 2012)

In practice, CHWs may be known by a variety of titles, including community health advisor, lay health worker, community health representative, promotora or promotores de salud, and patient navigators. The actual responsibilities of CHWs vary both within and across these different job titles, but there are several core elements that are common across them. For one, CHWs typically have a strong connection to the patient community they are serving, and are often members of that same community themselves. Second, CHWs are distinguished from other health professionals because their training and orientation focuses on education and health system navigation rather than direct provision of health care services. CHWs provide support to the clinical care team by resolving issues that create obstacles to accessing services, such as transportation to appointments, intervention with utility companies, etc. In this way they are differentiated from nurse case managers and other clinically-trained personnel engaged in care coordination activities. There have been attempts to create a standard definition and role for CHWs, but the scope of their work and the methods of integration within a clinical team continue to take many forms.

While there are commonalities in the general role that CHWs play, the deployment of these individuals is highly variable. CHWs may operate as “generalists” across multiple patient populations or be focused on a patients with a single clinical condition. They may be employed as part of a short-term grant-funded initiative or be permanent employees of a community health center. CHWs may play their role as full-time or part-time employees or may even be unpaid volunteers. In the sections that follow, we seek to understand the evolution of the CHW workforce on both a national and regional level, understand the evidence on the clinical and financial impact of CHW programs, and seek to identify program components most closely associated with success.

1.2 Evolution of U.S. CHW Workforce

The notion of an individual assisting other members of his or her community in health-related matters is a longstanding one. Evidence of lay individuals advocating for, and in some cases providing basic healthcare dates back to at least the 17th century. Examples include the “feldshers,” who were deployed to treat Russian military personnel during a shortage of doctors, “barefoot doctors,” who provided basic primary care services in remote Chinese villages that did not have medical personnel, and “promotores,” a movement that grew in Latin America in the 1950s to bring health care to the poor as a means of empowerment (Perez, 2008).

In the U.S., published literature on CHW programs began to appear in the mid-1960s. Early efforts focused primarily on anti-poverty strategies rather than specific health improvement activities. For example, the passage of the Federal Migrant Health Act of 1962 mandated outreach by community aides, and programs sponsored by the U.S. Office of Economic Opportunity focused on community roles as a means for job creation (Meister, 1992). Early examples of community health worker activity were centered on localized programs to treat acute conditions such as tuberculosis and pediatric respiratory infections (Wilkinson, 1992; Cauffman, 1970).

In the 1970s and 1980s, the World Health Organization’s recognition of the need for CHWs served to increase awareness of their potential role in public health and sparked substantial growth in private and public funding for more broad-based initiatives. Examples include the “Resource Mothers” programs that dealt with maternal and child health issues (May, 2005) and the Health Education Training Centers program to serve immigrant populations along the U.S.-Mexico border (HRSA, 2007).

Efforts to organize, train, and credential CHWs began in earnest in the early 1990s. Training programs began at community health centers in Boston and San Francisco. The New Mexico Community Health Worker Association was founded with support from the University of New Mexico and created a training program with a grant from the Robert Wood Johnson Foundation

(Love, 2004). The Centers for Disease Control and Prevention (CDC) and the Department of Education provided federal grants for the development of educational curricula. Arizona and Kentucky used annual state appropriations to fund CHW programs; the former has focused on maternal and child health issues in specific communities since 1992 (Arizona Department of Health Services, 2013), while the latter has targeted medically needy individuals in selected poor and rural counties across the state since 1994 and is administered by the University of Kentucky (University of Kentucky Center of Excellence in Rural Health, 2013).

The first effort to describe the profile of CHWs on a national basis, the National Community Health Advisor Study, was released in 1998 (Rosenthal, 1998). As previously mentioned, in 2009 the U.S. Dept. of Labor recommended the establishment of a Standard Occupational Classification for CHWs (Office of Management and Budget, 2010). And in 2010 the Patient Protection and Affordable Care Act passed including language that specifically identified CHWs as health professionals, while also authorizing grant funding for the use of CHWs to support medically underserved populations (PPACA, 2010). In addition to national activities, several states have been particularly active in developing public policy around CHWs, most notably Massachusetts, Minnesota, Oregon, and Texas. We describe these state-specific experiences in further detail below.

Massachusetts

Support for a more comprehensive approach to training and deploying CHWs in Massachusetts began in 2000 with the creation of the Massachusetts Association of Community Health Workers (MACHW), which has become a national leader with regard to education, research, and advocacy on behalf of CHWs (Rosenthal, 2010). The state health care reform law of 2006 included two key provisions for CHWs. First, the state Department of Public Health (DPH) was directed to conduct a comprehensive evaluation of CHW programs in the state and provide recommendations for workforce sustainability. This report, which was released to the state legislature in late 2009, included 34 recommendations for maintaining a viable workforce. Among the key recommendations were those advocating a statewide “identity” campaign to standardize CHW nomenclature, roles, and responsibilities; creating a training, certification, and continuing education infrastructure; expanding funding mechanisms; and establishing a state government infrastructure to support CHW work moving forward (Anthony, 2009). The 2006 legislation also provided a seat for MACHW on the state’s Public Health Council, the body that advises DPH on major policy decisions.

The state legislature responded to the report’s recommendations by passing legislation in 2010 to authorize the creation of a Board of Certification for CHWs (MAlegislature.gov, 2010), which includes the Commissioner of Public Health, community health, public health, and health plan representatives, and representatives from MACHW. The Board, which began meeting in July 2012,

is tasked with creating a program of certification for CHWs and defining standards and requirements for educational and training programs over a 5-year time horizon. In addition, legislation passed in 2012 designed to control costs in part by shifting from fee-for-service reimbursement to global payments authorized a formal role for CHWs as part of the primary care team within accountable care organizations, and recommended that the state Medicaid program include CHWs in its alternative payment methodologies (Turnbull, 2013; AHRQ, 2013).

Oregon

Oregon's efforts to integrate CHWs into primary care practice began in 2008 with the development of a statewide CHW network in conjunction with the Northwest Regional Primary Care Association (NWRPCA, 2013). Relevant legislative efforts began in earnest following the election of John Kitzhaber for a non-consecutive third term as governor in 2010. Kitzhaber, a former emergency room physician and health services researcher, has campaigned consistently for improved efficiency and wider access to care (Goldsmith, 2003). In 2011, the first of two laws was enacted, requiring the Oregon Health Authority to explore methods of improving birth outcomes among women of color, including but not limited to the use of doulas (non-medical birth assistants) (Oregon State Legislature, 2011). The second law, more far-reaching in nature, established an integrated network of care delivery systems known as "coordinated care organizations" (CCOs) to deliver care to recipients of medical assistance with a focus on prevention, reducing disparities, and improving health equity using alternative payment methods, patient-centered medical home structures, and evidence-based information. The law also specifies that beneficiaries must have access to personal health navigators and qualified CHWs (OregonLaws.org, 2011).

In 2013, the Center for Medicare and Medicaid Services (CMS) Center for Medicare and Medicaid Innovation awarded Oregon a \$45 million grant and Medicaid waiver to test the effects of the CCO framework and alternative payment models on both clinical outcomes and costs. All CCOs will utilize CHWs as part of integrated care teams (Oregon Health Authority, 2013). Oregon has identified 33 performance measures against which to judge the program's impact, including rates of appropriate/inappropriate resource utilization, clinical measures (e.g., BMI, tobacco use), patient satisfaction, and others (Johnson, 2013). The state legislature is also currently considering a bill to establish a health workers commission that would identify training and education requirements for CHWs and other health professionals.

Minnesota

In the early 2000s, Minnesota recognized that a shortage of health care personnel coupled with an increasingly diverse population had the potential to increase disparities in terms of access to and use of health care services. A multi-stakeholder coalition known as the Healthcare Education-Industry Partnership Council (HEIP) worked to develop a standardized description of CHW roles and responsibilities as well as a credit-based educational curriculum that could be offered at community and technical colleges (Minnesota Community Health Worker Alliance, 2013). The curriculum is summarized in Table 1 below. The state legislature adopted this curriculum in 2007 as part of a system to allow CHWs, with appropriate supervision by advance practice nurses and physicians, to become billable Medicaid providers. The Centers for Medicare and Medicaid Services approved this change in 2008, which has since been expanded to include public health nurses and dentists as supervisors (Rosenthal, 2010). Minnesota thus became the first state to establish Medicaid reimbursement for a wide spectrum of CHW services.

Table 1. Standard Curriculum for Community Health Workers in Minnesota.

Phase	Components	Credit Hours
I: Core Competencies	Advocacy and Outreach	9
	Community and Personal Strategies	
	Teaching and Capacity Building	
	Legal and Ethical Responsibilities	
	Coordination, Documentation, and Reporting	
	Communication Skills and Cultural Competence	
II: Health Promotion Competencies	Healthy Lifestyles	3
	Heart and Stroke	
	Maternal/Child/Teen Health	
	Diabetes	
	Cancer	
	Oral Health	
III: Internship	Mental Health	2
	72-80 Hours of Supervised Experience	

Source: Minnesota Community Health Worker Alliance (<http://www.mnchwalliance.org/CurriculumOutline.asp>)

Texas

In 2001, Texas became the first state to adopt legislation requiring that state health and human service agencies use CHWs/promotores to assist recipients of medical assistance (McCormick, 2012). As part of this legislation, the Department of State Health Services was tasked with developing and implementing a training and certification program to meet minimum standards. The certification standards are among the most stringent in the nation, requiring 160 hours of initial education and training as well as 20 hours of continuing education every 2 years for any salaried CHW (Texas Department of State Health Services, 2013).

In 2011, the state legislature charged the Department of State Health Services and Health and Human Services Commission with exploring the feasibility of deployment of CHWs and promotores across the state as well as funding and reimbursement mechanisms that could sustain the workforce. The resulting report, which was presented to the state legislature in 2012, featured an employer survey of organizations that did and did not employ CHWs (Texas Department of State Health Services/Health and Human Services Commission, 2012). Results indicated interest in maintaining and expanding CHW services among a substantial majority of employers, even those who did not currently employ CHWs. Recommendations to the legislature included consideration of successful Medicaid models from other states, alterations to the state uniform managed care contract to include CHWs, integration of CHWs into patient-centered medical homes and other alternative delivery initiatives, and exploration of inclusion of CHWs into Texas' own Medicaid waiver project.

1.3 CHW Status in Other New England States

Implementation of CHW policy and CHW-related activities have progressed at varying rates in the New England states other than Massachusetts. CHW status is highlighted in each state in the sections that follow.

Connecticut

Connecticut does not yet have a professional association of CHWs, though efforts are in place to improve recognition of CHWs, further define their role in the healthcare workforce, and identify mechanisms for CHW credentialing and reimbursement.

Presently there is no mandated training or certification for CHWs, but training opportunities exist through the Connecticut Area Health Education Center (AHEC) network, an independent non-profit

organization first developed as part of a national program that received Congressional appropriations in the 1970s (Gessert, 1981). The Connecticut AHEC has developed post-secondary education training programs for CHWs that include a core competency curriculum through several academic partnerships.

Funding for CHWs in Connecticut is primarily through grants from both the federal and local levels, which are often short-term in nature.

Maine

Although several health centers and independent programs in Maine make use of CHWs, there is no statewide program committed to expand their use. CHWs are not required to be certified or to have received training to practice in the state, and no training curriculum has been implemented at any state college or university, though on-site training and other community resources are available.

Through Maine's Patient Centered Medical Home (PCMH) Pilot program, health centers across the state are considering using CHWs as part of Community Care Teams (CCTs). The PCMH pilot began in 2010 and includes participation from major commercial payers, Medicaid, and Medicare, as well as a diverse mix of adult and pediatric practices from across the state. CCTs are "multi-disciplinary, community-based, practice-integrated care management teams" designed to improve care for the most complex, high need patients in each practice (Maine Quality Counts, 2013). CCTs connect patients to broader community and health services, including referrals to community-based agencies, transportation services, behavioral health, medication management, and education services. Currently there are 10 CCT providers operating in the state.

New Hampshire

As in Connecticut and Maine, there is no statewide coordinated effort to develop the community health workforce in New Hampshire, and no legislative requirements are currently in place for certification or training.

Regardless, some independent initiatives are making use of CHWs. For example, in May 2012 the National Health Care for the Homeless Council received a CMS Innovation grant to integrate CHWs into Federally Qualified Health Centers in 10 states, including New Hampshire, for the purpose of performing outreach and case coordination services to improve access to care and reduce inappropriate utilization of emergency services (CMS, 2012).

Rhode Island

Rhode Island is the only other New England state in addition to Massachusetts with a professional association for CHWs. In 2009, the state Department of Labor and Training launched an investigation into the status of CHWs and found that there were over 3,300 self-identified or employed CHWs in the state (Rhode Island Department of Labor and Training, 2009). The RI Department of Health now includes specific language recognizing CHWs as part of the healthcare team in new programs and funding opportunities (Alvisurez, 2013).

Efforts are in place through the Rhode Island Community Health Worker Association to develop a curriculum as well as training modules for CHWs, though certification or formal training is not currently required for practice in the state.

According to the state's report, the majority of CHWs in Rhode Island are funded through fee-for-service reimbursement or grant support (Rhode Island Department of Labor and Training, 2009), though funding is often short-term or limited. Details on funding sources and payer participation were not available in this report.

Vermont

As with most of the other states in the region, Vermont is without a statewide CHW association or formal legislative efforts to recognize, certify, or train CHWs. The majority of Vermont's community health workforce development is based in efforts to implement patient centered medical homes. Vermont is one of eight states selected for the CMS patient centered medical home demonstration project. The Vermont Blueprint for Health, launched in 2006, is a statewide reform initiative that forms the core of the state's participation in the CMS project by recognizing Advanced Primary Care Practices as patient centered medical homes, and requiring health insurers to reimburse "Community Health Teams" (VanLandeghem, 2012). Some sites have embedded CHWs onto these teams to help patients and their families navigate social services, connect to community resources, and secure health appointments. In this model, CHWs also support a patient's self-management goals and help reinforce the physician's treatment plan. Community health teams are funded through a combination of fee-for-service and capitated payments from commercial insurers, Medicare, and Medicaid (Bielaszka-DuVernay, 2011).

2. Effectiveness of CHW Programs

2.1 Summary of the Evidence

In 2009, the Agency for Healthcare Research and Quality (AHRQ) published an evidence report evaluating the characteristics of CHW programs and outcomes associated with CHW interventions (Viswanathan, 2009). To frame the review, CHWs were defined as individuals that “connect community members, particularly difficult-to-reach populations, to the health care system; receive training associated with their scope of work; and are a recognized or identifiable member of the community in which he or she works, defined by but not limited to geographic location, race or ethnicity, and exposure or disease status” (Viswanathan, 2009). The literature search included English-language studies published from 1980 – November 2008 that were conducted in the U.S., included ≥ 40 participants, involved randomized or nonrandomized comparisons of CHW interventions to an alternative, and allowed for the effect of the CHW intervention to be isolated (some studies included CHWs in a combination intervention without the ability to measure the effects of the CHW component) (Viswanathan, 2009). Search terms included multiple synonyms for CHWs, including “health advisor,” “health advocate,” “dumas,” “promotoras,” “outreach worker,” and others.

Study quality was rated using a customized form that evaluated multiple reporting domains, including description of study objectives/hypotheses, sample definition and selection, randomization technique, description of intervention, adjustments for bias, blinding, measurement techniques, follow-up, comparability of groups, use of intent-to-treat analysis, and supported conclusions. We focused attention on good- or fair-quality studies in the AHRQ review that measured the impact of CHW interventions on “health outcomes” and/or resource utilization, as listed below:

- Clinical measurements (e.g., BMI, blood pressure, HbA1c)
- Symptoms (e.g., “symptom-free” days)
- Missed work or activity limitations
- Health-related quality of life
- Medication adherence
- “Appropriate” resource utilization (e.g., appointments kept, screenings performed)
- “Unscheduled” resource utilization (e.g., ED/urgent care visits, hospitalizations)

We did not include studies in our analysis that focused attention solely on improvements in patient knowledge or satisfaction. Of the 53 studies identified in the AHRQ review that involved active

comparisons of CHW interventions to lower-intensity interventions or usual care, 29 included an assessment of CHW intervention impact on health outcomes as described above and were of good or fair quality (see Appendix , Table 1).

We also conducted an updated systematic literature search utilizing the search criteria and quality ratings from the AHRQ review, spanning the period January 2008 – April 2013. A total of 17 studies examined the impact of CHW interventions on health outcomes and were of good or fair quality (see Appendix, Table 3 for individual study details).

Findings from the AHRQ review as well as our analysis of more recent literature are summarized in the sections that follow, organized by clinical context.

Chronic Disease Management

Diabetes

The impact of CHWs on the prevention and management of diabetes was evaluated in 8 studies. Study locations included a community health center in Oahu, HI, family health centers in Los Angeles, CA and primary care clinics in East Baltimore, MD. Studies recruited patients using a combination of criteria, including race or ethnicity, income, residence, enrollment at health center, and/or physician referral. Interventions consisted of individual home visits or group sessions; one study evaluated an intervention that included group education classes, home visits, and a joint provider visit with the CHW at the clinic (Spencer, 2011). Comparators included usual care with access to medical care and educational materials. Most studies followed patients for 6 months, but 2 studies assessed outcomes after a 2-year intervention (Katula, 2013; Gary, 2000). At least one significant positive outcome favoring the CHW intervention was reported in 6 studies, including significant changes in glycosylated hemoglobin (HbA1c) and improved self-reports of dietary changes. Two studies found no significant differences in HbA1c and other measures (Sixta, 2008; Gary, 2000).

Asthma

Three studies assessed CHW interventions in children's asthma (Krieger, 2002; Parker, 2008; Fisher, 2009). Patients were recruited from urban neighborhoods in Detroit, MI and Seattle-King County, WA, along with communities in St. Louis County, MO. The studies enrolled participants who experienced persistent asthma as identified by a provider diagnosis or screening questionnaire. Participants typically came from low-income households and lived in a neighborhood with a predominantly African American or Latino population. Multiple home visits by CHWs during 1-year follow-up occurred in 2 studies as compared to a single visit or educational material (Krieger, 2002; Parker, 2008). In St. Louis County, Fisher et al. (2009) utilized phone calls with 2 home- or neutral-

site visits vs. usual medical care in a 2-year study. All 3 studies reported significant positive results including decreased number of hospital admissions, less need for unscheduled/urgent medical care, and decreased number of days with activity limitations in a 2-week period.

The Seattle-King County intervention (Krieger, 2002) has received national attention for its randomized comparison of “high-intensity” (home assessment, individualized action plans, linkage to community resources, multiple visits) vs. “low-intensity” interventions (single CHW visit, general educational materials). CHWs were ethnically matched to families, lived in the community and had personal experience with asthma. Significant outcomes at 1 year included less use of urgent healthcare services (Odds Ratio [OR] 0.38; 95% confidence interval [CI] 0.16-0.89) and a significant decrease in the number of days with activity limitations ($p=0.029$).

Hypertension

The impact of CHW interventions on blood pressure control was evaluated in 2 studies (Balcázar, 2009; Levine, 2003). Study sites included community health centers in the Lower Valley of El Paso, TX and community-based organizations and local providers in West Baltimore, MD. One study evaluated group sessions with phone calls over a 9-week period compared with receipt of educational materials (Balcázar, 2009), and the other study assessed multiple home visits over a 40-month period compared with a single home visit (Levine, 2003). Positive outcomes associated with group sessions included improvement in self-reports of dietary habits (Balcázar, 2009). No significant differences between intervention and usual care were reported in either study for clinical outcomes including blood pressure and body mass index (BMI).

An additional study examined the impact of CHWs in promoting medical follow-up in patients with hypertension who lived in low-income neighborhoods in Seattle, WA (Krieger, 1999). CHWs interacted with patients utilizing phone calls, home visits and postcards over a 3-month period. More patients completed a follow-up appointment in the CHW intervention compared to the control (65% vs. 47%, $p=0.001$).

Cardiovascular Disease Risk

Two studies assessed the impact of CHWs on cardiovascular disease risk (Balcázar, 2010; Hayashi, 2010). One study across 4 health centers in Los Angeles and San Diego examined individual counseling sessions over a 12-month period vs. healthy behavior education classes with low-income, underinsured or uninsured Hispanic women (Hayashi, 2010), finding statistically-significant changes in systolic blood pressure ($p=0.038$). Significant changes in self-reports of moderate and vigorous physical activity were also reported. Balcázar et al. (2010) found a statistically-significant change in diastolic blood pressure ($p<0.001$) over a 4-month period in Hispanic patients attending group-based educational sessions compared to patients receiving basic materials in El Paso, TX. No significant differences were reported in other clinical measures including BMI, weight, blood glucose and cholesterol measures.

Other Conditions

Six studies evaluated the impact of CHWs in other disease states. One study assessed the impact of one-on-one meetings in patients with human immunodeficiency virus (HIV) over a 12-month period vs. usual-care control (Roth, 2012). Patients in the intervention group were more likely to have viral loads under control (<50 copies/ml) (OR 2.01, 95% CI 1.18-3.43). Another study evaluated the impact of CHWs on adherence to medical follow-up in patients newly diagnosed with tuberculosis in a homeless population in San Francisco, CA (Pilote, 1996). CHWs met with patients, assisted with paperwork, and attended follow-up appointments with patients, resulting in significantly greater adherence compared to control (75% vs. 53%, $p=0.004$). In a study of patients with back pain, group classes over a 12-month period did not have a significant impact on changes in disability scores as compared to patients receiving usual care and print materials on back pain ($p=0.092$) (Von Korff, 1998). The impact of a brief motivational interview with a CHW on risk of contracting a sexually transmitted disease in intravenous drug-positive patients was evaluated at a hospital in Boston, MA (Bernstein, 2012). The study did not report significant differences at 12 months in the number of transmitted infections compared to patients receiving only standard medical care. In a study of healthy women in rural Douglas, AZ receiving a home visit by a CHW in addition to postcard reminders, no significant differences were seen in the number of women returning for a second annual preventive exam as compared to patients receiving only postcards (Hunter, 2004).

Finally, the impact of a CHW intervention on medical care utilization by newly-released prisoners was evaluated in a single good quality study (Wang, 2012). Patients received individual case management over a 12-month period from a CHW with a personal history of incarceration, along with access to primary care and public health resources. Control patients had identical access to primary care and public health resources but no CHW interaction. Patients in the intervention group recorded significantly less use of the emergency department ($p=0.04$) compared to controls.

Cancer Screening

Breast Cancer

The effect of a CHW intervention on breast cancer screening behaviors was assessed in 6 studies. Study sites included church communities in Arkansas, Colorado and California as well as rural neighborhoods in Washington. Participants varied by study and included women from ethnic or racial minorities, women with low-to-moderate incomes, and/or women in rural areas. Interventions consisted of a group presentation or group sessions, telephone calls and print materials compared with exposure to a community-based educational campaign and provision of print materials only. Three of these studies followed patients for 2 years (Suaia, 2007; Andersen, 2000; Derose, 2000); follow-up ranged from 4-14 months in the other studies. Three studies

reported statistically-significantly improved adherence with breast cancer screening associated with the CHW intervention (Nguyen, 2009; Paskett, 2006; Derose, 2000), while the remaining 3 showed no significant differences (Suaia, 2007; Andersen, 2000; Erwin, 1997).

A separate meta-analysis of prospective controlled studies (n=18) evaluating the effects of CHW interventions on mammography screening rates reported a statistically-significant association between participation in the CHW intervention and obtaining a screening mammography; the effect was quite modest, however (Risk Ratio [RR] 1.06, 95% CI 1.02-1.11) (Wells, 2011). Stronger effects of CHW interventions were evident when patients were matched to CHWs by race or ethnicity (RR 1.58, 95% CI 1.29-1.93).

Cervical Cancer

The role of a CHW intervention on cervical cancer screening rates was evaluated in 6 studies. Two studies evaluated rural populations in Ohio Appalachia and Appalachian Kentucky (Studs, 2012; Paskett, 2011). Four studies assessed urban populations in South Philadelphia, PA (African-American women), Seattle, WA (Chinese-American women) and Santa Clara County, CA (Vietnamese-American women) (O'Brien, 2010; Taylor, 2010; Mock, 2007; Taylor 2002). Follow-up was 12 months or less for all studies. Interventions consisted of home visits, group visits, letters and phone calls, compared to usual care and direct mailings. All studies reported at least one positive outcome associated with the CHW intervention, including a statistically-significantly greater proportion of patients receiving a Pap smear and a larger change in the number of patients ever having a Pap smear.

Colorectal Cancer and Screenings for Multiple Cancers

One 6-month study assessed the impact of phone calls made by a CHW vs. no intervention on screening practices for colorectal cancer at an inner-city primary care practice in East Harlem, NY (Jandorf, 2008). Significantly more patients in the intervention arm completed colonoscopy appointments at 6 months as compared to control (24% vs. 5%, p=0.019). At local community sites in Phoenix, AZ, social support group sessions with CHWs targeted cancer screening rates for breast, cervical and colorectal cancer as compared to individual sessions (Larkey, 2012). Screening assessment at 3 months and maintenance assessment at 15 months demonstrated no significant differences between intervention groups. One study evaluated the impact of small group and one-on-one sessions led by a CHW vs. control on screening behaviors for breast and cervical cancer over a 4-year period in low-income areas of San Francisco, CA (Hiatt, 2008). No statistically-significant differences were seen between intervention and control groups at follow-up.

Maternal/Child Health

Pregnancy

The impact of home visits by a CHW on pregnancy-related outcomes was evaluated in 2 studies. In New England, CHWs intervened with women diagnosed with maternal phenylketonuria resulting in positive outcomes during pregnancy (shorter time to achievement of metabolic control, 8.5 vs. 16.1 weeks, $p < 0.05$) and at 12 months following the birth of the child (higher developmental quotient at 6-12 months of age, $p < 0.05$) as compared to control (St. James, 1999). Positive outcomes, including increased ratio of actual vs. expected clinic visits ($p = 0.007$) were also reported in women receiving CHW services at an inner-city prenatal clinic in Cleveland, OH compared to routine clinic care (Graham, 1992).

Immunizations

Two studies reported the effect of CHWs on vaccination rates in children. Positive outcomes at 6 months were associated with patients receiving home visits and phone calls from CHWs in an immigrant community in New York City (Barnes, 1999) compared with no intervention. In the other study, based in Fulton County, GA, and comparing a CHW intervention that featured phone calls, a postcard and a home visit compared with a second arm consisting of automated phone call reminders only and a control arm with no reminders, no significant effects on vaccination rates were reported in either intervention arm compared to control (Rask, 2001).

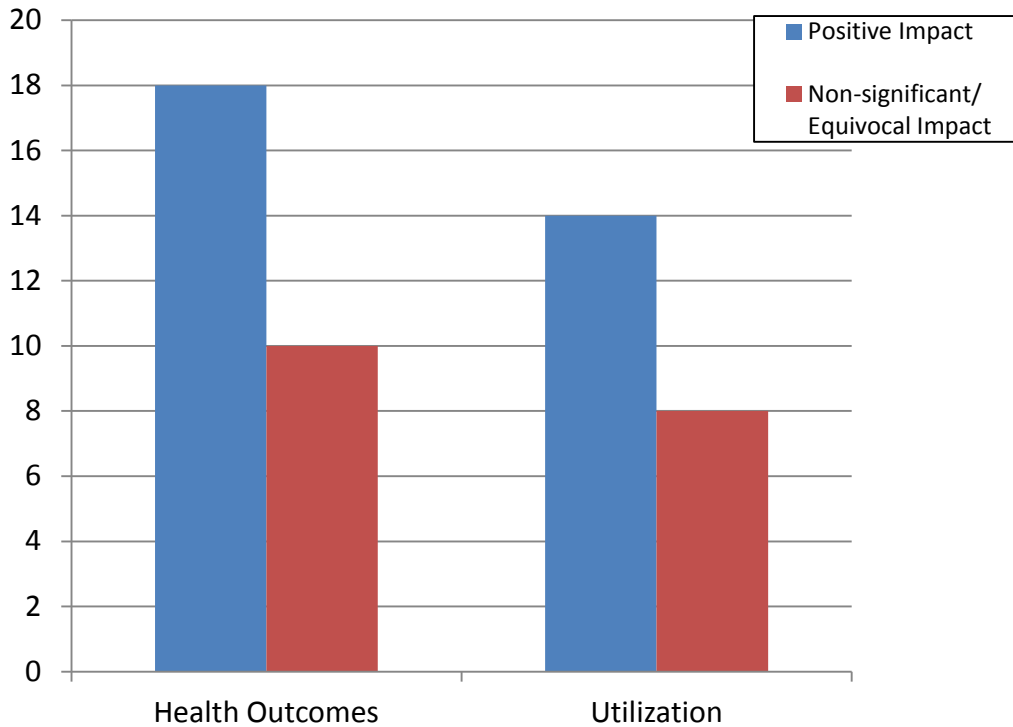
Maternal/Child Health and Development

Five additional studies evaluated the impact of CHWs on mother-child interactions (Schuler, 2000; Korfmacher, 1999) or measures of children's health (Conway, 2004; Silver, 1997; Black, 1995). CHW-based interventions consisted of repeated home visits and were compared to standard care and referrals, as well as to a nurse-led intervention (Korfmacher, 1999). Study participants varied, with the majority recruiting women and children from metropolitan health centers or university hospitals. Study participants tended to be from minority populations with low household incomes. In 2 studies (Schuler, 2000; Conway, 2004) women were drug users or smokers, respectively. CHWs were associated with improvements in motor development in children ($p = 0.02$) and mental health in mothers ($p = 0.03$) in 2 studies (Korfmacher, 1999; Black, 1995). The remaining studies showed no differences between groups.

2.2 Key Program Components & Correlation with Positive Outcomes

As described in detail in the sections above, the majority of published studies showed a positive impact of CHW-based interventions on health outcomes and/or resource utilization relative to limited interventions or usual care. Figure 1 below shows the number of studies with a positive impact on health outcomes and/or utilization vs. studies reporting no between-group differences.

Figure 1. Number of studies showing positive vs. no impact of CHW interventions.



In the reviewed literature, 32 total studies reported positive findings in health outcomes and/or resource utilization associated with a CHW intervention while 18 studies evaluated found no difference in outcomes between CHW interventions and control groups. These results should be viewed with caution given the likelihood of publication bias in favor of studies with positive results.

We attempted to compare all studies in order to identify key characteristics of CHW interventions associated with positive results. However, many study reports were missing descriptions of important aspects of CHW interventions. We opted instead to evaluate frequently-reported intervention characteristics in studies reporting positive outcomes. Program characteristics are presented in detail in Table 2 on the following page.

Table 2. CHW intervention characteristics described in studies reporting positive results.

	Element Present (% of studies)	Element Absent (% of studies)
CHW paid salary/stipend (n=22)	95%	5%
CHW matched to patient (n=28)		
By Community	96%	4%
By Ethnicity/Race		
By Disease State/Condition		
Formalized training (n=27)	67%	33%
Patient financial incentives (n=17)	100%	0%
Method of patient interaction		
Weekly Meetings (n=18)	44%	56%
In-person Home Visits (n=26)	73%	27%
Phone Calls (n=27)	48%	52%
Group Sessions (n=27)	33%	67%
Visit/Session Length ≥ 1 hour (n=18)	72%	28%
> 5 sessions (n=24)	50%	50%

Note: only studies reporting data specific to each element are included.

n: # of studies reporting on element; NR: Not reported

Several key characteristics of CHW interventions are common among studies reporting positive results. Nearly all successful interventions paid their CHWs a salary or a stipend and specifically matched them in some way to individual patients. Approximately two-thirds of successful CHW interventions used CHWs who had received formalized training based on a specific interaction theory and/or through an established training program. Interactions with patients could include weekly meetings in the clinical office, group sessions with other patients, and phone calls, but nearly three-fourths of successful programs also had in-person meetings set up at the patient's home. Most successful programs had average visit or session lengths of at least one hour. Having a high number of visits or sessions, however, was not a consistent characteristic of successful interventions: only half of successful programs had an average of more than 5 visits with each patient.

Patient financial incentives were commonly reported to be part of successful CHW interventions. The most common type of incentive reported was payment for completion of an evaluation or follow-up assessment (11 studies). Six studies supplied gift certificates to local stores and provision of small gifts (pedometers, tote bags, baby toys). Free transportation or bus tokens represented incentives in 5 studies while items integral to the intervention were supplied in 3 studies (i.e., cleaning supplies, vacuum cleaner, pedometer, kitchen items). Two studies evaluating CHW interventions in children's asthma-related health provided patients with free allergy testing, low

emission vacuum cleaners, pillow and mattress covers and household cleaning supplies (Parker, 2008; Krieger, 2002).

Policy Comparator: Medicare's Disease Management & Care Coordination Demonstration Projects

Studies of CHW interventions have usually compared the study intervention with usual care or with some minor variant of the study intervention itself. No direct head-to-head studies exist comparing CHW interventions to interventions using nurse case managers or social workers to help patients manage their socioeconomic situation or to improve the coordination of care. Among these options, models of care coordination based on nurse case managers have received growing attention, especially when considered as part of patient centered medical home initiatives. Therefore, in order to present CEPAC with context around the policy options being considered by provider groups in New England, we present the below information from recent evaluations of nurse case manager programs that formed part of 34 Medicare disease management and care coordination demonstration projects (Nelson, 2012). These projects varied in the scope of beneficiaries included as well as the types of interventions provided, but all involved patients with one or more chronic conditions and utilized nurse care managers to educate patients, advocate for their needs, and monitor their status. Medicare paid a negotiated monthly fee between \$70 and \$225 per beneficiary to support these programs, but the stated goal was for the programs to reduce overall Medicare expenses by using improved coordination to reduce hospital admissions and other services.

With very few exceptions, hospital admissions and Medicare expenditures did not reduce at all or did not reduce by a large enough margin to offset program fees (Nelson, 2012). Among 11 programs specifically targeted at high-risk populations, only 4 demonstrated statistically significant reductions in hospitalization rates compared to control groups (Brown, 2012). Analyses were performed to identify the program characteristics in those 4 studies that correlated with reductions in hospitalizations, and these characteristics, many of which overlap with the characteristics of successful CHW interventions, are listed below:

- *At least monthly face-to-face contact with patient*
- *Regular contact between care coordinators and patients' physicians*
- *Role as communications "hub" for all of a patient's providers (e.g., providing information across providers, updating providers on patient's condition)*
- *Use of comprehensive, evidence-based educational material, supplemented by training of care coordinators in behavior-change and motivational techniques*

- *Role overseeing comprehensive medication management, including access to pharmacists and medical directors to triage issues*
- *Development of timely and detailed transition plans for hospitalized patients*

Another conclusion drawn from the research on the Medicare demonstration projects was that programs reduced utilization only among very select “high-risk” patients (Peikes, 2012). While the programs all targeted patients with serious medical conditions, only patients who had been hospitalized in the prior 12 months and therefore had very high risk of near-term rehospitalization realized reductions in hospitalizations (Brown, 2012). In fact, one of the highlighted programs, at Washington University Medical Center, was initially unsuccessful at reducing utilization when it targeted all of its high-risk patients. Savings were realized only after using local nurse case managers to meet face-to-face with patients at the highest risk of near-term hospitalization (Peikes, 2012). The study by Brown and colleagues also suggested that, even for programs targeting these very high-risk individuals, overall cost savings could not be achieved unless program fees were kept below approximately \$125-\$150 per member per month (Brown, 2012).

3. Economic Impact of CHW Programs

3.1 Available Evidence

A total of 14 studies (5 from the AHRQ review and 9 from our updated search) evaluated the economic impact of CHW interventions. Clinical contexts studied included asthma, diabetes, and HIV management, cancer screening, and targeted interventions for high consumers of healthcare resources or other high-risk individuals. Study designs varied, including randomized controlled trials, comparative cohort studies, assessment of the change in costs in a single cohort prior to and following CHW interventions, and simulation models.

Most of the economic evaluations adopted the perspective of a PCMH or other provider organization that would be “at risk” for all health care expenditures incurred by the target population and would also incur the incremental costs of instituting a CHW program. A smaller number of studies took the perspective of the health insurer responsible for both reimbursement of CHWs and health care services required by patients. Regardless of perspective, the majority of studies reported that CHW interventions resulted in net cost savings (i.e., cost offsets from reduced healthcare utilization were greater than the marginal costs of the intervention) over 6 months to 2 years of program follow-up relative to control groups involving limited or no intervention. Exceptions to these were studies of CHW interventions to improve cancer screening rates (Larkey, 2012; Taylor, 2010); this is not surprising, as the outcome of interest for these interventions is an increase in appropriate utilization rather than a near-term decrease in unexpected utilization. An additional study found no cost offsets associated with a CHW intervention for medication self-management among patients with HIV over 1 year of follow-up (Roth, 2012); again, the primary objective of this program was to promote better adherence to medication regimens rather than reductions in other healthcare expenditures.

The Seattle-King County asthma intervention described previously represents an example of a detailed economic evaluation from the provider perspective (Krieger, 2005). A total of 214 children with persistent asthma from urban, low-income households were randomized to receive a “high intensity” CHW intervention that featured an initial home environmental assessment resulting in a patient-specific action plan, 4-8 additional visits to implement action steps, educational and social support, and mitigation resources (e.g., mattress encasements, low-emission vacuums) or a low-intensity intervention consisting of a single CHW visit and limited education. Health care utilization was assessed every 2 months during 1 year of follow-up. Multiple data sources were used to estimate costs; offsets from reduced use of emergent or urgent health care services were estimated to be \$57-\$80 lower per 2-month period for high-intensity vs. low-intensity patients, or \$342-\$480 annually (Krieger, 2005). Incremental program costs for the high-intensity intervention, including

salary and benefits for 3 full-time CHWs, supplies, rent, travel, office expenses, and indirect expenses, were estimated to be \$1,124 per child for the program year. The authors estimate that the program would become cost-saving after 3-4 years if cost offsets were to continue after the intervention ends.

From the insurer perspective, the impact of a CHW intervention focused on high-risk patients on Medicaid expenditures was assessed in a cohort study of enrollees in Medicaid managed care plan in New Mexico (Johnson, 2012). High-risk patients were defined as those with 3 or more ED visits during a 3-month period. CHWs provided a variety of services, including frequent home visits for needs assessment, appointment support and reminders (CHWs were made aware of missed appointments through electronic reporting), health literacy and education, advocacy, and provision of equipment and supplies. A total of 6 CHWs were hired to cover 691 patients enrolled in the program; the evaluation was conducted on 448 of these patients for whom claims data were available during the 6 months before and after program implementation, as well as on a matched group of 448 high-risk enrollees not participating in the program. Costs declined from baseline to follow-up in both groups; however, the CHW group observed significantly greater reductions in ED use, hospitalization, and both narcotic and non-narcotic prescriptions, resulting in an annual cost offset of \$3,003 per patient relative to the non-CHW group. Total program costs were estimated to be \$559 per patient per year, and were comprised of salaries and benefits for employees managing the CHW program as well as per member per month (PMPM) payments made to the provider groups providing the CHW benefits (Johnson, 2012).

3.2 Budget Impact Analysis

As noted in the section above, estimates of the economic impact of CHW-based programs vary widely and are dependent on program breadth, setting, and a variety of other considerations. We elected to assess the potential budgetary impact of CHW-based programs based on information contained in the 2 studies described in detail above in Section 3.1. We selected these studies because they represented examples of best practice approaches to 2 different types of CHW interventions: those focused on single diseases; and those more “generalist” in their orientation. We also selected these CHW interventions as the basis for a budget impact analysis because the articles describing them provided detailed information on program costs and resource allocation, services provided by CHWs during the intervention and impact on resource utilization, and health care costs over time. We conducted budget impact analyses on both the Seattle-King County asthma program and the New Mexico “high utilizer” program from the perspective of the 6 New England Medicaid programs.

In both analyses, program costs, cost “offsets” (i.e., from reductions in unnecessary or unscheduled services), and net costs or savings were estimated for the Medicaid population in New England. We also examined the impact of varying patient caseloads and CHW salaries on program costs and net budgetary impact. For these analyses, we assumed an annual salary of \$40,000 for each full-time CHW based on the approximate midpoint of the reported range of hourly wages from the ICER survey (see Section 4.2), and an additional \$5,000 in program expenditures for benefits, supplies, and indirect expenses for each CHW. Details on the specifics of the budget impact models and results are provided in the sections that follow.

Budget Impact of a CHW Intervention for Children With Persistent Asthma

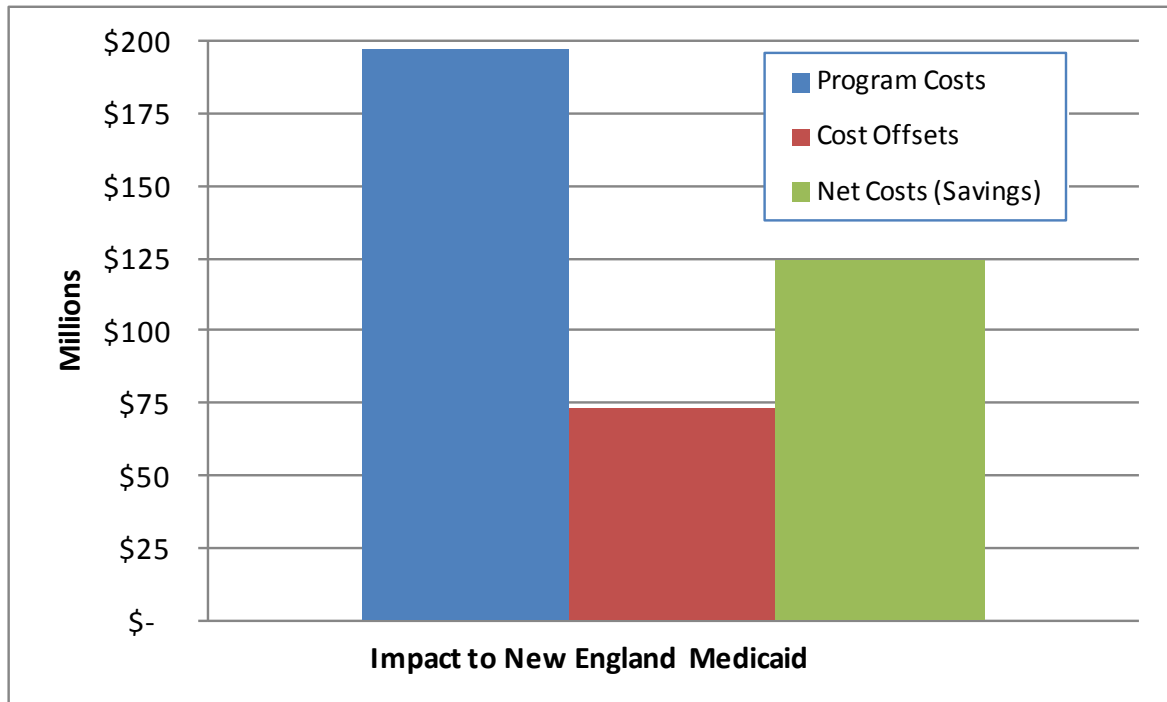
The number of New England children aged <18 receiving benefits under Medicaid was estimated to be approximately 1.2 million (Kaiser State Health Facts, 2009). The prevalence of persistent asthma in this group was estimated to be 12.7% based on data from an analysis of the National Health Interview Survey stratified by household income (Smith, 2005), yielding an estimated total of 151,914 children in Medicaid with persistent asthma across New England.

The estimated incremental program cost to the provider (relative to a low-intensity comparator that consisted of a single CHW visit and limited educational support) in the Seattle-King County study was \$1,124 per participating child per year (Krieger, 2005). We assumed that this incremental cost would be somewhat higher when compared to *no* intervention, however. We therefore increased the incremental cost to \$1,200 and added \$100 to reflect an incentive payment to participating families similar to that received during the study, yielding an annual program cost of \$1,300 per participant. These costs were generated in a program that had a caseload of approximately 71 asthma patients per CHW (Krieger, 2005).

Cost offsets were estimated based on reductions in the costs of urgent care services (i.e., ED visits, hospitalizations, unscheduled clinic visits) for the high- vs. low-intensity groups. Offsets varied based on the method used to estimate costs; we assumed the higher end of the reported range, which equated to \$80 per patient every 2 months or \$480 annually (Krieger, 2005). We used this higher estimate based on an assumption (as above) that cost offsets would be greater when a high-intensity intervention was compared to *no* intervention.

Model results are presented in Figure 2 on the following page, showing program costs, cost offsets, and net budgetary impact for the Medicaid population in New England during a 1-year period.

Figure 2. Estimated program costs, cost offsets, and net budgetary impact for a CHW-based pediatric asthma intervention.



Using the caseload of 71 patients per CHW reported in the study, a total of 2,140 CHWs would be required to provide this intervention to all 151,194 children on Medicaid with persistent asthma in New England. Annual salary and other program costs are estimated to total \$197.5 million. Cost offsets associated with reduced utilization of urgent health care services would total approximately \$72.9 million in this population, yielding a net cost to the region of \$124.5 million. CHW caseload would be required to increase to 192 patients per worker, or salaries decreased by two-thirds, in order for the program to become cost-neutral. As mentioned above, the authors of the study report suggest that the program may become cost-saving 3-4 years after program implementation (Krieger, 2005); this optimistically assumes, however, that reduced utilization would continue at the same rate after intensive CHW-based support would end.

Budget Impact of a CHW Intervention for Adults with High Resource Utilization

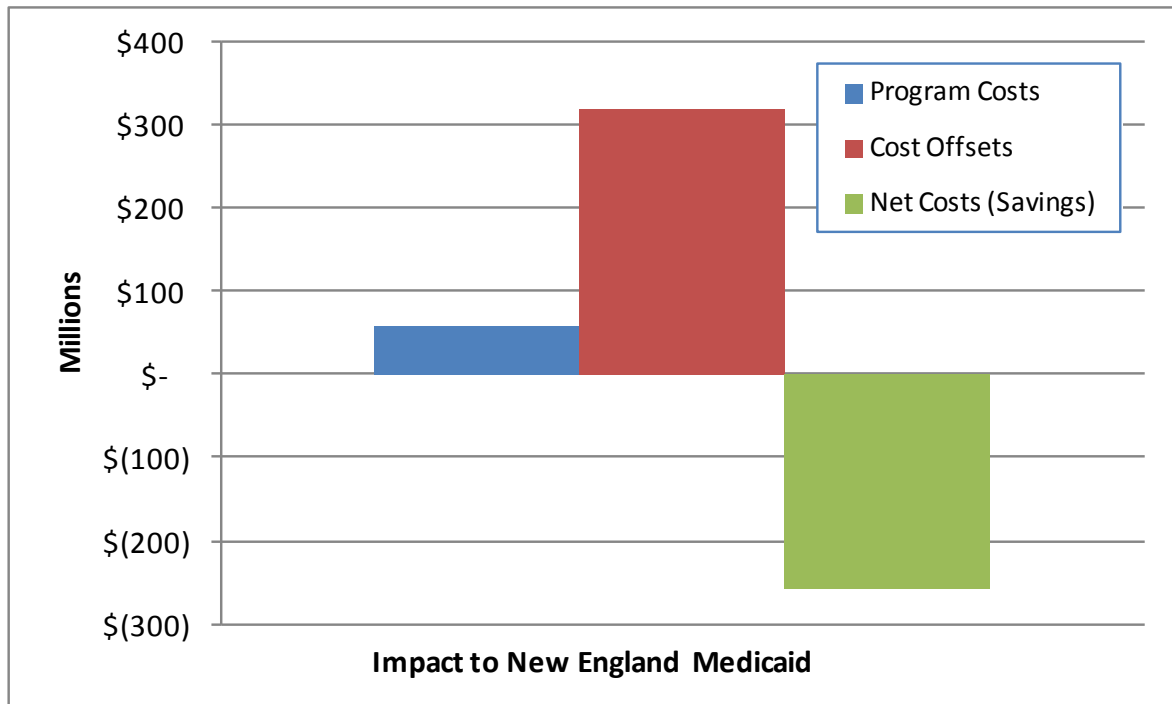
The estimated number of adults (i.e., age 18 and older) insured by Medicaid in New England totals approximately 1.1 million (Kaiser State Health Facts, 2009). The number of these expected to be “high utilizers” of services was based on an analysis of Medicaid claims for >9 million enrollees; approximately 10% of enrollees demonstrate patterns of excessive prescription use, ED visits, use of multiple prescribers and pharmacies, and other “uncoordinated care” patterns (Owens, 2010). The

total estimated “high utilizer” population in New England was estimated using this 10% figure, leading to a total of 106,135 adults.

The New Mexico CHW program targeted Medicaid managed care enrollees who had 3 or more ED visits within a 6-month timeframe (Johnson, 2012). Program costs were estimated to total \$559 per patient per year, including employee salaries and benefits, supplies, and PMPM payments from Medicaid to provider groups administering CHW services, and were generated in a program that had approximately 115 patients for every CHW (Johnson, 2012). Unlike in the asthma model, we did not adjust estimated program cost further, as the comparison group in the New Mexico study did not receive any intervention.

Cost offsets, due primarily to reductions in ED visits, hospitalizations, and prescription drug usage, were estimated to total over \$1.3 million annually for patients receiving the CHW intervention vs. the control group, or \$3,003 per patient (Johnson, 2012). Program costs, cost offsets, and net budgetary impact extrapolated to the New England Medicaid population are displayed in Figure 3 below.

Figure 3. Estimated program costs, cost offsets, and net budgetary impact for a CHW-based intervention targeting high utilizers of services.



At a caseload of 115 patients per CHW, 923 CHWs would need to be deployed to implement this program across the region. Program costs would be expected to total \$59.3 million per year under

this scenario, while cost offsets associated with reduced use of ED, inpatient, and prescription services would total approximately \$319 million, yielding net program savings of \$259.3 million on an annual basis. Based on these figures, the caseload would need to be reduced to approximately 15 patients per CHW, or salaries increased fivefold, for annual program costs to equal cost offsets. It should also be noted that we did not assume any diminishing economic returns in future years; it is possible that the initial intervention addresses the “worst offenders” and the economic impact of future intervention might be less.

4. Policy Expert Perspectives

We reviewed recently published surveys of CHW experts detailing their perspectives on CHW programs. Below we present summaries of these previous surveys, followed by the results of our own unstructured interviews and brief survey of regional and national policy leaders. The goal of these efforts was to explore lessons learned, current controversies regarding the effectiveness of CHW interventions, and potential best practices to guide possible implementation of CHW programs in the future.

4.1 Historical Survey Data

Health Resources Administration Survey

In its 2007 report profiling the national CHW workforce, HRSA collected information on CHW activities in 4 key states (Arizona, Massachusetts, New York, and Texas) through a national survey (the CHW National Employer Inventory) and unstructured interviews with CHWs and employers (HRSA, 2007). The study's major findings are described by survey/interview domain below.

Demographics

While CHW demographics and population characteristics differed by state, CHWs tended to mirror the communities they served. In many situations, employers required CHWs to live in the target communities. CHWs in these selected states and nationwide were more likely to be female and between the ages of 30 and 50. Educational attainment differed somewhat by state – in Massachusetts and New York, most CHWs had some college training, while in Arizona and Texas, a high school diploma or GED was most common. CHWs most commonly served uninsured, immigrant, and homeless populations; programs involved rural communities in only about one-third of cases.

Activities

CHW activities were tabulated for New York, Texas, and nationwide (Massachusetts and Arizona respondents were too small in number). The top 3 activities in both states and nationwide involved: 1) assistance in gaining access to medical services and programs; 2) provision of culturally appropriate health promotion and education; and 3) assistance in gaining access to *non-medical* services or programs. The most common health problem consistently addressed in both states and nationwide was nutrition, followed by women's health concerns. Other problems were specific to locality, such as HIV/AIDS in New York (77%) and diabetes in Texas (60%).

Consistently across geographic locations, the most important skill sets deemed to be a requirement at hire included communications skills, interpersonal skills, and commitment to confidentiality. Interestingly, advocacy skills and service coordination abilities were deemed important by only 50-60% of respondents.

University of Utah Survey

A more recent survey of health care organizations that employ CHWs was conducted by a workgroup at the University of Utah Center for Public Policy and Administration (McCormick, 2012). The survey was directed both at employers of CHWs nationwide (covering 10 states) and in Utah specifically. Major findings of the assessment are described in further detail below.

National Assessment

The most common types of organizations that engaged CHWs included community-based organizations, public health departments, community health centers, faith-based organizations, and hospitals. Insurers had direct involvement with CHWs in only half of the states surveyed. Of note, as of 2012, there were 27 national, state, or regional CHW associations that are registered with the American Public Health Association (APHA) and have their own special interest group that meets regularly (APHA, 2013).

CHW organizations reported financing efforts primarily through time-limited grant funding, mostly from private sources. Federal grant funding, when available, has come primarily from HRSA and the National Institutes of Health. Other than for Minnesota and Alaska Medicaid, insurance funding was not yet widespread, and was limited to specific private insurers or disease-related programs, such as a cancer-based patient navigator program in Georgia. Some states also reported program funding by providers from core operating budgets, such as the Prevention and Access to Care and Treatment (PACT) programs.

Certification and training requirements varied across states. Seven of the 10 states surveyed have no formal certification requirements (including Massachusetts, which has not yet finalized its requirements). Of the 3 states with formal requirements (Kentucky, Minnesota, and Texas), all are conditional. For example, Minnesota requires certification for CHWs who bill Medicaid for services, but CHWs may still work under other funding conditions. Kentucky requires certification only for individuals working in the Homeplace program. CHW training programs were available in 9 of the 10 states surveyed, and most often offered through a broad curriculum in a community college setting.

The Utah assessment inquired about core roles. The most common roles included 1) providing culturally appropriate health education and information, 2) providing cultural mediation between communities and the health/social services system, and 3) advocating for individual and community

needs. This is in contrast to the HRSA survey, in which only 11-24% of respondents deemed cultural mediation to be important (HRSA, 2007).

As with the national assessment, CHW funding in Utah was primarily grant-based. However, two-thirds of respondents stated that funding came at least in part from federal categorical grant sources, while 29% received Medicaid or state funding and 24% were funded by private foundations. Only one-third of respondents paid for CHWs out of a core operating budget. In Utah, approximately half of organizations engaged CHWs as paid employees, while the remaining groups used either volunteers/AmeriCorps workers or independent contractors. Among organizations employing CHWs, employment was relatively evenly mixed between full-time and part-time status. Salaries ranged widely between \$11 and \$20 per hour at these institutions. Most full-time CHWs also received benefits in addition to salary. Training of CHWs in Utah is performed primarily on an “in-house” basis rather than in programs offered by educational institutions.

4.2 ICER New England Survey

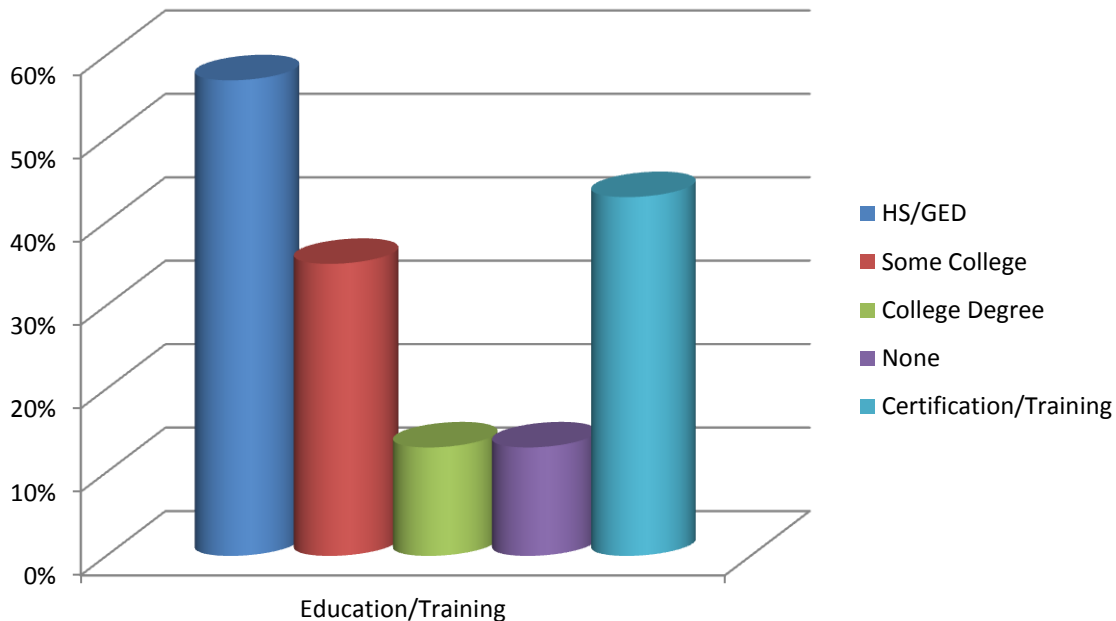
ICER developed its own survey instrument, based in part on those summarized above, in order to get a profile of CHW engagement and activity in New England. A total of 23 respondents completed the 25-item instrument, of which 44% came from Massachusetts, 17% from Connecticut, 13% from Maine, 13% from New Hampshire, and 9% from Rhode Island. No one from Vermont completed the survey, and one respondent came from outside the New England area. Findings are reported by survey domain in the sections that follow.

CHW Workforce

Two-thirds of respondents were from community health centers, hospitals, or integrated health systems, while the remaining were not-for-profit organizations, CHW associations, or local government agencies. A large percentage (48%) of organizations using CHWs recruited them through advertisements in local newspapers, followed by postings at community health centers (22%) and medical clinics (17%). A variety of other approaches to find CHWs were also used, including job fairs, social media, community outreach, job search sites, and word of mouth.

Minimum educational and training requirements for CHWs are presented in Figure 4 on the following page. Organizations were more likely to require a high school diploma or GED than to require college-level education. Prior medical knowledge or experience was not a common requirement, but participation in a formal training and/or certification program was required by over 40% of responding organizations. Other stated qualifications included English literacy as well as life experience and commitment to the service community.

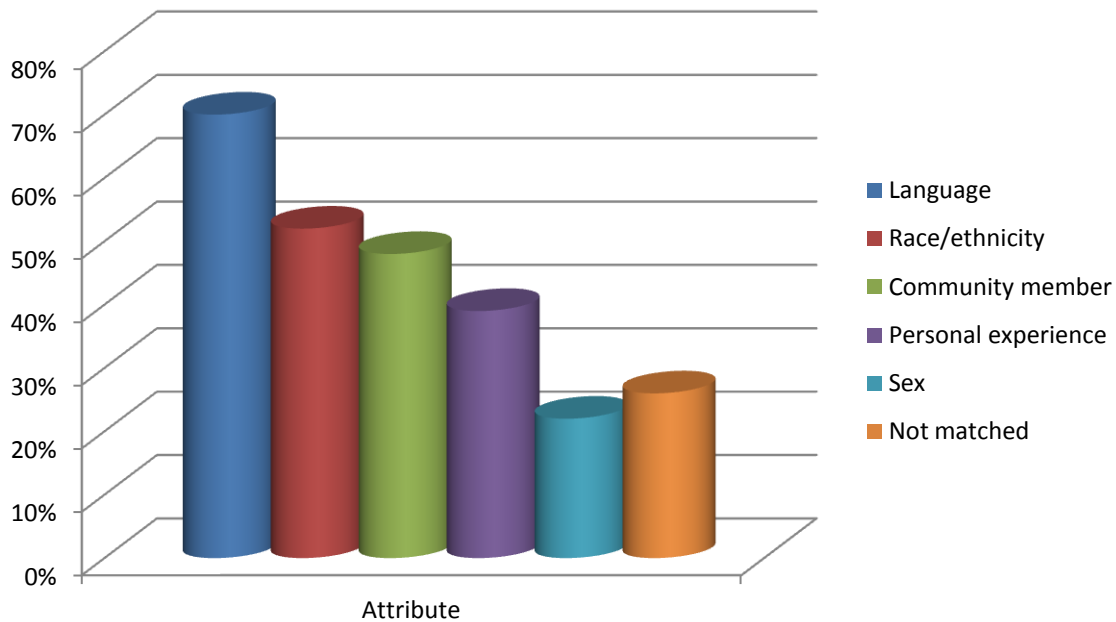
Figure 4. Minimum educational and training requirements for Community Health Workers in New England.



Approximately 60% of organizations that have hired CHWs respondents maintain their own CHW training program. These training programs focus on CHW core competencies, motivational interviewing skills, process competencies, legal and ethical responsibilities, cultural sensitivities, and disease-specific training. Some organizations provide standardized training while others indicated flexible training is given depending on program intent. Organizations conducting research on their CHW programs also train CHWs in basic data collection and evaluation techniques. Training is relatively intensive, as two-thirds of respondents require 40 or more hours of training; the remaining one-third require less than 20 hours.

Nearly three-quarters of organizations using CHWs match CHWs to individual patients. Figure 5 on the following page provides a ranking of the most common attributes used to match CHWs to patients. Matching was most commonly performed based on primary language, followed by race or ethnicity and residence in the community. Other matching attributes cited included occupation (for a farmworker program) and same or similar culture.

Figure 5. Attributes used to match Community Health Workers to patients in New England.



Program/Populations

Approximately half of respondents stated that their CHW program was based on an existing model. Models cited included the Partners in Health Accompaniment model in Haiti, the City College of San Francisco Capacitation Center, the Prevention and Access to Care and Treatment (PACT) program initiated at Brigham & Women’s Hospital in Boston, and the guidelines described in the CMS Innovations grant program (<http://innovation.cms.gov/>).

The types of individuals served by CHW programs in New England are listed in Table 3 on the following page. Findings suggest that most CHW programs in the region are multi-faceted and cover multiple at-risk groups. Programs less commonly served the military and veterans, migrant workers, and rural populations; low rates for the latter two categories may be due in part to the demographics of the region (i.e., no major influx of migrant workers, majority of populations near urban or suburban locations).

Table 3. Types of individuals served by Community Health Worker programs in New England.

Type of Individual Served	Percentage of Programs
Racial and ethnic minorities	83%
Specific diseases or conditions	83%
Pregnant women	74%
Older adults or seniors	74%
Individuals with disabilities	70%
Infants and children	70%
Adolescents	65%
Homeless individuals	61%
Individuals with substance abuse disorders	61%
Income eligible individuals	57%
Refugees	57%
Migrant workers	35%
Military/veterans	35%
Rural populations	26%

Of those programs focused on racial and ethnic minorities, 89% reported working with Hispanics/Latinos and 84% with Blacks/African Americans. Approximately 60% of programs work with Asian Americans. Programs were less commonly involved with Native Americans or Pacific Islanders. Other groups reported to be foci of New England CHW programs included Afro-Caribbeans, Eastern Europeans, Iraqis, and Asian immigrants (e.g., Cambodia, Burma, Bhutan).

Programs focused on specific diseases or conditions were also quite diverse. Approximately two-thirds of programs with such a focus targeted asthma, diabetes, HIV/AIDS, and mental health, while slightly more than half focused on obesity/nutrition. Some respondents stated that their focus was on “high risk” populations defined by multiple comorbidities as well as non-medical concerns such as sexual assault, domestic violence, and physical environmental factors such as lead exposure.

Prominent CHW activities are displayed in rank order in Table 4 on the following page. The most common activities included outreach and education, referral for medical and social services, and health promotion. Less common were language interpretation, insurance and benefits enrollment, informal counseling, and health screening.

Table 4. Involvement in key activities among Community Health Worker programs in New England.

Type of CHW Activity	Percentage of Programs
Outreach and education	96%
Referral for medical/social services	91%
Health promotion	87%
Patient advocacy	83%
Insurance and benefits enrollment	61%
Language interpretation	61%
Informal counseling	61%
Health screening	48%

Nearly all respondents stated that their CHWs interact with patients face-to-face in the home as well as over the telephone. Sixty-one percent reported one-on-one clinic visits with patients, and 52% were involved in group sessions. Other forms of contact included accompaniment to medical appointments and e-mail contact.

As shown in Figure 6a below, interactions typically lasted over 30 minutes in over 90% of programs, and were approximately split between 31-60 minutes and over one hour. Figure 6b depicts interaction frequency, which is distributed relatively evenly. In many cases, however, interactions occur on an “as-needed” basis depending on client need.

Figure 6. Distribution of visit length and frequency among Community Health Worker programs in New England.

Figure 6a: Length

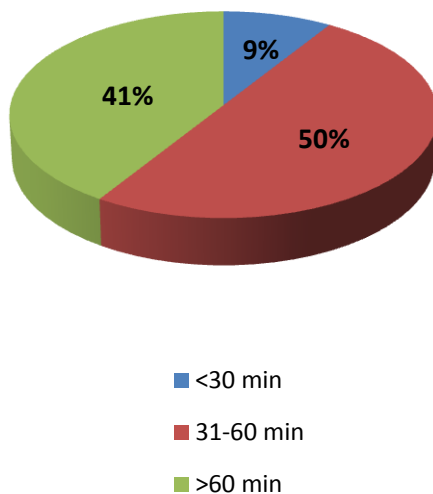
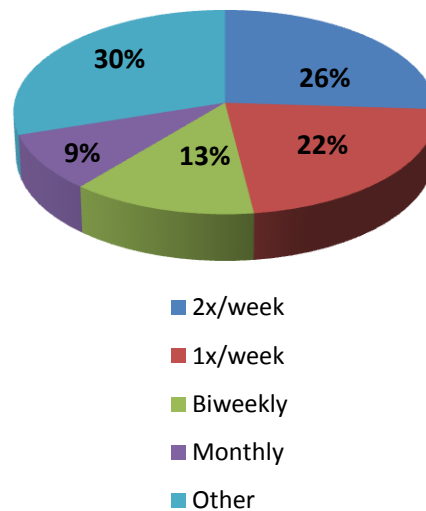


Figure 6b: Frequency



As with interaction frequency, the duration of the relationship was most frequently reported as “indefinite” and variable depending on the needs of the patient and family. Respondents also noted that the ability to have indefinite relationships is subject to continuation of funding.

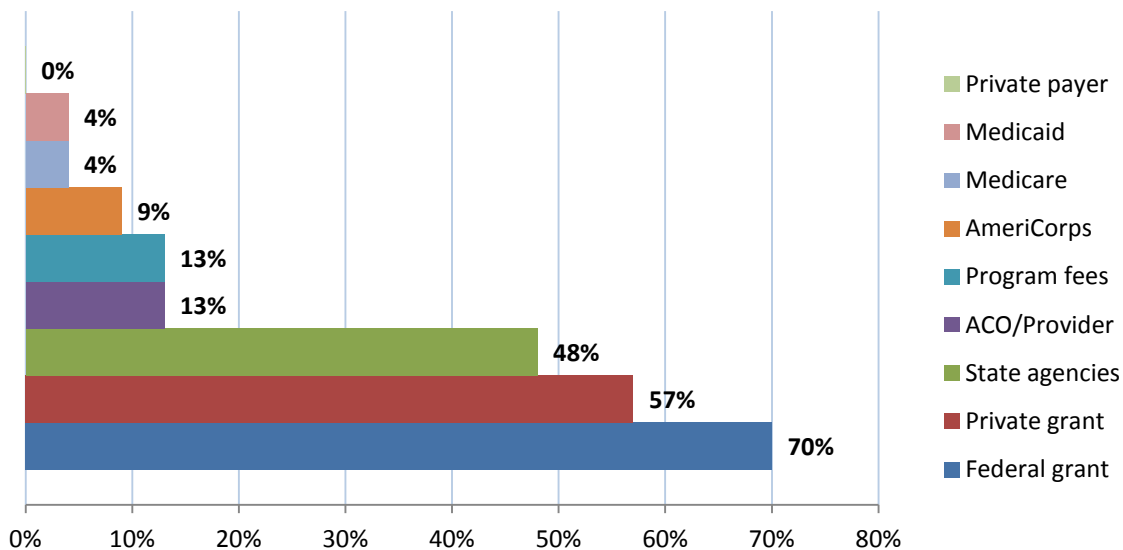
Follow-up and monitoring of patients was most often reported in the form of phone calls (91%) or home visits (83%). Clinic visits were reported as a means of follow-up by 57% of respondents. Postcard (22%) and e-mail (17%) follow-up was relatively infrequent.

Patient incentives for participation in CHW programs were provided by only 30% of respondents. When provided, incentives most frequently took the form of a merchant gift card.

Operations/Logistics

Funding sources for CHW programs in New England are presented in Figure 7 below. As with the other surveys discussed, funding is provided primarily by federal/state grants and private foundations. Respondents indicated that little to no reimbursement is provided in New England from public or private payers, including Medicaid.

Figure 7. Funding sources for Community Health Worker programs in New England.



State support is provided in multiple forms, including target funds from departments of public health, social services, and labor, the attorney general’s office, block grants, and state appropriations through the CDC and CMS. The small number of respondents that indicated receipt

of third-party reimbursement indicated that reimbursement came entirely as a proportion of bundled or global payment rather than on a fee-for-service basis.

Eighty-seven percent of respondents indicated that CHWs were paid employees, while approximately one-quarter also made use of volunteers and/or interns or students. Relatively few respondents engaged independent contractors or AmeriCorps/Vista workers as CHWs. Hourly wages for paid CHWs ranged widely, from \$13-\$35 per hour. Higher wage rates tended to apply to workers with another form of advanced training, such as medical interpreters or group facilitators.

One-third of respondents indicated that they formally evaluated individual CHW performance annually; smaller percentages evaluated their CHWs every 6 months or monthly. However, several respondents indicated that, while formal evaluations occur every 6-12 months, CHWs meet regularly with supervisors to discuss case load, triage issues, and address any performance issues. These meetings may occur weekly, every 2 weeks, or monthly.

Nearly all respondents indicated that they evaluated the overall outcomes of their CHW programs. Outcome measurement varied substantially, from simple process measures such as numbers of contacts and visits to adherence measures (e.g., screenings performed, insurance applications processed) to patient outcomes (e.g., CD4 counts, ER visits/hospitalizations). One respondent indicated that 2 RCTs had been performed evaluating the outcomes of peer counseling interventions in 2 distinct clinical areas.

Two-thirds of respondents indicated that there is evidence that their CHW programs are cost-saving or cost-neutral, and a majority of those that answered “neither” to this question felt that their programs had potential to be cost-saving.

4.3 Regional and National Policy Expert Perspectives on Best Practices

In addition to the survey results above, we conducted unstructured interviews with 11 regional and national policy experts representing CHW associations, health centers and hospitals, state agencies, and academic institutions to understand the major issues CHWs face and to identify “best practices” for successful CHW initiatives. These conversations are summarized beginning on the following page by providing key lessons or recommendations supported by a large majority of policy experts.

1. Credentialing: Certification should not be required for practice as a CHW, but credentialing is important for increasing recognition of the workforce and to demonstrate standards to payers in order to promote a sustainable model for CHW reimbursement.

Most experts believe that certification represents an important milestone in the evolution of CHWs from ad hoc, unskilled health care workers into full members of care teams with their own professional status. Some experts felt that certification may become less important under global payment schemes where the restrictions for billable vs. non-billable providers under fee-for-service reimbursement may not apply. A few experts felt that credentialing, if made too high a bar to entry, could have the unintended consequence of excluding the recruitment of the outstanding CHWs needed for some communities.

2. Recruitment: Community Health Workers must have the respect of the community.

Recruitment is a major challenge for large, bureaucratic organizations and the qualities that are important for the position are often difficult to capture using the tools that many employers and human resource departments conventionally use. Some stakeholders suggested that organizations wanting to start working with CHWs partner with community-based organizations such as local aid groups and religious or cultural organizations to recruit CHWs or hire technical assistants to manage recruitment to ensure that appropriate individuals are selected for the job.

3. Training: A training curriculum should focus on the development of core competencies and skills that translate across disease areas or conditions.

Despite the focus of many CHW interventions in the published literature on specific, single diseases or conditions, most policy experts believe that CHWs should receive training in core skills that can translate across conditions and even potentially across multiple patient communities. There are some notable examples of this kind of training. The Southwestern Connecticut AHEC bases its core competency training on the City College of San Francisco CHW certification program, whose curriculum includes health education and promotion, community building and advocacy, and working with underserved and/or linguistically isolated communities (CCSF.edu, 2013). Southwestern Connecticut AHEC programs also include a specialized or disease-specific component; for example, some programs collaborated with the state Department of Social Services to include specific training on Medicaid and other social benefits. A typical training program through Southwestern Connecticut AHEC includes 48 hours of training in 5 – 6 different areas and 50 competencies, in combination with 8 hours of field work assessment.

The Boston Public Health Commission developed a community health education training that also combines education on core competencies and condition-specific specialized modules that has provided a relatively standardized training curriculum for CHWs across Massachusetts (BPHC.org, 2013). The training program requires a total of 54.5 hours of training. Core competency items focus on developing skills around leadership, cross-cultural communication, community organizing, public health, outreach education, and assessment techniques. Specialized training includes condition-specific health information and local referral resources. Advanced comprehensive outreach certification is also available and includes 13 sessions over 55 hours and centers around the development of communication skills to help CHWs more effectively work with clients and other agency professionals. Specific modules include advanced leadership development, client advocacy, professional writing skills, and boundary setting. Advanced health modules are available in the form of one-day sessions that provide more in-depth training for a variety of health topics.

Though specialist and condition-specific training is important to many CHW roles, a majority of stakeholders interviewed felt that generalist curriculums held greater importance since CHWs must be able to address a range of issues within any given topic area, making the development of core competencies essential. One expert felt that generalist training in managing mental/behavior health issues is requisite, and that if CHWs are trained to address issues surrounding mental health, chronic disease management will fall into place. Another expert felt that an accessible, low-cost basic training in professionalism, respect for patient, and confidentiality is lacking in many training programs. However, for CHWs serving in patient navigation or resource referral roles, some stakeholders felt that additional training on social resources and benefit eligibility is crucial.

4. Matching Community Health Workers with individual patients: CHWs must have the respect of the community by demonstrating an understanding of the patient's entire cultural and socioeconomic environment.

CHWs are experts in the social determinants of health, and any knowledge of the patient's specific condition or disease is secondary in importance to the environmental and social context surrounding the patient's treatment. Some experts felt that CHWs should be matched not according to shared race or ethnicity but rather according to a shared geographic and socioeconomic community, as credibility is built more by shared life experiences than racial identity. In one community health center, all CHWs are members of the community and are patients of the health center themselves.

In other programs, CHWs were not matched to any community but selected for their understanding of and ability to navigate the complex social and medical systems surrounding the patient's care.

5. Interaction with patients: 1) Significant, extended face-time with patients, and often, families, is needed; 2) Individual visits in the home or clinic are essential for success; and 3) Active engagement with patients to plan for future care is critical.

Policy experts felt that the amount of one-to-one patient or one-to-one family time is extremely important to the success of any CHW intervention. Oftentimes, CHWs are the only member of the clinical care team able to spend significant face time with the patient, which can support the uptake of health messaging and adherence to treatment.

To help CHWs monitor activity intensity and support CHW's interactions with patients with HIV/AIDS, the PACT Program at Brigham and Women's Hospital makes use of a "CHW Facilitator's Guide," which includes numerous modules and sample conversations and scripts that CHWs can use when having conversations with patients to ensure that the visit is a meaningful interaction and achieves the appropriate level of intensity.

For socially isolated and geographically dispersed populations where in-person interactions may not be feasible with every patient, some programs are making use of telemedicine to connect patients to resources. A partnership between academic, clinical, and community partners in Connecticut and California collaborated to provide geographically dispersed older Cambodian-Americans with linguistically appropriate medication therapy management by utilizing videoconferencing and a care team of pharmacists and CHWs (Center for Technology and Aging, 2011). During this intervention CHWs performed home visits and completed a web-based medication assessment to document the patient's condition, medication status, and drug therapy problems, which achieved significant time-savings for the pharmacist. The CHW then operated the teleconferencing software and provided medical interpretation services during the pharmacist's remote consultation. CHWs can help patients prioritize what to discuss with healthcare professionals who are pressed for time. Individual visits help make the intervention more patient-centered and lead to an individualized plan or course of treatment based on the patient's unique needs and goals.

For populations whose interactions with the health system are challenged by stark differences in language and culture, an individualized approach proved crucial to improving the patient's experience and adherence to treatment. Khmer Health Advocates uses CHWs to serve older Cambodian-Americans, many of whom are refugees and victims of torture and trauma, by immersing themselves in the community and gaining a comprehensive understanding of each patient's individual situation (KhmerHealthAdvocates.org, 2013). Under this model, community health workers accompany patients to physician appointments, perform home visits, and complete regular check-ins in order to catch issues early on before they develop into a more complex or life-threatening situation.

6. Program Funding: Payers and provider organizations should work together to develop and maintain stable mechanisms for paying for CHW initiatives.

Financially sustaining CHW initiatives is one of the most significant challenges faced by organizations engaged in CHW interventions. The majority of funding remains through grants that expire and are disruptive to a program's impact. Grant funding also makes it difficult to fully integrate CHWs on care teams or expand the generalist model for CHWs. Grant funding tends to be disease- or condition-specific, so developing a CHW's core competencies and role on a care team that works across conditions often conflicts with funding models. The temporary nature of grant support also makes data collection inconsistent, as programs often have to change focus or innovate to secure additional funding, making it difficult to document the long-term impact of CHWs and specific interventions.

CHWs are rarely eligible for categorical reimbursement through health insurers, and of the programs that have sought reimbursement this way most have confronted obstacles due to the rigid nature of the billing structure and the lack of codes for CHWs and supportive services through existing fee-for-service mechanisms. In Massachusetts, payment reform under Chapter 224 has laid the groundwork for CHWs to be reimbursed through bundled payment schemes, and demonstration projects are currently in place for certain disease-specific interventions such as asthma. CHW advocates stressed that reimbursement through bundled payment is not the only answer, and funding mechanisms through additional grant opportunities and private-public partnerships continue to be explored.

7. Care Team Integration: There must be a clear plan for integration of CHWs into the clinical care team that includes role definition of all team members and that allows CHWs to act as "interventionists," not merely navigators.

A majority of policy experts underscored the challenge, and the importance, of effectively integrating CHWs within clinical care teams. Many care organizations do not fully appreciate the potential of CHWs, hiring them to fill a narrow role and missing the chance to derive much greater benefit if the scope of their role were expanded. Experts noted that a clear, concrete role for the CHW, even if that role eventually expands, helps signal to the rest of the care team on how to make use of their position.

Clinical supervisors may have little prior experience working with CHWs and may not understand how to maximize their potential on the clinical team. Stakeholder experts cited the importance of training not only the CHW for their position, but also training the entire care team on how to effectively work with CHWs. One expert commented that the biggest predictor of failure is when a

care manager is not adequately educated on how to integrate and make of use of CHWs on their team, so training modules for ground-level supervisors are essential.

Experts also indicated that CHWs need access to clinical staff in order to have a systematized role fully embedded in clinical practice, and that social workers and clinicians should be available to CHWs for clinical and social management “backup” at all times. Fully integrating CHWs into the practice also has important implications for patient experience and utilization of services. One expert noted that when CHWs are embedded in the practice, they can help patients make same-day appointments and avoid unnecessary use of emergency room services.

8. Participation Incentives: Incentives for patient participation are not necessary for successful CHW interventions.

Some CHW programs in New England do use patient incentives, including the Asthma Regional Council of New England, which provides patients with supplies for home environmental asthma trigger control (e.g., pillow and mattress casings). However, most programs have not relied on patient incentives of any kind, and policy experts do not believe that incentives are required when the true incentive for patient engagement comes from the personal relationship they often achieve with an individual CHW and the health and other benefits that often appear following the beginning of this working relationship.

9. Evaluation: CHW programs should seek to evaluate their effectiveness on patient health outcomes and on health care utilization and overall costs.

The evidence base supporting the effectiveness and value of CHW interventions has significant limitations and all CHW programs should attempt to evaluate their impact, not just to help improve the services they are providing to patients but to contribute new evidence to guide policy considerations. PACT at Brigham and Women’s Hospital has a particularly innovative approach to document the nature of each CHW’s patient interaction in order to better codify what is happening in the field. Under the PACT model, CHWs track and document what they do during each interaction on a handheld data system for in-field data sharing in order to develop a better sense of intensity level and distinguish between insignificant and meaningful interactions.

5. Questions and Discussion

Following the public CEPAC meeting on June 28, 2013, this section will be completed to capture the discussion of the Council members regarding the evidence, specifically around the Questions to Guide Discussion (questions for deliberation are posted for public comment at cepac.icer-review.org).

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Appendix

Table 1. Good and Fair Quality Studies from the AHRQ Technology Assessment

Author, Year	Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes	
Beckham 2008	Prospective cohort	Community health center in Oahu, HI	Evaluation of CHWs in the diabetic management of Hawaiian/Samoan patients	1) CHW intervention: <ul style="list-style-type: none"> • Home or clinic visits 2) Control: <ul style="list-style-type: none"> • Usual care, no details provided 	Initial patient recruitment: n=116 Inclusion criteria: <ul style="list-style-type: none"> • Age ≥ 18 years • Type 2 diabetes • HbA1c > 10% 1) CHW intervention (n=80) <ul style="list-style-type: none"> • Mean age: 51.8 ± 11.7 • Female: 55% • Public insurance: 73% • Private insurance: 23% 2) Control (n=36) <ul style="list-style-type: none"> • Mean age: 46.6 ± 11.8 • Female: 50% • Public insurance: 76% • Private insurance: 22% 	All patients enrolled completed follow-up	1-year follow-up HbA1c 1) CHW: 8.8% 2) Control: 10.4% p<0.0001 (calculated by AHRQ EPC)	Fair		
Hiatt 2008	2x2 factorial design	Low-income neighborhoods and public health clinics in and around San Francisco, CA	Impact of lay health workers on breast and cervical cancer screening	1) Lay Health Worker intervention: <ul style="list-style-type: none"> • Small group and one-on-one sessions • Presentations at community organizations • Women's Health Days 2) Control: <ul style="list-style-type: none"> • NR 	Initial patient recruitment: n=2,370 Inclusion criteria: <ul style="list-style-type: none"> • Low-income women • Age 40-75 years 1) Lay health worker intervention (n=801) <ul style="list-style-type: none"> • Age < 50: 38% • Female: 100% • Less than high school education: 26% • Household income <\$20,000: 44% • Public insurance: 28% • Private insurance: 59% • No insurance: 13% 2) Control (n=798) <ul style="list-style-type: none"> • Age < 50: 40% • Female: 100% • Less than high school education: 40% • Household income <\$20,000: 42% • Public insurance: 19% • Private insurance: 57% • No insurance: 24% 	Post-test evaluations conducted in 1,616 patients (68% of originally recruited population)	4-year follow-up No significant differences evaluated between groups in the screening behaviors for mammography, clinical breast exam or Pap smear	Fair		
Parker 2008		Urban neighborhoods in Eastside and Southwest Detroit, MI	Impact of CHWs on children's asthma-related health	1) Community Environmental Specialist intervention: <ul style="list-style-type: none"> • Home visits 2) Control: <ul style="list-style-type: none"> • Educational booklet 	Initial patient recruitment: n=328 Inclusion criteria: <ul style="list-style-type: none"> • Children age 7-11 years • Persistent asthma 1) Community environmental specialist intervention (n=150) <ul style="list-style-type: none"> • Mean age of child: 9.0 ± 1.5 • Female: 43% • Household income <\$10,000: 37% 2) Control (n=148) <ul style="list-style-type: none"> • Mean age of child: 8.8 ± 1.4 • Female: 41% • Household income <\$10,000: 46% 	Attrition for those not completing follow-up: 1) CES: n=46 (28%) 2) Control: n=55 (33%)	1-year follow-up Significant intervention-effect found in the daily nadir FEV1 (p=0.03) and in daily nadir PF (p=0.02) Significant intervention-effect in the frequency of persistent cough (p=0.034) and in coughing w/exercise (p=0.017) Need for unscheduled medical care significantly less in the intervention group (p=0.004)	Non-significant intervention effect in the percent of patients w/symptoms ≥2 days/week and not on any corticosteroid medication (p=0.073) Significant intervention effect in the percent of patients w/symptoms ≥2 days/week and not on any controller medication (p=0.004)	Fair	

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Lujan 2007 RCT	Faith-based community clinic in a Texas-Mexico border city	Effectiveness of promotora interventions on diabetes-related outcomes	1) Promotora intervention: • Group sessions • Follow-up phone calls • Postcards 2) Control: • Usual care, including medical follow-ups w/education and pamphlet distribution	Initial patient recruitment: n=150 Inclusion criteria: • Self-reported Mexican American ethnicity • Age ≥ 40 years • Non-completion of clinic diabetes education program Baseline demographics reported for entire population • Mean age: 58 • Female: 80% • < high school education: 95% • Household income <\$10,000: 42% • No insurance: 68%	Overall attrition: 9 (6%)	6-month follow-up Adjusted analysis Change in HbA1C 1) Promotora: -0.45% 2) Control: 30% p<0.001	Good		
Mock 2007 RCT	Santa Clara County, CA	Impact of lay health workers on cervical cancer screening	1) Lay Health Worker intervention: • Group sessions • Individual outreach • Media education 2) Control: • Media education	Initial patient recruitment: n=1005 Inclusion criteria: • Vietnamese American women • Age ≥ 18 years 1) Lay health worker (n=491) • Mean age: 45.7 ± 15.4 • Female: 100% • Less than 12 years of education: 58% 2) Control (n=477) • Mean age: 46.0 ± 15.3 • Female: 100% • Less than 12 years of education: 55%	Overall attrition: n=37 Retention rates: 1) Lay health worker: 98% 2) Control: 95%	3-4 months follow-up (Self-report) Change in % of patients ever having a Pap test 1) Lay health worker: 16% 2) Control: 5% Z test, p=0.001 Change in % of patients becoming up-to-date (having a Pap test in the last year) 1) Lay health worker: 22% 2) Control: 5% Z test, p<0.001	Fair		
Paskett 2006; Katz 2007 RCT	Federally-funded community health centers in rural Robeson County, NC	Impact of lay health advisors on mammography utilization	1) Lay Health Advisor intervention: • Home visits • Phone calls • Educational mailings 2) Control: • Mailing	Initial patient recruitment: n=897 Inclusion criteria: • Age > 40 years • Women w/out a mammogram in prior 12 months 1) Lay health advisor (n=433) • Mean age: 54.5 • Female: 100% • < high school education: 42% • No health insurance: 26% 2) Control (n=418) • Mean age: 55.7 • Female: 100% • < high school education: 45% • No health insurance: 31%	At 12-14 month follow-up: 1) Lay health advisor: n=51 (11%) 2) Control: n=26 (6%)	12-14 month follow-up (Medical record data) Patients receiving a mammogram in the 12 months prior to follow-up 1) Lay health advisor: 43% 2) Control: 27% RR 1.56 (95% CI, 1.29-1.87) The lay health advisor intervention showed significant association w/mammography within each racial group: 1) African Americans: RR 1.54 (95% CI, 1.11-2.14) 2) Native Americans: RR 1.58 (95% CI, 1.18-2.13) Whites: RR 1.54 (95% CI, 1.05-2.25) Among multiple baseline factors, women who were current smokers had 0.77 times the probability of receiving a mammogram at follow- up (p=0.016)	No significant differences between groups in cervical cancer screening rates within risk-appropriate guidelines (self- report) No differences evaluated inc cervical cancer screening rates by racial groups Multiple demographic factors were significantly associated with Pap test completion including education, employment status, socioeconomic, and risk status Economic outcomes Total cost of intervention delivery over course of study: \$329,054 Cost per additional mammography screening: \$4,986	Good	

Author, Year Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes
Jandorf 2005 RCT	Inner-city primary care practice in East Harlem, NY	Evaluation of patient navigators and screening for colorectal cancer	1) Peer Navigator Intervention: • Telephone calls 2) Control: • NR	Initial patient recruitment: n=78 Inclusion criteria: • Age ≥ 50 years • Non-adherent to colorectal screening 1) Peer navigator (n=38) • Mean age: 61.1 ± 7.2 • Female: 76% • High school degree: 13% • Annual income <\$10,000: 72% • Public insurance: 69% 2) Control (n=40) • Mean age: 61.3 ± 8.4 • Female: 73% • High school degree: 10% • Annual income <\$10,000: 64% • Public insurance: 70%	All patients enrolled completed follow-up	6-month follow-up Patients completing FOBT after 3 months 1) Peer navigator: 42% 2) Control: 25% p=0.086 Patients having an endoscopy appointment at 3 months 1) Peer navigator: 18% 2) Control: 0% p=0.005 Patients completing endoscopy at 3 months 1) Peer navigator: 16% 2) Control: 5% p=0.115 Patients completing endoscopy at 6 months 1) Peer navigator: 24% 2) Control: 5% p=0.019	Fair	
Welsh 2005; Sauaia 2007 Retrospective cohort	Church communities in CO	Evaluation of a promotora intervention to increase breast cancer screening	1) Promotora intervention: • Printed materials • Meetings after mass or at church events • Home group meetings 2) Control: • Printed materials	Initial patient recruitment: n=4,739 Inclusion criteria: • Age 50-69 years • Continuous enrollment in Medicaid/Medicare >23 months 1) Promotora (n=585) • Age < 60: 50% • Female: 100% • Annual income < \$38,300: 20% • HMO: 64% Medicaid FFS: 23% Medicare FFS: 13% 2) Control (n=6,070) • Age < 60: 45% • Female: 100% • Annual income < \$38,300: 40% • HMO: 42% Medicaid FFS: 30% Medicare FFS: 29% Latina vs. non-Latina whites Latina 1) Promotora (n=165) • Mean age: 59.0 ± 4.1 • Female: 100% 2) Control (n=2,034) • Mean age: 58.4 ± 4.4 • Female: 100% Non-Latina white 1) Promotora (n=153) • Mean age: 57.5 ± 4.3 • Female: 100% 2) Control (n=5,838) • Mean age: 57.9 ± 4.5 • Female: 100%	N/A	Time between baseline and follow- up: 2 years No significant changes in screening rates within groups; adjusted analyses found a significant impact of time, favoring the promotora intervention Other factors significantly associated with not receiving screening were a lower income and having a disability Insurance was a significant factor: Latinas having Medicare FFS were less likely to have screening than patients w/ HMO coverage, but more likely than patients w/Medicaid coverage	Fair	2 studies examining the same interventions but in separate sub- groups based on ethnicity and insurance coverage

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Conway 2004 RCT	San Diego county, CA	Impact of promotoras on reduction in tobacco smoke exposure	1) Promotora: • Home sessions • Telephone sessions 2) Control: • No intervention	Initial patient recruitment: n=143 Inclusion criteria: • Latino adults • Having a child age 1-9 years • Exposure of child to ≥6 cigarettes/week Baseline demographics reported for entire population • Mean age of parents: 33 ("almost all female") • Mean age of children: 4 (55% female) • Median education level: 9-11 years • Mean household income: \$8,400-13,200	Overall attrition: 19%	12-month follow-up No significant differences between groups in the measurement of tobacco exposure in children's hair	Fair	Economic outcomes Estimated intervention costs: \$29,000 Calculated cost per intervention: \$400
Hunter 2004 RCT	Rural area along US- Mexico border, Douglas, AZ	Impact of a promotora intervention on annual preventive exams	1) Promotora intervention: • Home visit • Postcards 2) Control: • Postcards	Initial patient recruitment: n=101 Inclusion criteria: • Women attending an initial clinical exam • Age ≥ 40 years 1) Promotora intervention (n=51) • Mean age: 51.1 ± 7.9 • Female: 100% • Less than high school education: 82% • Living below poverty level: 75% 2) Control (n=50) • Mean age: 49.6 ± 7.1 • Female: 100% • Less than high school education: 72% • Living below poverty level: 77%	Overall attrition: n=3 (3%)	Follow-up NR Patients returning for a second annual clinical exam 1) Promotora: 65% 2) Control: 48% RR: 1.35 (95% CI, 0.95-1.92)	Fair	
Levine 2003	Sandtown- Winchester (urban) community of West Baltimore, MD	Comparison of more and less intensive interventions by community health workers on blood pressure control	1) More intense Community Health Worker intervention: • Multiple home visits • Blood pressure measurement 2) Less intense CHW group: • Single home visit	Initial patient recruitment: n=789 Inclusion criteria: • African American adults • Diagnosis of hypertension 1) More intense CHW intervention (n=387) • Mean age: 53.8 • Female: 61% • Less than high school education: 57% • Annual family income <\$15,000: 74% • Having health insurance: 78% 2) Less intense CHW (n=402) • Mean age: 54.6 • Female: 63% • Less than high school education: 59% • Annual family income <\$15,000: 78% • Having health insurance: 76%	At 40-month follow-up: 1) More intense CHW: n= 147 (38%) 2) Less intense CHW: n= 171 (43%)	40-month follow-up No statistically significant differences between interventions in the change in blood pressure No significant difference in the percent of patients with adequate blood pressure control (<140/90) No significant differences in the classification of stage of blood pressure control as compared to baseline categorization	Fair	

Author, Year Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes
Krieger 2002 & 2005	Low-income, urban households in King County, WA	Evaluation of the effectiveness of a CHW intervention to reduce exposure to indoor asthma triggers	1) High intensity Community Home Environmental Specialist intervention: • Multiple home visits 2) Low intensity CHES group: • Single home visit	Initial patient recruitment: n=274 Inclusion criteria: • Children age 4-12 years • Diagnosis of persistent asthma • Enrollment in Medicaid • Income <200% of federal poverty threshold 1) High intensity intervention (n=138) • Mean age of child: 7.4 • Female: 44% • Caregiver education < high school: 41% • Household income < 100% poverty threshold: 52% 2) Low intensity group (n=136) • Mean age of child: 7.3 • Female: 38% • Caregiver education < high school: 38% • Household income < 100% poverty threshold: 61%	At 1-year follow-up: 1) High intensity: n=28 (20%) 2) Low intensity: n=32 (24%)	1-year follow-up Urgent health care services use declined significantly more in the high intensity intervention, OR 0.38 (95% CI 0.16-0.89) No significant differences between groups in the number of days w/symptoms over 2 weeks (p=0.138) Patients in the high intensity intervention had a significantly greater decrease in the number of days w/activity limitations over 2 weeks, p=0.029 No significant differences seen between groups in the number of school days missed (p=0.105) and in the number of work days missed (p=0.89)	Good	Economic outcomes • Potential savings estimation based on product of # of units of urgent care services multiplied by unit cost of each service (Urgent care costs: hospital admissions, ED visits, unscheduled clinic visits during the 2 months prior to exit interview) Urgent care costs were \$6,301-\$8,856 less in high intensity group (\$57-\$80/child) relative to low intensity
Taylor 2002 RCT	Community clinics in metropolitan Seattle, WA	Impact of outreach workers on cervical cancer screening	1) Outreach worker intervention: • Letter • Home visit • Phone call 2) Direct mail: • Mailing of educational material 3) Control: • Usual care, provided by local clinic	Initial patient recruitment: n=199 Inclusion criteria: • Chinese women • Age 20-69 years • Non-adherent to cervical cancer screening • Completion of baseline survey Baseline demographics reported for all patients, in Seattle, WA and Vancouver, Canada 1) Outreach worker (n=67) 2) Direct mail (n=66) 3) Control (n=66)	At 6-month follow-up: 1) Outreach worker: n=8 (12%) 2) Direct mail: n=3 (5%) 3) Control: n=7 (11%)	6-month follow-up (Self-report) Patients w/Pap testing after randomization and before follow-up 1) Outreach worker: 37% 2) Direct mail: 22% 3) Control: 22% No pairwise comparisons were statistically significant	Fair	Medical record confirmation provided in 94/181 (52%) of patients; results from Seattle population only NR Patients w/Pap testing in last 2 years 1) Outreach worker: 69% 2) Direct mail: 48% 3) Control: 39% • 1) vs. 3): p<0.001 • 2) vs. 3): p=0.34 • 1) vs. 2): p=0.01
Rask 2001 LeBaron 2004 RCT	Inner-city clinics and hospitals in Fulton County, GA	Impact of outreach workers on low vaccination rates	1) Outreach worker intervention: • Phone calls • Postcard • Home visit 2) Autodialer: • Automated phone call • Postcard 3) Combination of outreach worker and autodialer interventions 4) Control: • No interventions	Initial patient recruitment: n=3,050 Inclusion criteria: • Care received through Fulton County health dept. clinics or public hospital health system 1) Outreach worker intervention (n=760) • Median age of child: 9 months • Female: 51% 2) Autodialer (n=763) • Median age of child: 9 months • Female: 51% 3) Combination intervention (n=764) • Median age of child: 9 months • Female: 52% 4) Control • Median age of child: 9 months • Female: 51%	Overall attrition within intervention groups (did not receive intervention): n=304	Completion of 4-3-1-3 vaccination series (diphtheria, tetanus, pertussis) at 24 months of age Completion rates 1) Outreach worker: 37% 2) Autodialer: 40% 3) Combination: 38% 4) Control: 34% Autodialer group significantly different from control (p<0.05); all others, p=NS No significant differences between groups in the % of children receiving ≥ 1 valid dose No significant differences between groups in the % of children needing vaccination at the end of the study	Good	Economic outcomes Program costs are direct costs only, from the perspective of program replication Total annualized intervention costs (1997 \$) 1) Outreach worker: \$16,868 2) Autodialer: \$12,089 3) Combination: \$24,826 Monthly cost per child 1) Outreach worker: \$1.87 2) Autodialer: \$1.34 3) Combination: \$2.76

Author, Year Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes	
Williams 2001; Auslander 2002 RCT	Large Midwestern city, MO	Impact of peer educators on risk reduction of diabetes	1) Peer Educator intervention: <ul style="list-style-type: none"> Group sessions Individual sessions 2) Control: <ul style="list-style-type: none"> Workbook 	Initial patient recruitment: n=NR Inclusion criteria: <ul style="list-style-type: none"> African American women Age 25-55 years 1) Peer educator (n=138) <ul style="list-style-type: none"> Mean age: 41.2 ± 7.8 Female: 100% High school education or less: 33% Below the poverty line: 47% 2) Control (n=156) <ul style="list-style-type: none"> Mean age: 40.2 ± 8.2 Female: 100% High school education or less: 44% Below the poverty line: 48% 	Overall attrition: 104 (% NR)	3- and 6-month follow-up No significant differences between groups in weight and BMI Significant changes in the intervention group as compared to control in self-reports of low-fat dietary patterns and dietary fat intake	Fair		
Andersen 2000 & 2002 RCT of communities	Rural neighborhoods in WA	Evaluation of mammography promotion by volunteers	1) Individual Counseling intervention: <ul style="list-style-type: none"> Mailings Telephone calls 2) Community activities: <ul style="list-style-type: none"> Access to events and activities 3) Combination intervention: <ul style="list-style-type: none"> Telephone calls Access to events and activities 4) Control: <ul style="list-style-type: none"> NR 	Initial patient recruitment: n=9,484 Inclusion criteria: <ul style="list-style-type: none"> Women Age 50-80 years Baseline demographics reported for entire population <ul style="list-style-type: none"> Completed high school: 37% Annual income <\$15,000: 21% 	Based on baseline-eligible patients, overall attrition: n=2,222 (25%)	2-year follow-up (Self-report) % change of mammography use in under-users at baseline was not statistically different in each of the intervention arms as compared to control % difference in women using mammography among regular users, compared to control 1) Individual counseling: 0.4% p=0.81 2) Community activities 2.9% p=0.01 3) Combination: 1.4% p=0.27 Economic outcomes Cost per additional mammography user 1) Individual Counseling: \$1,984 2) Community activities: \$1,953 3) Combination: \$2,451 For under-users, cost per additional mammography user 1) Individual Counseling: \$2,267 2) Community activities: \$4,650 3) Combination: \$3,771 For promotion of mammography in women ≥ 50, the cost per additional year of life saved was approximately \$56,000	Sub-group analyses Significantly more women were using mammography at follow-up in the following populations of under-users: <ul style="list-style-type: none"> ≥50 % of patients are under-users Women without health insurance (for community activities and combination groups) Communities w/out a female MD Among patients who are regular users, results were highly variable	Good	

Author, Year Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes
Derose 2000 RCT	Church communities in southern LA County, CA	Impact of peer counselors on mammography adherence	<p>1) Peer Counselor Intervention:</p> <ul style="list-style-type: none"> Telephone sessions Access to print and computer resources <p>2) Control:</p> <ul style="list-style-type: none"> Access to print and computer resources 	<p>Initial patient recruitment: n=1,113</p> <p>Inclusion criteria:</p> <ul style="list-style-type: none"> Women Age 50-80 years <p>1) Peer counselor intervention (n=416)</p> <ul style="list-style-type: none"> Age 50-64: 61% Female: 100% Less than high school education: 18% Income ≤\$10,000: 16% Having insurance: 92% <p>2) Control (n=397)</p> <ul style="list-style-type: none"> Age 50-64: 56% Female: 100% Less than high school education: 15% Annual income ≤\$10,000: 13% Having insurance: 92% 	Overall attrition: n=300 (27%)	<p>2-year follow-up (Self-report)</p> <p>Nonadherence rates for patients adherent at baseline</p> <p>1) Peer counselor: 16%</p> <p>2) Control: 23%</p> <p>p=0.029</p> <p>Nonadherence rates for patients nonadherent at baseline</p> <p>1) Peer counselor: 35%</p> <p>2) Control: 37%</p> <p>p=0.324</p>	Fair	<p>Economic outcomes</p> <ul style="list-style-type: none"> Multiple analyses conducted <p>1) 3 cost models for church-related program costs</p> <p>2) Cost per female participant based on each model</p> <p>3) Costs per additional screening, depending on patient's reported adherence at baseline</p> <p>Cost of mammography per year of life saved: \$12,676 (1997 \$)</p>
Gary 2000, 2003 & 2005 Batts 2001 Vetter 2004	Primary care clinics in East Baltimore, MD	Impact of nurse and CHW interventions on risk factors for diabetes-related complications	<p>1) Community Health Worker intervention:</p> <ul style="list-style-type: none"> Home visits Phone calls <p>2) Nurse case manager group:</p> <ul style="list-style-type: none"> Clinic visits <p>3) Combination group:</p> <ul style="list-style-type: none"> Home visits Clinic visits Phone calls <p>4) Control:</p> <ul style="list-style-type: none"> Usual medical care 	<p>Initial patient recruitment: n=186</p> <p>Inclusion criteria:</p> <ul style="list-style-type: none"> African American adults Age 35-75 years Diagnosis of type 2 diabetes <p>1) CHW intervention (n=41)</p> <ul style="list-style-type: none"> Mean age: 59 ± 9 Female: 78% Years of education: 9 ± 3 Yearly income ≤\$7,500: 61% Receives medical assistance: 46% <p>2) NCM (n=38)</p> <ul style="list-style-type: none"> Mean age: 59 ± 11 Female: 76% Years of education: 10 ± 2 Yearly income ≤\$7,500: 42% Receives medical assistance: 34% <p>3) Combination (n=36)</p> <ul style="list-style-type: none"> Mean age: 60 ± 7 Female: 78% Years of education: 10 ± 3 Yearly income ≤\$7,500: 53% Receives medical assistance: 36% <p>4) Control (n=34)</p> <ul style="list-style-type: none"> Mean age: 57 ± 8 Female: 74% Years of education: 10 ± 3 Yearly income ≤\$7,500: 44% Receives medical assistance: 50% 	Overall attrition: n=37 (20%)	<p>2-year follow-up</p> <p>No significant differences seen between the CHW intervention and other groups, including control in HbA1c, cholesterol measures and blood pressure</p>	Good	

Author, Year Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes	
Schuler 2000	University hospital serving inner-city population in MD	Effect of lay visitors on mother-infant interactions	1) Lay Visitor intervention: • Home visits 2) Control: • Visits to track participants and reduce attrition only	Initial patient recruitment: n=192 Inclusion criteria: • Women w/infants having a positive urine tox screen at birth or history of recent drug use 1) Lay visitor intervention (n=84) • Mean age: 27 ± 5.2 • Female: 100% • Years of education: 10.9 ± 1.4 2) Control (n=87) • Mean age: 27.1 ± 5.2 • Female: 100% • Years of education: 10.9 ± 1.6	Overall attrition: 1) Lay visitor: n=11 (12%) 2) Control: n=10 (10%)	6-month follow-up No differences between groups in self-report of maternal drug-use	Fair		
Korfmacher 1999 Olds 2002 & 2004 RCT	Public and private prenatal clinics in Denver, CO	Effects of nurses and paraprofessionals using home visitation to reduce child maltreatment	1) Paraprofessional intervention: • Screening and referral • Home visits 2) Nurse: • Screening and referral • Home visits 3) Control: • Screening and referral	Initial patient recruitment: n=735 Inclusion criteria: • Qualified for Medicaid or without private insurance • Pregnant women 1) Paraprofessional intervention (n=245) • Mean age: 19.4 ± 3.7 • Female: 100% • Years of education: 11.0 ± 1.8 • Annual household income: \$13,241 2) Nurse (n=235) • Mean age: 20.2 ± 4.2 • Female: 100% • Years of education: 11.2 ± 2.0 • Annual household income: \$13,126 3) Control (n=255) • Mean age: 19.7 ± 4.1 • Female: 100% • Years of education: 11.2 ± 1.9 • Annual household income: \$12,701	At 24-month follow-up, and at age 4 years: • Interviews 1) Paraprofessional: 24-month, n=32 (13%) Age 4, n=34 (14%) 2) Nurse: 24-month, n=41 (17%) Age 4, n=31 (13%) 3) Control: 24-month, n=32 (13%) Age 4, n=39 (17%) • Child assessments 1) Paraprofessional: 24-month, n=57 (23%) Age 4, n=47 (19%) 2) Nurse: 24-month, n=67 (29%) Age 4, n=39 (17%) 3) Control 24-month, n=51 (20%) Age 4, n=44 (17%)	24-month follow-up No significant differences seen between paraprofessional and control groups in measures including decrease in tobacco use, use of preventive and emergency services, subsequent pregnancy and birth, education achievement and employment No significant differences seen between paraprofessional and control groups in mother-child interactions and child outcomes (e.g. language development and behavior problems score) Outcome effect was approximately half for paraprofessionals as compared to nurses, but this was not significant except for language development	Follow-up at age 4 Women in the paraprofessional intervention had significantly better mental health scores as compared to control (p=0.03), and had more sensitive and responsive play sessions w/children (p=0.03) Economic outcomes (2002 \$) Average inflation-adjusted, per-family total cost of 2.5 year program 1) Paraprofessional: \$6,162 2) Nurse: \$9,140 Average cost, including staff salaries, fringe benefits, supplies, travel, rent, equipment, training costs (over 2.5 years) 1) Paraprofessional: \$5,178 2) Nurse: \$7,681	Fair	
Barnes 1999 RCT	Immigrant community in Northwestern Manhattan, NY	Impact of community volunteers on immunization rates	1) Community volunteer intervention: • Home visits • Phone calls 2) Control: • No intervention	Initial patient recruitment: n=434 (randomization before recruitment for enrollment) Inclusion criteria: • Children < 2 years • Overdue for a vaccine • No-show for scheduled appointment 1) Community volunteer intervention (n=74) • Mean age of child: 9.5 months • Female: 50% • Medicaid: 70% Self-pay: 30% 2) Control (n=89) • Mean age of child: 9.4 months • Female: 40% • Medicaid: 75% Self-pay: 25%	Overall attrition: n=23 (14%)	6-month follow-up Children up-to-date (for age) w/vaccines 1) Community volunteer: 75% 2) Control: 54% p=0.03 Children late for ≥1 vaccination 1) Community volunteer: 18% 2) Control: 38% p=0.03	Fair		

Author, Year Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes
Krieger 1999 RCT	Low-income neighborhoods in Seattle, WA	Evaluation of CHWs in promoting medical follow-up	1) Community health worker intervention: • Varied interactions including, phone calls, postcards and home visits 2) Control: • Advised to pursue medical follow-up	Initial patient recruitment: n=421 Inclusion criteria: • Elevated blood pressure • Age ≥ 18 years • Income ≤ 200% of federal poverty level 1) CHW (n=209) • Age < 40: 26% • Female: 28% • Less than high school education: 22% • Income ≤ federal poverty level: 64% 2) Control (n=212) • Age < 40: 24% • Female: 17% • Less than high school education: 26% • Income ≤ federal poverty level: 68%	At 3-month follow-up: 1) CHW: n=63 (30%) 2) Control: n=47 (22%)	3-month follow-up (Self-report w/medical provider verification) Patients w/completed follow-up appointment within 90 days 1) CHW: 65% 2) Control: 47% p=0.001	Fair	Medical provider verification available for 94% of patients w/follow-up
St. James 1999 Retrospective cohort	New England	Effectiveness of resource mothers to decrease adverse consequences of maternal phenylketonuria	1) Resource mother intervention: • Home visits 2) Control: • NR	Inclusion criteria: • Women w/maternal phenylketonuria 1) Resource mother intervention (n=14) • Mean age: 26.5 ± 3.6 • Low socioeconomic position 79% 2) Control (n=55) • Mean age: 24.1 ± 3.9 • Low socioeconomic position 76%	N/A	12-months after birth follow-up Weeks until attainment of metabolic control 1) Resource mother: 8.5 2) Control: 16.1 p<0.05 Children w/mothers in the intervention group had a significantly higher developmental quotient at 6-12 months of age (p<0.05)	Fair	
Von Korff 1998 RCT	Health maintenance organization in Western WA	Impact of a lay person-led self-management group intervention for back pain	1) Lay leader intervention: • Group classes 2) Control: • Usual care, w/book provided on back pain care	Initial patient recruitment: n=255 Inclusion criteria: • Diagnosis of back pain • ≥ 1 prior PCP visit for back pain • Age 25-70 years 1) Lay leader intervention (n=129) • Mean age: 49.4 ± 11.7 • Female: 68% • 12 years or less education: 12% • Receiving worker's compensation: 6% 2) Control (n=126) • Mean age: 50.3 ± 10.9 • Female: 56% • 12 years or less education: 17% • Receiving worker's compensation: 6%	At 12-month follow-up: 1) Lay leader: n=17 (13%) 2) Control: n=20 (16%)	12-month follow-up No significant difference between groups in Roland Disability score (p=0.092)	Fair	
Erwin 1997 Prospective cohort	Churches and community centers in the River Delta region of AK	Impact of witness role models on mammography practice	1) Witness Role Model intervention: • Group presentation 2) Control: • NR	Initial patient recruitment: n=433 Inclusion criteria: NR 1) Witness role model intervention (n=216) • Mean age: 52.5 • Female: 100% • High school education or less: 70% • Household income ≤\$15,000: 78% 2) Control (n=217) • Mean age: 49.3 • Female: 100% • High school education or less: 66% • Household income ≤\$15,000: 78%	At 6-month follow-up: 1) Witness role model: n=10 (5%) 2) Control: n=11 (5%)	6-month follow-up (Self-report) Significant differences noted between baseline and follow-up % of patients performing BSE regularly, in the previous month and in reports of ever having a mammogram; no between-group analyses conducted	Fair	

Author, Year Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes
Silver 1997 RCT	Large, urban medical centers in the Bronx or lower Westchester, NY	Impact of lay intervenors on psychological outcomes in mothers of children w/ongoing health problems	1) Lay Intervenor intervention: • Individual visits at the home or hospital • Group social activities • Phone calls 2) Control: • Standard care, details not provided	Initial patient recruitment: n=365 Inclusion criteria: • Children aged 5-8 years w/an ongoing health condition 1) Lay health intervenor intervention (n=183) • Mean age of child: 7.2 • Mean age of mother: 34.7 • Less than high school education: 23% • Family receiving welfare: 48% 2) Control (n=182) • Mean age of child: 7.0 • Mean age of mother: 34.0 • Less than high school education: 21% • Family receiving welfare: 48%	At 12-month follow-up: 1) Lay intervenor: n=9 (5%) 2) Control: n=13 (7%)	12-month follow-up No significant differences between groups in self-reported psychiatric scores For mothers reporting ≥ 5 stressful life events, post-test anxiety was significantly lower for the intervention group as compared to the control, $p < 0.05$ No significant differences seen between groups based on socioeconomic status or family structure (e.g. single-mother)	Fair	
Pilote 1996 RCT	Shelters and food lines in San Francisco, CA	Impact of peer health advisers on adherence to medical follow-ups	1) Peer Health Adviser intervention: • Individual meeting • Attendance w/patient at medical appointment • Provision of follow-up appointment 2) Monetary incentive: • Provision of follow-up appointment • \$5 payment for attending follow-up appointment 3) Control: • Provision of follow-up appointment	Initial patient recruitment: n=244 Inclusion criteria: • Homeless individuals • Positive PPD test 1) Peer health adviser intervention (n=82) • Median age: 40 • Female: 13% • Less than high school education: 38% 2) Monetary incentive (n=83) • Median age: 39 • Female: 19% • Less than high school education: 29% 3) Control (n=79) • Median age: 40 • Female: 16% • Less than high school education: 35%	At 3-week follow-up: 1) Peer health adviser: n=21 (25%) 2) Monetary incentive: n=13 (16%) 3) Control: n=37 (47%)	3-week follow-up Patients adherent to first follow-up appointment 1) Peer health adviser: 75% $p = 0.004$, as compared to control 2) Monetary incentive: 84% $p < 0.001$, as compared to control 3) Control: 53%	Fair	

Author, Year Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes	
Black 1995; Hutcheson 1997 RCT	Urban pediatric clinics serving low-income families in Baltimore, MD	Impact of lay home visitors on the growth and development in children with nonorganic failure to thrive	1) Lay Home Visitor: • Home visits • Clinic-based multidisciplinary services 2) Control: • Clinic-based multidisciplinary services	Initial patient recruitment: n=130 Inclusion criteria: • Age of child < 25 months • Weight < 5th percentile • Gestational age ≥ 36 weeks • Birth weight appropriate for gestational age Age 1-12 months at recruitment 1) Lay home visitor intervention (n=32) • Mean age of child: 7.8 ± 2.8 • Mean age of mother: 23.8 ± 5.0 • Mean years of education: 10.8 ± 1.5 • Medicaid: 81% 2) Control (n=29) • Mean age of child: 6.6 ± 3.6 • Mean age of mother: 22.7 ± 4.3 • Mean years of education: 10.3 ± 1.4 • Medicaid: 78% Age 12.1-24.9 months at recruitment 1) Lay home visitor intervention (n=32) • Mean age of child: 17.1 ± 3.7 • Mean age of mother: 24.8 ± 4.3 • Mean years of education: 11.2 ± 1.7 • Medicaid: 78% 2) Control (n=37) • Mean age of child: 17.9 ± 4.3 • Mean age of mother: 26.3 ± 6.1 • Mean years of education: 10.7 ± 1.6 • Medicaid: 89%	At 1-year follow-up, overall attrition: n=14 (11%) At 4-year follow-up, overall attrition: n=56 (43%)	1-year follow-up Follow-up at age 4 Cognitive and motor development • In younger cohort, significantly less decline evaluated in the intervention group, p=0.02 • In the older cohort, no significant difference between groups, P=NR No significant differences seen between groups of both age cohorts in language development and parent-child interaction	Patients in the intervention group had a significant effect on motor development (p=0.02) Economic outcomes Costs determined by ingredients method for lay home visitor intervention, 1993 \$ • \$2,828/child for 1-year intervention	Fair	
Graham 1992 RCT	Inner-city prenatal clinic in Cleveland, OH	Impact of home visitors on pregnancy outcomes	1) Home Visitor intervention: • Home visits • Routine clinic care 2) Control: • Routine clinic care	Initial patient recruitment: n=145 Inclusion criteria: • Black women • Between 17 and 28 weeks gestation • At least 1 stressful life event during pregnancy Baseline demographics reported for initially screened population • Mean age: 24 • Female: 100% • Medicaid insurance: 84%	Withdrawals prior to birth of child: 1) Home visitor: n=28% 2) Control: n=5 (9%)	Follow-up: birth of child Rates of low-birth weights were not statistically different between the groups Ratio of actual to expected number of clinic visits 1) Home visitor (all scheduled visits): 1.17 p=0.007, as compared to control 2) Home visitor (some home visits only): 1.12 p=0.029, as compared to control 3) Control: 0.93	Fair		

Note: Shaded studies report at least 1 statistically significant positive outcome associated with a CHW intervention

AHRQ: Agency for Healthcare Research and Quality; BSE: breast self exam; CES: community environmental specialist; CHW: community health worker; CI: confidence interval; ED: emergency department; EPC: Evidence-based Practice Center; FEV; forced expiratory volume; FFS: fee-for-service; FOBT: fecal occult blood test; HbA1c: glycosylated hemoglobin; HMO: health maintenance organization; NCM: nurse case manager; NR: not reported; NS: not significant; OR: odds ratio; PCP: primary care provider; PF: pulmonary function; RR: relative risk

Table 2. Characteristics of Community Health Worker Interventions in the AHRQ Technology Assessment

Author/ Year	Title	Paid/ Volunteer	Recruitment of CHWs	Education requirements	CHW characteristics	Training details	CHW supervision	Patient recruitment/ CHW-matching	Patient incentives	Components of interaction	Interaction specifics (location, length, timing, follow-up)	Funding details	Notes
Beckham 2008	Community Health Worker	NR (recorded as "Paid" in AHRQ report)	NR	• 6-month program at community college	• Long-time residents of the Wai'anae community • 2 of 3 were bilingual (Samoan-English) • 1 was diabetic	• Training in medical asst. duties • Diabetes-specific curriculum w/2 months of weekly training, followed by monthly training during study	• Biweekly meetings w/Medical Director & Prev. Health Dept. Director for in- service training & case conferences	• Efforts made to match ethnicity	• Free transportation to clinic	<ul style="list-style-type: none"> • Multidisciplinary team collaboration on individual intervention plan • Incorporation of self-management skills, identification of barriers, observation of family dynamics • Individualized intervention plan involving self-monitoring, adherence, diet & exercise plan and preventive health • Visual aids, problem-solving and patient-feedback utilized • Reminders of medical appointments provided • Orientation to supportive cultural services through Traditional Hawaiian Healing Center • Referral to nutrition assessment • F/u visits determined by patient 	<ul style="list-style-type: none"> • Initial visit at site of patient choosing (home or clinic) • Avg visits: 4.24 (1-15) • Visit length: 1-1.5 hours • Study duration: up to 1 year 	Bureau of Primary Health Care	
Hiatt 2008	Lay Health Worker	Paid	NR	NR	<ul style="list-style-type: none"> • Represented targeted ethnic groups: African American, Chinese, Hispanic, and White • Varying levels of education and experience 	<ul style="list-style-type: none"> • Based on the San Francisco Women's Cancer Network program • Training topics included basic breast and cervical cancer biology, screening, and treatment, local health resources • Procedure protocols reviewed w/discussion on adoption stages for screening based on the Transtheoretical Model 	NR	NR	NR	<ul style="list-style-type: none"> • Ongoing interactions to encourage and direct patients to screening • Accompanied patients to Women's Health Days and to clinics for screening and education 	<ul style="list-style-type: none"> • Small group and one-on-one sessions, number and length NR • Contact occurred at various sites • Study duration: up to 4 years 	NR	
Parker 2008	Community Environmental Specialists	NR	• Application process w/hiring by a steering committee	<ul style="list-style-type: none"> • Minimum of a high school education • Training and certification in integrated pest management 	<ul style="list-style-type: none"> • Detroit residents • 2/4 were bilingual (English/Spanish) • Were not clinically trained health professionals 	<ul style="list-style-type: none"> • Intervention based on the Seattle-King County Healthy Homes Project • Intensive 4-week initial training • Training topics included clinical aspects of asthma, allergens and triggers, accessing medical care and local resources, strategies for behavior change • Ongoing training activities throughout the year 	NR	• No role in recruitment	<ul style="list-style-type: none"> • \$4 gift certificate to local shoe store for initial questionnaire • \$15 gift certificate for annual interviews • Small gifts for children completing weekly lung function tests • Local restaurant gift certificates for data collection • \$50 at end of project 	<ul style="list-style-type: none"> • Initial home assessment, providing information on asthma and role of environmental triggers • Assessment of families' social service needs, including primary care, health insurance coverage • Referral for social services, clinics and public assistance programs • Development of individual household action plan based on questionnaire, skin prick allergy test, bedroom allergen testing and evaluation by study pediatric pulmonologist • Provided families with vacuum cleaner, mattress & pillow covers, household cleaning supplies • Oral and written materials given • When appropriate, professional pest management services provided 	<ul style="list-style-type: none"> • Planned: 9 visits/year • Mean # of visits: 9.24 (range 1-17) • Length of visit NR • Study duration: 1 year 	Natl. Institute of Environmental Health Services; US Environmental Protection Agency	

Author/ Year	Title	Paid/ Volunteer	Recruitment of CHWs	Education requirements	CHW characteristics	Training details	CHW supervision	Patient recruitment/ CHW-matching	Patient incentives	Components of interaction	Interaction specifics (location, length, timing, follow-up)	Funding details	Notes
Lujan 2007	Community lay workers (promotoras)	Paid	NR	NR	• Bilingual clinic employees	• 60 hours of training on diabetes self- management	• Supervised by PI during weekly classes	NR	• Transportation to classes • Class attendance incentive applied to clinic account • Small token gift • Gift certificate at assessment interviews for use at major local discount store	• In-person group meetings • Classes developed by a health educator, following ADA curriculum guidelines • Interactive, hands-on instruction such as flip charts, food models, food product labels, low-literacy handouts in English & Spanish • Follow-up phone calls to answer questions, reinforce education and promote change • After completion of classes, patients received faith-based health-behavior change postcards	• 8 weekly, 2-hour classes, led by 2 CHWs, in English or Spanish • 4 phone calls • Biweekly postcards sent for 16 weeks following completion of meetings • Total duration: 6 months	Paso del Norte Health Foundation, Center for Border Health Research	
Mock 2007	Lay Health Worker	Paid	Recruited by coordinator of community-based organization	NR	• Vietnamese American women • Member of the community	• 2 sessions, 3 hours each • Research staff conducted training	NR	• Lay health workers recruited patients from their social networks	• \$60 given to all participants	• Provision of education on causes of cervical cancer and screenign procedures • Discussion of accessing medical services • Assistance w/scheduling appointments • Use of Vietnamese-language flip charts and booklets	• 2 group sessions, 90- 120 minutes each, 3-4 months apart • Individual contacts over 3-4 months • Study duration: 3-4 months	CDC; Asian American Network for Cancer Awareness, Research and Training through a Natl. Cancer Institute Cooperative Agreement	
Paskett 2006 Katz 2007	Lay Health Advisor	Paid	NR	NR	• 2 Native Americans, 1 African American • Previous professional education: nurse, social worker and research study interviewer	• Training provided over 1 week at Wake Forest University and local settings within the county • Conducted by Project Manager and other study personnel • Follow-up training throughout study • Training theories based on PRECEDE- PROCEED Model, and other models • Topics included general project information and protocols, education on breast development, abnormalities, cancer screening, diagnosis, treatment and risk factors • Role playing utilized • Resource manual supplied	• Weekly phone calls or in-person meetings w/supervisor • Periodic attendance at patient visits by supervisor	• Ethnicity	• \$10 gift certificate for completion of baseline survey • \$10 grocery store gift certificate for completion of follow-up survey • Provision of small gifts at final home visit (mugs, calendar)	• Provision of individualized health education program • Educational materials provided dealing w/risk, barriers, self-exam and scheduling a mammogram • Provision of feedback on initial discussion • Assistance w/scheduling appointments	• 2 home visits, 45-60 and 30- 45 minutes each • Visits occurred w/in 2-3 weeks • Phone calls made during months 2 and 6, following 2nd visit • 2 mailings at months 4 and 8 • Final follow-up home visit at 10-14 months	Natl. Cancer Institute	
Jandorf 2005	Peer Navigator	Paid	• Research assistant in study was the peer navigator	NR	• Similar ethnic background • Member of the community	NR	NR	• Approached patients for possible enrollment	NR	• Provided support and advocacy to patient • Provided education on risks of colorectal cancer and prevention • Coordinated w/healthcare facilities for scheduling endoscopy procedure • Provided reminders about screening and follow-up • Identification of barriers and addressing of patient concerns w/ potential resolution	• Telephone contact, number and duration NR • 6-month follow-up	National Cancer Institute	

Author/ Year	Title	Paid/ Volunteer	Recruitment of CHWs	Education requirements	CHW characteristics	Training details	CHW supervision	Patient recruitment/ CHW-matching	Patient incentives	Components of interaction	Interaction specifics (location, length, timing, follow-up)	Funding details	Notes
Welsh 2005; Sauaia 2007	Promotora	Paid	<ul style="list-style-type: none"> Recruited by project and Clinica Tepeyac staff 	NR	<ul style="list-style-type: none"> Member of the community Shared ethnicity 	<ul style="list-style-type: none"> Standardized curriculum developed by La Clinica Tepeyac Training conducted by project and Clinica Tepeyac staff 	NR	NR	NR	<ul style="list-style-type: none"> Delivery of education about breast cancer screening Discussion and printed materials utilized Incorporation of homily delivered by a respected church leader about women's breast health 	<ul style="list-style-type: none"> At least bimonthly meetings held after mass or church events, number and length NR Home health group meetings, 1-3 over course of study Study duration: 2 years 	Natl. Cancer Institute	
Conway 2004	Promotora	NR	NR	NR	<ul style="list-style-type: none"> Bilingual and bicultural Latina women 	NR	NR	NR	NR	<ul style="list-style-type: none"> Problem solving designed to lower the child's exposure Approaches included contracting, shaping, positive reinforcement, and social support Individualized goals were established based on identified barriers 	<ul style="list-style-type: none"> Six home/telephone visits (length NR) Study duration: 4 months 	California Tobacco-related Disease Research Program	
Hunter 2004	Promotora	NR	NR	NR	<ul style="list-style-type: none"> Bilingual Member of the community Experience w/community-based health education programs 	<ul style="list-style-type: none"> Training included topics such as patient consent, confidentiality, data collection, documentation and coordination w/community health center staff 	NR	NR	NR	<ul style="list-style-type: none"> Discussion of barriers to making and attending follow-up appointments Rescheduling of appointments as necessary 	<ul style="list-style-type: none"> Postcard reminders sent Home visit, 2 weeks after postcard Follow-up: NR 	NR	
Levine 2003	Community Health Worker	NR	<ul style="list-style-type: none"> Recruited in part by community-based health advisory board 	<ul style="list-style-type: none"> Certification in blood pressure assessment 	<ul style="list-style-type: none"> Indigenous to the community 	<ul style="list-style-type: none"> Trained in blood pressure management standards of the AHA and certified by Johns Hopkins Univ. and the MD State Dept. of Health 3-month training period 	<ul style="list-style-type: none"> Supervised by community advisory board, including healthcare providers 	NR	NR	<ul style="list-style-type: none"> Initial home visit w/education and counseling Provision of wallet-sized card for recording BP measurements and educational booklet Additional home visits w/measurement of BP, help in reducing barriers to BP control, access to care and social services Individualized education on shopping/food preparation, physical activity, medication adherence and BP goals Teaching of family & friends to provide support and help 	<ul style="list-style-type: none"> 6 visits (length NR) Study duration: 2.5 years 	Natl. Heart, Lung, and Blood Institute	
Krieger 2002 & 2005	Community Home Environmental Specialists	Paid	<ul style="list-style-type: none"> Word-of-mouth Networking w/community-based organizations in city and community newspapers Posting in county personnel system 	<ul style="list-style-type: none"> High-school education w/out higher education 	<ul style="list-style-type: none"> Diverse ethnic backgrounds: 4 African Americans, 1 Latin American, 1 Vietnamese; 54% shared ethnicities w/participants Communication through use of primary language 5 women/ 1 man 4 had asthma or a child w/asthma; 2 w/close family members w/asthma Lived in same geographic area as patients 	<ul style="list-style-type: none"> 40-hour program w/didactic sessions, role-playing & field practice Training manual based on Master Home Environmentalist program of the American Lung Association 6 hours cultural competency training 10-20 hrs CE/year 	<ul style="list-style-type: none"> Met w/study PI every 2 weeks & steering committee every 2-3 months 	<ul style="list-style-type: none"> Matched ethnicities when possible 	<ul style="list-style-type: none"> \$45 for completion of baseline data collection \$65 for project completion Provision of pillow/mattress covers, low-emission vacuums, cleaning kits Free allergy testing 	<ul style="list-style-type: none"> Home assessment @ 1st visit Individualized Home Action Plans w/education & assistance (e.g. free smoking cessation counseling, nicotine replacement patches; vacuum cleaners) Offered free allergy testing Participants received \$110 Other assistance: initiated cleaning, helped w/minor repairs, referral to local support groups, finding free furniture (beds), assisted w/buying asthma medication, and finding other sources of financial support 	<ul style="list-style-type: none"> 4-8 visits: avg 7 visits/pt Initial visit: avg 50 min. (30-90 min); F/u visits: avg 45 min. (20-120 min) 1-year program 	Natl. Institute of Environmental Health Services; Seattle Partners for Health Communities; the Nesholm Foundation; the Seattle Foundation	Vietnamese CHW would drop in on patients - something they preferred, while other CHWs did not w/their patients

Author/ Year	Title	Paid/ Volunteer	Recruitment of CHWs	Education requirements	CHW characteristics	Training details	CHW supervision	Patient recruitment/ CHW-matching	Patient incentives	Components of interaction	Interaction specifics (location, length, timing, follow-up)	Funding details	Notes
Taylor 2002	Outreach worker	NR	NR	NR	<ul style="list-style-type: none"> Chinese women Trilingual, bicultural 	<ul style="list-style-type: none"> Training followed model developed by the Community house Calls Program Use of visual aids 	NR	NR	<ul style="list-style-type: none"> Transportation assistance: taxi or bus passes 	<ul style="list-style-type: none"> Provided social support, acted as role model, and served as cultural mediator w/healthcare facility Addressed individual barriers to screening Co-viewing of education-entertainment video, created within Chinese cultural context Provided motivational pamphlet and fact sheets on local services, information on interpreter services Assistance w/scheduling appointments and clinic referrals 	<ul style="list-style-type: none"> Home visit, length NR Follow-up phone call after 1 month, length NR 	Natl. Cancer Institute, NIH	
Rask 2001 LeBaron 2004	Outreach worker	NR	NR	NR	<ul style="list-style-type: none"> African American woman, raised in inner-city Atlanta College-educated For Hispanic families, CHW was a bilingual, college-educated Hispanic individual 	NR	<ul style="list-style-type: none"> Supervised by individual w/doctoral degree in community psychology w/extensive experience in inner-city studies 	<ul style="list-style-type: none"> By ethnicity/race 	NR	<ul style="list-style-type: none"> Reminder to obtain vaccination dose Determination of necessary assistance to facilitate vaccination dose 	<ul style="list-style-type: none"> Phone contact attempted 1 week after missed immunization (mail if no phone) Postcard sent 7 days following call 30 days following missed immunization, home visit conducted w/monthly f/u until contact established 6-month follow-up 	National Immunization Program, CDC; Georgia Dept. of Human Resources, Atlanta	
Williams 2001; Auslander 2002	Peer Educator	NR	NR	NR	<ul style="list-style-type: none"> African American women from target community No background in nutrition or education 	<ul style="list-style-type: none"> Over 4 months, 3 half-day training sessions/week Training team made of dietitians, social workers and health educators 	<ul style="list-style-type: none"> Weekly supervision provided by educators, dietitians and research staff 	NR	NR	<ul style="list-style-type: none"> Manual-based program: group and individual sessions provided weekly Group sessions: specific skill areas focusing on assessing fat in diet, reading labels, comparison shopping, eating out Individual sessions: dietary pattern to reduce fat in diet, tailored to patient's stage of readiness to change 	<ul style="list-style-type: none"> 6 group sessions 6 individual sessions Weekly sessions, lasting 45-90 minutes Study duration: 6 months 	National Institutes of Diabetes and Digestive and Kidney Diseases; NIH - Office of Research on Minority Health; School of Social Work, Washington Univ.	
Andersen 2000	Volunteer	Volunteer	Recruited from the target patient population	NR	<ul style="list-style-type: none"> Member of the community Age 50-80 years 	<ul style="list-style-type: none"> Based on Barrier-Specific Telephone Counseling approach and theories of decision-making Training involved research protocols, including data collection 2-day training session Utilized role-playing Conducted by field research coordinator 	<ul style="list-style-type: none"> Research staff coordinated w/volunteer coordinator (one of the volunteers) to provide support, answer questions 	NR	NR	<ul style="list-style-type: none"> Barriers to mammography screening were addressed through individualized counseling Topics such as cost and insurance barriers were discussed Information on free and low-cost programs and local facilities provided 	<ul style="list-style-type: none"> 1 phone call, length NR 2-year follow-up 	Natl. Cancer Institute	

Author/ Year	Title	Paid/ Volunteer	Recruitment of CHWs	Education requirements	CHW characteristics	Training details	CHW supervision	Patient recruitment/ CHW-matching	Patient incentives	Components of interaction	Interaction specifics (location, length, timing, follow-up)	Funding details	Notes
Derose 2000	Peer counselor	Paid	Members of participating churches	• None; varied educational backgrounds	• Multiple ethnicities (African American, Anglo and Latina) • Women	<ul style="list-style-type: none"> • Based on Barrier-Specific Telephone Counseling approach, involving the Health Belief Model, transtheoretical model of behavior change and conflict model of decision making • Multiple topics included such as breast cancer and mammography and counseling techniques • 12 hours of workshop training • 8-12 hours of on-site training • Refresher training conducted during year 2 of study 	• Phone center supervised by an outreach worker	• Language • Where possible, denomination and ethnicity	NR	<ul style="list-style-type: none"> • Individualized counseling to address barriers to screening • Discussion of risk status and education on prevalence, guidelines • Encouragement to request referrals • Information provided on free/ low-cost mammograms, mobile units and transportation resources 	<ul style="list-style-type: none"> • 2 annual phone calls, average length 7-11 minutes • 2-year follow-up 	Natl. Cancer Institute; Rand corporate research funds	
Gary 2000, 2003 & 2005 Batts 2001 Vetter 2004	Community Health Worker	NR	NR	NR	<ul style="list-style-type: none"> • Local high school graduate, part-time college student • No formal training in health care prior to study • Only 1 CHW in study, a woman 	NR	<ul style="list-style-type: none"> • Weekly meetings w/project investigators to discuss case management, specific barriers 	NR	NR	<ul style="list-style-type: none"> • Home visits and/or telephone calls • Facilitation of preventive care: scheduling appts. and visits, provision of education • Monitor behavior, reinforce adherence to treatment recommendations, provide physician feedback - including reporting of problems like high blood pressure 	<ul style="list-style-type: none"> • 45-60 minute visits • 6 visits over 2 years • 62% of patients received at least 3 visits • Phone calls: NR • 2-year follow-up 	NIH; Johns Hopkins University Outpatient Dept. General Clinical Research Center	
Schuler 2000	Lay Visitors	NR	NR	NR	<ul style="list-style-type: none"> • Middle-aged African American women • Previous experience with home visiting • Knowledge of community 	<ul style="list-style-type: none"> • Trained to use the HELP at Home: Hawaii Early Learning Profile (comprehensive curriculum of developmental skills) 	<ul style="list-style-type: none"> • Weekly meetings w/psychologist & pediatrician to track progress and discuss concerns 	NR	<ul style="list-style-type: none"> • Payment provided for each clinic evaluation visit • Bus tokens provided 	<ul style="list-style-type: none"> • Home visits during first 6 months postpartum • Increased maternal empowerment through assistance w/identifying and managing problems utilizing families and social supports • Provided help w/housing, public assistance programs, partner abuse, effects of drug use and drug treatment • Modeling/observation of appropriate behavior/play with infants 	<ul style="list-style-type: none"> • Weekly home visits provided over 6 months • Mean # of visits: 8.9 (range 0-23) • Mean length of visits: 30.1 min. • 6-month follow-up 	Natl. Institute on Drug Abuse	
Korfmacher 1999 Olds 2002 & 2004	Paraprofessional	Paid	• From paraprofessional home visitor programs in Denver	<ul style="list-style-type: none"> • High school education only w/out any college prep-work in "helping professions" 	<ul style="list-style-type: none"> • Assigned to geographic areas to increase likelihood of matched race/ethnicity, but no specific matching protocol used 	<ul style="list-style-type: none"> • 1 month of extensive training, including pilot experience w/2 families 	<ul style="list-style-type: none"> • Supervised by 2 licensed clinical social workers 	<ul style="list-style-type: none"> • No specific matching protocol used 	NR	<ul style="list-style-type: none"> • Protocol-based program, adapted to individual mother • Goals included: improved pregnancy outcomes through promoting health behavior, improved child health, development & safety, enhanced parent life-course development • Assistance w/obtaining social services, health services, development of family/friend relationships 	<ul style="list-style-type: none"> • Weekly visits during first 4 weeks following enrollment, and first 6 weeks after delivery • Bi-weekly visits through child's 21st month • Monthly visits during final 3 months • Avg visits during pregnancy: 6.3 (0-21) • Avg visits during infancy: 16 (0-78) • Program completion when child turns 2 years 		

Author/ Year	Title	Paid/ Volunteer	Recruitment of CHWs	Education requirements	CHW characteristics	Training details	CHW supervision	Patient recruitment/ CHW-matching/	Patient incentives	Components of interaction	Interaction specifics (location, length, timing, follow-up)	Funding details	Notes
Barnes 1999	Community volunteers	Volunteer	NR	NR	<ul style="list-style-type: none"> Bilingual (85%) Living in the same neighborhood as participants (60%) Organized by coordinator from local branch of larger international charitable organization 	<ul style="list-style-type: none"> Trained by study director (no detail provided) Scripted interview formats utilized 	NR	NR	NR	<ul style="list-style-type: none"> Initial home visit w/provision of basic immunization education and referral Follow-up done via home visits or telephone calls to provide reminders Support/assistance provided, e.g. contacting the clinic or escorting to appointment 	<ul style="list-style-type: none"> Unspecified number of home visits/ phone calls over 6-month period 	NY City Department of Health, Immunization Action Plan	<ul style="list-style-type: none"> Volunteers assessed for having a secondary agenda Each volunteer signed a contract agreeing to appropriate and non-appropriate outreach activities
Krieger 1999	Community Health Worker	NR	NR	<ul style="list-style-type: none"> Certified blood pressure measurement specialists 	<ul style="list-style-type: none"> Black Member of the community 	<ul style="list-style-type: none"> 100 hours of training provided on topics such as hypertension, cardiovascular anatomy, risk factors, community resources, research methods, stress management 	NR	NR	NR	<ul style="list-style-type: none"> Provided referral to medical care and assistance w/finding a provider Assistance w/scheduling follow-up appointment Provided an appointment reminder letter Addressed barriers to care Referrals made for other services such as transportation and child care 	<ul style="list-style-type: none"> Multiple interactions made (no specific data reported) Potential interactions: postcard, phone or home visit 3-month follow-up 	Natl. Heart, Lung, and Blood Institute	
St. James 1999	Resource Mother	Paid	<ul style="list-style-type: none"> Metabolic centers 	NR	<ul style="list-style-type: none"> Mothers of children with PKU 	<ul style="list-style-type: none"> Extensive initial training: confidentiality, PKU and maternal PKU, dietary treatment, home visitation 	<ul style="list-style-type: none"> Additional supervision every 3 months 	NR	N/A	<ul style="list-style-type: none"> Weekly sessions initially, with increasing intervals as pregnancy progressed Topics included shopping & cooking, meal planning, discussion of medical recommendations 	<ul style="list-style-type: none"> 20 sessions, 2 hours each Study follow-up until 12 months after birth of child 	Bureau of Maternal and Child Health; NIH	
Von Korff 1998	Lay leader	Volunteer	NR	NR	<ul style="list-style-type: none"> Individuals w/chronic or recurrent back pain 	<ul style="list-style-type: none"> 2 days of formal training provided by study investigator 	NR	NR	NR	<ul style="list-style-type: none"> Modeled after self-management program from Stanford Univ. Standardized information provided on topics such as sources of back pain, pacing of exercise & activity, handling flare-ups, working w/healthcare providers Developed individual action plans and personal goals Action plans reviewed/ revised Provided supporting materials: book & 2 videotapes on self-management and exercises 	<ul style="list-style-type: none"> Weekly classes 4 two-hour classes over 1 month 12-month follow-up 	NIH; The Boeing Company; Group Health Foundation	
Erwin 1997	Witness Role Model	NR	Members of Witness Project team	NR	<ul style="list-style-type: none"> Shared race (African American) Women Breast/cervical cancer survivors 	<ul style="list-style-type: none"> Training based on multiple theories including Health Belief Model, Locus of Control beliefs, Social Learning Theory and Transtheoretical Model Approaches taught included story-telling and experiential learning techniques 	NR	N/A	<ul style="list-style-type: none"> A limited number of vouchers for free mammograms were distributed 	<ul style="list-style-type: none"> Discussion of personal experiences Emphasis placed on early detection and treatment Reinforced empowerment, assertiveness and need to spread education throughout community Demonstrated BSE w/model Provided resource material, information about reduced-cost mammograms Presentations began w/hymn or prayer, and included biblical quotations and statements of faith 	<ul style="list-style-type: none"> Single presentation held at church or community organization, length NR 6-month follow-up 	Susan G. Komen Breast Cancer Foundation; NIH/Natl. Cancer Institute and cooperative agreement from the CDC	

Author/ Year	Title	Paid/ Volunteer	Recruitment of CHWs	Education requirements	CHW characteristics	Training details	CHW supervision	Patient recruitment/ CHW-matching	Patient incentives	Components of interaction	Interaction specifics (location, length, timing, follow-up)	Funding details	Notes
Silver 1997	Lay Intervenors	Paid	• Recruited through neighborhood newspaper ads	NR	• Women who had raised children w/ongoing health conditions • Worked about 21 hours/week	• 40-hour training program w/focus on listening, reflection and communication skills	• Supervised by clinical psychologist and social worker	• Randomized patients to the intervention were contacted by the lay intervenor and invited to participate	• Mothers received \$20 for each 1-hour interview (4 possible interviews)	<ul style="list-style-type: none"> Facilitated maternal empowerment to be active participants in child's healthcare Addressed specific child's health and behavior issues Provided support to all family members Connected families w/community resources Discussed parenting & coping skills, provided emotional support, particularly at times of crisis such as a hospitalization, and identified sources of support in family/friend networks Group social activities (with entertainment and food) provided psychological support by involving program participants 	<ul style="list-style-type: none"> 6, 1-hour visits Mean # of visits: 2.9 (max 14) Mean total length of visits: 4.7 hours Biweekly phone calls, mean # of contacts: 17.9 Mean total time of phone contact: 4.1 hours (max 20) 3 group social activities Study duration: 12 months 	National Institute of Mental Health, Branch for Prevention Research	
Pilote 1996	Peer Health Adviser	Paid	Referred by social workers	NR	• Homeless or in unstable living situations • From the community • Reliable	NR	NR	NR	• Bus tokens for travel to appointments	<ul style="list-style-type: none"> Establish trust and ways to facilitate communication Accompanied patients to follow-up appointment Assisted w/paperwork Reviewed physician's recommendations 	NR • Study follow-up: 3 weeks	Kaiser Family Foundation; Acquired Immunodeficiency Syndrome Clinical Research Center; Universitywide Acquired Immunodeficiency Syndrome Clinical Research Program; Natl. Institute on Drug Abuse	
Black 1995; Hutcheson 1997	Lay home visitor	Paid	NR	NR	• Staff members from a community-based agency • Part-time employees • Selected for experience w/children & families, interpersonal skills, knowledge of community	• 8-session training program on topics incl. health/nutrition, development, behavior management, advocacy, problem-solving strategies, community resources and services	• Supervised by community health nurse; weekly sessions w/pediatrician or psychologist to track progress, develop strategies	NR	• \$25 received for each of 3 completed assessments	<ul style="list-style-type: none"> Home visits Program developed as negotiated partnership w/families Individualized plan w/goals & objectives Hawaii Early Learning Program as curriculum guide Reinforcement of nutrition recommendations Concerns regarding family relationships, housing and finances addressed Provision of personalized notebooks, calendars, handouts Visual aids utilized, and toys made w/mothers out of household items 	<ul style="list-style-type: none"> Weekly, hour-long visits for 1 year Avg visits: 19.2 (0-47) 1-year follow-up w/long-term follow-up to age 4 	Maternal and Child Health Research Program	Home intervention conducted by community-based agency To protect CHWs, 20% of visits accompanied by plain clothed policeman
Graham 1992	Home Visitor	NR	NR	NR	• Black women • Non-professional • Demonstrated rapport w/clinic population	• Training topics included childbirth education, community resources, and nutrition during pregnancy • Training involved readings, discussion groups, weekly meetings and attendance at hospital prenatal classes	NR	NR	<ul style="list-style-type: none"> Fast-food restaurant coupon provided for completion of screening questionnaire Small gift provided at each visit (e.g. a baby rattle) 	<ul style="list-style-type: none"> Family-focused intervention Strengthening of intrafamilial, interpersonal support system Services provided according to a prescribed protocol Education provided on pregnancy w/encouragement for significant other to participate in all aspects of care Family stress reduction w/utilization of community resources and role as family advocate Provided information on health risks, nutrition and prenatal care 	<ul style="list-style-type: none"> 4, 1-hour home visits Occurred every 2-4 weeks Study follow-up until birth of the child 	Robert Wood Johnson Foundation; Gerson Family Foundation	

Note: Shaded studies report at least 1 statistically significant positive outcome associated with a CHW intervenor

ADA: American Diabetes Association; AHA: American Heart Association; AHRQ: Agency for Healthcare Research and Quality; BP: blood pressure; BSE: breast self exam; CDC: Centers for Disease Control; CE: continuing education; CHW: community health worker; F/U: follow-up
N/A: not applicable; NIH: National Institutes of Health; NR: not reported; PI: principal investigator; PKU: phenylketonuria

Table 3. Results of the Updated Literature Search: Study Characteristics

Author, Year	Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes	
Katula JA 2013 Lawlor MS 2013 RCT		Community intervention in Forsyth County, NC	Impact of CHWs in the prevention of diabetes	<p>1) Community Health Worker intervention:</p> <ul style="list-style-type: none"> • Group sessions • Consults w/dietitian <p>2) Control:</p> <ul style="list-style-type: none"> • Consults w/nutritionist • Newsletter 	<p>Initial patient recruitment: n=301</p> <p>Inclusion criteria:</p> <ul style="list-style-type: none"> • Age ≥ 21 years • BMI ≥ 25 kg/m2 and ≤ 40 kg/m2 • Fasting blood glucose levels indicating prediabetes <p>1) CHW intervention (n=151)</p> <ul style="list-style-type: none"> • Mean age: 57.3 ± 10.1 • Female: 58% • High school education or less: 19% <p>2) Control (n=150)</p> <ul style="list-style-type: none"> • Mean age: 58.5 ± 9.0 • Female: 57% • High school education or less: 21% 	<p>At 24-month follow-up:</p> <p>1) CHW intervention: n=24 (16%)</p> <p>2) Control: n=16 (11%)</p>	<p>24-month follow-up (Between group comparisons averaged from 18-month and 24-month data)</p> <p>Significant differences seen between groups, favoring the CHW intervention, in the following outcomes:</p> <ul style="list-style-type: none"> • Fasting glucose: -4.35 mg/dl (p<0.001) • BMI: -1.40 kg/m2 (p<0.001) • Weight: -4.19 kg (p<0.001) • % weight loss: -4.59% (p<0.001) • Measures of insulin and insulin resistance (p=0.006) <p># of patients ≥ 10% below baseline weight</p> <p>1) CHW: 21.3%</p> <p>2) Control: 5.3%</p> <p>p<0.001</p> <p>No significant differences between the groups in the incidence of diabetes (p=0.10)</p>	<p>Economic outcomes</p> <ul style="list-style-type: none"> • Based on patient attendance, include direct medical and non-medical costs and indirect costs • Adjusted to 2010 US \$ <p>Per capita direct medical costs for 2 years</p> <p>1) CHW: \$850</p> <p>2) Control: \$142</p> <p>Per capita direct non-medical costs for 2 years</p> <p>1) CHW: \$13,836</p> <p>2) Control: \$12,881</p> <p>Difference = \$955</p> <p>Total costs per capita of CHW intervention, relative to control, over 2 years</p> <ul style="list-style-type: none"> • Health system perspective: -\$1,569 • Societal perspective: -\$614 	Good	
Bernstein E 2012 RCT		Academic urban, Level 1 trauma center Emergency Dept. Boston, MA	Evaluation of brief, motivational interviewing impact on sexual risk of drug positive patients	<p>1) Lay counselor intervention:</p> <ul style="list-style-type: none"> • Brief motivational interview • STI/HIV information • Point-of-service testing • Referral to appropriate services <p>2) Control:</p> <ul style="list-style-type: none"> • STI/HIV information • Point-of-service testing • Referral to appropriate services 	<p>Initial patient recruitment: n=1,030</p> <p>Inclusion criteria:</p> <ul style="list-style-type: none"> • Age 18-54 years • Drug abuse severity score ≥ 3 <p>1) Lay counselor intervention (n=513)</p> <ul style="list-style-type: none"> • Mean age: 35.8 ± 8.2 • Female: 33% • Less than high school education: 35% • Household income <\$20,000: 90% • Having any health insurance: 92% <p>2) Control (n=517)</p> <ul style="list-style-type: none"> • Mean age: 35.7 ± 8.6 • Female: 33% • Less than high school education: 32% • Household income <\$20,000: 89% • Having any health insurance: 90% 	<p>At 12-month follow-up:</p> <p>1) Lay counselor</p> <p>Lost-to-follow-up: 114</p> <p>Deaths: 15</p> <p>Incarcerated: 45</p> <p>Total: 174 (34%)</p> <p>2) Control</p> <p>Lost-to-follow-up: 105</p> <p>Deaths: 6</p> <p>Incarcerated: 39</p> <p>Total: 150 (29%)</p>	<p>12-month follow-up</p> <p># sexually transmitted infections</p> <ul style="list-style-type: none"> • New cases of HIV <p>1) Lay counselor intervention: 2</p> <p>2) Control: 2</p> <p>p=1</p> <ul style="list-style-type: none"> • Gonorrhea <p>1) Lay counselor intervention: 0</p> <p>2) Control: 0</p> <ul style="list-style-type: none"> • Chlamydia <p>1) Lay counselor intervention: 3</p> <p>2) Control: 8</p> <p>p=0.153</p>	Fair	All patients received follow-up reminders (written and by phone, including e-mail and text messages)	
Hargraves JL 2012 Controlled trial		Community health centers across MA	Evaluation of CHW integration into the healthcare team at CHCs for assistance w/diabetes self-management	<p>1) CHW intervention:</p> <ul style="list-style-type: none"> • Individual encounters by phone or at CHC • Patient care provided by the CHC Collaborative team <p>2) Control:</p> <ul style="list-style-type: none"> • Patient care provided by the CHC Collaborative team 	<p>Initial patient recruitment: n=1,415</p> <p>Inclusion criteria:</p> <ul style="list-style-type: none"> • Patients w/type 2 diabetes <p>1) CHW intervention (n=494)</p> <ul style="list-style-type: none"> • Mean age: 54.9 ± 14.0 • Female: 53% • Public insurance: 62% • Private insurance: 11% • Uninsured: 12% <p>2) Control (n=921)</p> <ul style="list-style-type: none"> • Mean age: 52.5 ± 13.0 • Female: 51% • Public insurance: 49% • Private insurance: 14% • Uninsured: 21% 	NR	<p>13-month follow-up</p> <p>Adjusted percentages listed by ethnicity/race</p> <p>Change in % of patients w/LDL < 100</p> <p>1) CHW</p> <ul style="list-style-type: none"> • African American: -0.4 • Latino: 6.1 • Non-Hispanic White: -9.3 (p<0.05) - change from baseline only) <p>2) Control</p> <ul style="list-style-type: none"> • African American: 13.8 (p<0.01 - change from baseline only) • Latino: 5.0 • Non-Hispanic White: 2.1 <p>Change in % of patients w/HbA1c < 7, BP < 130/80:</p> <p>No significant changes from baseline in either group</p>	Poor		

Author, Year	Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes
Larkey LK 2012 Randomized trial	Sites (including churches, schools, community centers) located in metropolitan Phoenix, AZ	Evaluation of promotora interventions on cancer screening behavior	1) Social Support Group: • Group sessions 2) Individual Group: • One-on-one sessions	Initial patient recruitment: n=1,006 Inclusion criteria: • Self-identified Hispanic/Latina women • Age ≥ 18 years • Non-adherent to appropriate breast, cervical or colorectal cancer screening 1) Social support group (n=604) • Mean age: 38.9 ± 13.7 • Female: 100% • High school education or less: 89% • Household income <\$25,000: 83% • Public insurance: 24% Private insurance: 10% No insurance: 66% 2) Individual group (n=402) • Mean age: 37.7 ± 12.9 • Female: 100% • High school education or less: 90% • Household income <\$25,000: 86% • Public insurance: 26% Private insurance: 10% No insurance: 65%	At 3-month follow-up (screening assessment): 1) Social support group: 297 (49%) 2) Individual group: 200 (50%) At 15-months follow-up (maintenance assessment): 1) Social support group: 186 (61%) 2) Individual group: 110 (54%)	3-month follow-up (screening assessment) (Self-report) 15-month follow-up (maintenance assessment) (Self-report)	Economic outcomes Cost-analysis from perspective of future provider organization 2006 dollars, w/adjustment using CPI Total cost per participant 1) Social support group: \$103.44 2) Individual group: \$392.38 Total cost per screening (assuming that all those who started program had same rate of screening adherence as those completing program) 1) Social support group: \$262.54 2) Individual group: \$862.38 Total cost per screening (using screening rates for patients in study who completed program, w/a zero screening rate for those who started in each group) 1) Social support group: \$516.53 2) Individual group: \$1,716.22	Fair	
Roth AM 2012 RCT	Enrollees in the high-risk insurance pool in Marion County, IN	Impact of lay health workers in promotion of better medical self-management	1) LHW intervention: • One-on-one meetings 2) Control: • Usual care	Initial patient recruitment: (n=463) Inclusion criteria: • HIV positive • Age ≥ 18 years • Fluent English 1) LHW intervention (n=91) • Mean age: 44.6 ± 10.7 • Female: 15% • Public insurance: 100% 2) Control (n=358) • Mean age: 44.3 ± 9.2 • Female: 15% • Public insurance: 100%	Completion of surveys: 1) LHW • Baseline: 61 (67%) • Follow-up: 52 (57%) • Both surveys: 46 (51%) 2) Control • Baseline: 181 (51%) • Follow-up: 201 (56%) • Both surveys: 140 (39%)	12-month follow-up Viral load test • LHW group more likely than controls to receive test: OR 3.05 (95% CI, 1.05-8.86) • LHW group more likely to have viral load under control (<50 copies/ml): OR 2.01 (95% CI, 1.18-3.43) CD4 count • No significant differences found between groups in receipt of test and in numerical count	Economic outcomes Total claims paid expressed as a function of baseline costs and group assignment, controlled for total claims paid in year prior to baseline No significant difference shown between groups (p=0.35)	Fair	
Studs CR 2012 RCT	Churches in 4 counties in Appalachian KY	Impact of a faith-placed lay health advisor on cervical cancer screening	1) Lay Health Advisor intervention: • Home visits • Tailored newsletter • Educational lunch program introducing study 2) Control: • Wait-list • Educational lunch program introducing study	Initial patient recruitment: n=345 Inclusion criteria: • Women • Age 40-64 years • No Pap test in prior 12 months Baseline demographics provided for entire population • Age <50 years: 40% • Female: 100% • Less than high school education: 26% • Household income ≤\$30,000: 55% • Public insurance: 28% Private insurance: 40% No insurance: 32%	At 14-month follow-up: 1) LHA: 9 (5%) 2) Control: 5 (3%)	8-month follow-up (primary endpoint) (Self-report) Patients receiving a Pap test 1) LHA: 31 2) Control: 19 OR = 2.56 (95% CI 1.03,6.38), p=0.04	Good		

Author, Year Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes	
Wang EA 2012 RCT	San Francisco, CA	Impact of CHWs on medical care utilization by recently-released prisoners	1) Community Health Worker intervention: • Case-management • Expedited primary care appointment • Access to public health resources 2) Control: • Expedited primary care appointment • Access to public health resources	Initial patient recruitment: n=200 Inclusion criteria: • Recently paroled patients • English speaking • Age ≥ 50 years or ≥ 1 chronic illness 1) CHW intervention (n=98) • Mean age: 42.9 ± 9.7 • Female: 8% • Less than high school education: 34% • Public insurance: 21% Private insurance: 8% No insurance: 67% 2) Control (n=102) • Mean age: 43.6 ± 8.3 • Female: 4% • Less than high school education: 43% • Public insurance: 18% Private insurance: 9% No insurance: 71%	All patients completed 12-month follow-up	12-month follow-up (Medical record reports) Patients utilizing primary care: ≥2 visits to clinic 1) CHW: 38% 2) Control: 47% p=0.18 Patients w/any emergency department use 1) CHW: 26% 2) Control: 39% p=0.04 Patients w/any hospitalization 1) CHW: 10% 2) Control: 15% p=0.34	Good		
Monaghan PF 2011 Controlled trial	Citrus groves in southwestern counties in FL	Impact of CHWs on eye injury prevention	1) CHW intervention: • Provision of safety glasses • Educational encounters w/crew members • Administration of first aid 2) Control: • Provision of safety glasses	Initial patient recruitment: n=278 on 13 crews Inclusion criteria: • Not specified 1) CHW intervention (9 crews) 2) Control (4 crews) • Age: 20-40 years • Male: 100%	N/A	15-weeks Field observations of mean eyewear use 1) CHW: 27.5% 2) Control: 2.6% p=0.012 Workers who knew and received help from the CHW were significantly more likely to wear glasses as compared to control workers: OR 3.73 (95% CI, 1.21-11.57)	Poor		
Paskett ED 2011 RCT	Health clinics in Ohio Appalachia	Impact of lay health advisors on cervical cancer screening	1) Lay Health Advisor intervention: • In-person visits • Phone calls • Postcards 2) Control: • Letter from physician w/National Cancer Institute brochure	Initial patient recruitment: n=286 Inclusion criteria: • Women • Age ≥ 18 years 1) Lay health advisor intervention (n=143) • Age <51 years: 69% • Female: 100% • Less than high school education: 7% • Household income ≤\$20,000: 36% • Public insurance: 22% Private insurance: 57% No insurance: 21% 2) Control (n=137) • Age <51 years: 66% • Female: 100% • Less than high school education: 7% • Household income ≤\$20,000: 39% • Public insurance: 26% Private insurance: 60% No insurance: 14%	At 12-month follow-up: 1) Lay health advisor • Ineligible: 2 (1%) • Missing medical record data: 4 (3%) • Missing self-report data: 28 (19%) 2) Control • Ineligible/ withdrew: 4 (3%) • Missing medical record data: 6 (4%) • Missing self-report data: 19 (13%)	12-month follow-up % of patients w/Pap test screening within last 12 months • Medical record data 1) Lay health advisor: 51% 2) Control: 42% p=0.135 • Self-report data 1) Lay health advisor: 71% 2) Control: 54% p=0.008	Good		
Rorie JL 2011 Controlled trial	Public housing developments in Boston, MA	Impact of resident health advocates on public health screening	1) Resident Health Advocate intervention: • Outreach activities • One-on-one conversations • Use of volunteer "peer leaders" in activities 2) Control: • Flyer distribution by management staff	Initial patient recruitment: (n=147) Inclusion criteria: • Not specified 1) RHA intervention (n=100) • Mean age: 45.1 ± 18.7 • Female: 60% • < high school education: 42% • Public insurance: 59% Private insurance: 11% No insurance: 30% 2) Control (n=47) • Mean age: 42.8 ± 17.2 • Female: 62% • < high school education: 49% • Public insurance: 62% Private insurance: 17% No insurance: 21%	N/A	Post-screening follow-up care Results for 2007 Adults screened 1) RHA: 6% 2) Control: 3% • RR 1.74 (95% CI, 1.24-2.44) Results for 2007 & 2008 Use of mobile screening was higher at the intervention sites as compared to the control sites: RR 1.55 (95% CI, 1.12-2.15)	2007 Positive screens for any condition: 91 Consent for follow-up: 44 Appointments made: 27 Appointments attended: 14 2008 Positive screens for any condition: 44 Consent for follow-up: 33 Appointments made: 33 Appointments attended: 24 Completion of follow-up appointments: 2007: 15% (14/91) 2008: 55% (24/44) (No statistical test provided)	Poor	Study conducted June-August 2007-2008; Initial screening data presented for 2007; follow-up data based on positive screening compared for 2007 and 2008

Author, Year Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes
Spencer MS 2011 RCT	Southwest and Eastside Detroit, MI	Impact of a family health advocate intervention on diabetes self- management	1) Family Health Advocate intervention: • Education classes • Home visits • Joint clinic visit • Access to community activities • Care from REACH providers 2) Control: • Wait-list • Access to community activities • Care from REACH providers	Initial patient recruitment: n=183 Inclusion criteria: • African American or Latino/Hispanic patient w/type 2 diabetes • Age ≥ 18 years • Medical care from federally qualified CHC or major local health system 1) Family health advocate intervention (n=72) • Mean age: 50 • Female: 75% • High school graduate: 60% 2) Control (n=92) • Mean age: 55 • Female: 67% • High school graduate: 59%	At 6-month follow-up: 1) Completion of follow-up interview: • FHA: 56 (67%) • Control: 74 (75%) 2) Completion of follow-up lab: • FHA: 58 (69%) • Control: 69 (70%)	6-month follow-up Adjusted analyses listed % change in mean HbA1c 1) FHA: -0.8 2) Control: 0.0 Intervention effect: -9.7 (95% CI -15.9, -3.0) p<0.01 No significant differences between groups in % of patients w/mean changes in blood pressure, LDL and BMI	Fair	Non-significant intervention effects were measured between groups in the % of patients in the following categories: (Self-report) • Meeting physical activity guidelines • Daily fruit/vegetable servings • Fried/fatty foods ≥2/week • Soda pop or fruit-flavored drinks ≥2/week • Checking feet every day Intervention effect in % of patients inspecting inside of shoes every day • 3.3 (95% CI 1.4,7.9), p<0.01
Waitzkin H 2011 RCT	Community health centers, NM	Role of promotoras in depression care	1) Promotora intervention: • Administration of Patient Health Questionnaire • In-person interviews • Follow-up phone calls 2) Control: • Administration of Patient Health Questionnaire	Initial patient recruitment: n=130 Inclusion criteria: • Patients meeting criteria for a diagnosis of depression Baseline demographics provided for entire population • Age <60 years: 88% • Female: 71%	NR	6- and 12-month follow-up No significant differences found between groups on the effect on depression	Poor	Randomization by CHC
Hayashi T 2010; Coleman KJ 2012 RCT	4 health centers in Los Angeles and San Diego counties, CA	Evaluation of short- term lifestyle interventions on CVD risk (WISEWOMAN Study)	1) CHW intervention: • One-on-one counseling sessions • Usual care, consisting of healthy behavior education, handouts and classes, routine health screenings 2) Control: • Usual care, consisting of healthy behavior education, handouts and classes, routine health screenings	Initial patient recruitment: n=1,093 Inclusion criteria: • Hispanic women • Age 40-64 years • Income <200% of federal poverty level • No or insufficient health insurance 1) CHW intervention (n=433) • Mean age: 51.8 ± 6.4 • Female: 100% • Less than high school education: 73% 2) Control (n=436) • Mean age: 52.1 ± 6.4 • Female: 100% • Less than high school education: 69%	At 12-month follow- up: 1) CHW intervention: 119 (22%) 2) Control: 105 (20%)	12-month follow-up Change in systolic blood pressure (mmHg) 1) CHW: -5.9 2) Control: -3.7 p=0.038 All other clinical measures (diastolic blood pressure, cholesterol measures, BMI and 10-year CHD risk) were not significantly different between groups	Fair	Physical Activity (self-reported) • Increased moderate activity 1) CHW intervention: OR 2.19 (95% CI, 1.57-3.07) 2) Control: OR 1.10 (95% CI, 0.80-1.50) • Increased vigorous activity 1) CHW intervention: OR 3.37 (95% CI, 2.38-4.77) 2) Control: OR 1.11 (95% CI, 0.77-1.59)
Balcázar HG 2010 RCT	the Lower Valley of El Paso, TX	Evaluation of a <i>Promotoras de Salud</i> intervention to decrease cardiovascular risk factors (Project HEART)	1) Promotora intervention: • Group-based educational classes provided weekly for 8 weeks • Follow-up phone calls • Small group session at clinic 2) Control: • Basic educational materials provided	Initial patient recruitment: n=407 Inclusion criteria: • Age 30-75 years • ≥1 risk factor for CVD (e.g. smoking, obese, diabetes) 1) Promotora (n=192) • Mean age: 53.5 ± 13.4 • Female: 75% • Years of education: 9.7 ± 3.5 • Household income <\$20,000: 72% • No health insurance: 44% 2) Control (n=136) • Mean age: 54.0 ± 13.2 • Female: 68% • Years of education: 10.7 ± 3.3 • Household income <\$20,000: 72% • No health insurance: 39%	Completion of follow- up assessment: n=284 (87%)	4-month follow-up Adjusted differences listed Diastolic blood pressure (mmHg) 1) Promotora intervention: 79.8 ± 9.3 2) Control: 75.5 ± 10.6 p<0.001 Other clinical measures (BMI, weight, waist circumference, Metabolic Syndrome, cholesterol measures, blood glucose, HbA1c and systolic blood pressure) were not significantly different between the 2 intervention groups	Fair	Self-reported nutrition-related behaviors • Weight-control practices Significant difference, favoring promotora intervention (p=0.01) • Salt intake Significant difference, favoring promotora intervention (p<0.001) • Cholesterol and fat intake Significant difference, favoring promotora intervention (p=0.01) Potential patient overlap w/Balcázar, 2009 (#16)

Author, Year	Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes
Faridi Z 2010 Controlled trial		Church-based populations in 2 urban African American communities; Bridgeport and New Haven, CT	Impact of community-based intervention on diabetes prevention (PREDICT program)	1) CHA intervention: • Individually tailored sessions • Group-based classes combined w/Bible study classes • Community outreach events and diabetes-related advocacy 2) Control: • NR	Initial patient recruitment: n=258 Inclusion criteria: • African-American residents of 2 cities • ≥ 18 years • Members of church congregation • Diabetes or w/risk of diabetes 1) CHA (n=121) • Age 18-49: 37% • Female: 85% • Some high school or high school diploma: 48% Some college: 32% • Household income <\$29,999: 52% 2) Control (n=125) • Age 18-49: 32% • Female: 78% • Some high school or high school diploma: 28% Some college: 44% • Household income <\$29,999: 32%	Successful completion of follow-up: n=161 (65%) Withdrawals: 1) CHA: 38 (31%) 2) Control: 47 (38%)	1-year follow-up Mean change in body weight (lbs) 1) CHA: 0.32 ± 25.9 2) Control: 0.82 ± 19.3 p=0.8974 Mean change in BMI (kg/m2) 1) CHA: -0.63 ± 6.7 2) Control: 0.13 ± 3.2 p=0.4191	Poor	Mean physical activity level in past 3 months (self-reported) 1) CHA Increased: 26% Decreased: 18% No change: 56% 2) Control Increased: 32% Decreased: 15% No change: 53% p=0.6652 No significant differences between groups in self-reported dietary habits
O'Brien MJ 2010 RCT		South Philadelphia, PA	Evaluation of a promotora intervention to reduce cervical cancer disparities	1) Promotora intervention: • Group workshops 2) Control: • Usual care, no details provided	Initial patient recruitment: n=120 Inclusion criteria: • Hispanic women • Age 18-65 years 1) Promotora intervention (n=60) • Mean age: 32 ± 11 • Female: 100% • ≤ 12 years of education: 83% • Having insurance: 10% 2) Control (n=60) • Mean age: 31 ± 12 • Female: 100% • ≤ 12 years of education: 90% • Having insurance: 7%	At 6-month follow-up: 1) Promotora: Did not receive intervention: 17 Lost-to-follow-up: 9 Total: 26 (43%) 2) Control: Lost-to-follow-up: 24 (40%)	6-month follow-up (Self-report w/chart review) % of patients receiving a Pap smear 1) Promotora: 65% 2) Control: 36% p=0.02	Fair	Medical chart verification conducted of 83% of participants reporting undergoing screening
Scoggins 2010; Taylor VM 2010 RCT		Metropolitan Seattle, WA	Impact of lay health workers on cervical cancer screening	1) Lay Health Worker intervention: • Home visit • Provision of educational materials • Follow-up phone calls 2) Control: • Direct mailing on physical activity	Initial patient recruitment: n=234 Inclusion criteria: • Participants in community-based survey • Women w/out cervical cancer screening in previous 3 years • Age 20-69 years 1) LHW intervention (n=118) • Age < 50: 47% • Female: 100% • Education <12 years: 54% 2) Control (n=116) • Age < 50: 43% • Female: 100% • Education <12 years: 51%	At 6-month follow-up: 1) LHW: 34 (29%) 2) Control: 26 (22%) p=NS	6-month follow-up Intent-to-treat population % of patients receiving a Pap test (Self-report) 1) LHW: 24% 2) Control: 14% p=0.07 Adjusted OR 1.78 (95% CI, 0.88-3.60) % of patients receiving a Pap test (Verified by medical record) 1) LHW: 21% 2) Control: 9% p=0.03 Adjusted OR 2.84 (95% CI, 1.09-7.39) Economic outcomes The ICER of intervention vs. control was calculated from the societal perspective: \$30,015 per QALY	Fair	Medical records verified in 25/28 (89%) of intervention patients and 16/16 (100%) of control patients

Author, Year Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes
Babamoto KS 2009 RCT	3 inner-city family health centers; Los Angeles, CA	Evaluation of relative effectiveness of a CHW intervention among Hispanic patients w/newly diagnosed type-2 diabetes	All patients received standard provider care and education materials, provided in Spanish and English 1) CHW intervention (Amigos en Salud): • Individual educational sessions w/patients and their families at homes or clinics • Follow-up phone calls 2) Case Management: • Clinic sessions led by a nurse case manager • Follow-up phone calls as needed 3) Standard Provider Care: • Routine appointments, lab tests, medications and referrals	Randomized patients: n=318 Inclusion criteria: • Hispanic/Latino • ≥18 years • ADA diagnosis of type 2 diabetes 1) CHW (n=75) • Mean age: 51.0 ± 12.5 • Female: 64% • Completed <6th grade: 67% • Household income <\$25,000: 55% 2) Case Management (n=60) • Mean age: 50.0 ± 12.1 • Female: 52% • Completed <6th grade: 58% • Household income <\$25,000: 50% 3) Standard Provider Care (n=54) • Mean age: 50.0 ± 11.0 • Female: 78% • Completed <6th grade: 57% • Household income <\$25,000: 56%	Successful completion of program: n=189 (59%) Reasons for withdrawal: lost to follow-up, disenrolled in study or couldn't be contacted Significantly more patients lost to follow-up in standard provider care group (50%) and case management group (43%) as compared to CHW group (28%, p<0.05)	6-month follow-up Mean HbA1C 1) CHW: 7.2% 2) Case Management: 7.4% 3) Std. Provider Care: 7.4% All significantly different from baseline measurements (p<0.05) Mean BMI (kg/m2) 1) CHW: 32.0 2) Case Management: 32.5 3) Std. Provider Care: 31.5 NS as compared to baseline ED admittance in previous 6 months (self-reported) 1) CHW: 9% 2) Case Management: 20% 3) Std. Provider Care: 28% Statistically significant between-groups difference (p<0.05)	Fair	Exercise 3x/week (self-reported) 1) CHW: 63% 2) Case Management: 38% 3) Std. Provider Care: 35% Statistically significant among-groups difference (p<0.05) 2 or more servings of fresh fruit/day (self-reported) 1) CHW: 73% 2) Case Management: 78% 3) Std. Provider Care: 54% Statistically significant among-groups difference (p<0.05) 2 or more servings of vegetables/day (self-reported) 1) CHW: 76% 2) Case Management: 57% 3) Std. Provider Care: 43% Statistically significant among-groups difference (p<0.05) No significant differences between groups for self-reported daily fatty food consumption
Balcázar HG 2009 RCT	the Lower Valley of El Paso, TX	Evaluation of a promotora pilot program to improve hypertension control	1) Promotora intervention: • Group-based educational sessions given at weeks 1,2,3 and 8 • Follow-up phone calls during weeks 4-7 2) Control: • Educational materials provided	Initial patient recruitment: n=98 Inclusion criteria: • Diagnosis of hypertension 1) Promotora (n=58) • Mean age: 54.9 • Female: 87.9% • Less than high school education: 96.5% • Household income <\$15,000: 83% • No insurance: 69% Medicare/Medicaid: 24% 2) Control (n=40) • Mean age: 49.7 • Female: 65% • Less than high school education: 86% • Household income <\$15,000: 75% • No insurance: 75% Medicare/Medicaid: 20%	All patients completed baseline and 9-week follow-up	9-week follow-up Clinical outcomes assessed: • BMI • Blood pressure • Waist circumference No significant differences found between the promotora intervention and control groups, after adjusting for confounders	Fair	Self-reported dietary habits • Salt and sodium healthy habits Significant difference, favoring promotora intervention (p=0.036) • Cholesterol and fat healthy habits Significant difference, favoring promotora intervention (p=0.022) • Weight control healthy habits No significant difference between promotora intervention and control groups, after adjusting for confounders
Fernández ME 2009 RCT	2 farmworker "home-based" communities along US-Mexico border (Anthony, NM; Eagle Pass, TX); 2 in the Central Valley of CA (Merced and Watsonville)	Evaluation of a lay health worker intervention to increase breast and cervical cancer screening	1) Lay health worker intervention: • One-on-one session • Follow-up in person or by phone 2) Control: • NR	Initial patient recruitment: n=713 Inclusion criteria: • Age ≥50 years • No prior/current cancer diagnosis • Farmworker status • Non-adherent to breast/cervical cancer screening Demographics provided based on mammography/Pap test cohorts; (211 women were non-adherent to both) 1) Mammography cohort (n=464) • Age 50-69: 76% • Female: 100% • Education 0-11 years: 88% • Household income <\$20,000: 75% 2) Pap test cohort (n=243) • Age 50-69: 71% • Female: 100% • Education 0-11 years: 89% • Household income <\$20,000: 72%	At 6-month follow-up: 1) Mammography cohort • Lay health worker intervention: 77 (37%) • Control: 80 (31%) 2) Pap test cohort • Lay health worker intervention: 51 (39%) • Control: 22 (20%) (p=0.001)	6-month follow-up Adjusted statistical analyses listed (Self-report w/validity testing) Screening completion • Mammography, in patients w/follow-up 1) Lay health worker: 41% 2) Control: 30% p=0.041 • Mammography, in patients w/out follow-up (intent-to-treat) 1) Lay health worker: 26% 2) Control: 21% p=0.142	Poor	Validity-testing of self-report: medical records reviewed of all patients reporting screening completion, as well as a random sample of patients reporting no screening; criteria met for good agreement (concordance estimate >0.80)

Author, Year	Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Study Quality	Notes
Fisher EB 2009 RCT	St. Louis City and County, MO	Evaluation of a CHW intervention to reduce hospitalizations of children with asthma	1) Asthma coach intervention: • Initial phone contact • Home/neutral site visits • Follow-up phone calls • Usual care, including asthma education, discharge planning, suggested follow-up appointments 2) Control: • Usual care, including asthma education, discharge planning, suggested follow-up appointments	Initial patient recruitment: n=191 Inclusion criteria: • Parents w/children hospitalized for asthma • Medicaid coverage • African American children aged 2-8 years 1) Asthma coach intervention (n=96) • Mean age of child: 5.00 ± 2.18 • Female: 49% • Parent's education, less than high school: 30% • Medicaid coverage: 100% 2) Control (n=93) • Mean age of child: 4.75 ± 1.95 • Female: 32% • Parent's education, less than high school: 36% • Medicaid coverage: 100%	At 24-month follow- up: 1) Asthma coach: • Custody transfer to Division of Family Services: 1 2) Control: • Custody transfer to Division of Family Services: 1	24-month follow-up At least 1 hospitalization 1) Asthma coach: 35/96 (37%) 2) Control: 55/93 (59%) p=0.002 Likelihood of any hospitalization (controlling for confounders) • Comparison of Asthma coach vs. Control: RR 0.61 (95% CI, 0.45-0.83) Mean number of admissions per child (controlling for admissions in the prior year) 1) Asthma coach: 0.728 2) Control: 1.518 p<0.001 Percentage of emergency visits w/out hospitalization (controlling for confounders) 1) Asthma coach: 64% 2) Control: 54% p=0.11	Fair		
Nguyen TT 2009 RCT	Community- based organizations in Santa Clara County, CA	Impact of lay health workers on breast cancer screening	1) Lay health worker intervention: • Group sessions • Follow-up phone calls • Exposure to community-wide awareness campaign 2) Control: • Exposure to community-wide awareness campaign	Initial patient recruitment: n=1,100 Inclusion criteria: • Vietnamese women • Age ≥40 years 1) Lay health worker intervention (n=550) • Mean age: 57.0 ± 10.1 • Female: 100% • Less than 12 years education: 57% • Public insurance: 59% Private: 19% No insurance: 22% 2) Control (n=550) • Mean age: 57.6 ± 10.5 • Female: 100% • Less than 12 years education: 60% • Public insurance: 59% Private: 22% No insurance: 19%	Lost-to-follow-up: 1) Lay health worker: 7 (1%) 2) Control: 4 (1%)	4-5 month follow-up (Self-report) % change in patients reporting ever having a clinical breast exam 1) Lay health worker: 21.9 2) Control: 9.7 p<0.001 % change in patients reporting having a mammogram in past 2 years 1) Lay health worker: 16.2 2) Control: 2.4 p<0.001 % change in patients reporting ever having a mammogram 1) Lay health worker: 7.5 2) Control: 2.2 p<0.05 % change in patients reporting having a clinical breast exam in past 2 years 1) Lay health worker: 23.1 2) Control: 4.2 p<0.001	Fair		
Sixta CS 2008 RCT	Community health center in Webb County, TX (along the Mexico border)	Impact of a promotora intervention on diabetes self- management	1) Promotora intervention: • Group sessions 2) Control: • Wait-list w/access to usual care by clinic provider or self-care intervention group	Initial patient recruitment: n=131 Inclusion criteria: • Patients w/type 2 diabetes • Mexican American • Age > 18 years 1) Promotora intervention (n=63) • Mean age: 54.5 • Female: 71% 2) Control (n=68) • Mean age: 52.8 • Female: 71%	Overall attrition: 60/131 (46%) patients completed baseline, 3- & 6- month assessments 105/131 (80%) of patients completed either 3- or 6- month assessments	6-month follow-up Change in HbA1c 1) Promotora: 0.18 2) Control: 0.05 Difference was not significant (p-value NR)	Fair		

Note: Shaded studies report at least 1 statistically significant positive outcome associated with a CHW intervention

ADA: American Diabetes Association; BMI: body mass index; BP: blood pressure; CI: confidence interval; CHA: community health advisor; CHC: community health center; CHW: community health worker; CPI: consumer price index; CVD: cardiovascular disease; ED: emergency department;
FHA: family health advocate; HbA1c: glycosylated hemoglobin; HIV: human immunodeficiency virus; LDL: low-density lipoproteins; LHW: lay health worker; N/A: not applicable; NR: not reported; OR: odds ratio; QALY: quality-adjusted life-year;
RCT: randomized controlled trial; RHA: resident health advisor; RR: relative risk; STI: sexually-transmitted infection

Table 4. Results of the Updated Literature Search: Characteristics of Community Health Worker Interventions

Author/ Year	Title	Paid/ Volunteer	Recruitment of CHWs	Education requirements	CHW characteristics	Training details	CHW supervision	Patient recruitment/ CHW- matching	Patient incentives	Components of interaction	Interaction specifics (location, length, timing, follow-up)	Funding details
Katula JA 2013 Lawlor MS 2013	Community Health Worker	Paid	Recruited through local Diabetes Care Centers and clinics	NR	<ul style="list-style-type: none"> • Patients w/type 2 diabetes • Well-controlled diabetes (HbA1c<7%) • Completion of diabetes self-management education 	<ul style="list-style-type: none"> • 36-hour program over 6-9 weeks • Training utilized experiential learning, didactic instruction, peer mentoring and observation • Topics included study protocol, weight loss, physical activity and nutrition basics, data entry, group facilitation, cognitive-behavioral principles • Conducted by registered dietitian 	<ul style="list-style-type: none"> • Direct observation by registered dietitian (Certified Diabetes Educators) • Registered dietitians provided feedback, monitored and supported CHWs throughout study 	<ul style="list-style-type: none"> • No role in recruitment 	NR	<ul style="list-style-type: none"> • Lifestyle intervention based on the Diabetes Prevention Program intervention • Focus on self-efficacy and outcome expectations • Specific objectives addressed knowledge, diet, physical activity and behavioral skills • Manual-based protocol • Local expert presentations included, as well as a DVD series, and visual aids for portion size 	<ul style="list-style-type: none"> • Weekly group sessions at community sites during months 1-6 • Monthly group sessions (months 7-24) • Monthly phone calls (months 7-24) • Individual sessions w/dietitian at months 1,3 & 6 • Over 24 months, patients attended 58.6% of sessions, made up 18.7% and missed 22.8% • Study duration: 24 months 	Natl. Institute of Diabetes and Digestive and Kidney Diseases; Joslin Diabetes Center; Novo Nordisk
Bernstein E 2012	Lay Counselor	NR	NR	NR	<ul style="list-style-type: none"> • Experience in substance abuse or HIV outreach 	<ul style="list-style-type: none"> • 2-month manual-driven training on research methods, STI counseling, and biologic testing procedures • 2-day required course by Mass. DPH w/certification for voluntary counseling/testing w/drug treatment referral • Practice and evaluation w/simulated patients 	<ul style="list-style-type: none"> • Direct observation of intervention 	NR	<ul style="list-style-type: none"> • \$20 at enrollment • \$20 at 6-month follow-up • \$25 at 12-month follow-up 	<ul style="list-style-type: none"> • Safe sex interview adapted from best practices • Motivational interviewing based on self-efficacy/ social cognitive theory and decisional balance/ trans-theoretical model • Discussion of patient goals w/identification of personal strengths/successes and sources of support 	<ul style="list-style-type: none"> • One-time interview • Study follow-up: 24 months 	NIH/ National Institute of Drug Abuse
Hargraves JL 2012	Community Health Worker	Funded at half- time	NR	NR	NR	<ul style="list-style-type: none"> • 48-hour training program w/16 3-hour modules • Program developed w/Central Massachusetts Area Health Education Center • Core competencies included service coordination skills, communication, leadership and cultural awareness • Chronic Care Model training, focusing on chronic disease management and diabetes, self-efficacy and health behaviors • 18-hours of on-the-job training and reinforcement 	<ul style="list-style-type: none"> • Monthly conference calls • Frequent contact w/project director and registered nurse 	NR	NR	<ul style="list-style-type: none"> • Discussion of self-management goals • Provision of diabetes information including glucose testing and medication adherence • Information given on healthy eating, exercise strategies • Referrals for follow-up medical care, including mental health and nutrition • Evaluation of self-management behaviors, and stage of change 	<ul style="list-style-type: none"> • Total patient encounters over 13 months: 724 • Type of encounter: Group: 6% Individual: 45% Phone: 49% • Length of encounter: ≤15 minutes: 48% 16-30 minutes: 33% >30 minutes: 19% • 13-month follow-up 	Robert Wood Johnson Foundation, Finding Answers: Disparities Research for Change

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Larkey LK 2012	Promotora	Paid	NR	NR	<ul style="list-style-type: none"> Bilingual Latina Members of the community Personal use of available community resources 	<ul style="list-style-type: none"> Training curriculum built on promotora input, from earlier study, <i>Las Mujeres Saludables</i> General cancer issues, including risk factors, prevention and screening Generic health promoter skills 	NR	<ul style="list-style-type: none"> Promotoras provided initial study presentation, on-site, in Spanish Collected contact information for potential patients 	NR	<ul style="list-style-type: none"> Education and information on cancer Dietary, tobacco and physical activity recommendations for decreasing risk Information on screening procedures Resource booklet w/local options for screening and care (in Spanish and English) Group-based curriculum emphasized discussion, group-teaching and creative handouts 	<ul style="list-style-type: none"> 6 weekly 80-minute sessions 7th session for support group was a graduation, and a final visit for individual group Sessions took place at recruitment site, and in patient's home 3-month follow-up 	American Cancer Society, <i>Juntos en la Salud</i> : Cancer Prevention and Screening for Latinas	
Roth AM 2012	Lay Health Worker	Paid	Executive Director of the Indiana Comprehensive Health Insurance Association that developed LHW program	NR	<ul style="list-style-type: none"> Previous experience working w/vulnerable populations Varied professional backgrounds, but none were medical or mental health providers Part-time employees 	<ul style="list-style-type: none"> <i>Positive Choices</i> program to promote LHWs as "health coaches" Training on role, methods of engagement, documentation and reporting Monthly training by staff at Dept. of Health's HIV Care Coordination Program and a clinical pharmacist Areas of training included behavior change theory, disclosure of HIV status, disease prevention, insurance coverage, care coordination, problem-solving 	NR	NR	<ul style="list-style-type: none"> After randomization, LHWs contacted patients for enrollment in the intervention arm 	NR	<ul style="list-style-type: none"> Building of trusting relationship through one-on-one meetings Provision of health education, behavioral skill development, and emotional support Materials provided included a Tool Kit, Resource Guide, and <i>Positive Choices Newsletter</i> Individualized sessions, varying by type, location and frequency based on the patient's needs 	<ul style="list-style-type: none"> In-person meetings or by phone Study duration: 12 months 	Indiana Comprehensive Health Insurance Association
Studs CR 2012	Lay Health Advisor	NR	<ul style="list-style-type: none"> Many belonged to participating churches 	NR	<ul style="list-style-type: none"> Members of participating communities No professional healthcare background 	<ul style="list-style-type: none"> Training provided by study team Included topics were cervical cancer, Pap test, community resources, screening procedures 3 training sessions provided on research subjects protection, home, study procedures, tailoring of content to the individuals 	<ul style="list-style-type: none"> Feedback provided throughout study w/retraining as necessary 	<ul style="list-style-type: none"> Demographically similar to most patients (married, middle-aged, middle-lower socioeconomic status) 	<ul style="list-style-type: none"> \$25 provided for completion of each survey (4 total) Thank-you letters and invitations to continue participation sent following enrollment 	<ul style="list-style-type: none"> Identification of individual patient barriers to screening Information about cervical cancer and screening, tailored to individual patient Encouragement and facilitation of scheduling and obtaining a Pap test (no actual referrals made) Provision of newsletter with patient-specific information addressing barriers 	<ul style="list-style-type: none"> Home visit, lasting about 2 hours, provided 5 months after baseline assessment, and 1 month after the first assessment point 8-month follow-up 	National Cancer Institute	

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Wang EA 2012	Community Health Worker	Paid	NR	<ul style="list-style-type: none"> 6-month certificate program at community college 	<ul style="list-style-type: none"> Personal history of incarceration 	<ul style="list-style-type: none"> Training in certification program On-the-job training 	<ul style="list-style-type: none"> Primary care provider at clinic 	NR	<ul style="list-style-type: none"> \$10 gift card to local grocery store 	<ul style="list-style-type: none"> Provision of referrals to housing, education and employment support Accompanying patients to pharmacies, medical/behavioral health appointments Chronic disease management including home visits for health education, support w/medication adherence Urgent care appointments 	<ul style="list-style-type: none"> NR Study duration: 12 months 	<ul style="list-style-type: none"> The San Francisco Foundation; California Endowment; California Wellness Foundation; California Policy Research Center; San Francisco Dept. of Public Health; Natl. Heart, Lung and Blood Institute
Monaghan PF 2011	Community Health Worker	Paid	<ul style="list-style-type: none"> Crew leaders and employers were asked to identify respected harvesters; workers recommended coworkers 	NR	<ul style="list-style-type: none"> Crew members Living among fellow crew members 	<ul style="list-style-type: none"> 20-hour program conducted in Spanish Topics included eye hazards, disease, first aid Discussion of methodology to fit and promote use of safety glasses Conducted by Florida Prevention Research Center and migrant service organization 	<ul style="list-style-type: none"> Records/ logs reviewed biweekly w/field coordinator 	NR	<ul style="list-style-type: none"> Distribution of eyewear w/encouraged use Education of all crew members on eyewear benefits Administration of first aid Modeled safe behavior w/wearing of safety eyewear 	<ul style="list-style-type: none"> NR Study follow-up: 15 weeks 	<ul style="list-style-type: none"> CDC/Health Promotion and Disease Prevention Centers; Community Based Prevention Marketing; Building Local Capacity for Disease Prevention and Health Promotion, Citrus Worker Pilot Project; National Institute for Occupational Safety and Health/CDC; Association of Schools of Public Health Trans-Association 	
Paskett ED 2011	Lay Health Advisor	NR	NR	NR	<ul style="list-style-type: none"> Indigenous to Ohio Appalachia Between 40-50 years No post-secondary education 	<ul style="list-style-type: none"> Theories taught: Social Learning (Social Cognitive) Theory, general models of health behavior, Transtheoretical Model for staging readiness, and Communication-Behavior Change model 	<ul style="list-style-type: none"> Observation in the field by study coordinators 	NR	<ul style="list-style-type: none"> Information provided on cervical cancer, Pap test screening Individual risk assessment Individualized counseling addressing reported barriers to receiving a Pap test Provision of encouragement based on stage of change Screening reminders 	<ul style="list-style-type: none"> Initial visit at patient's home or site in community, lasting 45-50 minutes Phone calls at 1 and 5 months following visit 4 postcards mailed at 2,3,6 and 7 months Final visit, 10 months after first Study duration: 12 months 	<ul style="list-style-type: none"> NIH (Centers for Population Health and Health Disparities) 	
Rorie JL 2011	Resident Health Advisor	Paid	<ul style="list-style-type: none"> Application process 	NR	<ul style="list-style-type: none"> Resident of housing development At least RHA was bilingual 	<ul style="list-style-type: none"> Conducted by the Partners in Health and Housing Prevention Research Center 	NR	<ul style="list-style-type: none"> Working with volunteer "peer leaders," conducted outreach to fellow residents 	NR	<ul style="list-style-type: none"> One-on-one conversations Distribution of flyers door-to-door Notification provided of screening dates and times for mobile services Assistance in accessing mobile van 	<ul style="list-style-type: none"> Locations included the building management office, tenant task force meetings, hallways and parking lots Study follow-up: occurred during 2 summers 	<ul style="list-style-type: none"> NR

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Spencer MS 2011	Family Health Advocate	Paid	NR	NR	<ul style="list-style-type: none"> Members of participating communities African American and Latino/ Hispanic ethnicity 	<ul style="list-style-type: none"> Curricula based on diabetes lifestyle intervention designed and evaluated for southwest Native Americans ("Strong in Body and Spirit") Adapted through input from focus groups and earlier studies, for African Americans, "The Journey to Health" and for Latinos/Hispanics, "El Camino a la Salud" 80 hours of training provided Theories included empowerment-based approaches (motivational interviewing), and social cognitive theory w/cultural symbols, themes, patterns and concepts 	NR	<ul style="list-style-type: none"> Ethnically matched to patients 	NR	<ul style="list-style-type: none"> Activities included reflection, group and individual problem-solving, goal setting, role-playing and hands-on activities Use of culturally adapted stories for each ethnic group to describe diabetes, reflect on experiences and enhance self-management behaviors Current recommendations from the ADA and CDC presented on dietary habits and physical activity Information on diabetes, risk factors and complications Patient-specific goal-setting, coaching on communication w/health providers, facilitation of referrals for other services 	<ul style="list-style-type: none"> 11, 2-hour group sessions of 8-10 patients Sessions held in Spanish or English Held every 2 weeks at 2 community locations Monthly home visits of about 60 minutes 1 clinic visit w/provider and FHA Biweekly phone calls 86% (44/72) attended ≥ 1 class; 54% attended all 11 classes Mean number of classes attended: 8 6-month follow-up 	<ul style="list-style-type: none"> National Institute of Diabetes and Digestive and Kidney Disease; CDC; Michigan Diabetes Research and Training Center; Robert Wood Johnson Foundation Clinical Scholars Program
Waitzkin H 2011	Promotora	Paid	NR	<ul style="list-style-type: none"> High school education 	<ul style="list-style-type: none"> Roots in the community 	<ul style="list-style-type: none"> 5 training sessions Model for program was established mentorship program Topics included research methods (e.g. ethics and responsibility, collaborative methods in community-based participatory research) and grant applications and management Educational program on depression for CHWs provided 	<ul style="list-style-type: none"> Lunch hour conferences among providers, promotoras and other staff members 	<ul style="list-style-type: none"> Promotoras recruited and randomized patients in the CHCs 	NR	<ul style="list-style-type: none"> Areas addressed included underemployment, inadequate housing, food insecurity and violence Resources utilized such as community-based organizations for vocational training, job opportunities and employment-related services Referrals tracked w/follow-up phone calls Arrangement of psychiatric care or psychological consultation as needed 	<ul style="list-style-type: none"> In-person visit at CHC Monthly or bi-monthly calls as needed 12-month follow-up 	<ul style="list-style-type: none"> Robert Wood Johnson Foundation

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Hayashi T 2010 Coleman KJ 2012	Community Health Worker	Paid • Employed by clinics during intervention and follow-up	NR	NR, but 6/8 had at least 2 years of college and 2 had post-graduate degrees from Mexico	<ul style="list-style-type: none"> Bilingual (Spanish, English) Bicultural (having similar heritage as patients) Living in same communities as study sites Basic computer skills 	<ul style="list-style-type: none"> 2.5 days of initial training Repeat training at 3 months Trainers included specialized professionals and physicians Presentations, discussions and role-playing utilized 	<ul style="list-style-type: none"> Research personnel visited each study site twice during the intervention Monthly conference calls 	CHWs participated in recruitment; no details reported	<ul style="list-style-type: none"> Grocery and transportation vouchers Items including: tote bags, cutting boards, pedometers, dynabands, insulated lunch bags, water bottles, measuring cups/spoons, and the Spanish CD, <i>Movimiento</i> 	<ul style="list-style-type: none"> Face-to-face counseling sessions, at the clinic Based on <i>New Leaf</i>, intervention material developed by the North Carolina WISEWOMAN program, published in Spanish and English <i>New Leaf</i> curriculum binder provided to patients for home review and updating during future sessions Program emphasizes self-efficacy and monitoring, individual tailoring and collaborative goal-setting, using self-identified barriers to facilitate change w/family and social support Visual aids, hands-on tools, food models and exercise tools to teach nutrition and physical activity 	<ul style="list-style-type: none"> In-person sessions conducted at 1, 2 and 6 months after screening Average duration of session: 50 minutes Follow-up ranged from 9-14 months; average: 12 months 	CDC
Balcázar HG 2010	Promotora	Paid	NR	NR	NR	<ul style="list-style-type: none"> Training curriculum: <i>Your Heart, Your Life</i> developed by the National Heart, Lung and Blood Institute's <i>Salud Para Su Corazón</i> promotora program 16-18 hours of training by a lead promotora from a local community clinic 	NR	Graduate students and community clinic employees visited homes to enroll patients	NR	<ul style="list-style-type: none"> Group health classes using the <i>Su Corazón, Su Vida</i> curriculum Follow-up phone calls Small group session to discuss changes made as well as further changes Materials and presentations available in Spanish and English 	<ul style="list-style-type: none"> Weekly, 2-hour classes for 2 months 2-month follow-up w/phone calls Study duration: 4 months 	NIH/ National Center for Minority Health Disparities
Faridi Z 2010	Community Health Advisor	Paid for training only	Pastors of participating churches nominated 2-3 members	NR	<ul style="list-style-type: none"> Willingness to commit to CHA training and participation 	<ul style="list-style-type: none"> 10-week training session series 2 hours/session Training done by certified diabetes educator and facilitated by research team Research-team developed curriculum, based on DPP lifestyle strategies Topic areas: <ul style="list-style-type: none"> Health-enhancing physical activity programs, healthful diet, reading food labels, portion control Weight loss programs, social support Diabetes medications Effective communication w/physicians 	Monthly meetings w/research team to review activities, problem solving and reporting of study progress	CHAs directly recruited 10-15 members of their congregation	NR	<ul style="list-style-type: none"> CHAs individually developed and tailored intervention methods Group education sessions combined w/Bible study classes Individual interactions Community outreach to raise diabetes awareness Presentations to community residents on the PREDICT program No specific data provided on dose and duration of intervention activities 	<ul style="list-style-type: none"> Church-based Community-based Other details: NR 1-year follow-up 	Connecticut Health Foundation and Centers for Disease Control

Author/ Year	Title	Paid/ Volunteer	Recruitment of CHWs	Education requirements	CHW characteristics	Training details	CHW supervision	Patient recruitment/ CHW-matching	Patient incentives	Components of interaction	Interaction specifics (location, length, timing, follow-up)	Funding details
O'Brien MJ 2010	Promotora	NR	<ul style="list-style-type: none"> • Ads in local Spanish-speaking newspaper, networking • Study nurse coordinator w/clinical experience in target population, identified, interviewed and helped select individuals 	<ul style="list-style-type: none"> • Completion of high school in home country 	<ul style="list-style-type: none"> • Hispanic ethnicity • Bilingual 	<ul style="list-style-type: none"> • 4, 6-hour session • Training domains included skills-based knowledge, research implementation knowledge, health knowledge • Previously studied cancer prevention curriculum utilized • Roles, responsibilities of a CHW • Skills covered included time management, record-keeping, team-building, female anatomy, screening guidelines, confidentiality, and data management • Conducted by nurse coordinator and physician (involved in study) 	<ul style="list-style-type: none"> • Random observation by nurse coordinator and PI 	<ul style="list-style-type: none"> • Recruitment/enrollment done at local faith-based and community-based organizations, the Philadelphia Mexican Consulate, and at patients' homes 	<ul style="list-style-type: none"> • 2, \$20 gift cards provided for participation 	<ul style="list-style-type: none"> • Interactive format w/information provided about anatomy, risk factors, myths about cervical cancer, screening procedures and recommendations • Curriculum provided along w/other materials such as information from the American Cancer Society 	<ul style="list-style-type: none"> • 2, 3-hour workshops w/4-10 women/group • 6-month follow-up 	National Center for Research Resources
Taylor VM 2010	Lay Health Worker	NR	NR	NR	<ul style="list-style-type: none"> • Bilingual, ethnic Vietnamese women • Grew up in Vietnam • Not a certified health professional 	<ul style="list-style-type: none"> • Barrier-specific counseling guidelines used in training 	NR	<ul style="list-style-type: none"> • Married w/children, to help traditional Vietnamese patients to be comfortable discussing reproductive concerns 	<ul style="list-style-type: none"> • Small financial incentive given upon completion of follow-up interview 	<ul style="list-style-type: none"> • Provided basic information on cervical cancer and Pap test, in context of Vietnamese cultural beliefs about health • Materials utilized included a Vietnamese-language DVD (w/English subtitles), Vietnamese/English pamphlet, visual aids such as graphs and diagrams • LHWs offered to watch the DVD w/patients 	<ul style="list-style-type: none"> • Home visit • Follow-up phone calls 1 month later to provide further assistance • 6-month follow-up 	National Cancer Institute; CDC
Babamoto KS 2009	Community Health Worker	Paid	From surrounding community, clinic and local organizations	<ul style="list-style-type: none"> • High-school degree or GED 	<ul style="list-style-type: none"> • Bilingual • Hispanic • Individuals w/diabetes or family member/friend w/diabetes 	<ul style="list-style-type: none"> • 6-week training curriculum: <ul style="list-style-type: none"> -Clinic policies, procedures -CHW roles and responsibilities -Diabetes standards -Self-management strategies incorporating patient cultural/spiritual beliefs -Health behavior change theory 	NR	NR	NR	<ul style="list-style-type: none"> • Individual educational sessions based on ADA standards, tailored to patients' needs, addressing knowledge, identification of problems, goals and levels of progress • Culturally appropriate educational materials to improve self-management of health behaviors such as physical activity, medication adherence, self-monitoring practices 	<ul style="list-style-type: none"> • Sessions conducted in patients' homes or clinics • Follow-up phone calls • Duration and frequency of visits NR • Mean number of sessions (in-person and by phone): 11.3 • 6-month follow-up 	Pfizer Foundation and Pfizer Health Solutions Inc.

Author/ Year	Title	Paid/ Volunteer	Recruitment of CHWs	Education requirements	CHW characteristics	Training details	CHW supervision	Patient recruitment/ CHW-matching	Patient incentives	Components of interaction	Interaction specifics (location, length, timing, follow-up)	Funding details
Balcázar HG 2009	Promotora	Paid	NR	NR	NR	<ul style="list-style-type: none"> • Training curriculum: <i>Your Heart, Your Life</i> developed by the National Heart, Lung and Blood Institute's <i>Salud Para Su Corazon</i> promotora program • 4-days of education and guided practice • Training conducted by experienced promotoras from local, community-based clinic 	NR	Posters and flyers were posted at AYUDA, the community-based organization serving the target area	<ul style="list-style-type: none"> • Food coupons • Household products • Gifts (small) 	<ul style="list-style-type: none"> • Group sessions, conducted in Spanish • 6 educational modules, based on <i>Su Coraz ón, Su Vida</i> -Education on hypertension, salt and sodium intake -Information on physical activity & healthy weight -Education on diet and involving family • Incorporation of specially-designed photonovela discussing using a family approach to control high blood pressure • Follow-up phone calls to answer questions and discuss lifestyle changes • Make-up classes provided for patients missing any of the group sessions 	<ul style="list-style-type: none"> • 2-hour group sessions, provided by 2 promotoras, 15-20 participants • 3 weekly sessions followed by 4 weeks of follow-up phone calls • 1 final group session at week 8 • 9-week follow-up 	CDC and Association of Schools of Public Health (ASPH)
Fernández ME 2009	Lay Health Worker	NR	NR	NR	NR	<ul style="list-style-type: none"> • Program curriculum developed from intervention mapping process • 12 lesson plans provided • Learning activities and visual aids presented • Conducted by clinic staff 	<ul style="list-style-type: none"> • Encounter forms used • Random observation by a supervisor 	NR	<ul style="list-style-type: none"> • \$20 incentive provided after completion of surveys at baseline and follow-up (total=\$40) 	<ul style="list-style-type: none"> • Education and motivation for screening provided with presentation of <i>Cultivando la Salud</i> materials • Facilitated access to screening services with local providers • "Tool box" utilized: bilingual breast and cervical cancer information, w/ Spanish-language video, bilingual flipchart, breast models • Follow-up contact to provide further assistance 	<ul style="list-style-type: none"> • One-on-one home visit within 2 months of enrollment • Sessions lasted 1-2 hours • Follow-up contact in-person or by phone • Overall, 61% of intervention group received the intervention, lasting ≥ 30 minutes • 6-month follow-up 	CDC; National Cancer Institute Preventive Oncology Academic Award; National Cancer Institute research grant; CDC Prevention Research Center Special Interest Project
Fisher EB 2009	Asthma Coach	Paid • Full-time university employees	From previous project, and through church	NR	<ul style="list-style-type: none"> • African American women • High school education • Living in same general neighborhood as patients 	<ul style="list-style-type: none"> • 3-month training on disease, action plans, communication techniques, social support, behavior change strategies 	<ul style="list-style-type: none"> • Weekly supervisory meetings w/nurse and psychologist 	Patients recruited from hospitalization records, contacted by phone survey workers	<ul style="list-style-type: none"> • \$10 for each phone survey: baseline, 6, 12, 18 months • \$50 for final survey and home visit 	<ul style="list-style-type: none"> • Standardized intervention based on set of 7 key asthma management behaviors, including use of an Asthma Action Plan, administration of medications, attending PCP monitoring visits and minimization of secondhand-smoke exposure • Focus on individualized Action plan, problem solving • Collaborative work to identify goals and steps to achieve them 	<ul style="list-style-type: none"> • Initial phone call to establish rapport and schedule visit • 2 home or neutral-site visits to review management behaviors along w/problem solving • Biweekly phone calls for 3 months, followed by monthly calls for completion of intervention • Biweekly phone contact following rehospitalization • 90% of patients had contacts through ≥ 4 of 8 quarters • 24-month follow-up 	NHLBI; National Institute of Environmental Health Sciences; Peers for Progress of the American Academy of Family Physicians Foundation; Eli Lilly and Company Foundation

Author/ Year	Title	Paid/ Volunteer	Recruitment of CHWs	Education requirements	CHW characteristics	Training details	CHW supervision	Patient recruitment/ CHW-matching	Patient incentives	Components of interaction	Interaction specifics (location, length, timing, follow-up)	Funding details
Nguyen TT 2009	Lay Health Worker	Paid	Lay health worker coordinators, hired by the community-based organizations, recruited individuals from social networks	NR	<ul style="list-style-type: none"> Vietnamese women Housewives, students and other members of the community 	<ul style="list-style-type: none"> 2, 4.5-hour sessions Training in approaches to and procedures for lay health workers Training manual provided Conducted by researchers 	NR	<ul style="list-style-type: none"> Face-to-face or phone contact with women in their social networks Introduced research project and collected names for potential enrollment 	<ul style="list-style-type: none"> \$30 received for completion of baseline survey, after randomization 	<ul style="list-style-type: none"> Education about breast cancer, clinical exams and mammography Utilized Vietnamese-language flip-chart and booklet to provide information and motivation Individually-tailored messaging to participants Follow-up contact to answer questions and help schedule appointments Follow-up session to answer questions, emphasize benefits of screening 	<ul style="list-style-type: none"> 2 small (3-10 women) group sessions, lasting 90 minutes, 2 months apart Held at community-based organization or a patient's home Follow-up phone calls 1-2 months after each session 4-5 months follow-up 	CDC; The Asian American Network for Cancer Awareness, Research and Training
Sixta CS 2008	Promotora	Paid	<ul style="list-style-type: none"> Clinic employees 	NR	NR	<ul style="list-style-type: none"> Training developed and implemented by clinic providers 	<ul style="list-style-type: none"> Random observation by nursing director Debriefing w/study author after each session Monthly meetings w/the nursing director, Certified Diabetes Educator, and providers to discuss all aspects of the study/ patients 	<ul style="list-style-type: none"> No role in recruitment Matching NR 	None provided	<ul style="list-style-type: none"> Scripted diabetes course curriculum developed by clinic providers Group sessions w/each promotora responsible for specific session components Pictures, activities and discussion used to teach about diabetes, exercise, nutrition, blood glucose management, coping strategies Self-management process used to address patient attitudes, behaviors and beliefs Behavior goals set and revised Referrals to all members of clinic staff provided 	<ul style="list-style-type: none"> 10, 1.5-hour sessions taught by pairs of promotoras Weekly sessions, conducted in Spanish 87% (55/63) patients showed up for class 65% (41/63) attended ≥ 6 classes 6-month follow-up 	Ruth L. Kirschstein National Research Service Award; Speros Martel Endowment for the Aging Scholarship, Univ. of TX School of Nursing at Houston, Center on Aging; PARTNERS Scholarship, Univ. of TX School of Nursing at Houston

Note: Shaded studies report at least 1 statistically significant positive outcome associated with a CHW intervention

ADA: American Diabetes Association; CDC: Centers for Disease Control; CHA: community health advisor; CHC: community health center; CHW: community health worker; DPP: Diabetes Prevention Program; FHA: family health advocate; GED: General Educational Development (test); HbA1c: glycosylated hemoglobin; HIV: human immunodeficiency virus; LHW: lay health worker; N/A: not applicable; NHLBI: National Heart, Lung, and Blood Institute; NIH: National Institutes of Health; NR: not reported; PCP: primary care provider; PI: principal investigator; PKU: phenylketonuria; RHA: resident health advisor; STI: sexually-transmitted infection

Table 5. Updated Literature Search: Economic Analyses

Author, Year	Study Design	Study Location	Study Objective	Interventions	Patient Demographics	Withdrawals/ Dropouts	Outcomes	Notes
Katula JA 2013 Lawlor MS 2013 RCT		Community intervention in Forsyth County, NC	Impact of CHWs in the prevention of diabetes	1) Community Health Worker intervention: • Group sessions discussing self-efficacy, education, diet and physical activity • Consults w/dietitian 2) Control: • Consults w/nutritionist • Newsletter	Initial patient recruitment: n=301 Inclusion criteria: • Age ≥ 21 years • BMI ≥ 25 kg/m2 and ≤ 40 kg/m2 • Fasting blood glucose levels indicating prediabetes 1) CHW intervention (n=151) • Mean age: 57.3 ± 10.1 • Female: 58% • High school education or less: 19% 2) Control (n=150) • Mean age: 58.5 ± 9.0 • Female: 57% • High school education or less: 21%	At 24-month follow- up: 1) CHW intervention: n=24 (16%) 2) Control: n=16 (11%)	24-month follow-up (Between group comparisons averaged from 18-month and 24-month data) Significant differences seen between groups, favoring the CHW intervention, in the following outcomes: • Fasting glucose: -4.35 mg/dl (p<0.001) • BMI: -1.40 kg/m2 (p<0.001) • Weight: -4.19 kg (p<0.001) • % weight loss: -4.59% (p<0.001) • Measures of insulin and insulin resistance (p=0.006) # of patients ≥ 10% below baseline weight 1) CHW: 21.3% 2) Control: 5.3% p<0.001 No significant differences between the groups in the incidence of diabetes (p=0.10)	Economic outcomes • Based on patient attendance, include direct medical and non-medical costs and indirect costs • Adjusted to 2010 US \$ Per capita direct medical costs for 2 years 1) CHW: \$850 2) Control: \$142 Per capita direct non-medical costs for 2 years 1) CHW: \$13,836 2) Control: \$12,881 Difference = \$955 Total costs per capita of CHW intervention, relative to control, over 2 years • Health system perspective: -\$1,569 • Societal perspective: -\$614
Adair R 2012 Prospective cohort		Inner-city primary care clinic in south Minneapolis, MN	Evaluation of care guides in the management of chronic diseases	Care Guide intervention: • One-on-one clinic visits • Phone calls • Assistance w/achieving recommended care goals (based on diagnoses and treatment recommendations) • Provision of coaching, problem-solving and resources	• Patient population: n=332 • Median age: 61 years • Female: 57% • Some high school or high school graduate: 56% • Public insurance: 75% Private insurance: 18% No insurance: 7%	At 1-year follow-up: n=23 (7%)	1-year follow-up % care goals met 1) Baseline: 67% 2) 1-year: 76% p<0.001 % unmet care goals: 1) Baseline: 33% 2) 1-year: 24%	Economic outcomes Hospital utilization costs based on patient subset (n=280) w/clinic visits in each of 4 consecutive years: 2 years prior to study, during study, and in year following study # of ED visits 1) Baseline: 310 2) Study year: 259 3) Following study: 269 # of hospitalizations 1) Baseline: 188 2) Study year: 166 3) Following study: 177 Net savings: \$103,065
Brown HS 2012 CEA		Medically underserved community in Laredo, TX	Long-term cost- effectiveness of a CHW intervention in diabetic patients	Community Health Worker intervention: • Home visits w/provision of individual guidance, education and counseling • Access to community- based nutrition, exercise and counseling classes	• Patient population: n=30 • Hispanic adults, ≥ 18 years • Patients w/type 2 diabetes and baseline HbA1c > 7.0% • ≥1 home visit	N/A	CEA of CHW intervention • Societal perspective • Archimedes model to project incremental lifetime health outcomes and related expenditures based on changes in HbA1c levels • Primary analysis: HbA1c ≤ 7.0% vs. HbA1c > 7.0% • Costs in 2010 \$	Resultant ICERs for all ages 1) 5-year period: \$130,272 2) 10-year period: \$56,009 3) 20-year period: \$33,319 Resultant ICERs for a 20-period: 1) 30-49 years: \$39,021 2) 50-64 years: \$30,786 3) 65-84 years: \$33,103

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Johnson D 2012 Retrospective cohort	Medicaid managed care organization network in NM	Impact of CHWs on high consumers of health resources	Community Health Worker intervention: • Home visits • Services provided through education, advocacy and social support	<ul style="list-style-type: none"> • Patient population: n=448 • Individuals having ≥ 3 ED visits in 3 months selected • 3 time periods: 1) 6 months prior to CHW intervention 2) 6 months receiving CHW services 3) 6 months after completion of CHW intervention • Comparator: High utilizers from same time period, not enrolled in CHW intervention 	N/A	<p>Resource utilization reported (mean, SD, median and range)</p> <p>Significant reduction in numbers of claims and payments seen after CHW intervention as compared to before and during evaluation periods</p> <p>Differences in costs, ED: 1) Before: \$650,875 2) During: \$589,060 3) After: \$225,324</p>	<p>Encounters per person: 1) Before: 5.9 ± 10.6 2) During: 3.9 ± 7.1 3) After: 1.8 ± 4.2</p> <p>Payment per person: 1) Before: \$1,453 ± \$3,056 2) During: \$1,315 ± \$2,803 3) After: \$570 ± \$1,370</p> <p>Larger reductions in resource utilization for inpatient, prescription and narcotic prescription counts and costs for the CHW intervention as compared to the non-CHW group</p>	
Larkey LK 2012 Randomized trial	Sites (including churches, schools, community centers) located in metropolitan Phoenix, AZ	Evaluation of promotora interventions on cancer screening behavior	<p>1) Social Support Group: • Group sessions w/provision of education on cancer and screening</p> <p>2) Individual Group: • One-on-one sessions</p>	<p>Initial patient recruitment: n=1,006 Inclusion criteria: • Self-identified Hispanic/Latina women • Age ≥ 18 years • Non-adherent to appropriate breast, cervical or colorectal cancer screening</p> <p>1) Social support group (n=604) • Mean age: 38.9 ± 13.7 • Female: 100% • High school education or less: 89% • Household income <\$25,000: 83% • Public insurance: 24% Private insurance: 10% No insurance: 66%</p> <p>2) Individual group (n=402) • Mean age: 37.7 ± 12.9 • Female: 100% • High school education or less: 90% • Household income <\$25,000: 86% • Public insurance: 26% Private insurance: 10% No insurance: 65%</p>	<p>At 3-month follow-up (screening assessment): 1) Social support group: 297 (49%) 2) Individual group: 200 (50%)</p> <p>At 15-months follow-up (maintenance assessment): 1) Social support group: 186 (61%) 2) Individual group: 110 (54%)</p>	<p>3-month follow-up (screening assessment) (Self-report)</p> <p>15-month follow-up (maintenance assessment) (Self-report)</p> <p>• Any one screening • Cervical cancer • Breast cancer • Colorectal cancer</p> <p>No significant differences between social support and individual groups</p> <p>• Rescreening adherent • Cervical cancer • Breast cancer • Colorectal cancer</p> <p>No significant differences between social support and individual groups</p>	<p>Economic outcomes Cost-analysis from perspective of future provider organization 2006 dollars, w/adjustment using CPI</p> <p>Total cost per participant 1) Social support group: \$103.44 2) Individual group: \$392.38</p> <p>Total cost per screening (assuming that all those who started program had same rate of screening adherence as those completing program) 1) Social support group: \$262.54 2) Individual group: \$862.38</p> <p>Total cost per screening (using screening rates for patients in study who completed program, w/a zero screening rate for those who started in each group) 1) Social support group: \$516.53 2) Individual group: \$1,716.22</p>	

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Margellos-Anast H 2012	Prospective cohort	Inner-city communities served by the Sinai Health System in Chicago, IL	Evaluation of a CHW program on asthma management	Community Health Worker intervention: • Home visits • Provision of individualized asthma education and facilitation of relationship w/a primary care provider	<ul style="list-style-type: none"> • Patient population: n=70 • African American children w/severe, poorly controlled asthma • Mean age: 7.3 years • Female: 43% • Education of caregiver, less than high school: 31% • Public insurance: 96% • Private insurance: 3% • No insurance: 1% 	At 1-year follow-up: n=20 (29%)	<p>1-year follow-up</p> <p>Frequency of daytime symptoms and days needing rescue medication over the past 2 weeks were significantly better at follow-up as compared to baseline (p<0.05)</p> <p>No significant differences seen between time points in frequency of night-time symptoms</p> <p>Frequency of symptom-free days in past 2 weeks: 1) Baseline: 10.0 2) Follow-up: 12.0 p<0.05</p>	<p>Significantly fewer ED visits, hospitalizations, hospital days and urgent clinic visits between baseline and follow-up (p<0.003)</p> <p>Economic outcomes Cost-savings analysis conducted based on the average reimbursement by the IL Dept. of Healthcare and Family Services, and estimated per child served in a calendar year by 1 full-time CHW</p> <ul style="list-style-type: none"> • Cost-savings of \$2,561.60/participant • \$5.58 saved per dollar spent on the intervention
Roth AM 2012	RCT	Enrollees in the high-risk insurance pool in Marion County, IN	Impact of lay health workers in promotion of better medical self-management in HIV patients	<p>1) LHW intervention: • One-on-one meetings w/provision of education, emotional support and development of behavioral skills</p> <p>2) Control: • NR</p>	<p>Initial patient recruitment: (n=463)</p> <p>Inclusion criteria: • HIV positive • Age ≥ 18 years • Fluent English</p> <p>1) LHW intervention (n=91) • Mean age: 44.6 ± 10.7 • Female: 15% • Public insurance: 100%</p> <p>2) Control (n=358) • Mean age: 44.3 ± 9.2 • Female: 15% • Public insurance: 100%</p>	<p>Completion of surveys:</p> <p>1) LHW • Baseline: 61 (67%) • Follow-up: 52 (57%) • Both surveys: 46 (51%)</p> <p>2) Control • Baseline: 181 (51%) • Follow-up: 201 (56%) • Both surveys: 140 (39%)</p>	<p>12-month follow-up</p> <p>Viral load test • LHW group more likely than controls to receive test: OR 3.05 (95% CI, 1.05-8.86) • LHW group more likely to have viral load under control (<50 copies/ml): OR 2.01 (95% CI, 1.18-3.43)</p> <p>CD4 count • No significant differences found between groups in receipt of test and in numerical count</p>	<p>Economic outcomes</p> <p>Total claims paid expressed as a function of baseline costs and group assignment, controlled for total claims paid in year prior to baseline</p> <p>No significant difference shown between groups (p=0.35)</p>
Felix HC 2011	Prospective controlled cohort	A Medicaid population in Monroe, Lee and Phillips Counties, AR	Evaluation of CHWs in connecting Medicaid patients to available services	<p>1) Community Health Worker intervention: • Targeted outreach into the community</p> <p>• Provision of information and education about available home- and community-based services and resources</p> <p>2) Control: • Propensity score matched group of Medicaid patients</p>	<p>• Patient population: n=1,863</p> <p>• Medicaid or Medicaid-eligible patients</p> <p>1) CHW intervention (n=919) • Mean age: 66.3 ± 16.7 • Female: 67%</p> <p>2) Control (n=944) • Mean age: 66.8 ± 20.1 • Female: 68%</p>	N/A	<p>Economic Outcomes</p> <p>Annual measures for use of Medicaid services and spending constructed from 2005-2009 Medicaid records, also for year before enrollment in intervention and for year after enrollment</p> <p>Total change in \$ spent on Medicaid services 1) CHW: \$3,100/person 2) Control: \$4,665/person • Unadjusted difference: -\$1,565/person, p<0.05</p>	<p>Overall net savings for Medicaid program: \$2.619 million</p> <p>Return on investment: \$2.92 per dollar invested in CHW program</p>

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Taylor VM 2010 Scoggins 2010 RCT	Metropolitan Seattle, WA	Impact of lay health workers on cervical cancer screening	<p>1) Lay Health Worker intervention:</p> <ul style="list-style-type: none"> • Home visit w/provision of educational on health and screening • Follow-up phone calls <p>2) Control:</p> <ul style="list-style-type: none"> • Direct mailing on physical activity 	<p>Initial patient recruitment: n=234 Inclusion criteria:</p> <ul style="list-style-type: none"> • Participants in community-based survey • Women w/out cervical cancer screening in previous 3 years • Age 20-69 years <p>1) LHW intervention (n=118)</p> <ul style="list-style-type: none"> • Age < 50: 47% • Female: 100% • Education less than 12 years: 54% <p>2) Control (n=116)</p> <ul style="list-style-type: none"> • Age < 50: 43% • Female: 100% • Education less than 12 years: 51% 	<p>At 6-month follow-up:</p> <p>1) LHW: 34 (29%) 2) Control: 26 (22%) p=NS</p>	<p>6-month follow-up</p> <p>Intent-to-treat population</p> <p>% of patients receiving a Pap test (Self-report)</p> <p>1) LHW: 24% 2) Control: 14% p=0.07</p> <p>Adjusted OR 1.78 (95% CI, 0.88-3.60)</p> <p>% of patients receiving a Pap test (Verified by medical record)</p> <p>1) LHW: 15% 2) Control: 7% p=0.06</p> <p>Adjusted OR 2.37 (95% CI, 0.94-5.97)</p>	<p>Population with follow-up data</p> <p>% of patients receiving a Pap test (Self-report)</p> <p>1) LHW: 33% 2) Control: 18% p=0.02</p> <p>Adjusted OR 2.17 (95% CI, 1.03-4.56)</p> <p>% of patients receiving a Pap test (Verified by medical record)</p> <p>1) LHW: 21% 2) Control: 9% p=0.03</p> <p>Adjusted OR 2.84 (95% CI, 1.09-7.39)</p> <p>Economic outcomes</p> <p>The ICER of intervention vs. control was calculated from the societal perspective: \$30,015 per QALY</p>	<p>Medical records verified in 25/28 (89%) of intervention patients and 16/16 (100%) of control patients</p>

BMI: body mass index; CEA: cost-effectiveness analysis; CHW: community health worker; CI: confidence interval; CPI: consumer price index; ED: emergency department; HbA1c: glycosylated hemoglobin; ICER: incremental cost-effectiveness ratio; LHW: lay health worker; OR: odds ratio; QALY: quality-adjusted life-year; RCT: randomized controlled trial; SD: standard deviation