

# HOW EFFECTIVE ARE COMMUNITY HEALTH WORKERS?

*An Overview of Current Evidence with Recommendations  
for Strengthening Community Health Worker Programs to  
Accelerate Progress in Achieving the Health-related  
Millennium Development Goals*

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Protecting Health, Saving Lives—*Millions at a Time*

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## Glossary

AIDS	Acquired immune-deficiency syndrome
AIM	Assessment and improvement matrix
APOC	African Program for Onchocerciasis Control
ART	Anti-retroviral therapy
ASHA	Accredited Social Health Activist (India)
BRAC	Building Resources across Communities (formerly Bangladesh Rural Advancement Committee)
CBIO	Census-based, impact-oriented
CCM	Community case management
CBD	Community-based distribution
CDI	Community-directed intervention
CHA	Community Health Agent (Brazil)
CHD	Child Health Day
CHW	Community health worker
CMAM	Community-based management of severe acute malnutrition
CPR	Contraceptive prevalence rate
DALY	Disability-adjusted life year
DOTS	Directly observed therapy, short course (for tuberculosis)
DMPA	Depot-medroxyprogesterone acetate
EPI	Expanded Program on Immunizations
FCHV	Female Community Health Volunteer (Nepal)
FP	Family planning
HAS	Hospital Albert Schweitzer (Haiti)
HIV	Human immunodeficiency virus
icddr,b	International Centre for Diarrhoeal Disease Research, Bangladesh (formerly)
IPTc	Intermittent preventive therapy to all children
ITN	Insecticide-treated bed net
LiST	Lives Saved Tool
MCH	Maternal and child health
MCH-FP	Matlab Maternal Child Health-Family Planning
MDG	Millennium Development Goal
MOH	Ministry of Health
NGO	Non-governmental Organization
PD	Positive deviant
ORS	Oral rehydration solution

ORT	Oral rehydration therapy
RDT	Rapid diagnostic test
RUTF	Ready-to-use therapeutic food
SEARCH	Society for Action, Education and Research in Community Health (India)
TB	Tuberculosis
TBA	Traditional birth attendant
TTBA	Trained traditional birth attendant
UNICEF	United Nations Children's Fund
WHO	World Health Organization

## I. Introduction

Community Health Workers (CHWs) provide a critical and essential link with health systems and are a powerful force for promoting healthy behaviors in resource-constrained settings. During the past decade, there has been an explosion of evidence and interest concerning community health workers and their potential for improving the health of populations where health workforce resources are limited. Given the massive shortage of health workers in Africa and Asia – recently estimated to be 4.25 million workers<sup>1</sup> – the inequitable distribution of health workers within countries, and the need to accelerate progress in achieving the MDGS for health, it is essential to take stock of the current body of evidence. This document serves to provide an update and supplement to the extensive review carried out by Bhutta and colleagues under the auspices of the World Health Organization and the Global Health Workforce Alliance in 2010.<sup>2</sup>

## II. Who Are Community Health Workers?

Viewed from the global perspective, CHWs are a diverse category of health workers who have many specific names that may be unique to the context in which they work (such as ASHA or *Angwanwadi* workers in India, *Promotores* in Latin America, Lady Health Workers in Pakistan, or Health Extension Workers in Ethiopia). These workers commonly work in communities (almost always outside of fixed health facilities) with some type of formal, but limited, training for the tasks they are expected to perform. The training is arranged by the health system or health program which sponsors their work. They do not, however, receive any formal professional or paraprofessional certificate or tertiary education degree.

CHWs are needed because facilities are often far away, people are reluctant to use them, or they are over-crowded. CHWs have a broad range of work environments and expectations. Some CHWs have only a few days of training, while others have six months or even more of training. Some CHW cadres are paid salaries, others work as volunteers. Some work full-time, and others work only a few hours per week. Some have a wide array of tasks and responsibilities, and others have a narrowly defined scope of work. Some have close interaction with health staff based in facilities and others operate far away and function in a very independent manner.

Community leaders, special community committees, and groups within the community, particularly women's groups, can play an important role in supporting CHW activities – in the selection of CHWs and in providing guidance, support and oversight. The capacity of health programs to effectively engage communities and establish CHW programs depends in part on the policy framework of the government and the degree to which it fosters strong partnerships between MOH programs and communities. And, of course, it depends on the quality of leadership of the health program at the district level and above, the importance given by the

health program to building community partnerships, and the manner in which local people are treated by the health program staff.

In all cases, community-level providers need to have some kind of linkage to the formal health system for proper training and supervision and for access to medicines, supplies and equipment. The Global Health Workforce Alliance, hosted by the World Health Organization, has given immediate priority to the expansion of education and training to increase the number of community- and mid-level health workers, alongside highly skilled staff, as the first step in ensuring that “all people, everywhere, shall have access to a skilled, motivated and facilitated health worker within a robust health system.”<sup>3</sup> In light of the renewed interest in CHWs, it is relevant to discuss the history of CHW programs since there are strong parallels between the contexts and potential pitfalls of the past with current programs.<sup>4</sup>

### **III. History of Community Health Worker Programs**

Each country where CHWs work has its own unique history of the origins of CHW programs, yet in virtually every country, CHWs are a product of the interaction between the socio-cultural milieu, the health system and government policies. In the late 1800s, Russia’s feldshers were trained for three years as paramedics to assist physicians and to function in their stead in rural areas where physicians were not present. Large numbers of feldshers also obtained training in midwifery.<sup>5, 6</sup> Feldshers constitute an important forerunner of the CHW movement in the sense that they were local people with limited training (and were therefore not formally trained medical doctors) who were authorized by the state to provide primary health care services in rural villages.

Large-scale CHW programs have their origins in Ding Xian, China in the 1920s. In contrast to the feldshers, the first CHWs in Ding Xian were illiterate and only received three months of training. They learned to record births and deaths, vaccinate against smallpox and other diseases, give first aid and health education talks, help communities keep their wells clean, and provide basic primary medical care.<sup>7, 8</sup> These CHWs were the precursors of the barefoot doctor program that grew rapidly parallel to and in close coordination with the people’s commune movement. By 1972, there were an estimated one million barefoot doctors serving a rural population of 800 million people in the People’s Republic of China. These “barefoot doctors” were peasants who were expected to work half time performing their health-related duties and half time doing agricultural work.<sup>9</sup>

In the 1960s, the inability of the modern Western medical model of trained physicians to serve the needs of rural and poor populations throughout the developing world was becoming readily apparent. The need for new approaches was obvious, and the barefoot doctor concept gained attention around the world as one approach to addressing this need.<sup>10</sup> During this period, CHW programs emerged in many countries, including Indonesia, India, Tanzania, Venezuela, and Honduras.



The World Health Organization began to explore the implications of the new approaches to provision of medical care and to health promotion that were based on principles of social justice, equity, community participation, disease prevention, multi-sectoral collaboration, decentralization of services to the periphery as close as possible to the people, use of appropriate technology, and provision of services by a team of workers, including community-based workers. These new ideas led to the WHO book published in 1975, entitled *Health by the People*, that consisted of a series of case studies from different countries where CHWs were the foundation of innovative community health programs.<sup>11</sup> The book was part of the intellectual foundation for the International Conference on Primary Health Care at Alma-Ata, Kazakhstan in 1978, sponsored by WHO and UNICEF and attended by official government representatives from virtually all WHO and UNICEF member countries, making it the first truly global health conference. The Conference resulted in the Declaration of Alma Ata, which called for the achievement of Health for All by the year 2000 through primary health care. The Declaration was clear in defining a role for CHWs when needed. Article VII.7 of the Declaration states:

Primary health care ... relies, at local and referral levels, on health workers, including physicians, nurses, midwives, auxiliaries and community workers as applicable, as well as traditional practitioners as needed, suitably trained socially and technically to work as a health team and to respond to the expressed health needs of the community.<sup>12</sup>

Thus, the Declaration explicitly defined CHWs as one of the important providers of primary health care in certain circumstances.

In the 1970s and 1980s, there was a proliferation of government CHW programs at national scale in Indonesia,<sup>13</sup> India,<sup>14</sup> Nepal,<sup>16</sup> Tanzania,<sup>16</sup> Zimbabwe,<sup>15</sup> Malawi, Mozambique, Nicaragua<sup>17</sup> and Honduras<sup>18</sup> as well as in other Latin American countries. During this same time there was also the beginning of smaller CHW programs operated by non-governmental organizations (NGOs) in many low-income countries around the world.

In the 1980s, it was becoming apparent that a number of large-scale programs were encountering serious challenges because of inadequate training, and insufficient remuneration or incentives. Programs were also plagued by insufficient continuing education, lack of supervisory support, lack of integration with the health system, inadequate logistical support for supplies and medicines, and lack of acceptance by higher-level health care providers. Additionally, in many programs political favoritism led to the selection and training of individuals who were not well motivated or suited for the role of the CHW.<sup>7</sup> A series of publications in the late 1980s highlighted these concerns, but optimism that these problems could be overcome prevailed.<sup>19-21</sup>

In the 1980s, in addition to these serious problems within large-scale CHW programs, other global forces also intervened. The global oil crises of the 1970s led to a global recession and a debt crisis for many developing countries in the 1980s. Governments were forced by

international organizations, most notably the World Bank, to embrace free market reforms and to reduce their public sector financing, including financing for health services. Thus, financial resources needed to support new health initiatives, including large-scale CHW programs, were not available.<sup>22, 23</sup> The cumulative effect of these shocks led to loss of financial and political support for comprehensive primary health care generally,<sup>22</sup> and CHW programs fell by the wayside.<sup>23</sup> These two forces together with the rising prominence of selective approaches that did not require CHWs led to the demise of a number of large-scale CHW programs as well as to the loss of momentum of the nascent primary health care movement.

The political commitment for primary health care and for strong and effective CHW programs was also often lacking. There was a sense that these programs represented “second class care” and that CHWs were a temporary solution. Priority was given to investments in secondary and tertiary levels of care, often benefitting primarily urban and elite populations whose influence on government decision-making for health services was notable.<sup>24</sup> Furthermore, monitoring and evaluation systems for primary health care programs and for large-scale CHW programs were weak, and evidence of their effectiveness and cost-effectiveness were limited.<sup>24</sup>

Another cause for the loss of support for large-scale CHW programs in the 1980s was the realization that they were not as inexpensive as had been anticipated and that they required a significant amount of financial and supervisory inputs.<sup>19</sup> In 1992, when there were more than two million CHWs throughout the world, one knowledgeable observer remarked that “it is striking how little is known about what CHWs actually do in relation to the tasks assigned to them, the impact of these activities upon health status, how much time they actually spend doing these various tasks, the response they find among the communities they serve, attrition rates, and costs of CHW programmes [p. 53].”<sup>25</sup>

As a result of all of these influences, many governments reduced or discontinued their CHW programs in the late 1980s and early 1990s as efforts at selective primary health care and vertical programs with strong international donor and technical support gained prominence.<sup>7, 26</sup>

### **A. National Examples of Large-Scale CHW Programs**

Successful examples of CHW programs at scale did, however, begin to emerge during the mid-1980s. Among the most notable of these programs emerging in the mid-1980s was the Brazilian national health care program (Special Service for Public Health – *Serviço Especial de Saúde Pública*), which started in 1987. Since then, the program has been able to gradually achieve universal coverage of primary health care services and marked improvement of health status of the population. The program utilizes health teams that include one of the largest CHW networks in the world, composed of 222,280 CHWs called *Visitadoras*, now called *Agentes Comunitários de Saúde*, who provide home-visits and services to 110 million people.<sup>27-29</sup>

Bangladesh started a community-based family planning program with an initial cadre of Family Welfare Assistants in the mid-1970s. The program expanded in the mid-1980s and was

complemented by NGO CHWs working in family planning. By 1997 Bangladesh had 30,000 female CHWs providing home-based family planning services.<sup>30</sup> This program became what has been widely regarded as one of the world's most successful family planning programs in a developing country. In the mid-1980s, BRAC, a national Bangladeshi NGO, initiated a CHW program composed of women who were members of a BRAC micro-credit savings group. Each group had women who obtained special training in an area of personal interest including various types of income-generating activities or health. The CHWs were called *Shashtya Shebikas*. This program has expanded gradually and rapidly such that at present this national NGO cadre consists of 80,000 CHWs that reach over 100 million people with comprehensive services.<sup>23, 30</sup>

Another notable program that emerged in the late 1980s is Nepal's Female Community Health Worker Program, which was established in 1988. This program was an outgrowth of an earlier CHW program that had begun in Nepal following the 1978 Alma Ata conference but that had failed in the early 1980s primarily because of lack of continued funding from the government. The resurrected program engaged unpaid women (many of whom had been originally trained under the initial CHW program) to ensure the distribution of vitamin A. Over the following decade, the National Vitamin A Program gradually scaled up to over 40,000 workers. Over the past decade, these Female Community Health Volunteers have taken on expanded responsibilities that include detection and treatment of common childhood diseases (including pneumonia), distribution of oral contraceptives, and promotion of available health services for first aid, antenatal care, family planning, and immunization.<sup>31, 32</sup>

These three countries – Brazil, Bangladesh and Nepal – have had some of the most rapid achievements in reducing under-five mortality in the world since 1990.<sup>33</sup> The strong CHW programs in each of these countries have all played a strong contributory role to this important achievement, we will describe further in a subsequent section.

## **B. CHW Programs that Have Emerged Since the 1990s**

CHWs came back into prominence globally as the World Health Organization (WHO) promoted task-shifting to alleviate over-stretched health care systems.<sup>34</sup> More recently, various countries have also begun to invest again in large-scale CHW programs. In 2004, Ethiopia began its CHW program to train Health Extension Workers, who now number more than 30,000.<sup>2</sup> The workers are literate, adult females who have completed 10<sup>th</sup> grade and who are from the local community.<sup>35</sup> These workers primarily serve in newly constructed health posts and provide services that include provision of basic first aid, contraceptives and immunizations and diagnosis and treatment of malaria, diarrhea and intestinal parasites.<sup>36</sup>

There are many other notable examples of countries currently implementing CHW programs. The Lady Health Worker Program in Pakistan was launched in 1992 and has gradually scaled up to serve 70% of the rural population with more than 90,000 workers.<sup>2</sup> Uganda began a national CHW program as part of its village health team strategy in 2003.<sup>2</sup> India initiated a

Rural Health Mission in 2005 that involves support for 800,000 CHW workers called ASHAs (Accredited Social Health Activists), making it the world's largest CHW program.<sup>2</sup> In the past decade, as rigorous evidence has continued to accumulate on the effectiveness of interventions delivered by community-based workers, enthusiasm has grown for a stronger investment in CHW programs as a strategy for accelerating progress in reaching the MDGs for health primary health care.

In spite of the growing enthusiasm for expanding CHW programs, as evidenced by a recent high-level call by a global Technical Task Force to train one million CHWs in Africa,<sup>37</sup> it remains the case that, as Frankel noted two decades ago,<sup>25</sup> our knowledge of the effectiveness of large-scale CHW programs remains limited, and the challenges faced by early large-scale CHW programs appear to still be present.

A recent renewed interest in CHW programs has been sparked by an increasing number of studies demonstrating the effectiveness of programs using CHWs in achieving demonstrable health benefits that directly related to the health-related Millennium Development Goals (MDGs), namely reducing child malnutrition, reducing child and maternal mortality, and controlling HIV/AIDS, tuberculosis (TB) and malaria. Thus, with the slow pace of progress in reaching the health-related MDGs in so many priority countries, expanding CHW programs held the potential for accelerating progress. In addition, over the past decade there has been increased attention given to what is now called the global health workforce crisis and the recognition that there will not be sufficient health manpower in virtually all countries around the world to meet the need and the demand. So, in this sense, there will of necessity be an ongoing process of task shifting in order to extend services to those who need them in the face of a shortage of physicians, nurses, and other higher-level health professionals.

South Africa provides an interesting case study in this regard. Although the country had developed a CHW cadre earlier, CHWs were not included in the first post-Apartheid health system because CHWs were seen as second-class providers of care<sup>38</sup>. However, with the expanded need for health care providers in the face of the AIDS epidemic (particularly for hospice care early on) and the availability of funding to support testing and long-term treatment of AIDS patients, CHWs have more recently come to be seen as an integral part of a well-functioning health system. South Africa is now in the process of beginning to develop a primary health care system modeled after Brazil's, in which CHWs are foundational.

As government interest in and commitment to CHW programming has waxed and waned over the past 50 years, there has been at the same time a steadily growing and increasingly positive experience among international and national NGOs engaged in health programs in using CHWs to carry out community-based programming, particularly for child survival programming. There is also increasingly support for other types of selectively focused programming such health education and health promotion for specific diseases or conditions,

provision of family planning services, as well as detection and treatment of HIV/AIDS and TB cases. This transition is aptly summarized by Bhutta and colleagues:

During the 1980s, CHWs were considered a cornerstone of primary health care, as envisioned by the Alma Ata Declaration, but its importance declined in the 1990s with a changing focus on alternative vertical programs and service delivery models. It is now evident that this change in direction was misplaced and given the increasing interest in integrated primary care and the recognition of the enormous mismatch between disease prevalence and optimal care, there has been a rekindling of interest in the importance of CHWs [p. 13].<sup>2</sup>

#### **IV. Assessing the Evidence on Community Health Worker Effectiveness**

The purpose of this review is to assess the effectiveness of CHW programs, with particular emphasis on how they have or how they might assist countries in achieving the health-related MDGs. Part of the challenge in addressing this issue is to not lose sight of the fact that CHW programs are not stand alone enterprises, but are a critical part of a larger system of activities that involve the larger formal health system, the community (or perhaps one might refer to it as the community health system), and specific interventions that require CHWs in order for them to reach those who need them. Thus, in reality what we are addressing is not so much the effectiveness of CHWs by themselves but the effectiveness of various programs and approaches in which CHWs play a critical role in providing services to those who need them. CHWs cannot achieve their full potential without the active engagement of communities as collaborating and supportive partners, without a supportive health system or health program that is involved in the selection of appropriate CHWs, their training, their ongoing support and supervision, including ensuring that they have the supplies, commodities, and medicines in order for them to function effectively, and without technical interventions that are known to be effective.

Assessing the effectiveness of health programs on the health of populations in general is a challenging methodological task, since it is not necessarily the case that any improvements in the health of a population can be attributed to one or more health program activities. Many factors contribute to the health of populations, including non-health program factors such as the standard of living, level of education, and so forth. Measuring the health of populations is no small task either – whether it is measuring under-five mortality, maternal mortality, or the incidence and prevalence of HIV/AIDS, TB, or malaria. So, the question of assessing the effectiveness of CHWs is not easy to answer. We will provide an overview of what we consider to be some of the most important research that addresses these issues, with priority given to recent research findings. When possible, we will refer to findings arising from reviews of studies in a particular area.

## V. Evidence of Effectiveness of CHWs in Achieving the Millennium Development Goals for Health

### A. Target 1C: Halve, between 1990 and 2015, the proportion of people who suffer from hunger

Approximately one-third of under-five mortality can be attributed to undernutrition, and the effects of undernutrition on long-term physical and mental development of children have been well-documented.<sup>39</sup> One out of every four children in developing countries is undernourished. Evidence regarding the effectiveness of nutritional programs in improving nutritional status in populations has been unfortunately quite limited, particularly for programs serving large populations. The contribution that CHWs have made or can make to the effectiveness of nutrition programs obviously depends not only on the CHWs themselves but on the efficacy of the nutritional intervention itself. Here we will review some of the notable recent research in this area, with particular reference to the contributions made by CHWs.

#### Promotion of Exclusive Breastfeeding

Exclusive breastfeeding during the first 6 months of life is recommended by WHO for optimal nutrition during early life and for optimal health outcomes, most notably the prevention of diarrhea.<sup>40</sup> At present, only 25% of infants are exclusively breastfed during their first 6 months of life,<sup>39</sup> and the extension of this intervention to all infants is one of the most important approaches to reducing under-five mortality. According to one estimate, 13% of under-five deaths could be prevented by the universal practice of exclusive breastfeeding during the first six months of life, more than could be achieved by universal coverage of any other single intervention.<sup>41</sup>

The promotion of exclusive breastfeeding by CHWs through community-based interventions has been shown to be highly effective. According to one recent systematic review and meta-analysis of randomized controlled trials, the odds of exclusive breastfeeding was 5.6 times greater in the group exposed to the CHW intervention compared to the group that was not.<sup>42</sup>

#### Promotion of Appropriate Complementary Feeding in Children

The effectiveness of CHWs in promoting appropriate feeding after 6 months of age, as measured by improvements in anthropometric measures, is minimal at best according to current evidence.<sup>43, 44</sup>

#### Community-based Rehabilitation of Malnourished Children using the Positive-Deviance Hearth Model

There is extensive experience in small-scale projects and limited experience in large-scale projects of CHWs identifying moderately or severely malnourished children in

communities and helping their mothers learn through appreciative inquiry how positive deviants feed their children in the community and apply this knowledge to their feeding and child care practices.<sup>45</sup> Positive deviants (PDs) are mothers in the same community with a similar socio-economic status who have well-nourished children. The most significant example of the effectiveness of PD Health is from Vietnam, where early success in reducing the percentage of children with severe malnutrition (from 23% to 6%) led to a scaling up of the program to two districts with a population of 1.2 million people and a reduction in the prevalence of severe malnutrition for 19% to 4%.<sup>46, 47</sup>

### Community-based Management of Severe Acute Malnutrition

Community-based management of severe acute malnutrition (CMAM) involves the provision of ready-to-use therapeutic foods (RUTF) in the community with inpatient care for children with complications. CMAM requires community mobilization and supplementary feeding programs where the level of moderate acute malnutrition is high. CHWs play an important role in organizing and administering this program. CMAM provides an alternative to the previous standard of inpatient care. The performance of these programs has been comparable to that of inpatient programs but with coverage of services five times higher than inpatient programs.<sup>48-51</sup> Cost-effectiveness analyses have confirmed that CMAM is a highly cost-effective approach based on criteria established by the World Health Organization and in comparison to other priority health care interventions in developing countries.<sup>52, 53</sup>

### Prevention of Micronutrient Malnutrition

Micronutrient deficiencies in children, most notably due to a lack of vitamin A and zinc, are now responsible for an estimated 10% of the global burden of disease in children globally.<sup>44</sup> CHWs can play an important role in reducing these micronutrient deficiencies. The most recent meta-analysis of the effect of vitamin A supplementation on child mortality concludes that there is a reduction in risk of death of 23% when vitamin A is provided in places where there is underlying clinical evidence of vitamin A deficiency.<sup>54</sup> CHWs are essential for ensuring that high-dose vitamin A capsules reach all children every six months in countries where vitamin A deficiency is present (which is essentially all countries with high levels of under-five mortality). Evidence is becoming stronger that zinc supplementation provided to children on a daily basis leads to improved growth<sup>55</sup> and reduced mortality from diarrhea and pneumonia.<sup>56</sup> The effect size on growth is 0.13-0.19 and there is a net gain of 0.37 cm in height, and there is a reduction in diarrheal mortality of 13% and pneumonia mortality of 15%. There will most likely strong recommendations for its widespread promotion in developing countries with high levels of under-five mortality, and CHWs will be needed to ensure that children receive these supplements.

The provision of micronutrients to pregnant women, principally iron, folate, and other minerals and vitamins, has been associated with favorable results for birth weight,<sup>44, 57, 58</sup> and



mortality during early infancy, including for pre-term infants.<sup>59, 60</sup> For instance, iron and folate supplementation reduce intrauterine growth restriction by 14%.<sup>44</sup>

Micronutrients can obviously be provided to patients at health facilities or at drug shops. However, when CHWs provide these through routine periodic contact with all families, the coverage rate is much higher. The effectiveness studies cited above have all used CHWs to distribute micronutrients to households.

## **B. Target 4A: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate**

The evidence regarding the effectiveness of CHWs in reducing under-five mortality is substantial. We will first review findings related to studies and programs in which CHWs deliver specific child survival interventions, and then we will review studies of the effectiveness of integrated programs that have demonstrated impact on under-five mortality using CHWs to deliver a package of interventions, sometime in concert with additional facility-based health program activities and development activities. The interventions that we will review are (1) immunizations, (2) community case management of pneumonia, diarrhea and malaria, and (3) home-based neonatal care.

### **Immunizations**

Although vaccine-preventable diseases at present account for only approximately 4% of under-five deaths globally,<sup>61</sup> their widespread use is now responsible each year for the prevention of 2.5 million deaths of children globally.<sup>62</sup> Expansion of immunization coverage has been one of the important factors contributing to the decline in under-five mortality during the past 25 years, and maintenance of coverage is essential for mortality prevention in the future. Furthermore, as new vaccines are introduced that will provide protection against pneumonia, diarrhea, and other leading causes of childhood mortality, maintenance of high levels of coverage will also be needed to enable these immunizations to achieve their maximum effect.

The effectiveness of CHW interventions in expanding immunization coverage and especially in reaching priority, hard-to-reach groups is well-documented in numerous reviews. These studies complement numerous other studies that demonstrate that in rural or marginalized populations, face-to-face one-one interpersonal communication through CHWs is the most effective means of promoting immunization uptake.<sup>63</sup>

One systematic review of the literature concerning the effects and costs of expanding coverage of immunization services in developing countries identified 60 relevant studies and concluded that the two most effective interventions were (1) engaging CHWs to promote uptake of immunization services in communities and working with mobile vaccination teams, and (2) door-to-door canvassing using CHWs (or sometimes non-health workers who may not formally be CHWs).<sup>64</sup> Their review identified one study from Ecuador that assessed the cost-effectiveness of the CHW approach (in which CHWs participated in the planning and implementation of the immunization program) compared to a strategy in which CHWs were not



utilized. The cost-effectiveness ratio compared to the approach that did not engage CHWs was less than zero, meaning that the cost of the CHW approach was less, and the effectiveness of the approach was greater. The cost per immunized child for the CHW strategy was US \$32 per child compared to US \$778 per immunized child using only Ministry of Health (MOH) staff.<sup>65</sup> A controlled trial from Ghana demonstrated markedly increased immunization coverage through home visitation for promotion and provision of immunizations.<sup>66</sup>

Ryman et al.<sup>67</sup> searched the available evidence regarding the effectiveness of approaches used at the sub-national level to increase immunization coverage. Approaches that engage CHWs (often by working with untrained community members) to disseminate information for increasing demand for immunizations, to bring immunizations closer to the community, and to identify those who need immunizations were the most effective strategies for expanding coverage.<sup>67</sup> Community maps identifying all households and registers identifying all newborns and their vaccination status are commonly used in these efforts.

More recently, the Global Polio Eradication Initiative has relied on CHWs to engage in social mobilization efforts in the hardest-to-reach areas in countries where poliovirus has been circulating. These CHWs have also been promoting utilization of routine immunization services as well as participation in special polio immunization campaigns. These techniques involve training CHWs to conduct house-to-house visits and inform people about polio immunization by visiting, engaging, and mobilizing families and caregivers as well as meeting with community leaders to overcome resistance. Recent published evidence suggests that CHWs make it possible to improve coverage in the challenging priority areas for polio eradication<sup>68</sup> and that interpersonal communication at the household level is a critical contributor to expanding coverage.<sup>69</sup>

A recent review of the evidence for the role of CHWs in increasing immunization coverage in rural India concludes that “[e]vidence supports the effectiveness of CHW interventions and further suggests that they may have a greater impact when compared to other strategies for expanding immunization coverage.”<sup>63</sup> However, the authors noted that research is limited in terms of quality and quantity. A broader systematic review of the evidence regarding the effectiveness of CHWs in increasing immunization coverage found only 12 high-quality studies, only five of which were from low- and middle-income countries.<sup>70</sup> Again, the conclusion that the results using CHWs are promising and potentially important for helping to achieve the MDGs for children is tempered with a call for further high-quality studies. Not surprisingly, a review of the cost-effectiveness of vaccination programs incorporating CHWs found insufficient data to allow conclusions to be drawn.<sup>71</sup>

### **Community Case Management of Serious Childhood Illness**

Numerous studies over the years have demonstrated that in research studies and in NGO programs, CHWs can be trained to effectively diagnose and treat serious childhood illness,

most notably pneumonia, diarrhea and malaria. These three conditions current are the cause of 41% of under-five deaths at present.<sup>61</sup>

### Pneumonia

Globally, pneumonia is the leading cause of under-five mortality, responsible for 18% of deaths.<sup>61</sup> An analysis of the combined results of seven published studies from Bangladesh, India, Nepal, Pakistan, the Philippines, and Tanzania demonstrated that the diagnosis and treatment of childhood pneumonia by CHWs can reduce the risk of death by 36% in children with this condition, and it can reduce the overall risk of death for all children living in geographic areas where the program exists by 24%.<sup>72</sup> The results varied from study to study, and not all studies showed a statistically significant decline in mortality. However, in terms of total mortality reduction among under-fives, the reduction in mortality ranged from 5% to 42%. A more recent review of available studies of community case management for pneumonia published in 2010 has concluded that the reduction in mortality from pneumonia could be as high as 70%.<sup>73</sup> In one of the original studies, the cost per pneumonia death prevented was \$2.64.<sup>74</sup>

It has been well-documented that CHWs can effectively diagnose and treat with oral antibiotics uncomplicated cases of childhood pneumonia (that is, those with rapid breathing and no signs of lower chest in-drawing, able to drink, no convulsions, not lethargic, and no persistent vomiting). Until recently, the recommendation had been that those children with signs of severe pneumonia (that is, those with lower chest in-drawing) or very severe pneumonia (with inability to drink, convulsions, lethargy, or persistent vomiting) should not be treated by CHWs but rather referred to a facility for management there. However, one recent randomized trial reported that the outcome of children with severe pneumonia who were treated in the community by CHWs was just as good as that for children who were referred for treatment in facilities, 70% of whom actually obtained care there.<sup>75</sup> In other studies, the percentage of parents who take their child to a facility for more severe cases of childhood pneumonia is often very low; in one recent study from urban Pakistan it was 24%.<sup>76</sup>

Nepal has been a global leader in the implementation of community case management for pneumonia by its lowest-level cadre of CHWs, referred to as Female Community Health Volunteers (FCHVs). Over a 14-year period, this intervention was scaled up to 42 of 75 of Nepal's districts, containing 69% of the country's under-five population. In these districts, an estimated 56% of the expected number of pneumonia cases were receiving treatment, and most of the cases (57%) were diagnosed and treated by FCHVs. Supervision of the FCHVs and monitoring of quality of care has been maintained by district and international partner staff. The intervention has been estimated to save 6,000 lives per year in Nepal and is expected to save 10,200 lives per year when national scale up has been completed.<sup>77</sup>

The quality and acceptability of CHWs in providing community case management of childhood pneumonia in urban areas of Africa has been assessed and found to be similarly positive as for rural areas of Africa, though the proportion of cases treated in urban areas is less.<sup>78</sup>

Only one-quarter of children in the 68 highest mortality countries (where 97% of child deaths occur) currently receive antibiotics when they have symptoms suggestive of pneumonia.<sup>79</sup> The potential of CHWs to expand coverage for this critical intervention is enormous, and it represents one of the priorities for accelerating progress in reducing under-five mortality. On the basis of the current evidence, WHO and UNICEF recommended in 2004 that countries can reduce pneumonia-related mortality by training and supporting CHWs to diagnose and treat childhood pneumonia.<sup>80</sup> Progress in expanding the coverage of intervention with CHWs has, however, been tragically slow.

### Diarrhea

Diarrhea is the second leading cause of under-five mortality globally, currently accounting for 15% of under-five deaths.<sup>61</sup> The introduction of oral rehydration therapy (ORT) in the 1960s to treat dehydration from diarrhea using packs of oral rehydration salts (ORS) or a simple home-made solution of sugar, salt and water or other recommended fluid is now estimated to save millions of lives each year and is used by mothers throughout the world without the assistance of CHWs. A recent review of the available evidence concludes that ORS may reduce diarrhea mortality by up to 93%.<sup>81</sup> However, in developing countries only 32% of children younger than 5 years of age receive ORS packets or pre-packaged ORS fluids when they have diarrhea, and this percentage has shown no progress during the previous decade.<sup>82</sup>

Preventive strategies such as promotion of a clean home environment, access to safe water and adequate sanitation, good hygiene (most notably hand washing), exclusive breastfeeding during the first six months of life, and good nutrition are all important for reducing the incidence of childhood diarrhea and diarrhea deaths. CHWs can assist in the promotion of these activities.<sup>83</sup>

What is the evidence that CHWs have contributed to the decline in mortality from diarrhea? This literature on the effectiveness of interventions to prevent and treat childhood diarrhea is vast, but limited attention has been given to the specific contribution of CHWs in diarrhea prevention and treatment. In the above section on nutrition, we have highlighted the contribution of CHWs to nutrition programs and specific nutrition interventions. We are not aware of any specific studies related to the contribution of CHWs to expanding access to clean water and sanitation, although they are often important contributors to programs that promote improved water and sanitation.

Several important studies highlight the importance of home visitation by CHWs to promote hand washing and its impact on both childhood diarrhea and pneumonia. Current estimates are that hand washing, if practiced at the proper times and with soap or ash, could

reduce the deaths of 1 million children.<sup>84</sup> A randomized controlled trial in which CHWs made routine weekly visits to all households to promote hand washing in an urban slum population in Karachi, Pakistan led to a 53% reduction in the incidence of childhood diarrhea and a 50% reduction in the incidence of childhood pneumonia.<sup>85, 86</sup>

One of the most notable programs using CHWs to reduce diarrhea mortality was carried out in Bangladesh between 1980 and 1990, when the NGO BRAC, working in collaboration with the Government of Bangladesh, trained 1,200 CHWs (called Oral Rehydration Extension Program Workers, to visit 12.5 million households nationwide once to train one woman in the household how to prevent diarrhea and how to prepare and administer home-based ORS with available sugar, salt and water.<sup>83</sup> At its completion in 1990, 90% of mothers in the 12.5 million households reached by the program knew how to prepare ORS.<sup>83</sup> The use of ORS for treating diarrhea in Bangladesh increased nationally from 1% of all cases in the 1980s to 40% in 1993<sup>87</sup> and currently Bangladesh has the highest usage rate in the world, with a reported 81% of children with diarrhea given ORS in 2011.<sup>88</sup> Through this program along with numerous other community-based efforts to raise awareness about prevention and treatment of diarrhea in Bangladesh, ORS use has become part of the culture of the country.<sup>89</sup>

The addition of oral zinc for 10-14 days is now recommended by WHO and UNICEF to be part of the standard treatment of childhood diarrhea.<sup>90</sup> Zinc decreases the proportion of diarrheal episodes which last beyond 7 days, the risk of hospitalization, all-cause mortality, and diarrhea mortality; diarrhea mortality is estimated to decrease by 23%.<sup>91</sup> We are not aware of any studies so far specifically documenting the effectiveness of CHWs in treating diarrhea according to these new guidelines or in promoting appropriate treatment by mothers. However in all the community-based efficacy studies that have been carried out, CHWs were used to implement the intervention.

## **Malaria**

The effectiveness of the distribution and utilization of insecticide-treated bed nets in endemic areas in reducing under-five mortality has been well-established.<sup>92</sup> In some settings, CHWs provide an important role in bed net distribution and promotion of their appropriate use. However, these programs can also be managed by health staff at facilities. We are not aware of any studies comparing the effectiveness of these two approaches.

Community case management of malaria by CHWs can reduce overall and malaria-specific under-five mortality by 40% and 60%, respectively, and severe malaria morbidity by 53%.<sup>93, 94</sup> However, there are published reports which have shown no impact on mortality.<sup>95</sup> Recent studies indicate that in Zambia and Madagascar CHWs can comply with treatment guidelines and safely treat children with suspected malaria with good clinical outcomes.<sup>96, 97</sup> CHWs in Senegal were taught to diagnose and treat childhood malaria and to administer intermittent preventive therapy to all children (IPTc) younger than 10 years of age during the malaria transmission season. The addition of IPTc reduced the number malaria episodes and

the level of parasitemia among children receiving both interventions.<sup>98</sup> A study of the costs of CHW delivery of IPTc compared to provision of services at Expanded Program on Immunization (EPI) outreach clinics by facility-based health workers demonstrated that the CHW delivery strategy was only slightly less costly than provision of services at EPI outreach sites because of the resources required to support supervisors to travel to remote rural areas, and the coverage of services was only slightly higher using the CHW strategy.<sup>99, 100</sup>

With the emergence of rapid diagnostic tests for malaria, studies have been conducted recently to assess the quality of diagnosis and treatment carried out by CHWs. One recent study from Madagascar, for instance, reported that CHWs were able to achieve clinical cures in 98% of childhood cases, compliance with medication treatment in 83% of patients, and no adverse effects.<sup>97</sup> Similar findings have been reported from Tanzania as well.<sup>101</sup>

### **Interventions to Reduce Neonatal Mortality**

Newborns deaths (those that occur during the first 28 days of life) account for 41% of all deaths among children under age five. The major causes of newborn mortality include pre-term birth complications, birth asphyxia and sepsis. In settings where most births take place in the home – because health facilities are not accessible or are not acceptable to the population – CHWs can provide critical services that save lives. CHWs can identify pregnant women and provide them with basic education during prenatal home visits; promote clean delivery; provide essential newborn care; manage birth asphyxia (if they attend the delivery); assist with hygienic care of the umbilical cord; diagnose and refer (or treat if referral is not possible) cases of newborn sepsis; and assist with healthy practices after birth, such as preventing hypothermia, preventing infection and promoting immediate breastfeeding. An analysis of combined results of eight studies of home-based newborn care provided by CHWs indicates that newborn mortality can be reduced by 24% using this approach.<sup>102</sup> These studies were carried out in Bangladesh, India, Nepal and Pakistan. There was variation in mortality impact from study to study, ranging from reductions from 0% to 50%.

A systematic review and meta-analysis of studies of the effectiveness of community-based neonatal care provided by CHWs in India concluded that this approach is associated with a 26% reduction in the neonatal mortality rate in resource-limited settings with the greatest effect seen where the neonatal mortality rate is greater than 50 per 1,000 live births.<sup>103</sup>

A meta-analysis of the published literature concerning the effectiveness of strategies for incorporating training and support of traditional birth attendants (TBAs) on perinatal and maternal mortality demonstrated a 24-30% reduced risk of perinatal mortality and a 21-39% reduced risk in neonatal mortality.<sup>104</sup>

### **Participatory Women's Groups using a Participatory Learning and Action Cycle**

Evidence is growing that CHWs can work with groups of women to achieve health benefits for mothers and their newborns. There are two strategies for working with

participatory women's groups which have been documented to be effective. In both cases, CHWs travel from village to village to provide supervision and guidance to women's groups. In one strategy, the CHW meets with women in a village who are interested and who choose to come to a previously announced meeting, and these meetings occur on a monthly basis. They follow a strategy of building self-awareness in the participants as well as providing them with education about maternal and neonatal health through a participatory learning and action cycle. The second type of participatory women's group strategy, referred to as the Care Group model, will be discussed below under integrated strategies for reducing under-five mortality. Two randomized trials of this approach have been carried out showing statistically significant reductions in neonatal mortality, with a 30% reduction in Nepal<sup>105</sup> and a 32% reduction in India with.<sup>106</sup> However, a third trial did not show any benefit, and this finding was attributed to inadequate attention to contextual and programmatic factors.<sup>107</sup> A cost-effectiveness study was carried out of the intervention in Nepal and demonstrated that the incremental cost per life-year saved was \$211.<sup>108</sup>

## **Impact of Integrated Interventions Provided by CHWs on Under-Five Mortality**

### Child Health Days

Child Health Days (CHDs) are used in countries to deliver multiple maternal and child health interventions during focused periods of several days. The strategy is helpful in settings with large numbers of mothers and children not reached by routine services. CHWs are required to make these strategies work. In Somalia, for instance, a network of CHWs used for supplemental polio and measles immunizations was enlisted to deliver a package of services that included, in addition to polio, measles, and diphtheria-pertussis-tetanus vaccine, deworming tablets, vitamin A, oral rehydration salts, water treatment tablets (Aquatabs), and measurement of mid-upper-arm circumference to detect cases of severe malnutrition. Using the Lives Saved Tool (LiST), one study estimated that in two CHD rounds that reached more than 1 million children with these services at each round, approximately 10,000 deaths were averted and nearly 500,000 life years were saved at a cost of \$34 per life saved.<sup>109</sup>

### Multiple Interventions Provided by CHWs

Assessing the impact of CHW programs designed to deliver curative interventions against malaria, diarrhea, or pneumonia along with their other activities has received surprisingly little attention given the importance of the topic. Christopher et al. reviewed these and were able to identify only seven studies, but they demonstrated under-five mortality reductions of 63% to 87% relative to contemporaneous controls (in six studies) or in "after" versus "before" comparisons (one study).<sup>110</sup> All of these studies were from West Africa, and malaria-related interventions were prominent activities in most studies, although the CHWs generally performed a wide variety of different tasks including health education on nutrition,

hygiene and immunizations, and oral rehydration solution, and the dispensed anti-malarial medication and other unspecified medications.

One recent randomized trial assessed the effectiveness of CHWs in Zambia in treating all febrile children and those with signs of pneumonia and compared it to the effectiveness of treatment of children at facilities.<sup>96</sup> CHWs were able to effectively and appropriately treat children with fever using rapid diagnostic tests for malaria, and they were able to correctly assess and treat children with non-severe pneumonia.

### Participatory Women's Groups using the Care Group Model

In addition to the approach discussed above to work with women's groups using a participatory learning and action cycle, a second approach has emerged in which paid CHWs meet regularly with a group of volunteer CHWs who each take responsibility for delivering health education to 10 neighboring households. A group of 10 or so volunteers make up a Care Group, which meets every two to four weeks with a supervisor. These volunteers provide education and support. During each meeting, the Care Group Volunteers learn a new health education message to share with their neighbors, who they visit one-on-one in their homes or as a small group, how to discuss the message and how to implement it. A variety of different messages are disseminated over the course of several years by these peer-to-peer educators. One published study demonstrated a 42% decline in under-five mortality in rural Mozambique.<sup>111</sup> In another report using the Care Group model in rural Cambodia, Care Group Volunteers reported a 72% decline in mortality over a 5-year period.<sup>112</sup>

### Integrated, Comprehensive, Long-term Approaches Utilizing CHWs

While most of the published research on the effectiveness of CHWs in reducing under-five mortality has been focused on the impact of specific interventions such as those described above, there is some published evidence that projects and programs that include CHWs as an integral element of comprehensive programming have been successful in achieving an impact on under-five mortality. These are not randomized controlled trials, so the findings are not as conclusive, and the programs often have many components in addition to the CHW element. Nevertheless, in all cases, CHWs are integral component of the program, and in all cases the duration of the impact is considerably longer than has been possible to demonstrate for specific, vertical interventions.

The oldest of these integrated programs is the Matlab Maternal Child Health-Family Planning (MCH-FP) Project in Matlab, Bangladesh, operated since 1978 by icddr,b (formerly the International Centre for Diarrhoeal Research, Bangladesh). The program has used CHWs to deliver a basic package of MCH-FP services to a population of approximately 112,000 people with ongoing registration of vital events and a similar demographic surveillance process in an adjacent geographic area.<sup>113</sup> This package included immunizations, community case management of pneumonia and diarrhea, as well as family planning interventions. This



program also included facility-based care and hospital referral services as well. The differences in under-five mortality between the intervention and comparison areas varied over time, but in 1985, it was approximately 25% less and in 2005 it was 38% less.<sup>57, 58</sup> More recently, the differences have narrowed as overall under-five mortality has declined nationwide. Similar differences were observed for the total fertility rate. In 2007 a new Maternal, Neonatal and Child Health Project was established in Matlab that strengthened existing services and added some new ones facilitating a continuum of care model for pregnancy, intrapartum, and post-natal period by improving established links between CHW services and facility-based services. One early assessment of the impact of this experience has documented increased coverage of antenatal care, facility-based deliveries, and cesarean section rates, with a resultant significant improvement in perinatal mortality.<sup>114</sup>

The second of these is the Hospital Albert Schweitzer (HAS) in Haiti, which has offered community-based services provided by CHWs since 1967 for a population of 180,000 people within a program providing primary health care services at facilities and referral hospital services along with community development activities.<sup>115</sup> Compared with rural Haiti, which has similar socioeconomic and nutritional indicators, coverage levels of key child survival indicators were considerably higher in the HAS program area.<sup>116</sup> Under-five mortality rates were initially one-quarter those for Haiti but as the overall under-five mortality rates declined in Haiti, the HAS under-five mortality rates remained one-half those for the remainder of the country.<sup>117</sup>

The third of these integrated programs is the Jamkhed Comprehensive Rural Health Project, which has been operating in central India in Jamkhed, Maharashtra since 1970. The project provides a broad array of services similar to those at HAS for a population of 500,000 people.<sup>118</sup> The program documented a dramatic expansion in coverage of key child survival interventions and a similarly dramatic decline in infant mortality from 178 deaths per 1,000 live births in 1970 to 50 in 1980.<sup>118, 119</sup> A recent independent evaluation documented that during the period from 1992 to 2007, the 1-59-month mortality rate was 30% less than in a surrounding comparison area.<sup>120</sup>

The fourth of these integrated programs for which there are published evidence on long-term impact on under-five mortality is also in central India in Gadchiroli, Maharashtra. There, SEARCH (Society for Education, Action and Research) has directed a program for a population of 80,000 people since 1986.<sup>121</sup> Community-based services are provided by CHWs as part of a program of primary health care and hospital services. SEARCH was the site of pioneering research on the effectiveness of community case management of pneumonia and home-based neonatal care which provided the foundation for much of the subsequent research that has been cited above.<sup>74, 122</sup> In the intervention area of the SEARCH program (where innovative community-based interventions using CHWs were being tested), the infant mortality rate was 26.5 deaths per 1,000 live births while in the comparison area it was more than twice that.<sup>123</sup> The cost-effectiveness of the home-based neonatal care component has been reported



for the SEARCH program: the recurring cost per mother-newborn was \$6, and the cost per disability adjusted life year (DALY) averted was \$6, making it one of the one of the cost-effective interventions known.<sup>123</sup>

It should be noted that in all four of these programs, CHWs have a broad role that includes not only health promotion and education, but also diagnosis and treatment and referral for both maternal and child health services, including family planning.

### Modeling the Potential Impact of CHWs on Under-Five Mortality

Using a technique called the Lives Saved Tool (LiST)<sup>124</sup> and assuming that the mortality impact of interventions that CHWs can provide (based on the most recent scientific evidence) is maintained as interventions are scaled up, we have estimated that if CHW interventions are expanded to 100% coverage in the 73 highest-burden countries globally, 3.6 million under-five deaths could be averted each year— almost half (47%) of the under-five deaths occurring annually at present.

This number of lives saved was calculated separately for each of these 73 countries, and it was assumed that 100% coverage was achieved immediately. The LiST tool takes the baseline levels of mortality for a given country and the current coverage of key interventions and the computes lives saved based on expansion in coverage of these key interventions. Table 1 lists the interventions that are used in LiST calculations, and it also shows the ones that can be provided by CHWs and hence were used in the calculation we have reported here. Further details on the List tool and the assumptions underlying its use are available elsewhere.<sup>124, 125</sup>

<b>Intervention<sup>1</sup></b>	<b>Interventions that can be provided by CHWs</b>
<b><i>Periconceptual Interventions</i></b>	
Folic acid supplementation or fortification	Yes
Safe abortion services	No
Post-abortion case management	No
Ectopic pregnancy case management	No
<b><i>Antenatal Care</i></b>	
Antenatal care	yes
Syphilis detection and treatment	no
Calcium supplementation	yes
Multiple micronutrient supplementation	yes
Intermittent preventive treatment of malaria during pregnancy (IPTp)	yes

<sup>1</sup> This list of interventions was kindly provided by Ingrid Friberg, Assistant Scientist in the Department of International Health at the Johns Hopkins Bloomberg School of Public Health, one of the developers of the LiST tool.

<b>Table 1. Evidence-based Interventions for Reducing Under-Five Mortality Used for the Lives Saved Tool (LiST), with Identification of Those That Can Be Provided by CHWs</b>	
<b>Intervention<sup>1</sup></b>	<b>Interventions that can be provided by CHWs</b>
Tetanus toxoid immunization	yes
Promotion of favorable nutritional intake (balanced energy supplementation)	yes
Provision of magnesium sulfate for the management of pre-eclampsia	no
Diabetes screening and management	no
Case management of malaria in pregnancy	no
Screening for fetal growth restriction and appropriate management	no
<b>Child birth care</b>	
Delivery within a facility	no
Attendance at birth by a skilled attendant	yes
<b>Breastfeeding</b>	
Breastfeeding promotion	yes
<b>Preventive care after birth</b>	
Preventive postnatal care (healthy practices and illness detection)	yes
Complementary feeding education	yes
Complementary feeding, education and supplementation	yes
Use of improved water source within 30 minutes of home	yes
Use of water connection in the home	no
Improved excreta disposal (latrine/toilet)	yes
Hygienic disposal of children's stools	yes
Use of insecticide-treated materials (bed nets or curtains) or indoor residual spraying	yes
Vitamin A supplementation	yes
Zinc supplementation	yes
<b>Vaccinations</b>	
Diphtheria, pertussis and tetanus (DPT)	yes
Hemophilus influenza type b (Hib)	yes
Measles	yes
Pneumococcus	yes
Rotavirus	yes
<b>Curative care after birth</b>	
Maternal sepsis case management	no
Kangaroo mother care	yes
Oral antibiotics: case management of severe neonatal infection	yes
Injectable antibiotics: case management of severe neonatal infection	no
Full supportive care: case management of severe neonatal infection	yes
Oral rehydration therapy (for diarrhea)	yes
Antibiotics for dysentery	no
Zinc treatment of diarrhea	yes

<b>Table 1. Evidence-based Interventions for Reducing Under-Five Mortality Used for the Lives Saved Tool (LiST), with Identification of Those That Can Be Provided by CHWs</b>	
<b>Intervention<sup>1</sup></b>	<b>Interventions that can be provided by CHWs</b>
Case management of pneumonia (with oral antibiotics)	yes
Vitamin A for measles treatment	yes
Case management of malaria (with oral antibiotics)	yes
Therapeutic feeding (for children with severe acute malnutrition)	yes

### **C. Target 5A: Reduce by three-quarters the maternal mortality ratio**

There is much less evidence regarding the contribution of CHWs to reducing maternal mortality than there is for under-five mortality. Because of the slow progress in reducing maternal mortality and the lack of documented effectiveness of TBAs in reducing maternal mortality, most countries with high levels of maternal mortality are now promoting delivery at facilities and even prohibiting TBAs from conducting home deliveries. However, there is important evidence now emerging that CHWs can reduce maternal mortality in various ways. Perhaps the most important of these is through the provision of family planning services.

There is now a re-emergence of interest in and evidence to support the contribution of family planning in reducing maternal mortality. An estimated 215 million women who want to avoid pregnancy are not using an effective method of contraception and 40% of pregnancies that occur in developing countries are unintended in the sense that they are not wanted or planned. Furthermore, 82% of those women with unintended pregnancies had an unmet need for effective contraception.<sup>126</sup>

There is a long history and substantial evidence supporting the effectiveness of CHWs in providing family planning services. We will review this evidence in the Section D on reproductive health services.

#### **Training of Traditional Birth Attendants**

A recent meta-analysis of the published literature concerning the effectiveness of strategies for incorporating training and support of TBAs on perinatal and maternal mortality demonstrated no significant impact on maternal mortality.<sup>104</sup> An earlier meta-analysis was not able to come to a conclusion regarding the impact of training TBAs on maternal mortality because of incomplete reporting of outcomes.<sup>127</sup> However, one randomized trial using TBAs in rural Pakistan demonstrated a 26% reduction in maternal mortality and a 30% reduction in perinatal mortality.<sup>128</sup>

#### **Prevention of Post-Partum Hemorrhage**

Pilot studies have been conducted that assess the feasibility, safety, acceptability and coverage of uterotonic protection achieved by the distribution of misoprostol by CHWs during

the prenatal period.<sup>129, 130</sup> Misoprostol is an oral uterotonic medication taken by women at home following delivery to promote uterine contraction. These studies were conducted in isolated areas of Nepal and Afghanistan where childbirth often takes place at home. In both cases, high rates of coverage of uterotonic protection were achieved (73% and 92%), the intervention was safe, and patient satisfaction was high. In the Nepal study, there was a statistically significant decline in maternal mortality.<sup>129</sup> Based on these and other data, the utilization of misoprostol for home births is estimated to have the potential of 38-81% reduction in maternal mortality at a cost of \$6-170 per disability-adjusted life year (DALY) averted.<sup>131, 132</sup>

#### **D. Target 5B: Achieve universal access to reproductive health services**

Although reproductive health services involve much more than the provision of family planning services, we will review here only the effectiveness of CHWs in providing family planning services. There has been a long history of programs and documented effectiveness. Family planning is one of the four pillars of the Safe Motherhood Initiative to reduce maternal deaths in developing countries. A recent analysis has estimated that without the use of family planning there would be 1.8 times as many maternal deaths as there are at present and that satisfying the current unmet need for family planning would further reduce the current number of maternal deaths by 29%.<sup>133</sup>

CHWs were used initially in family planning programs for what were referred to as community-based distribution (CBD) programs. These began in Latin America in the 1960s, in Asia in the 1970s and 1980s, and in Africa during the 1980s and 1990s. These programs include various service delivery strategies including home visits and education of groups of women.<sup>134</sup> A review of the evidence regarding the advantages of using CHWs for CBD over the past three decades has recently been summarized.<sup>135</sup> CBD programs have increased utilization of family planning services and decreased costs for clients (and increased convenience) when compared to facility-based services, particularly in rural areas. Bangladesh is considered to have had one of the world's most successful family planning programs in a setting where there was not concurrent rapid economic development. This program's "backbone" was the community-based distribution of pills and condoms by Family Welfare Agents who visited the homes of women every two months throughout the country.<sup>30</sup> The cost-effectiveness of these programs becomes even greater as CBD programs are linked to other interventions such as immunizations.<sup>136</sup>

A recent review of the evidence of the effectiveness of CHWs in providing family planning services concluded that CHWs can safely provide birth control pills and condoms, emergency contraception, injectable contraception, the Standard Days Method, and the Lactational Amenorrhea Method. They can also effectively refer patients for long-acting and permanent forms of family planning.<sup>137</sup> The authors conclude that "When appropriately designed and implemented, community-based FP services can increase use of contraception,

particularly where unmet need is high, access is low, and geographic or social barriers to use of services exist.” Their conclusions related to injectable contraceptives are based on a recent review of evidence from 16 projects in nine countries where experts found that CHWs can provide these services safely and effectively in a manner that is acceptable to clients and at a level of quality that is equivalent to that obtained in clinics.<sup>137, 138</sup>

Although Africa has numerous CBD programs in which CHWs distribute pills and condoms, the provision of injectable contraception by CHWs is very limited even though this is the most preferred source of contraception in Africa because of their effectiveness, simple administration (one injection every three months) and the discretion with which it can be applied.<sup>139</sup> One recent study from rural Uganda demonstrated that injectable contraceptives can be provided by CHWs as safely and effectively as services provided in clinics – the first such evidence from Africa.<sup>139</sup> A more recent study from Ethiopia demonstrated that CHWs can provide injectable contraceptives as safely and acceptably as similar services provided in health posts and that discontinuation rates were lower for clients served by CHWs.<sup>140</sup>

A recent review has been conducted concerning the provision of injectable depot-medroxyprogesterone acetate (DMPA) by CHWs. The conclusion of the review of 19 studies is that appropriately trained CHWs can competently screen clients, provide DMPA injections safely, and provide counseling on side effects (although the quality of this is often suboptimal).<sup>141</sup> The review also found that both clients and CHWs were satisfied with the program, and that the CHW programs expanded access to underserved clients.<sup>141</sup> One recent study from Uganda, for instance, found that women preferred CHWs as providers of DMPA injections to clinic-based providers.<sup>142</sup>

There are many countries where CHWs have been used successfully to provide family planning services and increase the percentage of couples using a modern family planning method. A review published in 1991 cited a number of examples of programs from around the world in which CHWs employing CBD were able to increase the contraceptive prevalence rate (CPR), which is formally defined as the percentage of women of reproductive age using a method of modern contraception. Generally, the CPR rose by 15-30 percentage points from very low levels (often 5-10%).<sup>143</sup> Studies of CBD programs in the 1970s and 1980s indicated that costs were often greater than those of more traditional facility-based programs because the scale of outreach efforts required new support systems, new levels of supervision, and extended logistics chains. But, of course, the number of clients being served also increased greatly.<sup>144</sup>

One recent striking example is from Afghanistan, which has had one of the world’s highest rates of fertility. By utilizing CHWs that were trained to provide a broad array of MCH and primary care services, and by working with community leaders, CHWs were able to increase the contraceptive prevalence rate (CPR) by 24-27% in eight months in 13 provinces. The use of injectable contraceptives showed the greatest increase.<sup>145</sup>

A 1999 review of CBD family planning programs in Africa provides an important discussion of why some of the early programs failed.<sup>134</sup> Discussions of CHW program failures are rarely documented in the literature, unfortunately, even though learning from this is critical for the future success of CHW programs. The authors cited the following factors as responsible:

- Failure to give adequate attention to sound management and quality assurance, especially as programs scale up
- Failure to test and develop pilot approaches and scaling up without making adjustment to large-scale operations
- Failure to use strategies that are guided by community opinion
- Failure to build political and administrative/bureaucratic support for the program
- Premature focus on sustainability and cost recovery

Of course, the benefits of family planning extend far beyond “simply” reducing the risk of maternal mortality to virtually all of the other MDGs since birth space leads to lower under-five mortality, it reduces HIV transmission by reducing the number of HIV-infected infants (because of fewer pregnancies among HIV-infected women), and it improves nutrition and women’s empowerment and education of women because of the greater control they have over their lives. And, of course, it reduces environment degradation by slowing population growth.<sup>146, 147</sup>

#### **E. Target 6A: Have halted by 2015 and begun to reverse the spread of HIV/AIDS**

In 2010, there were 2.7 million new HIV infections, 34 million people living with HIV infection, and 1.8 million AIDS-related deaths. Only one-half of those in need of treatment (and one-quarter of children and adolescents in need of treatment) were receiving it.<sup>148</sup> Only 35% of pregnant women in low- and middle-income countries received an HIV test in 2010, and only 50% of pregnant women in need of treatment to prevent infection of their infant received it in 2010.<sup>148</sup>

Health system human resources in the developing world have been stretched, particularly in countries with a high prevalence of HIV/AIDS. CHWs have been employed in many settings to address these human resource demands and have been instrumental in dramatic increases in the available human resources for health in Malawi and Ethiopia.<sup>149</sup> For example, over 30,000 community workers have been mobilized in Ethiopia to provide a range of preventive and curative services, as described below.

CHWs have been integral in the fight against HIV/AIDS as a “cornerstone to the HIV response by international organizations and funding agencies” [353].<sup>4</sup> Initially, CHW home-based care programs were used to support primary care givers of people living with HIV/AIDS

(PLWHA) to facilitate dignified deaths, to educate community members and to provide counseling and general assistance, among other tasks. CHW services have now evolved into more comprehensive care.<sup>150</sup> The World Health Organization has identified 313 tasks which are essential for the prevention of HIV transmission, identification of HIV-positive individuals, provision of basic HIV clinical management, and initiation and maintenance of patients on antiretroviral therapy (ART). The WHO recommends that 115 of these tasks can be performed by CHWs, highlighting the immense potential of CHWs in HIV services.<sup>151</sup> Even so, there is a dearth of studies assessing the effectiveness of CHWs in HIV/AIDS programs.

CHWs fill diverse roles in HIV prevention and care, including provision of home-based, palliative care, voluntary HIV counseling and testing services, treatment preparation and support services, community mobilization<sup>152</sup> and HIV prevention/ health promotion. In South Africa, these prevention services include condom provision and promotion, community-based HIV education and mobilization for HIV testing and treatment.<sup>153</sup> CHWs are particularly important in mobilizing pregnant women to undergo HIV testing, adhere to treatment and practice exclusive breastfeeding in order to prevent perinatal infections. Despite the broad range of CHWs' HIV-prevention-related services, there is little direct evidence of their impact on MDG Target 6A. We were not able to locate any studies that directly assessed this.

#### **F. Target 6B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it**

There is a heightened need for human resources following the availability of ART services.<sup>152, 154, 155</sup> A modeling exercise of the human resources for health required for the provision of universal access to ART by 2017 found that the current number of human resources for health in sub-Saharan Africa must be doubled every year for the next 10 years in order to achieve universal coverage by 2017.<sup>154</sup> In many countries, lack of human resources for health is the central barrier to attaining universal coverage of and access to HIV services.<sup>154, 155</sup> CHWs have been identified as a key resource for increasing health system access.<sup>34</sup> CHWs fill critical gaps in ART services by enhancing universal access to HIV counseling and testing. Provision of home-base care in communities by CHWs is also a mechanism for reducing stigma and facilitating access to care for individuals living with HIV.<sup>150</sup> Once patients test positive, CHWs can be used to assist in preparing patients for beginning treatment by carrying out home visits and educating them about the treatment process and about HIV. When the treatment process is underway, they can assist with adherence to treatment, including directly observing daily medication compliance or facilitating someone else to do this, including counting pills, and referring patients in need of additional care. And, of course the further away patients are from treatment facilities, the more essential these functions become.

These CHWs are often peers who have tested HIV-positive, and they are able to function quite effectively. HIV-positive CHWs have been found to provide better care than those who



are not HIV-positive.<sup>156</sup> One study in South Africa found that home-based care for persons living with HIV/AIDS by CHWs facilitated HIV-positive status acceptance and disclosure.<sup>157</sup> CHWs have also been employed to provide directly observed therapy with anti-retroviral therapy (ART) to enhance patient adherence. Studies in Haiti and inner-city Boston found that CHWs effectively monitored treatment, provided psychosocial support, and were associated with reduced stigma and improved ART adherence.<sup>158, 159</sup> Additionally, access to community support in the form of CHWs, treatment buddies and/or HIV/AIDS support groups, was the strongest predictor of treatment success in the public sector ART program in one South African province<sup>155</sup> and home-based care by CHWs in Uganda was associated with enhanced sense of community and social support.<sup>160</sup> Despite the centrality of CHW services in many ART programs, there is some evidence that they do not appropriately allocate their time and visit stable patients too frequently.<sup>156</sup> Other programs and interventions have found that home-based ART effectiveness compares favorably with formal health services.<sup>150</sup> CHWs are clearly essential in accelerating progress towards achieving universal access to treatment for HIV/AIDS.

## **G. Target 6C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases**

### **Malaria**

There were an estimated 216 million cases of malaria in 2010 and 655,000 deaths, mostly among African children.<sup>161</sup> CHWs provide a range of malaria-related services including community education on malaria prevention and diagnosis, distribution of insecticide-treated bed nets and provision of home-based management and preventive treatment of malaria. For example, the presence of CHWs was associated with a 6% reduction in malaria in rural Uganda, among other positive outcomes.<sup>162</sup> Their effectiveness in reducing child mortality was described above.

There was initial concern that CHWs might not be able to effectively use RDTs, but numerous studies have demonstrated that they can accurately read the test results and provide appropriate follow-up.<sup>163, 164</sup> CHW use of RDT is, however, less cost-effective in settings with very high prevalence of malaria, as was found in a study in the Democratic Republic of Congo where 93% of tests were positive.<sup>165</sup> CHWs effectiveness in reading test results can be further enhanced through provision of pictorial instructions and through a brief training on malaria RDTs. One study in Zambia found that CHWs given the pictorial instructions and training interpreted 93% of tests correctly. These CHW were far more effective than peers who only saw the manufacturer's test instructions,<sup>166</sup> highlighting the need for appropriate CHW training and materials. CHW treatment for malaria is also acceptable to community members and was preferred by respondents in Nigeria to self-treatment or treatment in clinics.<sup>167</sup> These studies have documented CHWs' relative effectiveness and cost-effectiveness in the provision of



artemisinin-based combination therapy for the treatment of uncomplicated malaria, relative to clinic-based services.<sup>163, 164</sup>

CHWs are also highly effective and cost-effective in the provision of intermittent preventive treatment of malaria in children<sup>100</sup> and pregnant women.<sup>168</sup> A systematic review of the evidence on CHWs' delivery of curative interventions for malaria, pneumonia and diarrhea in sub-Saharan Africa identified seven studies that determined the impact of CHW services on morbidity and mortality from these diseases. Overall, significant reductions in child morbidity and mortality were identified following CHW distribution of anti-malarial chemoprophylaxis.<sup>110</sup> These services can be cost-effective. One study of intermittent preventive treatment of malaria in children in Ghana found that the cost per delivery of at least one dose of treatment was lowest when delivered by village health workers and that these workers attained higher coverage than nurses.<sup>100</sup>

## **Tuberculosis**

Tuberculosis (TB) is second only to HIV as the leading cause of death globally from a single infectious agent. In 2010, 8.8 million people developed clinical illness from TB and 1.4 million died. Patients with HIV infection are at a greatly increased risk of developing TB, and 25% of deaths among people with HIV are from TB.<sup>169</sup> Reducing transmission requires early case detection since patients with active disease can infect as many as 10-15 other people over the course of a year. It also requires ensuring that patients complete their entire course of therapy so that a cure is achieved and patients do not develop drug-resistant TB.

CHWs have played a central role in TB programs throughout the world, particularly in community-based Directly Observed Therapy, Short-Course (DOTS). CHWs have been employed to visit homes to detect symptomatic patients and facilitate sputum testing, to visit patients in their homes to ensure treatment compliance,<sup>170</sup> and to assist in the treatment of patients in health clinics by, for instance, directly observing patients taking their medications.

Involvement of CHWs and other community members to facilitate DOTS can substantially increase treatment completion rates and reduce patient and societal costs, relative to facility-based services. CHWs have also been effectively employed in case-finding and stigma reduction activities in the community.<sup>149</sup> One study of the use of CHWs by the NGO BRAC in Bangladesh found that 90% of the community members identified as having TB by CHWs accepted twelve months of TB treatment and the overall cure rate was greater than 85%. The intervention communities had significantly lower prevalence of TB than communities without the CHW intervention.<sup>171</sup> Improved case-finding and treatment completion reduces the transmission of TB and slows the development of drug-resistant TB, facilitating progress towards MDG 6C.

Numerous studies have demonstrated that community-based care for TB is more cost-effective than other forms of care<sup>172</sup>. For example, DOTS with CHWs is more cost-effective in

improving the treatment success than health facility-based DOTS. Wandwalo and colleagues compared costs and cost-effectiveness of CHW-facilitated, community-based DOTS with health facility-based DOTS in an urban district of Dar es Salaam, Tanzania. They found similar treatment outcomes between the two approaches, but the health program cost of community-based DOTS was 35% less than the cost of facility-based DOTS, and the costs for patients and their families (for transport, and so forth) was much less still. Overall, community-based DOTS was more cost-effective per patient successfully treated than health facility-based services.<sup>170</sup>

There have been multiple studies with similar findings on equal effectiveness and increased cost-effectiveness of CHW services as compared to standard government services. The cost per a patient cured was \$34 less with BRAC than with government services (\$64, as compared to \$96).<sup>173</sup> Additionally, a study of TB treatment provided by Ethiopian Health Extension Workers found their services were significantly more effective and cost-effective than standard facility-based services.<sup>174</sup> Despite these notable successes related to CHW involvement in TB programs, there is some evidence that they may be comparable to DOTS provided by other community-based providers such as those offered by family members.<sup>175</sup> This is indicative of the value of community-based care, as compared to facility-based TB services.

## **H. CHW approaches and interventions that have effectiveness in achieving combinations of MDG goals**

### Integrated Approaches

In an approach called Community-directed interventions (CDI), communities are given important responsibilities for the planning and delivery of medications for certain diseases.<sup>176</sup> CDI was first adopted by the African Program for Onchocerciasis Control (APOC) in the mid-1990s to help ensure and sustain the provision of ivermectin treatment of over 75 million Africans in many remote and isolated locations. APOC works with communities to take ownership of the distribution process, defining who, when and where the intervention will be implemented. The community also decides how the implementation will be monitored, and what financial incentives or other support will be provided to the implementers. The community then selects the implementers, trained by APOC, and directs the implementation process.<sup>176</sup>

In recognition of the success of this approach, the Special Program for Research and Training in Tropical Diseases undertook a study to assess the potential of the CDI strategy for other diseases. Over a three-year period, the effectiveness of an expanded CDI strategy was tested in 35 health districts in Cameroon, Nigeria and Uganda with a total population of 2.3 million people. In the study area, in addition to the provision of ivermectin, communities became engaged in vitamin A supplementation, distribution of insecticide-treated bed nets, home management of malaria, and short-course directly-observed treatment of TB patients

through the CDI strategy. Compared to randomly selected control districts, higher intervention coverage was achieved for all interventions except the TB intervention.

The evaluation revealed that community participatory processes were important, communities and that community implementers (CHWs) were deeply committed to the CDI process. It also found that CHWs were more motivated by intangible incentives than external financial incentives. Based on the findings of this study, APOC has recommended that CDI approached be adopted for integrated, community-level delivery of appropriate health interventions in the 16 African countries with experience in community-directed treatment for onchocerciasis control. By engaging communities and empowering communities, the CDI program has prompted an eagerness on the part of communities to participate in the provision of multiple interventions, leading to cost savings for the health system as well as increased health system impact.<sup>177</sup> Community selection of CHWs led to improved performance in terms of coverage of interventions in Cameroon and Uganda.<sup>178</sup> Extension of the program to include community-directed interventions for ITN distribution and use as well as intermittent preventive treatment of malaria in pregnancy led to expansion of coverage of these interventions.<sup>179</sup>

This experience indicates that communities can become strong and active partners in CHW programs. Communities can select, motivate and supervise CHWs when linkage is provided to health programs than can establish the process, work with communities to define their roles and responsibilities, provide training for CHW, and ensure that they receive the commodities and supplies that they need to carry out their work.

## **VI. National Examples of CHW Contributions to Progress in Achieving MDG Goals**

Among the various countries with national CHW programs, there are three in particular that have made remarkable progress in achieving the MDGs for health and in which the contributions of CHWs have been well-documented. These are Brazil, Bangladesh, and Nepal. All three are on track to achieve the MDGs for mothers and children. Table 2 highlights their progress toward the health-related MDG goals.

<b>Country</b>	<b>Brazil<sup>180</sup></b>	<b>Bangladesh<sup>181</sup></b>	<b>Nepal<sup>182</sup></b>
Baseline MDG 1C- Under-five moderately or severely underweight	4.5% (1996)	61.5% (1990)	42.6% (1995)
Recent MDG 1C- Under-five moderately or severely underweight	2.2% (2007)	41.3% (2007)	38.8% (2006)
Baseline MDG 4A- Under-five mortality rate	59 (1990)	143 (1990)	141 (1990)
Recent MDG 4A- Under-five mortality rate	19 (2010)	48 (2010)	50 (2010)
Baseline 5A – Maternal mortality ratio	120 (1990)	800 (1990)	770 (1990)
Recent 5A- Maternal mortality ratio	56 (2010)	240 (2010)	170 (2010)
Baseline 5B- Births attended by skilled health professional	69.5% (1991)	9.5% (1993)	7.4% (1991)
Recent 5B- Births attended by skilled health professional	97% (2006)	26.5% (2010)	36 (2011)
Baseline 6A- % HIV incidence rate, 15-49 years old, (lower, upper bounds)	0.0, 0.1 (1990)	0.0, * (1990)	0.1, 0.1 (1990)
Recent 6A- % HIV incidence rate, 15-49 years old, (lower, upper bounds)	0.0, 0.1 (2009)	(0.0, 0.0 (2010)	0.0, 0.1 (2009)
Baseline 6B % with advanced HIV with access to ART	*	*	0 (2004)
Recent 6B % with advanced HIV with access to ART	70.0% (2010)	*	18.0% (2010)
Baseline 6C- TB detection rate under DOTS	60% (1990)	21% (1990)	33% (1990)
Recent 6C- TB detection rate under DOTS	88% (2010)	46% (2010)	72% (2010)
Use of CHWs as central feature to health system	Yes	Yes	Yes
On track for achieving MDGs for maternal and child health <sup>183</sup>	Yes	Yes	Yes

\*Data not available.

## **A. Brazil**

Brazil is one of the world's leading example in the use of community health workers and in achieving the MDGs. Brazil now has 222,280 CHWs called (Community Health Agents, or CHAs) who regularly visit on average 150 families per month and the program reaches 110 million people.<sup>184</sup> CHWs have been expanded over the past three decades and work as members of health teams providing services for populations of about 1,000 families within a defined geographic area. These workers have played a gradually increasing role within the Programa Saúde da Família since the 1970s, when they were working in the most impoverished and isolated areas of Brazils. In 1994 Brazil implemented a pilot project that used 300 health care teams. Following this initial success, the program expanded to a national program with 26,500 active health service teams<sup>185</sup> and by 2004 more than 80% of municipalities had health care teams operating in their area.<sup>186</sup> These teams are comprised of at least one family doctor,

one nurse, one assistant nurse and six CHAs, and each team provides comprehensive care for about 1,000 families within a defined geographic area.<sup>185</sup> All the team members are salaried, full-time employees, and the CHAs must be literate and residing in the local community.

Health care teams provide a range of promotive, preventive, recuperative, and rehabilitative care. Key services include the promotion of breastfeeding, the provision of prenatal, neonatal and child, the provision of immunizations, and the clinical management of infectious diseases (including screening for and providing treatment for HIV/AIDs and TB.<sup>175,186</sup>

The Brazilian health program, supported by CHAs, has been associated with significant improvements in health outcomes in Brazil. Brazil has one of the most rapidly declining under-five mortality rates in the world (and in fact it achieved its MDG goal for child mortality in 2010, five years ahead of the targeted date), only 2% of children are underweight, immunization coverage is 99%, 91% of women obtain four or more prenatal visits, 93% of the demand for family planning has been met, 90% of eligible women receive treatment to prevent mother-to-child transmission of HIV, the estimated percentage of cases of TB being detected is now 88%, improved drinking water coverage and improved sanitation coverage are 98% and 96% respectively, and 95% of AIDS patients in need of medication are receiving it.<sup>187, 188</sup> Exposure to the PSF program is significantly associated with a reduction in mortality across different age groups in Brazil.<sup>185</sup> Other countries, including South Africa, are now establishing CHW programs based on the Brazil model.

## **B. Bangladesh**

CHWs are critical to health service delivery in Bangladesh where the vast majority of the population resides in rural areas.<sup>189</sup> Bangladesh started a community-based family planning program with an initial cadre of Family Welfare Assistants in the mid-1970s. The program expanded in the mid-1980s and was complemented by NGO CHWs working in family planning. By 1997 Bangladesh had 30,000 female CHWs providing home-based family planning services.<sup>30</sup> This program became what has been widely regarded as one of the world's most successful family planning programs in a developing country.

Bangladesh has one of the most vibrant NGO sectors in the world, many of whom operate CHW programs. In the mid-1980s, BRAC was a national Bangladeshi NGO and it initiated a CHW program composed of women who were members of a BRAC micro-credit savings group. Each group had women who obtained special training in an area of personal interest including various types of income-generating activities or health. The CHWs were called *Shashtya Shebikas*. Now, BRAC has become the largest NGO in the world working across Asia and Africa. It has 80,000 CHWs in Bangladesh along who serve 100 million people with comprehensive services, including community-based maternal and child health and family planning services and collection of sputum specimens among persons with symptoms of TB and observation of daily treatment, among other activities.<sup>23, 30</sup> These workers provide a range of services and have less educational requirements than some of the other forms of CHWs

operating within Bangladesh.<sup>190</sup> In addition, the government has a strong cadre of approximately 50,000 CHWs who provide family planning services, immunizations, and other basic health care.<sup>30</sup> Bangladesh policy allows for a large number of services to be provided by CHWs. These include preventive services (such as immunization, vitamin A distribution, birth planning, and counseling) and curative services such as management of childhood pneumonia and neonatal sepsis.<sup>190</sup>

Bangladesh has made impressive progress in reducing child and maternal mortality since the 1980s and the country is on track to meet both MDG 4 and 5.<sup>183</sup> Bangladesh also reached its target for child mortality five years ahead of schedule although its levels of coverage of key services are still not as impressive as Brazil's, but of course Bangladesh is a much poorer country.<sup>187</sup> There was a 60% reduction in under-five mortality between 1989 and 2011. Its case detection rate for TB has doubled since 1993.<sup>191</sup> CHWs are widely seen as one of the major components of Bangladesh's remarkable progress in maternal and child health, fertility reduction, and control of TB. HIV and malaria are not major contributors to disease burden there.

### C. Nepal

Nepal is one of the least likely countries to be a leader in improving the health conditions of its people, given its mountainous terrain, the remote location of much its population, and the history of political instability in the past two decades. Its Female Community Health Volunteer (FCHV) Initiative began in 1988 as an outgrowth of community volunteer programs that began in Nepal stimulated by the 1978 Alma-Ata International Conference on Primary Health Care, where community participation community-level workers were seen as essential elements in reaching Health for All.<sup>12</sup>

Although the program became nearly moribund in the early 1990s, the National Vitamin A Program began to rely on them soon thereafter, leading to a transformation of the entire FCHV Initiative by finding ways to honor their service in the absence of formal remuneration, such as by giving them preference in participation in government programs and services.<sup>31</sup> Today there are 48,500 FCHVs throughout the country who detect and treat common childhood diseases such as diarrhea, acute respiratory infection and malnutrition, distribute oral contraceptives, and promote utilization of available health services for first aid, antenatal care, family planning, and immunizations.<sup>31, 192, 193</sup> The goal is to have one FCHV for every 400 people in the flat lowland (Terai) districts, 1 for every 250 people in the Hill districts, and one for every 150 people in the Mountain districts.<sup>194</sup>

The FCHV Initiative followed the creation of a district public health office that integrated all vertical programs at that level, thereby enabling district level workers to have an integrated function, whereas previously that had been assigned to vertical programs. These are unpaid community volunteers (mostly illiterate) who receive several weeks of training and then spend about 6 hours per week performing health promotion as well as some curative services. They

are supported by staff working at peripheral health facilities.<sup>195</sup> The FCHV provided an interface between clients and the health system that became more personal and frequent.<sup>194</sup>

An innovative system was developed for locally managed endowments of \$1,000 in local currency to support FHCVs and their work. They are used for small expenses such as tea and for other benefits. The interest generated by these funds is under the control of an Executive Committee at the local level that is comprised largely of FCHVs.<sup>31, 194</sup>

Through this new district-level structure, Nepal achieved by 1990 marked increases in immunization coverage, quite an achievement for a country with so many difficult-to-reach areas. This required solving many technical problems as well, such as cold chain management. Since the late 1990s, childhood and maternal immunization coverage levels have been maintained at around 80%.<sup>196</sup>

Now, with only 18 days of training, they provide family planning, diagnose and treat child illnesses (including childhood pneumonia), distribute misoprostol to pregnant women who plan to deliver at home, and provide home-based neonatal care.<sup>197</sup> They work on average eight hours per week and most are eager to take on more work.<sup>197</sup>

No other low-income country in the world with an under-five mortality rate greater than 100 in 1990 has made more rapid progress in reducing its child mortality, averaging a 5.5% annual decline since 1990.<sup>33</sup> CHWs are widely seen as have been essential for this success. One recent review<sup>194</sup> attributed Nepal's success with CHWs to a number of factors, including the following:

- Programs with simple and focused guidelines for the community and CHWs;
- Programs that focused on participatory training and improving quality of care at the community level;
- The recognition at the community level of CHW program success (it became obvious to FCHVs and communities that deaths from childhood pneumonia were becoming less frequent);
- Strong national leadership;
- Strong programs of logistics management and information systems, and delivery of resources outside of main government channels; and
- Effective donor coordination.

## **VII. Evidence Regarding the Effectiveness of Scaling Up Community Health Worker Programs**

Brazil, Bangladesh and Nepal all are success stories for scaling up CHW programs. These programs were scaled up gradually and deliberately, with adjustments made along the way to maintain program effectiveness. However, there have been many examples in which other CHW programs were scaled up too quickly and their quality and effectiveness were seriously undermined as a result.<sup>19</sup> The successful scaling up of community-based programs depends on



establishing a successful pilot project and the gradually scaling it up in a step-wise fashion with careful monitoring, making mid-course corrections, and ensuring that supervision and logistical support are maintained. This has been one of the important lessons learned in Nepal<sup>198</sup> and Bangladesh,<sup>30</sup> and the success of their national CHW programs has been one of the main reasons why these two countries have been global leaders in reaching the MDGs for health.

Pilot or model programs, particularly those operated by NGOs, are often dependent on highly competent and dedicated leadership, and once such programs go to scale, sound management practices and quality assurance are often lost. One recent prominent report sponsored by the Earth Institute called for the training of one million CHWs for rural sub-Saharan Africa, making one generalist, “polyvalent” CHW available to every 650 people, but no serious discussion was provided about overcoming the operational challenges that are inherent in scaling up and maintaining such large-scale CHW programs.<sup>37</sup> One of the major reasons for failure of national CHW programs in the 1980s was poor planning and inadequate organizations support as CHW programs scaled up quickly.

One recent report describing the scaling up of a CHW program for providing injectable contraceptives in rural Uganda made the following observations about the strategic management of scaling up CHW programs:

- Prior to scaling up, development partners and public sector agencies should assess their readiness to undertake an activity and the degree and type of support that will be needed before scaling up should begin. After scaling up begins, continued monitoring will be needed to ensure that the new systems are able to sustain the activity.
- Community ownership and acceptance of the new activity should not be taken for granted and efforts should be made to promote this by hiring staff and teams specifically for this purpose.
- All program components, including supervision, training, logistics, and so forth need to be harmonized within existing public sector systems.
- Areas where the program has already been scaled up and where it is working well can serve as valuable models for people beginning the scaling up process in new areas.<sup>142</sup>

## **VIII. Equity Considerations**

Extensive research and experience have demonstrated that utilization of facility-based services is lower among socio-economically disadvantaged sub-groups.<sup>199, 200</sup> Services provided by CHWs closer to the homes of clients, particularly in programs using regular visits to all homes, are inherently more likely to reach those who are disadvantaged and to ensure that they benefit from the interventions.<sup>201</sup> Numerous small-scale studies have shown that CHWs can produce dramatic increases in utilization, coverage and equity of curative and preventive services.<sup>19</sup> However, the presence of a fully trained and supported CHW does not necessarily



mean that community members will seek her out for services. In UNICEF's early experiences with the scaling up of community case management of childhood pneumonia, most mothers still took their child to a clinic when sick.<sup>202</sup> There is, nevertheless, evidence the community-based interventions that reach every household are pro-equity in the sense that the improvements in coverage of key interventions and utilization of facility-based services are greatest in the poorest households.<sup>201</sup>

## **IX. Cost-Effectiveness of Interventions and Services Provided by Community Health Workers**

Measuring the cost-effectiveness of CHW programs, particularly large-scale programs, is a daunting task for many reasons. Obtaining the full costs of routine health programs is frequently an extremely challenging task, and measuring changes in health status in populations served by health programs is methodologically challenging, especially in resource-constrained settings. Finally, attributing change in health status to the health program as opposed to other influences is a methodological challenge as well, not to mention assessing the value of the specific contribution made by CHWs within the context of the health program. Randomized controlled trials are not appropriate for assessing large-scale effectiveness of complex health interventions such as CHW programs embedded within primary health care programs.<sup>203, 204</sup>

A recent systematic review of CHW programs concluded that “there is a remarkable dearth of information on the cost-effectiveness of CHW programs [p. 9].<sup>2</sup> Furthermore, assessing cost-effectiveness only in terms of health impact fails to capture the total benefits of these programs in terms of the individual and social non-health benefits that CHW programs may provide, particularly in terms of responding to the felt needs of community members and community empowerment.<sup>172</sup>

CHW cost effectiveness is influenced by a broad array of contextual factors and the outcomes of many of their more promotive and preventive services are difficult to quantify. Many of CHW services do not “neatly fit into uni-dimensional measures of health that tend to be used in cost-effectiveness studies.”<sup>172</sup> Nonetheless, given the importance of the topic it is surprising that there have not been more attempts to study this issue.

The cost-effectiveness studies that are available often are based on narrowly defined interventions that have been carried out for relatively short periods of time in relatively ideal research settings where training, supervision, and support are more favorable than in more routine field conditions. There have been no evaluations that we are aware of that have assessed the cost-effectiveness of large-scale CHW programs.

There are very few published studies of the comparative cost-effectiveness of decentralized programs that use CHWs to provide primary health care services. One early attempt to do this, reported by Wang'ombe in 1984, carried out a cost-benefit analysis using a willingness-to-pay approach in rural Kenya where CHWs were trained as providers of basic health care and promoters of selected health, sanitation and nutrition practices. By calculating the total project costs and then asking community members about their willingness to pay for services, the author calculated a benefit-cost ratio of 5.3-5.6.<sup>205</sup>

In general, the existing research on cost-effectiveness of CHWs has been based on the cost of implementing an intervention provided by CHWs and then assessing the cost in terms of the health benefit achieved, usually in terms of lives saved (deaths averted) or disability-adjusted life years (DALYS) averted.<sup>2</sup> Research on the cost-effectiveness of interventions provided by CHWs remains limited, and the cost-effectiveness of longer-term programs providing a variety of interventions and other services is even more limited. Nonetheless, it is quite clear that CHWs can deliver highly cost-effective interventions of various types that improve the health of geographically defined populations, from promotion of healthier behaviors (such as promotion of exclusive breast feeding in newborns) to provision of preventive services (such as vitamin A supplementation) to treatment (such as community-based diagnosis and treatment of childhood pneumonia or detection and treatment of patients with TB). Similar evidence of cost-effectiveness is often not available for facility-based approaches, where most health care resources are invested. Part of the reason for this is that there is almost no evidence from resource-constrained settings that facility-based interventions by themselves improve geographically defined health outcomes. Where the cost-effectiveness of CHW-provided interventions is compared with that for facility-based interventions, the CHW-provided interventions are, with rare exception, found to be more cost-effective.

The reasons for this are the following: when properly trained, supervised and supported, CHWs can deliver effective interventions that reach down to every household in areas where health facilities are often far away, where the costs of utilization are of prohibitive, and where the reputation for quality is unfavorable. Thus, costs are lower and the coverage of services (and therefore the public health impact) of the CHW-provided interventions is greater than with facility-provided services. In terms of the cost per DALY averted or cost per life saved, CHW provided interventions are almost all classified as cost-effective or highly cost-effective according generally recognized global standards.

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<sup>2</sup> Disability-adjusted life-years (DALYs) provide a single measure of years of life lost due to premature death and to years of life lived with disabilities. DALYs are a composite measure of the total burden of disease in a population relative to what a healthy population would experience. The number of DALYs averted by a CHW program, as with other health interventions, is the number of years of life saved as a result of the intervention or program plus any reduction in disability as a result of the intervention or program, compared to what the alternative would have been without the intervention or program.

The most extensive research on the cost effectiveness of CHWs arises from interventions and programs for delivering child survival interventions. Table 3 summarizes the evidence of cost-effectiveness of interventions and programs for improving child health in which CHWs are the providers of community-based services. As shown in the table, the cost per death averted ranges from \$4 to \$5,398 for specific CHW provided interventions and from \$407 to \$4,817 for integrated community-based approaches. The cost per life-year gained ranges from \$72 to \$181 for specific interventions and from \$34 to \$70 for integrated community-based approaches. In terms of DALYS averted, the costs are \$1 to \$110 for specific interventions and \$43 to \$93 for integrated programs. When compared to international standard for cost-effectiveness based on WHO and World Bank-established criteria,<sup>206-208</sup> these interventions and programs are either cost-effective or highly cost-effective.

<b>Table 3. The Cost-Effectiveness of Specific Community-based Interventions Provided by Community Health Workers to Reduce Under-Five Mortality</b>				
<b>Specific Intervention</b>	<b>Cost-Effectiveness Outcome Measure</b>	<b>Cost*</b>	<b>Reference</b>	<b>Comment</b>
<b>Specific Nutrition Interventions</b>				
Breastfeeding promotion	Cost per DALY averted	\$930	<sup>209</sup>	p. 71
Community-based vitamin A distribution	Cost per death averted	\$11 [\$14]	<sup>210</sup>	This is the additional cost of adding vitamin A to an existing pneumonia control program in Nepal
Community-based vitamin A distribution	Cost per death averted	\$ 67 [\$79]	<sup>211</sup>	
Community-based vitamin A distribution	Cost per death averted	\$ 56	<sup>212</sup>	Calculation for national distribution during twice-annual child health days in Ethiopia
Community-based vitamin A distribution	Cost per DALY averted	\$ 2	<sup>212</sup>	Calculation for national distribution during twice-annual child health days in Ethiopia
<b>Community-based Therapeutic Care (CTC) for children with severe acute malnutrition</b>				
A CTC program in Lusaka, Zambia, compared to no care	Cost per death averted	\$327-1,760 [\$1,044]	<sup>52</sup>	
A CTC program in Lusaka, Zambia, compared to no care	Cost per DALY averted	\$53	<sup>52</sup>	
Review of 21 CTC programs	Cost per year of life gained	\$12-132 [\$72]	<sup>213</sup>	
<b>Pneumonia Control Programs</b>				
Community case management of childhood pneumonia	Cost per DALY averted	\$20-200 [\$110]	<sup>214</sup>	
Community case management of childhood pneumonia	Cost per death averted	\$3 [\$4]	<sup>74</sup>	
<b>Specific Interventions for Diarrhea Prevention or Treatment</b>				

<b>Table 3. The Cost-Effectiveness of Specific Community-based Interventions Provided by Community Health Workers to Reduce Under-Five Mortality</b>				
<b>Specific Intervention</b>	<b>Cost-Effectiveness Outcome Measure</b>	<b>Cost*</b>	<b>Reference</b>	<b>Comment</b>
Hygiene education	Cost per death averted	\$689 [\$798]	215	
Hygiene education	Cost per DALY averted	\$20-\$44 [\$37]	215	
Hygiene promotion to prevent diarrheal disease (including hand washing)	Cost per DALY averted	\$ 5	209	p. 51
Oral rehydration therapy	Cost per death averted	\$200-\$800 [\$579]	215	
Oral rehydration therapy	Cost per DALY averted	\$6-24 [\$20]	215	
Oral rehydration therapy and zinc when given to all children with diarrhea	Cost per death averted	\$2,100 [\$2,194]	216	Calculations based on data from the Republic of Tanzania
Oral rehydration therapy and zinc when given to all children with diarrhea	Cost per DALY averted	\$73 [\$76]	216	Calculations based on data from the Republic of Tanzania
Water quality interventions (water source improvements, household chlorination, household solar disinfection, and household flocculation/disinfection)	Cost per DALY averted	\$53-1117 [\$585]	217	For countries in sub-Saharan Africa and South East Asia with high mortality
<b>Malaria Control Programs</b>				
Insecticide-treated bed nets for children	Cost per death averted	\$600 [\$729]	218	
Insecticide-treated bed nets	Cost per DALY averted	\$11-17 [\$14]	219	
Intermittent preventive treatment of infants	Cost per death averted	\$100-301 [\$201]	220	
Intermittent preventive treatment of malaria in pregnancy	Cost per DALY averted	\$1	168	Incremental cost-effectiveness of a community-based delivery system compared to facility-based care
<b>Perinatal/Neonatal Health Programs</b>				
Participatory women's groups to improve birth outcomes	Cost per year of neonatal life gained	\$83-263 [\$181]	105, 108, 221	
Participatory women's groups to improve birth outcomes	Cost per neonatal death averted	\$3,422-6,912 [\$5,398]	105, 108, 221	\$6,912 was the cost with health systems strengthening
Home-based neonatal care program, Gadchiroli, India	Cost per neonatal death averted	\$ 150 [\$157]	123	
Home-based neonatal care program, Gadchiroli, India	Cost per DALY averted	\$7 [\$7]	123	
Home-based neonatal care program, Sylhet district, Bangladesh	Cost per neonatal death averted	\$2,996	222	
Community-based management of	Cost per	\$Int 1	223	Estimated for African countries

<b>Table 3. The Cost-Effectiveness of Specific Community-based Interventions Provided by Community Health Workers to Reduce Under-Five Mortality</b>				
<b>Specific Intervention</b>	<b>Cost-Effectiveness Outcome Measure</b>	<b>Cost*</b>	<b>Reference</b>	<b>Comment</b>
neonatal pneumonia	neonatal DALY averted			with very high child mortality for the year 2000
Community newborn care package and tetanus toxoid immunization	Cost per neonatal DALY averted	\$Int 10	223	Estimated for African countries with very high child mortality for the year 2000
Community newborn care package and tetanus toxoid immunization	Cost per neonatal DALY averted	\$Int 7	223	Estimated for countries in South East Asia with high child mortality for the year 2000
<b>HIV/AIDS Control in children</b>				
Prevention of mother-to-child transmission of HIV infection	Cost per DALY averted	\$1-81 [\$45]	224	
Prevention of mother-to-child transmission of HIV infection (nevirapine prophylaxis)	Cost per DALY averted	\$50-500 [\$275]	214	p. 25
Cotrimoxazole prophylaxis in HIV-infected children	Cost per life-year gained	\$72	225	
Cotrimoxazole prophylaxis in HIV-infected children	Cost per DALY averted	\$53	225	
<b>Child survival programs with multiple interventions</b>				
32 USAID-supported NGO child survival projects reaching 2.3 million mothers and children over a 4-5 year period providing multiple interventions	Cost per death averted	\$1,293	226	Indirect estimate using the Lives Saved Tool (LiST) to estimate lives saved from changes in coverage; interventions depend on local priorities
32 USAID-supported NGO child survival projects reaching 2.3 million mothers and children over a 4-5 year period providing multiple interventions	Cost per DALY averted	\$43	226	Indirect estimate using the Lives Saved Tool (LiST) to estimate lives saved from changes in coverage; interventions depend on local priorities
USAID-supported NGO child survival program: malaria control (promotion of ITNs and care seeking behaviors), immunizations and vitamin A, promotion of breastfeeding, promotion of ORS, pneumonia case management, community-based IMCI	Cost per death averted	\$1,000	227	Indirect estimate using the Lives Saved Tool (LiST) to estimate lives saved from changes in coverage
NGO child survival program: immunizations, nutrition, hygiene/control of diarrheal diseases, pneumonia case management (using the CBIO/Care Group approach)	Cost per death averted	\$1,198 [\$1,236]	228	Based on actual mortality rate declines collected by project staff

<b>Table 3. The Cost-Effectiveness of Specific Community-based Interventions Provided by Community Health Workers to Reduce Under-Five Mortality</b>				
<b>Specific Intervention</b>	<b>Cost-Effectiveness Outcome Measure</b>	<b>Cost*</b>	<b>Reference</b>	<b>Comment</b>
Accelerated Child Survival and Development Program (UNICEF) in 16 high-mortality districts in 11 countries in West and Central Africa provided a limited package of high-impact child survival interventions in a combined population of 11 million people over a 4-year period	Cost per death averted	\$407 [\$420]	229	Indirect estimate using the Lives Saved Tool (List) to estimate lives saved from changes in coverage; interventions depend on local priorities
Package of vitamin A and zinc supplementation, case management of pneumonia, measles immunization, and oral rehydration therapy	Cost per DALY averted	Int\$70-111 [\$93]	230	In high mortality countries of sub-Saharan Africa and South East Asia
Package of immunizations, vitamin A, oral rehydration salts, water purification tablets, de-worming tablets, and mid-upper arm circumference measurement provided during Child Health Days	Cost per life-year gained	\$34	109	Carried on in Somalia
<b>Comprehensive primary health care with a community-based component</b>				
Package of child health, women's health, nutrition, and family planning services implemented separately and in combination in rural India	Cost per death averted among children <3 years of age	\$749 [\$2,957]	231, 232	The cost of \$749 is expressed in 1971 dollars, and represents the total program cost per death averted
Package of child health, women's health, nutrition, and family planning services implemented separately and in combination in rural India	Cost per death averted among children <3 years of age	\$25-31 [\$116]	231, 232	1971 dollars; only the costs of services that "most likely" were responsible for averting death (about 5-10% of total program costs)
Package of nutrition and health care services in rural India	Cost per death averted among children <3 years of age	\$37-101 [\$116]	231, 232	
Comprehensive primary health care in rural Bolivia with community outreach and routine systematic home visitation (without hospital care or community development activities)	Cost per under-5 death averted	\$3,800 [\$4,817]	233	
Comprehensive primary health care in rural Bolivia with community outreach and routine systematic home visitation (without hospital care or community development activities)	Cost per year of life gained among under-fives	\$55 [\$70]	233	
Maternal and child health segment of a comprehensive program of primary health care, hospital referral care, and community development in rural Haiti; this includes community	Cost per under-5 death averted	\$2,775 [\$3,172]	234	

<b>Table 3. The Cost-Effectiveness of Specific Community-based Interventions Provided by Community Health Workers to Reduce Under-Five Mortality</b>				
<b>Specific Intervention</b>	<b>Cost-Effectiveness Outcome Measure</b>	<b>Cost*</b>	<b>Reference</b>	<b>Comment</b>
outreach and routine systematic home visitation				
Maternal and child health segment of a comprehensive program of primary health care, hospital referral care, and community development in rural Haiti; this includes community outreach and routine systematic home visitation	Cost per year of life gained among under-fives	\$40 [\$46]	<sup>234</sup>	
Maternal and child health segment of a comprehensive program of primary health care, hospital referral care, and community development in rural Haiti; this includes community outreach and routine systematic home visitation	Cost per DALY averted among under-fives	\$77 [\$88]	<sup>234</sup>	

\*Unless otherwise stated, costs are expressed in US\$. In the brackets it the average of the range of estimates, expressed in 2007 US dollars

An alternative approach to considering the cost-effectiveness of CHWs is to think globally about the impact of major investments in services that are known to be effective at saving lives and estimating their costs and potential impact in terms of lives saved. If coverage of key health interventions in high-mortality, resource-constrained settings is going to expand sufficiently in order to achieve the MDGs for health, programs will have to rely heavily on CHWs to achieve high coverage of services. Various costs and benefits for scaling up key interventions have been calculated which assume the foundational role of CHWs. For instance, the Guttmacher Institute, using available cost-effectiveness data, has estimated that an investment of \$24.6 billion annually (\$6.7 billion for family planning and \$17.9 billion for maternal and newborn services), which is approximately double current expenditures, would have the following benefits:

- Saving the lives of 251,000 women each year (including 38,000 women who would have died from complications of unsafe abortion)
- Saving the lives of 1.7 million newborns each year
- Prevention of 53 million unintended pregnancies
- Prevention of 14.5 million unsafe abortions

This would cost approximately \$12,000 for each life saved. The analysis does not specify the costs of CHWs in particular, but their presence is fundamental to achieving these benefits.

Other levels of service providers, facility-based services, as well as medicines and supplies and family planning commodities would also be required as well, of course.

Paradoxically, there is a common perception that CHW programs are cheap. In fact, they are expensive when their total cost at the population level – whether district, regional or national – is calculated. Nonetheless, they are the most cost-effective alternatives that are currently available. But without taking into account the full costs of large-scale CHW programs, which include not only training but supervision and support (including ensuring that supplies and commodities are available), the effectiveness of large-scale CHW programs cannot be sustained and hence their cost-effectiveness declines as well. Lehmann and Sanders, in their 2007 review of CHW programs, summarize the evidence this way:

Given present pressures on health systems and their proven inability to respond adequately, the existing evidence overwhelmingly suggests that particularly in poor countries CHW programmes are not cheap or easy but they are nonetheless a good investment, since the alternative in reality is no care for the poor living in geographically peripheral areas [p. 27].<sup>235</sup>

## **X. Interpreting the Evidence and Identifying the Knowledge Gaps**

One of the most important findings from this review and others carried out recently is the lack of evidence that we currently have about the effectiveness of CHW programs, given their recognized centrality to improving health in priority settings. Such research requires funding, and funding has been difficult to obtain for researchers interested in these issues.

Some of the evidence that demonstrates a lack of effectiveness of CHW programs may reflect poor training, supervision, and support. And, of course some of the evidence for strong impact of CHW programs may come from studies in settings where the quality of training, supervision and support is not likely to be achievable in routine field situations. So, findings need to be interpreted from this perspective as well. There is also the issue of what is referred to as publication bias – editors, researchers, program evaluators and programs themselves are not commonly eager to publish negative results. Therefore, the available evidence may be biased and may not reflect the true state of affairs.

Randomized controlled trials, which can answer very important scientific questions, are often not appropriate for assessing the effectiveness of complex public health interventions such as large-scale CHW programs. Furthermore, they are very expensive to carry out. The findings from recent reviews of randomized controlled trials of CHW programs and CHW-led interventions show evidence of only modest or low quality that CHWs are effective in for promoting childhood immunization uptake and breastfeeding, reducing neonatal and child mortality, and improving pulmonary TB cure rates when compared to usual care. The reviews



concluded that evidence was insufficient to draw conclusions concerning effectiveness of CHWs for other interventions or for intervention strategies that are likely to be most effective.<sup>236,237</sup>

There are two areas of great importance where the evidence is particularly weak. There are very few studies that give “voice” to CHWs and provide an opportunity to learn about their views regarding the challenges they face in their work and how programs could help to make them more effective. The other area concerns large-scale CHW programs – how effective they are, what influences their effectiveness, and what strategies and policies have led to increased effectiveness.

## **XI. Drivers of Community Health Worker Performance**

Research on the performance of individual CHWs and on the performance of large-scale CHW programs remains quite limited, and recommendations are often based on expert opinion and experience rather than on solid research. Even when such research has been conducted, it is often on small-scale programs or projects, many of which are carried out by NGOs.

Examples exist where CHWs were selected inappropriately, where the community was not engaged in CHW selection, training and support, where CHWs had unclear roles and expectations and where the community did not clearly understand the CHW’s role, where the behavior or conduct of CHWs was inappropriate, and where community needs and ideas were disregarded or not taken into account.<sup>238</sup> Further challenges for CHWs and their performance arise in situations in which there are political rivalries or cleavages among caste or kinship groups within communities or when local elites control decision-making over CHW selection.

One early report from Colombia found that the feedback and rewards provided by communities had more influence of work performance than did those arising from the health system.<sup>239</sup> The perceived value that community members place on CHW activities and the opportunity to see persons’ health improve as a result of CHW activities proved to be more motivating for CHWs than rewards provided by the health system.

There are numerous reasons why community members might choose to bypass a CHW for treatment of medical illness and, therefore, it is certainly possible the CHWs might be underutilized in certain settings, especially if their roles are primarily curative. Perceived social status and quality of training by villagers and allegiance to one faction or another within the community could influence utilization of services provided by CHWs, and villages could have access to services from other preferred sources.<sup>240</sup> In one study of CHWs in a rural district in Zambia, fewer than half of the CHWs trained were still active, even though the communities had selected their CHW. The inability of CHWs to obtain drug kits they needed to perform their work seriously hampered their effectiveness.<sup>241</sup> Low utilization of CHW services by community members has been a commonly expressed theme in the CHW literature.<sup>235</sup> Attrition rates have been reported to be as low as 3% to as high as 77% in a year, with higher rates generally associated with volunteer CHW programs. Taken together, this evidence would suggest that

processes that lead to a clear understanding of the role of CHWs, to apolitical selection of CHWs through community participation based on appropriate and clearly established criteria, and to appropriate support (especially of supplies and commodities) and supervision are important drivers of effective CHW performance.

One of the few published studies of a controlled study to assess the impact of an intervention to improve performance of CHWs was carried out in Nepal with Female Community Health Volunteers (FCHVs).<sup>193</sup> In one area, CHWs received training to improve their skills and to learn to diagnose and treat several serious childhood conditions, including diarrhea, malnutrition and acute respiratory infection. Community utilization of CHWs increased, their acceptance in the community improved, and the motivation of CHWs improved. Another study carefully tested promotion materials used by CHWs in rural Pakistan and demonstrated superior performance outcomes for CHWs when locally developed promotional tools developed in collaboration with the local population were utilized.<sup>242</sup>

Attrition of CHWs from their positions produces problems for programs since lack of functioning is not always detected by the program when it occurs, and replacements have to be found and trained, resulting in a gap in services. Factors that contribute to attrition have not been well-studied and rates of attrition are not even well-documented. The process of retention or attrition is a complex one dependent on many factors, including baseline expectations, satisfaction with the work, emergence of alternate opportunities, emergence of life events or other responsibilities, the community's valuation of CHW work, and the extent to which baseline expectations were met.<sup>243</sup> Factors commonly cited as reasons for attrition include lack of time, lack of adequate financial support, lack of community approval, a heavy workload, and conflicts with family responsibilities.<sup>243-246</sup> However, CHWs commonly report satisfaction with their work because of the appreciation they receive from the community and the partnerships they have developed with their neighbors<sup>239, 247</sup> Identifying causes of attrition and addressing them would appear to be an important driver of improving CHW performance.

CHW role definition, job description and task assignment are highly variable from country to country and even within countries in terms of breadth and depth. Being able to address priority health problems as perceived by the community and having a scope of responsibilities that is feasible and manageable for the CHW and the supporting health system seem to be of great importance.<sup>248</sup>

In large-scale CHW programs, supervision is almost always inadequate, and those responsible for supervision frequently have other responsibilities, usually for patient care at a peripheral health facility. They generally have had no formal training in nor special inclination for supervision of CHWs, and often have limited capacity to travel to the communities where CHWs work.<sup>248</sup>

In spite of the presence of a limited body of evidence regarding how communities and formal health systems can support effective CHW functioning, there is a strong need for

continuous learning and experimentation to make it possible for CHW programs to continuously adapt as they scale up.

There are many issues that are at play here which are separate from assessing the effectiveness of intervention(s) provided by CHWs. Among these are the following:

1. Influences at the macro level (the degree to which there is an enabling environment for CHW programs)
2. Influences of the quality of the overall CHW program (the degree to which the program is able to define an appropriate role for CHWs, recruit and select suitable candidates, provide appropriate support in terms of supplies and logistics, provide opportunities for CHWs to refer patients when necessary, and monitor and evaluate the overall CHW program)
3. Influences of the CHW program on individual CHW performance (the degree to which the program is able to provide high-quality initial and ongoing training, provide appropriate incentives and remuneration, keep CHWs satisfied with their role, promote long-term retention and opportunities for advancement, and provide services that have a high level of technical quality)
4. Influences of the community of demand for and support of CHW services (the degree to which the community seeks out CHW services and provides support for CHWs in terms of social support and financial incentives)

There is substantial evidence on common challenges faced by large-scale CHW programs, but less clear evidence on best practices in CHW program design and implementation. Large-scale programs are often chronically plagued by insufficient involvement of communities and local health systems in program planning and buy-in, inappropriate CHW selection, inadequate CHW initial and ongoing training, overburdening of CHWs with too many tasks or too many clients, weak linkages to formal health systems and community resources, deficient supply chains and supervision, inappropriate and underutilized monitoring and evaluation systems, insufficient incentives and remuneration for CHWs (or delays in payment), and low CHW retention. One study of CHWs in Pakistan (Lady Health Workers), for example, found that one-quarter of these CHWs had evidence of significant occupational stress as a result of not having consistent medical supplies, inadequate stipends, and a lack of a career structure.<sup>249</sup> Examples exist where large-scale programs were poorly planned, where the full costs of program operation were not taken into account, where unrealistic expectations and poorly defined job descriptions existed, or where the training was inadequate or inappropriate. These factors, when combined with a weak management and organizational structure, can lead to poor quality of work performed by CHWs, low morale, absenteeism and attrition.<sup>250</sup>

The shortcomings of large-scale CHW programs are well-known to those who work in them directly or who have personal experience in interacting with them, but they are not well documented in the literature. Furthermore, formal studies of the effectiveness of specific strategies to improve the functioning of large-scale CHW programs are virtually non-existent.

There have been, in the past several years, important discussions that have taken place and reports written that provide an opportunity for building a consensus regarding basic principles strengthening CHW programs. In 2007, the World Health Organization commissioned a review of the evidence regarding the effectiveness of CHW programs.<sup>235</sup> The World Health Organization and the Global Health Workforce Alliance commissioned a systematic review of the CHW literature, case studies, and recommendations for integration of CHWs into national health systems that was released in 2010.<sup>2</sup> Also in 2010 the Health Care Improvement Project of USAID carried out a literature review and identified key components of functional and sustainable CHW programs and common challenging and weakening characteristic of CHW programs.<sup>251</sup> In 2011 the Earth Institute of Columbia University convened a global technical task force to prepare a report for how CHW programs can best be expanded throughout Africa.<sup>37</sup> The Working Group on Community-based Primary Health Care of the International Health Section of the American Public Health Association held a workshop in 2011 on CHWs.<sup>252</sup> The US Government held an Evidence Summit on CHW Performance in 2012 where experts from around the world discussed the current evidence on the drivers of CHW performance, and three working groups made recommendations based on the current scientific evidence and expert opinion.<sup>248, 253-255</sup> In addition, the Royal Tropical Institute, Cordaid, UNFAP, UNICEF and the University of North Carolina sponsored a conference on the role of CHWs in maternal and neonatal health. Finally, there have been increasing opportunities for those with extensive experience in working with CHW program to discuss among themselves recommendations for improving the performance of CHW programs at scale.

With respect to the key issues influencing the performance of CHW programs and what measures could be taken to improve large-scale programs, the documents and conferences mentioned above have identified a remarkably consistent set of conclusions, many of which are described below. Given the enormously diverse roles and activities of CHWs throughout their history, within and across countries and across programs, and the range of contexts and resource availability from one program setting to another, it is not possible to provide a list of recommendations that are highly specific. Although evidence of best practices in the scientific literature is scarce, there is some evidence of best practices documented in the gray literature and arising from expert experiences that have influenced the findings shown below.

1. Countries need a comprehensive policy framework that is friendly to CHW programs, that ensures adequate financial support, that enables them to deliver interventions that have been proven to be effective and that have been recommended by or endorsed by the World

Health Organization, that ensure that CHWs who are diagnosing and treating patients or that are performing potentially dangerous or unsafe procedures (such as giving injections) are doing so with proper training and supervision.

There is still, unfortunately, strong resistance to CHW programs in many countries because of opposition by medical and nursing associations or from prominent leaders in the medical community. Also, great concern exists in many countries, and rightfully so, that CHWs trained to diagnose and treat serious medical conditions or perform procedures that are potentially harmful might provide poor quality care or abandon their positions as CHWs and go out on their own and become independent “mini-doctors.” Countries need a regulatory framework and enforcement procedures to minimize these concerns. Of course, these concerns are not limited to CHWs, but also exist for other non-physicians with training to diagnose and treat and perform procedures within government or NGO health systems. There is, however, a body of evidence that indicates the lower-level workers, including CHWs, are better able to adhere to simple clinical practice guidelines than are physicians and nurses.<sup>256-258</sup>

One of the major challenges in expanding the effectiveness of CHW programs is the lack of policy support for community case management (CCM), particularly for childhood pneumonia and neonatal infections. Among the 68 countries with the highest burden of childhood mortality, only 54% have policies for CCM of pneumonia and only 14% have policies for CCM of neonatal infections.<sup>259</sup> However, progress is being made and momentum is building; in 2008 only one-third of high-burden countries had policies supporting CCM of pneumonia.<sup>260</sup> In Ethiopia, CHWs were authorized to administer oral antibiotics to treat childhood pneumonia following a successful demonstration project operated by Save the Children using this approach and facilitation of a peer visit of Ethiopian policy makers to the Society for Education, Action and Research in Community Health (SEARCH) in India, where CCM for childhood pneumonia was pioneered, to discuss and observe CCM of pneumonia firsthand.<sup>261</sup>

The degree to which ministries of health take ownership of national CHW programs is important for the longer-term effectiveness and sustainability of the program. The USAID Health Care Improvement (HCI) Project’s CHW AIM (Assessment and Improvement Matrix) Toolkit for assessing and improving CHW programs provides measures for the degree to which the MOH has integrated the CHW cadre in health system planning, has included CHW program expenses in local, district and national budgets, and has provided logistical support to sustain CHW activities.<sup>262</sup>

2. Communities need to be partners in CHW programs, with the opportunity to participate in program design, in the selection of CHWs, and in providing oversight to CHW performance at the community level.

Local community representatives should be involved in the design and planning of CHW programs to ensure that the program is relevant to the local epidemiological, geographical and cultural realities and needs. Community preparedness and engagement should begin prior to selection of a CHW, and participatory selection of CHWs with the community is vital. Community engagement, building community partnerships, and empowering communities and groups within communities (particularly mothers) to become stakeholders in programs that can improve their health and the health of their children are increasingly seen as fundamental for effective health programming, and are fundamental for effective CHW programs.<sup>263</sup> Community involvement in decisions about selection of CHWs should not be left to community leaders but should include rank and file community members, particularly mothers.

There is considerable evidence that in practice, selection of CHWs is often a matter of either patronage controlled by local bureaucrats, village chiefs or other dignitaries or personal choice of health personnel.<sup>235</sup> One proposed alternative is a joint selection by village health committees (which are not controlled by local elites), health officials and training institutions.<sup>264</sup> Approaches to working with communities to providing support in CHW selection and supervision of CHW work have been explored elsewhere.<sup>263, 265</sup>

Lehmann and Sanders, in their 2007 review of the CHW literature, report that “the literature is unanimous in its assertion that CHW programmes should be owned and driven by communities and that CHWs should be accountable to their communities.”<sup>235</sup> However, this ideal is rarely achieved, particularly in large-scale programs. Unless CHW programs are “driven by, owned by and firmly embedded in communities themselves,” they are vulnerable to the “moods of policy swings without the wherewithal to lobby and advocate for their cause” and become fragile and unsustainable.<sup>235</sup> It has been repeatedly observed that during times of fiscal cutbacks or other crises, CHW programs are often the first item to be cut from health budgets.<sup>19</sup> Lehmann and Sanders conclude their review with this insightful comment about community participation:

The rhythms and dynamics of community participation ... are crucial to better understanding and discussion the future of CHW programmes. A key challenge lies in institutionalizing and mainstreaming community participation. To date, the largest and most successful programme in this regard is the Brazilian Family Health Programme, which has integrated CHWs into its health services and institutionalized community health committees as part of municipal health services to sustain social participation. This means that community participation does not become an alternative but an integral part of the state’s responsibility for health care [pp. 26-7].<sup>235</sup>

3. CHW programs need financial support and engagement in planning, training and deployment not only from the central, national level but also at the regional, district and

municipal levels. Decentralization of funding and operational decisions in the context of a set of uniform national policies is needed.

4. CHW role descriptions need to be well-designed and clearly defined job descriptions should exist.

CHW tasks need to be clearly defined and expectations clearly communicated to CHW recruits and communities. Tasks should be limited to ones that meet local and health system priorities without overburdening CHWs. CHW activities should reflect community needs.

Bhattacharyya and colleagues, in their review of CHW programs, observed that:

... the specific tasks and duties of CHWs affect their motivation and retention. When given too many tasks, CHWs feel overwhelmed with information or may spend so much time in training that they rarely practice what they have learned. Often the catchment areas they cover are too large with too many households, making it difficult for a CHW to spend the time or find the transportation to go to all the households. Many CHWs are restricted to preventive and promotive roles that leave them unable to respond to community demands for curative care (and usually medicines)[p. x].<sup>238</sup>

5. The number of CHWs and their distribution should be adequate for the tasks to be performed and for them to be able to reach those in need of services (or for those in need of services to reach them).

Adequate numbers of CHWs should be deployed so that they are readily accessible to their clients and so that they can perform their tasks without being overburdened. There is no predetermined formula for the optimal numbers of households a CHW should serve – it depends on the CHW's role, the time she is expected to spend in her role, and the geographic characteristics of the catchment area, including the degree of dispersion of households.

6. Appropriate pre-service education and continuing in-service education should be provided to CHWs.

Many recommend that CHWs have at least basic literacy and numeracy skills, but in some settings, particularly when working with volunteers, this may not be practical. Training should be provided on both biomedical principles and communication skills and it should be as close to the place of work as possible and include practical community-based experiences. When training is staggered, it limits the amount of time that trainees need to be away from home at any one time, which is often quite advantageous to women trainees with family responsibilities. Training needs to be able to impart to CHWs a sense of confidence in their



capacity to carry out their role, increase their self esteem, and provide assurance that there is a system for back-up support.<sup>266</sup> The general consensus is that training needs to be a combination of didactic teaching with interactive sessions involving group discussions, role playing, simulations, and opportunities for field experiences.<sup>2</sup> Such approaches are important for adults, particularly those who often have limited formal education.

In many settings, CHW training is not standardized, and available training material has not been disseminated, used, adapted, or updated. Providing credible training certification can be useful for CHWs for many reasons, including for later entry into a higher-level position, and it can also be useful for government regulation of CHW activities. There are usually no means to check on the knowledge of active CHWs or to incorporate new information into existing training and in-service programs.<sup>7</sup> Furthermore, there is often a mismatch between what CHWs are trained to do and what they actually do in practice.<sup>19</sup> There is no readily available catalogue of current training materials and techniques nor is there an evaluation of their adequacy, quality or effectiveness. Such a review was carried out in 1983-4 but there has been nothing similar since.<sup>267, 268</sup>

Ongoing refresher trainings have been found to be essential for CHWs to maintain their skills, usually for at least several days each year. Continuing education should be based on findings from monitoring and evaluation systems as well as from CHW, care-recipient and stakeholder feedback, and it should reflect needs and opportunities within the community.

#### 7. CHWs need effective linkages with the formal health system for supervision, continuing education, receipt of supplies and medicines, and referral of patients

CHWs should be formally introduced to the health system and its staff in the clinics and health posts with a clear delineation of their responsibilities and capabilities. They should have appropriate supplies and re-supply systems should exist to enable them to provide the services for which they received training. They should be perceived by other health workers as an integral and essential member of the health team and as the foundation of the health system. Partnerships of trust and harmony need to be built between higher-trained workers and CHWs rather than allowing relationships of rivalry and distrust to emerge. Unfortunately, health professionals often perceive CHWs to be “lackeys” (to use the phrase first coined by Werner in his famous article, “The village health worker – lackey or liberator.”<sup>269</sup>) and have a sense of superiority that undermines their capacity to appreciate the health promoting and enabling role that CHWs can and usually do play in their communities. Rarely do health professionals have an opportunity to interact with CHWs and with well-performing CHW programs during their training. In 1998, the World Health Organization identified the attitudes of health personnel toward CHWs as one of the major challenges facing CHW programs.<sup>265</sup>



## 8. CHWs need supportive supervision and constructive feedback

Supervision has often been the weakest element of CHW programs, particularly for CHWs working in remote rural areas.<sup>235</sup> Evaluations of large-scale CHW programs have documented irregular or even absent supervision. Even when supervision exists, supervisors often do not really understand the CHW's role, have not been trained to serve in that capacity and have been assigned that task on top of other duties, so it is not performed in a proper fashion. There is often a gender imbalance as well, since male supervisors are often supervising female CHWs. Therefore, there is a recognized need to establish a supervisory system in which local people who may have already worked as a CHW or who have a greater appreciation of the constraints that CHWs face in their work should serve as direct supervisors, with supervisors being responsible for no more than 20-25 CHWs. CHW supervisors should receive special training for their role, and they should be provided adequate resources (include time and transport) to carry out their responsibilities adequately. Innovative approaches to supervision of CHWs are being developed by UNICEF for community case management in Africa by hiring senior CHWs as supervisors, providing supervisors with motor bikes, and incorporating rapid assessment procedures (e.g., key informant interviews and transect walks) for supervisors to use when they visit a village.<sup>202</sup>

## 9. CHWs need adequate financial and non-financial incentives

Debates still continue about whether volunteer CHWs are appropriate. Some consider it unfair and unjust for such a situation to exist. However, most agree that if a CHW is expected to work more than a few hours per week, some form of regular financial compensation should be provided. The spirit of volunteerism and eagerness to help for the good of the community is often underestimated. Even so, there are very few examples of long-term CHW programs that rely exclusively on volunteer CHWs and also very few examples of CHW programs in which CHWs are paid through community financing.<sup>235</sup> Two notable examples are the Jamkhed Comprehensive Rural Health Project,<sup>118</sup> where CHWs have been given assistance with income-generating activities, and BRAC, whose CHWs earn money from the sale of commodities.<sup>23</sup> Unless a CHW is working only a couple of hours per week, CHWs should receive wages commensurate with the workload and time spent. Early trials are emerging with performance-based incentives for CHWs.

Non-financial incentives, such as badges, uniforms, special kits, community recognition, release from community work responsibilities, preferential access to health services, and so forth can go a long way toward giving volunteer CHWs who work only a few hours a week a sense of appreciation needed to stay motivated to continue their work.<sup>238</sup> In addition, the possibility of future paid employment, community respect, acquisition of valued skills, and

opportunities for personal growth and development can all motivate CHWs. Peer support, opportunities to participate in CHW associations, flexible work hours, witnessing improvements in health as a result of their efforts, and contributing to community empowerment are also strong motivations.<sup>238</sup> Lack of appropriate remuneration relative to the assigned workload leads to poor quality of services, loss of motivation, and attrition. Full-time, paid, more extensively trained CHWs may need to support a group of lesser trained volunteer CHWs (the so-called dual-cadre CHW system) in order to be able to provide all the services needed at the community level.

#### 10. Adequate resources must be provided through the supply chain to ensure that CHWs are properly equipped, supplied and supported

Having appropriate equipment and supplies is essential for CHWs in order for them to perform their jobs. Not having these has further repercussions as well: “[f]ailure to meet the expectations of ... populations [because of a lack of drugs or other supplies] will destroy the image or the credibility of the CHW.”<sup>264</sup> Unfortunately, in many large-scale CHW programs (as in other programs and services operated by ministries of health), supply chains are notoriously dysfunctional and they affect not only CHWs but also health workers at the primary health care level.<sup>235</sup> UNICEF is now trying innovative approaches to improve the supply chain for CHWs providing community case management by carrying out independent assessments of supply chain bottlenecks, contracting with third parties to deliver supplies to CHWs from supply stations, making contingency plans for the rainy season, and decreasing resupply frequency.<sup>202</sup>

#### 11. CHWs need opportunities for professional growth and career advancement

CHWs should have the capability to meet among themselves and to form CHW association for mutual support and professional growth. A number of emerging programs are creating CHW positions as entry level positions from which CHWs can advance into higher level cadres. For example, Zambia is now in the process of establishing a new CHW cadre called Community Health Assistants who will have formal registration with a national council and who will be eligible at a later point for entering to higher level training in nursing and other health-related fields. Such policies are likely to promote recruitment of higher-quality candidates and promote retention as well.

#### 12. CHW programs need to receive systematic monitoring and evaluation, including periodic transparent independent evaluation, and operations research on CHW programs should be encouraged through research funding for investigators

CHW programs should develop and utilize simple monitoring and evaluation systems so that both the community and the formal health system can assist the CHW in improving her performance and the performance of her supervisor. One recently developed tool for monitoring program performance is the USAID Health Care Improvement (HCI) Project's CHW AIM (Assessment and Improvement Matrix) Toolkit.<sup>262</sup> Each national CHW program should carry out an internal performance evaluation annually and an independent external evaluation every 4-5 years. There are at present very few evaluations of large-scale CHW programs and no rigorous impact assessments with baseline measures or with comparison areas where the program was not being implemented.

One example of the need for more operations research arises from a review of the literature concerning attrition in CHW programs.<sup>270</sup> The authors identified only one quantitative study of attrition in a large-scale CHW program, and they identified programs with extremes of attrition rates. The issues of what are current rates of attrition in CHW programs, what the reasons for attrition are and the costs of attrition to the programs and what can be done to reduce attrition are obviously important to large-scale CHW program functioning.<sup>238</sup>

Funding for research on CHW programs has been quite limited. Investigators should be encouraged to pursue operations research related to CHW programming, and funding should be available to test innovative practices for CHW programs. Additional research is needed particularly on the cost-effectiveness of CHW programs. Research within countries may be needed to confirm findings from other countries verifying the capacity of CHWs to perform certain tasks. This can provide further evidence about program effectiveness and how to improve it as well as lessen opposition from medical and nursing associations and medical leaders. Using national demographic and health surveys to acquire information on CHW functioning could be a powerful tool to assess CHW program effectiveness since it can be related to important health indicators collected from the same survey.

One recommendation from the literature for monitoring and evaluation of large-scale CHW programs is the following:

Especially during the early phases of program expansion, ... evaluation should resemble operations research, wherein the primary goal is to assess the dynamic performance of program components rather than a sole focus on health outcomes. Taken in concert, the life cycle of a national CHW program should naturally grow from an emphasis on scalability management to a focus on health outcomes. As national programs move into maintenance mode, it is crucial to both reward targeted responses to program deficiencies and foster mechanisms to incorporate innovations in scalability [p. 431].<sup>271</sup>

International sharing among CHW programs and professionalization of CHW program managers with opportunities for sharing best practices and results from program monitoring

and evaluation will help to strengthen programs, improve their quality, and establish professional standards for program performance.

13. Mobile health technology (mHealth) holds enormous potential for the training, supervision, continuing education, and technical support for CHWs, for assistance with the process of patient referral, and for community-based health information systems, and the further development and lowering costs of rapid diagnostic tests (RDTs) can improve the capacity of CHWs to provide treatment at the community level.

The use of mobile technology (mHealth) and the further development and introduction of rapid diagnostic tests (RDTs) have enormous potential for expanding the capabilities of CHWs as well as for monitoring of CHW programs. RDTs for malaria and HIV are now being utilized by CHWs. The commercialization (and affordable cost) of rapid, handheld CD4 count point-of care diagnostics, and the future development of a RDT for TB, for instance, could have enormous implications for expanding the capabilities of CHWs to contribute to the performance of HIV and TB programs in resource-constrained settings.

14. CHWs should be seen as a long-term foundational cadre of health systems in low-income settings whose centrality for effective health system functioning will persist even after the epidemiologic transition is completed and maternal and child health and infectious diseases are not longer priorities.

In the United States in the 1970s and 1980, non-physician health care providers were resisted because they were seen as seen as second-class providers who provide second-class quality of care for lower income groups. Now, four decades later, such providers are uniformly seen as essential for provision of clinical services in virtually all health programs, including the highest quality referral hospitals. In low-income settings, CHWs are in fact essential for health programs to achieve the highest quality possible in terms of effectiveness in improving the health of populations. As the epidemiologic and demographic transitions progress and chronic conditions and aging dominate societies as they do in the developed world, CHWs will be needed to deliver effective interventions and to provide support similar to what nursing homes provide in the US for the elderly. Thus, CHW programs should not be seen as a temporary and short-term solution but rather as a fundamental long-term complement to existing facility-based services. In the words of one recent review, "... the need to systematically and professionally train lay community members to be a part of the health workforce has emerged not simply as a stop-gap measure, but as a core component of primary health care systems in low-resource settings [p. 2]."<sup>37</sup>

Table 4 provides an overview of some of the evidence, examples of country experiences, and references that provide further insights into drivers of CHW performance.

	<b>Driver</b>	<b>Overview of evidence</b>	<b>Country experience</b>	<b>Key references</b>
1.	Comprehensive policy framework supportive of CHWs	CHW programs in many countries face resistance from medical and nursing organizations and at times are inadequately regulated. Primary health care programs often struggle in general to obtain needed financial support because of strong political pressure for medical elites to support referral hospital care. CHWs are often prohibited from providing critical, evidence-based services such as CCM. This compromises CHWs ability to provide locally-appropriate, quality services. Government ownership and supportive policies of CHW programs facilitate long-term effectiveness and sustainability. <sup>262</sup>	Medical societies in Brazil have pressured the government to prevent CHWs there from providing community case management, which prevented the expansion of this life-saving intervention. In Ethiopia, CHWs were authorized to administer oral antibiotics to treat childhood pneumonia after a successful pilot of this approach leading to improved health outcomes.	259, 261, 272, 273, 274
2.	Community involvement in CHW programs	Communities are generally expected to be highly involved in CHW selection and support, yet there is considerable evidence that, in practice, selection of CHWs is often influenced by patronage of local bureaucrats and village chiefs or personal choice of health personnel. This compromises CHW accountability to the community and, ultimately, programmatic sustainability.	In Pakistan there is a community member on the selection committee for Lady Health Workers (who are the local CHWs) and for their supervisors. This facilitates the CHWs' ability to fulfill their role linking communities to formal health services.	235, 275

	<b>Driver</b>	<b>Overview of evidence</b>	<b>Country experience</b>	<b>Key references</b>
3.	Adequate and decentralized funding	Chronic underfunding prevents adequate coverage of CHW services.	Management and financing of health in Brazil has been decentralized to the state and municipal levels since 1996. States and municipalities must allocate at least 12% and 15%, respectively, of their total budget to health.	<sup>276</sup>
4.	Clear job descriptions	CHW role definition, job description and task assignment are highly variable from country to country and even within countries in terms of breadth and depth. Being able to address priority health problems as perceived by the community and having a scope of responsibilities that is feasible and manageable for the CHW and the supporting health system seem to be of great importance. <sup>248</sup> Job descriptions that are too broad can lead to CHW frustration and inability to meet the expectations of community members and CHW attrition. <sup>243-246</sup>	One study of lady health workers in Pakistan found that one-quarter of the women had evidence of significant occupational stress as a result of not having consistent medical supplies, inadequate stipends, and a lack of a career structure. <sup>249</sup>	<sup>238, 248</sup>
5.	Sufficient number and equitable distribution of CHWs	There is no predetermined formula for the optimal numbers of households a CHW should serve – it depends on the CHW’s role, the time she is expected to spend in her role, and the geographic characteristics of the catchment area, including the degree of dispersion of households. Failure to have sufficient and equitable distribution of CHWs can lead to overburdened CHWs and low access to CHW services.	Nepal has different coverage ratios for CHWs, depending on the geographical characteristics of the community that they serve: 1:400 people in the flat lowland districts, 1:250 people in the hill districts, and 1:150 people in the mountain districts. <sup>277</sup>	<sup>37, 194</sup>

	<b>Driver</b>	<b>Overview of evidence</b>	<b>Country experience</b>	<b>Key references</b>
6.	Appropriate pre-service and in-service education and training	The general consensus is that training needs to be a combination of didactic teaching with interactive sessions involving group discussions, role playing, simulations, and opportunities for field experiences. Training needs to be able to impart to CHWs a sense of confidence in their capacity to carry out their role, increase their self esteem, and, ultimately, improve service delivery.	Health Extension Workers in Ethiopia undergo a year of pre-service training to capacitate them to perform their scope of work and subsequently have in-service trainings to ensure appropriate and up-to-date competencies. There have, however, been reports of little coordination amongst continuing education trainings.	2, 35, 266, 267, 268, 278, 279
7.	Effective linkages with the formal health system for supervision, continuing education, receipt of supplies and medicines, and referral of patients	CHWs should be formally introduced to the health system and its staff in the clinics and health posts with a clear delineation of their responsibilities and capabilities. They should have appropriate supplies, and re-supply systems should exist to enable them to provide the services for which they received training. They should be perceived by other health workers as an integral and essential member of the health team and as the foundation of the health system.	In Pakistan, all CHWs are affiliated with a rural health center or a basic health unit. They generally receive their supplies from these facilities, although there are challenges with insufficient staff and stock outs of supplies at the local clinics. CHWs in many countries also face substantial distrust and clear linkages and referral practices with their local clinics. For example, CHWs in South Africa are often not trusted by the clinics and little continuity of care exists.	280, 281, 282

	<b>Driver</b>	<b>Overview of evidence</b>	<b>Country experience</b>	<b>Key references</b>
8.	Supportive supervision and constructive feedback	Supervision has often been the weakest element of CHW programs, particularly for CHWs working in remote rural areas. . In large-scale CHW programs, supervision is almost always inadequate, and those responsible for supervision frequently have other responsibilities, usually for patient care at a peripheral health facility. They generally have had no formal training in nor special inclination for supervision of CHWs, and often have limited capacity to travel to the communities where CHWs work. <sup>248</sup> Weak management and organizational structure can lead to poor quality of work performed by CHWs, low morale, absenteeism and attrition. <sup>250</sup>	Innovative approaches to supervision of CHWs are being developed by UNICEF for community case management in Africa by hiring senior CHWs as supervisors, providing supervisors with motor bikes, and incorporating rapid assessment procedures (e.g., key informant interviews and transect walks) for supervisors to use when they visit a village. The introduction of mHealth technologies will hopefully have benefits for supervision of CHWs.	<sup>202, 235,</sup>



	<b>Driver</b>	<b>Overview of evidence</b>	<b>Country experience</b>	<b>Key references</b>
9.	Adequate financial and non-financial incentives	There is no clear consensus on the appropriateness of CHWs working without remuneration. There are, however, very few examples of long-term CHW programs that rely exclusively on volunteer CHWs and also very few examples of CHW programs in which CHWs are paid through community financing. Non-financial incentives, such as badges, uniforms, special kits, community recognition, release from community work responsibilities, preferential access to health services, and so forth can go a long way toward giving volunteer CHWs who work only a few hours a week a sense of appreciation that motivates them to continue their work.	Many countries are currently implementing tiered systems in which formally employed and remunerated CHWs supervise another cadre of volunteer CHWs. In Nepal, a volunteer cadre of CHWs (Female Community Health Volunteers) receives minimal compensation in exchange for working about eight hours a week. They are supervised by two other CHW cadres that work full-time and are formally compensated.	235, 238, 283, 277, 284
10.	Adequately resourced supply chain	In many large-scale CHW programs, supply chains are dysfunctional and compromise CHWs and health workers at the primary health care level. Failure to meet the expectations of community members because of a lack of drugs or other vital supplies reduces the status and the credibility of the CHW in the eyes of fellow community members and saps CHW motivation.	In Pakistan, each Lady Health Worker should have a supply kit that includes contraceptives and essential drugs in order to perform her work. These CHWs are resupplied each month at their local clinics, but there are often no supplies in the clinic. Improvements were made from 2000 to 2008, but many Lady Health Workers are still unable to provide all of their services because they lack the necessary supplies.	235, 264, 282, 280

	<b>Driver</b>	<b>Overview of evidence</b>	<b>Country experience</b>	<b>Key references</b>
11.	Opportunities for CHW professional growth and career advancement	A number of emerging programs are creating CHW positions as entry level positions from which CHWs can advance into higher level cadres. This facilitates retention of CHWs, attracts higher-quality CHW candidates, and can improve the quality of supervisors.	Zambia is now in the process of establishing a new CHW cadre called Community Health Assistants who will have formal registration with a national council and who will be eligible at a later point to enter into a higher level of training in nursing and other health-related fields.	243-246
12.	Systemic monitoring and evaluation of CHW programs	Systemic monitoring and evaluation can provide evidence about program effectiveness and how to improve it. It can also lessen opposition from medical and nursing associations and medical leaders.	A recent project that used CHWs to provide injectable contraceptives in Uganda highlighted the importance of systemic monitoring to ensure sustained, programmatic impact <sup>142</sup>	37
13.	Appropriately engage with mHealth	The use of mobile technology (mHealth) and the further development and introduction of rapid diagnostic tests (RDTs) have enormous potential for expanding the capabilities of CHWs as well as for monitoring of CHW programs.	Mobile phones have been utilized in diverse ways including to train CHWs, educate communities, and support CHW decision-making. For example, CHWs are using mobile phones in Ghana to share educational videos with their communities.	37, 37, 285, 286
14.	CHWs should be considered long-term, integral components of health systems	CHW programs should not be seen as a temporary and short-term solution but rather as a fundamental long-term complement to existing facility-based services. In the words of one recent review, "... the need to systematically and professionally train lay community members to be a part of the health workforce has emerged not simply as a stop-gap measure, but as a core component of primary health care systems in low-resource settings [p. 2]."	CHW programs have now been adapted as a core component of long-term, health service delivery in countries around the world, including Brazil and Ethiopia.	37

The summary statement in the 2007 WHO review perhaps sums many of the complex issues surrounding CHW programs the best:

...CHW programmes are ... neither the panacea for weak health systems nor a cheap option to provide access to health care for underserved populations. Numerous programmes have failed in the past because of unrealistic expectations, poor planning and an underestimation of effort and input required to make them work. This has unnecessarily undermined and damaged the credibility of the CHW concept.[p. v]<sup>235</sup>

## **XII. Conclusions**

CHWs provide the world's most promising health workforce resource for accelerating progress in achieving the health-related MDGs and for enabling health systems in resource-constrained settings to reduce the burden of disease from serious, readily preventable or treatable conditions and, thereby, to improve the health of population. They are the most promising health workforce resource because their effectiveness has now been demonstrated, they can be trained in a relatively short period of time, and their cost-effectiveness is almost always substantially better than the cost-effectiveness of similar services provided by higher-level staff based at facilities. Furthermore, they are living with the people who need services, in contrast to higher-level health professionals who often do not come from areas where services are needed or who do not want to live in such settings.

In most low-income countries, CHWs are still seen but higher-level health staff and by society at large as second-class providers of second-class care. The potential of CHWs to make it possible for health systems to reach their full potential is still not recognized.

The exact roles and responsibilities of CHWs will vary from country to country and from program to program within countries, and there is not now nor likely in the foreseeable future for an international CHW standard or a uniform "generic" CHW to emerge. However, establishing clear national guidelines and regulations describing what kinds of training and certification are needed by CHWs who provide diagnosis and treatment will clearly be needed.

CHWs have been "revered as a panacea and decried as a delusion in the past."<sup>235</sup> We need the same sober view that emerged in the late 1980s:

... [W]ith political will, ... governments can adopt more flexible approaches by planning CHW programmes within the context of overall health sector activities, rather than as a separate activity. Weaknesses in training, task allocation and supervision need to be addressed immediately. CHWs represent an important health resource whose potential in providing and extending a reasonable level of health care to underserved populations must be fully tapped [p. X].<sup>287</sup>

The view that CHW programs cannot function effectively or the idea that the CHW concept is fundamentally flawed is no longer tenable. As Frankel wrote in 1992, “There is no longer any place for discussion *whether* CHWs can be key actors in achieving adequate health care. The question is *how* to achieve their potential.”<sup>25</sup> So the challenge before governments, civil society, and the global health community is to learn from the experiences of the past and from the current evidence on what we know is effective and can work, some of which is described in this report. As the former Secretary-General of the World Health Organization said in 2005, “We have to work together to ensure access to a motivated, skilled, and supported health worker by every person in every village everywhere.” It is clear that the full potential of large-scale CHW programs has not yet been reached in most countries, and, as Berman and colleagues noted in 1987, it is still the case that “large increases in political, social, administrative and financial commitment are needed to assure that CHWs in large-scale programs are adequately supported.”<sup>19</sup> The biggest gap in our knowledge about CHWs at present is in the lack of evidence about how effective large-scale CHW programs and what factors have been responsible for those that are the most effective.<sup>235</sup>

### **XIII. Recommendations**

Governments, civil society (including NGOs), communities, international health organizations, technical organizations, and donors need to rally behind the groundswell of support that is rapidly emerging to transform health systems so that CHWs play a foundational role in reaching every household with essential services and providing a referral link to enable people to more readily and effectively access higher-level services within the health system. It is in everyone’s interest for large-scale CHW programs to work effectively, so all stakeholders need to begin to actively support CHWs in their roles and help to address short-comings in CHW program functioning and CHW performance. Political pressure needs to be brought to bear to ensure that policies and regulations are favorable to enable CHW programs to reach their full potential, to ensure that funding for CHW programs is sustained and adequate to enable programs to function effectively, including providing high-quality training, supervision and logistical support. Monitoring and evaluation of CHWs and CHW programs are essential in order to identify shortcomings and make continued improvements in CHW programs. Independent and transparent evaluations will also be needed on a regular basis. Finally, health systems need to begin to look for ways to shift their expenditures toward the most cost-effective interventions and programs, which most certainly will include CHW programs for address the health-related MDG goals.

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