Chapter 14

Community-Based Care to Improve Maternal, Newborn, and Child Health

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INTRODUCTION

Significant progress has been made in maternal, newborn, and child health (MNCH) in recent decades. Between 1990 and 2015, the global mortality rate for children under age five years dropped by 53 percent, from 90.6 deaths per 1,000 live births in 1990 to 42.5 in 2015 (Liu and others 2016). Maternal mortality is also on the decline globally.[1]

Despite progress, maternal, neonatal, and under-five mortality remain high in many low- and middle-income countries (LMICs). In 2015, approximately 303,000 women died as a result of complications from pregnancy and childbirth (WHO 2015). Globally, an estimated 5.9 million children under age five years die each year, including 2.7 million within the first month of life (Liu and others 2016).

Health indicators differ across countries, regions, and socioeconomic levels (Lozano and others 2011). Approximately 99 percent of all newborn deaths occur in LMICs (Bayer 2001). Maternal mortality is concentrated in Sub-Saharan Africa (Hogan and others 2010), where mortality rates for the poor are double those for the nonpoor, and they are higher among rural populations and women with low levels of education (*PLoS Medicine* Editors 2010). Children living in low-income countries are three times more likely to die before age five years than children living in high-income countries (HICs) (Black and others 2013).

Pneumonia, diarrhea, malaria, and inadequate nutrition drive early childhood deaths around the world. In 2015, an estimated 526,000 episodes of diarrhea and 922,000 cases of pneumonia in children under age five years led to death (Liu and others 2016). Undernutrition is a primary underlying cause of 3.5 million maternal and child deaths each year (Black and others 2013); stunting, wasting, and micronutrient deficiencies are responsible for approximately 35 percent of the disease burden in children under age five years and 11 percent of the total global disease burden (Lozano and others 2011). Although maternal mortality is caused chiefly by postpartum hemorrhage, preeclampsia and eclampsia, and sepsis, a large proportion of maternal deaths can be attributed to limited access to skilled care during childbirth and the postnatal period (Lozano and others 2011) as well as to limited access to family planning services and safe abortions (UNFPA and Guttmacher Institute 2010).

An appropriate mix of interventions can significantly reduce the burden of maternal and child mortality and morbidity. However, these interventions often do not reach those who need them most (Bayer 2001; Sines, Tinker, and Ruben 2006). An integrated approach that includes community-based care as an essential

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component has the potential to substantially improve maternal, newborn, and child health outcomes.

This chapter provides a summary of community-based programs for improving MNCH. The chapter discusses strategies to improve the supply of services, including through community-based interventions and home visitations implemented by community health workers (CHWs), and strategies to increase demand for services, including through community mobilization efforts. The chapter summarizes the evidence about the impact of such interventions, describes contextual factors that affect implementation, and considers issues of cost-effectiveness. It concludes by highlighting research gaps, the challenges of scaling up, and the way forward.

COMMUNITY-BASED CARE

It is widely agreed that communities should take an active part in improving their own health outcomes (WHO 1979, 1986, 2008, 2011) and that CHWs can play a vital role. Since 2000, national governments have realized the substantial potential of CHWs to achieve child survival goals; these governments have or are considering national programs for CHWs. For example, since 2003, Ethiopia has trained thousands of community-based health extension workers to focus on maternal, newborn, and child health (Medhanyie and others 2012).

Although strategies vary considerably, community-based interventions may encompass encouraging healthier practices and care seeking among communities and families; recruiting and training local community members to work alongside trained health care professionals; and community member involvement in service provision, including diagnosis, treatment, and referral. Within these broad categories are a range of approaches, including CHWS, traditional birth attendants (TBAs), health campaigns, school-based health promotion, home-based care, and even community franchise–operated clinics.

Community-based care is an important component of providing a continuum of care for low-resource communities. The health and well-being of women, newborns, and children are inherently linked. When mothers are malnourished, ill, or receive insufficient care, their newborns are at increased risk of disease and premature death. In LMICs, a mother's death during childbirth significantly raises the risk that the child will not survive (Ronsmans and others 2010).

Better health requires that women and children have the ability to access quality services from conception and pregnancy to delivery, the postnatal period, and childhood. Issues such as human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS), sexually transmitted infections, malaria, malnutrition, complications during pregnancy and delivery, and inadequate newborn and child care can be addressed through vertical programs. However, the best results can be obtained if these issues are tackled through interventions that target maternal, newborn, and child health care as a whole. Coordinating care, from preconception to delivery and the health of the child, can lead to profound benefits for the health and well-being of women and children and improve subsequent pregnancy and child health outcomes. A recent review of preconception risks and interventions shows that preconception care in community groups is associated with a lower neonatal mortality rate (risk ratio 0.76; 95 percent confidence interval 0.66–0.88), and a significant increase in antenatal care (ANC) (risk ratio 1.39; 95 percent confidence interval 1.00–1.93), breastfeeding rates (risk ratio 1.20; 95 percent confidence interval 1.07–1.36), and use of clean delivery kits (risk ratio 2.36; 95 percent confidence interval 1.55–3.60) (Dean and others 2011).

There are many approaches to community-based care. This chapter describes interventions aimed at improving the supply of services by delivering them in communities, often through CHWs, and interventions aimed at increasing demand for services and promoting healthy behaviors.

COMMUNITY-BASED CARE TO IMPROVE THE SUPPLY OF SERVICES

Health care provided in communities, as opposed to health facilities, is often provided by CHWs and may include home visitations and other intervention packages. The level of training CHWs receive, whether they are employed by a nongovernmental organization or the government and whether they are paid or volunteer, varies widely between and within countries. In general, they work in conjunction with frontline health workers across the primary health care spectrum to provide health education and promotion, distribute commodities, diagnose and manage illness, and provide referrals.

Substantial evidence suggests that community-based interventions are an important platform for improving health care delivery and outcomes (Bhutta and others 2010; Kerber and others 2007; Lassi, Haider, and Bhutta 2010; Lewin and others 2010; Singh and Sachs 2013).

Home Visits

For both at-risk pregnancies and healthy pregnancies, home visits by CHWs in the pre- and postnatal period to counsel mothers, provide newborn care, and facilitate

referral may lead to early detection of complications and appropriate referrals. Studies in Bangladesh, India, and Pakistan suggest that home visits can reduce newborn deaths in high mortality settings by 30 percent to 61 percent (Bang and others 1999; Baqui and others 2008; Bhutta and others 2008).

Community Management of Delivery Complications, Neonatal Care, and Childhood Illnesses

A pilot home-based newborn care intervention in India consisting of sepsis management; support for low-birth-weight (LBW) infants; and primary prevention, health education, and training of TBAs has been shown to decrease newborn and infant mortality rates (Bang and others 1999; Bang, Reddy, and others 2005). Home-based interventions in India to reduce neonatal and infant deaths and stillbirths included surveillance to identify pregnant women, followed by two home visits during pregnancy for birth preparedness and for routine neonatal care. In the event of a high-risk neonate or an LBW infant, extra care was administered. In the trial, 93 percent of neonates in the intervention areas received home-based care (Bang and others 1999). Similarly, results from a study in India show that the asphyxia-specific mortality rate was significantly reduced by 65 percent, comparing periods before and after CHW training with either tube-and-mask or bag-and-mask ventilation, and the case fatality of severe asphyxia was reduced by 48 percent (Bang, Bang, and others 2005). Results from a randomized controlled trial (RCT) in rural India (Bang and others 1999) suggest that implementation by CHWs of an essential newborn care package, in conjunction with administration of home-based antibiotic therapy for suspected neonatal sepsis, resulted in a 62 percent reduction in the neonatal mortality rate, when 93 percent of newborns in the intervention area were provided with treatment. Another study from an Indian urban slum reports a low case fatality rate of 3.3 percent among babies younger than age two months who were treated for serious infections as outpatients due to family noncompliance with advice for hospitalization (Bhandari and others 1996).

A systematic review of RCTs suggests that home visits for neonatal care by CHWs are associated with a 38 percent reduction in neonatal mortality and a 24 percent reduction in the stillbirth rate (table 14.1) in resource-limited settings with poorly accessible facility-based care, when conducted in conjunction with community mobilization activities (Gogia and Sachdev 2010). The review also shows significant improvements in other care-related outcomes (table 14.1).

Evidence suggests that home visits improve coverage of key newborn care practices such as early initiation of breastfeeding and exclusive breastfeeding; skin-to-skin contact; delayed bathing and attention to hygiene, such as handwashing with soap and water; clean umbilical cord care; immunization; and appropriate management and referral for sepsis and other infections. This evidence complements the experience from HICs, which shows that postnatal home visits are effective in improving parenting skills (Olds and others 2004).

Evidence also suggests that CHWs can effectively perform neonatal resuscitation. Basic neonatal resuscitation,

Table 14.1 Evidence on Community-Based Care through Home Visitations

Study	Interventions assessed	Outcomes	Estimates
Gogia and Sachdev 2010	Randomized controlled trials comparing various intervention packages, one being home visits for neonatal care by community health workers	Neonatal mortality	RR 0.62 (95% CI: 0.44–0.87); five studies
		Stillbirths	RR 0.76 (95% CI: 0.65–0.89); three studies
		Antenatal care visits	RR 1.33 (95% CI: 1.20–1.47); four studies
		Tetanus toxoid immunization	RR 1.11 (95% CI: 1.04–1.18); four studies
		Breastfeeding within one hour of birth	RR 3.35 (95% CI: 1.31–8.59); four studies
		Clean cord care	RR 1.70 (95% CI: 1.39–2.08); four studies
		Delayed bathing after more than 24 hours	RR 4.36 (95% CI: 2.29–9.37); four studies
Bhutta and Lassi 2010	Randomized controlled trials that built community support and advocacy groups for mobilization on issues related to maternal, neonatal, and child health	Neonatal mortality	RR 0.70 (95% CI: 0.61–0.81); six studies, n = 67,808

Note: CI = confidence interval; n = number of observations; RR = risk ratio.

including bag-and-mask ventilation, is adequate for most newborns who require neonatal resuscitation in low-resource settings (Newton and English 2006). The results of a systematic review report that several trials have shown that CHWs can perform neonatal resuscitation with reductions of up to 20 percent in intrapartum-related neonatal deaths (Wall and others 2009).

In integrated community case management (iCCM), CHWs are identified and trained in classification and treatment of key childhood illnesses, including identifying children in need of immediate referral.[2] A systematic review suggests that iCCM of pneumonia could result in a 70 percent reduction in mortality in children younger than age five years (Theodoratou and others 2010). Another systematic review (Das and others 2013) shows that community-based interventions correlate to 13 percent and 9 percent increases in care seeking for pneumonia and diarrhea, respectively (table 14.2). These interventions are also associated with an up to 160 percent increase in the use of oral rehydration solution, an 80 percent increase in the use of zinc for management of diarrhea, and a 32 percent reduction in pneumonia-specific mortality (Das and others 2013). Furthermore, in a meta-analysis of trials of community-based case management of pneumonia (Sazawal and Black 2003), all-cause neonatal mortality was 27 percent lower in the intervention group; pneumonia-specific neonatal mortality in the intervention group was reduced by an even greater amount.

A systematic review carried out to assess the improvement in skills of CHWs shows that workers trained in Integrated Management of Childhood Illness (IMCI), a strategy developed by the World Health Organization (WHO) in the 1990s, were more likely to correctly classify illnesses (risk ratio 1.93; 95 percent confidence interval 1.66–2.24) (Nguyen and others 2013). An RCT in Bangladesh demonstrates that implementation of IMCI improved health worker skills, health system support, and family and community practices, which translated into increased care seeking for illnesses. In IMCI areas, more children younger than age six months were exclusively breastfed (76 percent versus 65 percent; difference of differences 10.1 percent; 95 percent confidence interval 2.65–17.62), and the prevalence of stunting in children ages 24–59 months decreased more rapidly (difference of differences −7.33; 95 percent confidence interval −13.83 to −0.83) than in comparison areas, thereby reducing morbidity (Arifeen and others 2009).

An RCT from Zambia shows that CHWs can be trained to perform rapid diagnostic tests (RDTs) for malaria, treat test-positive children with antimalarials, and treat those with nonsevere pneumonia with amoxicillin. A higher number of children with nonsevere pneumonia received early and appropriate treatment in the intervention arm (treated by CHWs trained to perform RDTs) (risk ratio 5.32; 95 percent confidence interval 2.19–8.94). In the intervention group, only 27.5 percent of children with fever received antimalarial drugs after an RDT was conducted, while 99.1 percent of the children in the fever group received treatment for malaria (Yeboah-Antwi and others 2010).

This successful merger of formal health care systems with community-based efforts has profound effects on the achievement of Millennium Development Goals 4 and 5 to reduce child mortality and improve maternal health. Box 14.1 highlights an example of a CHW-based program.

Table 14.2 Evidence on Community Care through Home Visitations

Study	Interventions assessed	Outcomes	Estimates
Das and others 2013	Effect of community-based interventions, including community case management, on the coverage of various commodities and on mortality due to diarrhea and pneumonia	Health care seeking for pneumonia	RR 1.13 (95% CI: 1.08–1.18); two studies, n = 671
		Health care seeking for diarrhea	RR 1.09 (95% CI: 1.06–1.12); four studies, n = 8,253
		Pneumonia mortality in newborns from birth to age one month	RR 0.58 (95% CI: 0.44–0.77); four studies, n = 1,070
		Pneumonia mortality in children ages 1–4 years	RR 0.58 (95% CI: 0.50–0.67); nine studies, n = 2,507
		Zinc use rates	RR 2.39 (95% CI: 1.45–3.93); four studies, n = 32,676
		Free distribution of oral rehydration solution	RR 3.10 (95% CI: 1.28–7.48); two studies, n = 14,783
Theodoratou and others 2010	Effect of case management of childhood pneumonia on mortality	ALRI-related mortality	RR 0.65 (95% CI: 0.52–0.82); nine studies

Note: ALRI = acute lower respiratory infection; CI = confidence interval; n = number of observations; RR = risk ratio.

Box 14.1

Pakistan's Lady Health Workers

Pakistan's lady health worker (LHW) program, a government-supported community health service begun in 1994, has expanded to cover more than 70 percent of the rural population. In the program, LHWs receive a regular salary and are trained to promote health awareness and provide basic care to pregnant mothers, neonates, and children, including ensuring up-to-date immunizations and monitoring nutritional status. LHWs also provide contraceptive and family planning services.

LHWs serve the community, working from home, and attend to approximately 200 households. Approximately 20 percent of the entire population of Pakistan is covered by 69,000 LHWs. Lady health supervisors are responsible for supervising the LHWs; external evaluations are conducted every three to five years.

Studies show that women are more likely to use modern reversible contraceptive methods if offered by LHWs, and coordination of traditional birth attendants (TBAs) and LHWs led to a reduction in stillbirths and in hemorrhage-related complications. In another study, LHWs were given additional training and were linked with *dais* (TBAs in Pakistan), who were given training for newborn resuscitation and immediate newborn care; this approach also led to reductions in stillbirths, improvements in institutional deliveries, and increased initiation of early and exclusive breastfeeding.

Source: Bhutta and others 2010.

Community-Based Intervention Packages

Data suggest that the introduction of community-based intervention packages has the potential to reduce maternal and neonatal mortality (Ricca and others 2013; Schiffman and others 2010). Community-based care may improve breastfeeding practices and increase referrals to health facilities for pregnancy-related complications and other health care services during pregnancy, such as iron and folic acid supplementation (Lassi and others 2013). Results from a systematic review suggest that implementation of community-based intervention care packages led to a 25 percent reduction in neonatal mortality; referrals to health facilities for pregnancy-related complication increased by 40 percent; rates of early breastfeeding increased by 94 percent; and health care seeking for neonatal illnesses increased by 45 percent, leading to decreases in neonatal and maternal morbidity (tables 14.3 and 14.4) (Lassi, Haider, and Bhutta 2010). Interventions for the topics that follow are covered in more detail in two *DCP3* volumes: *HIV/AIDS, STIs, Tuberculosis, and Malaria* (Volume 6, Bundy and others), and *Child and Adolescent Development* (Volume 8, Holmes and others), both forthcoming in 2016.

Malaria. Community-based interventions may also contribute to prevention of malaria. Bhutta and others (2013) show that intermittent preventive treatment with sulfadoxine-pyrimethamine in pregnancy, delivered through community-based approaches, is associated with a higher mean birth weight compared with case management (weighted mean difference 108.6 grams; 95 percent confidence interval 55.67–161.54). The review also indicates that ownership of insecticide-treated nets (ITNs) increased by 116 percent and usage increased by 77 percent. The use of ITNs was associated with a 23 percent reduction in the risk of delivering an LBW newborn. A meta-analysis replicates the findings of Bhutta and others (2013) and finds that ITN ownership significantly affects morbidity outcomes, including parasitemia, malaria prevalence, and anemia (Salam, Das, and others 2014).

Helminths. Salam, Maredia, and others (2014) also find that interventions such as preventive chemotherapy, health education to promote general hygiene and sanitation, iron and beta-carotene supplementation, construction of latrines, removal of cattle from residential areas, staff training, and community mobilization can have significant impacts on the prevention and management of worm infestations in children. Evidence suggests that school-based delivery of antihelminths can significantly reduce soil-transmitted helminths prevalence by 55 percent, schistosomiasis prevalence (risk ratio 0.50; 95 percent confidence interval: 0.33–0.75), and anemia prevalence (risk ratio 0.87; 95 percent confidence

Table 14.3 Evidence on Community-Based Intervention Packages

Study	Interventions assessed	Outcomes	Estimates
Lassi, Haider, and Bhutta 2010	Randomized controlled trials undertaken to compare effects of various community-based intervention packages on maternal and newborn care	Neonatal mortality	RR 0.43 (95% CI: 0.27–0.69); 13 studies, n = 136,425
		Stillbirths	RR 0.84 (95% CI: 0.74–0.97); 11studies, n = 113,821
		Perinatal mortality	RR 0.80 (95% CI: 0.71–0.91); 10 studies, n = 110,291
		Maternal morbidity	RR 0.75 (95% CI: 0.61–0.92); 4 studies, n = 138,290
		Institutional deliveries	RR 1.28 (95% CI: 0.98–1.67); 8 studies, n = 80,479
		Rates of early breastfeeding	RR 1.94 (95% CI: 1.56–2.42); 6 studies, n = 20,627
		Referrals to health facility for pregnancy-related complication	RR 1.40 (95% CI: 1.19–1.65); 2 studies, n = 22,800
		Health care seeking for neonatal illnesses	RR 1.45 (95% CI: 1.01–2.08); 5 studies, n = 57,157
Kidney and others 2009	Randomized controlled trials that assess community-level interventions and maternal death as an outcome	Maternal mortality	OR 0.62 (95% CI: 0.39–0.98); 2 studies, n = 26,238
Salam, Das, and others 2014	Effectiveness of community-based delivery of interventions for the prevention and management of malaria, including distribution of ITN, environmental cleaning, and provision of intermittent preventive treatment during pregnancy and childhood	ITN ownership	RR 2.16 (95% CI: 1.86–2.52); 14 studies
		ITN usage	RR 1.77 (95% CI: 1.48–2.11); 14 studies
		Parasitemia	RR 0.56 (95% CI: 0.42–0.74); 10 studies
		Malaria prevalence	RR: 0.46 (95% CI: 0.29–0.73); 9 studies
		Anemia	RR: 0.79 (95% CI: 0.64–0.97); 11 studies
Salam, Maredia, and others 2014	Effectiveness of community-based delivery for the prevention and control of helminthiasis, including soil-transmitted helminthiasis (ascariasis, hookworms and trichuriasis), lymphatic filariasis, onchocerciasis, dracunculiasis, and schistosomiasis	Soil-transmitted helminthic	RR 0.45 (95% CI: 0.38–0.54); 10 studies
		Schistosomiasis	RR 0.40 (95% CI: 0.33–0.50); 13 studies
		Mean hemoglobin levels	SMD 0.24 (95% CI: 0.16–0.32); 11 studies
Salam, Haroon, and others 2014	Effectiveness of community-based interventions for the prevention and management of HIV, including educational activities, counseling, home visits, mentoring, women's groups, peer leadership, street	HIV/AIDS-related knowledge scores	SMD 0.66 (95% CI: 0.25–1.07); 6 studies
		Mean number of times condom used	SMD 0.96 (95% CI: 0.03–1.58); 2 studies
		Protected sex	RR 1.19 (95% CI: 1.13–1.25); 4 studies

table continues next page

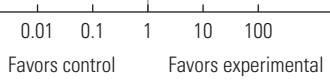
Table 14.3 Evidence on Community-Based Intervention Packages (continued)

Study	Interventions assessed	Outcomes	Estimates
	outreach activities, and dramas to increase awareness of HIV/AIDS risk factors and address perceived barriers to counseling and voluntary testing	Treatment adherence	MD 3.88 (95% CI: 2.69–5.07); 1 study
		Stillbirths	RR 0.34 (95% CI: 0.18–0.65); 1 study
Arshad and others 2014	Effectiveness of community-based interventions for the prevention and treatment of tuberculosis, including variants of DOTS; community outreach; training sessions and increased awareness to increase the detection rate and decrease relapse rates	Completion of tuberculosis treatment	RR 1.09 (95% CI: 1.07–1.11); 36 studies
		Tuberculosis detection rates	RR 3.10 (95% CI: 2.92–3.28); 5 studies

Note: CI = confidence interval; DOTS = directly observed treatment short course; HIV/AIDS = human immunodeficiency virus/acquired immune deficiency syndrome; ITN = insecticide-treated net; MD = mean difference; n = number of observations; OR = odds ratio; RR = risk ratio; SMD = standard mean difference.

Table 14.4 Forest Plot on a Community-Based Intervention Package and Its Impact on Health Care Seeking for Neonatal Illnesses

Study or subgroup	Intervention package N	Standard care N	Log [risk ratio] (SE)	Risk ratio IV, random, 95% CI	Weight (%)	Risk ratio IV, random, 95% CI
Azad and others 2010	15,695	15,257	–0.117 (0.12)		22.5	0.89 [0.70, 1.13]
Bari and others 2006	520	548	0.068 (0.03)		24.6	1.07 [1.01, 1.14]
Kumar and others 2008	1,087	1,079	0.657 (0.08)		23.7	1.93 [1.65, 2.26]
Manandhar and others 2004	2,864	3,181	1.044 (0.277)		16.0	2.84 [1.65, 4.89]
Tripathy and others 2010	8,807	8,119	0.425 (0.35)		13.2	1.53 [0.77, 3.04]
Total (95% CI)					**100**	**1.45 [1.01, 2.08]**
Heterogeneity: $Tau^2 = 0.14$; $Chi^2 = 63.42$, df = 4 (P<0.00001); $I^2 = 94\%$ Test for overall effect: Z = 1.99 (P = 0.047)						



Source: Lassi, Haider, and Bhutta 2010.
Note: CI = confidence interval; IV = inverse variance; n = number of participants; SE = standard error.

interval 0.81–0.94) in school-going children. It also improves the mean hemoglobin levels significantly (standard mean difference 0.24; 95 percent confidence interval 0.16–0.32) (Salam, Maredia, and others 2014).

HIV/AIDS. Similarly, community-based interventions can significantly improve HIV/AIDS status. Interventions such as educational activities, counseling sessions, home visits, mentoring, women's groups, peer leadership, and street outreach to increase awareness of HIV/AIDS risk factors have shown significant impacts on sexual practices and health outcomes. These interventions improve HIV/AIDS-related knowledge scores (standard mean difference 0.66; 95 percent confidence interval 0.25–1.07) and the frequency of protected sex (risk ratio 1.19; 95 percent confidence interval 1.13–1.25). Home visits can also decrease HIV-related morbidity by significantly increasing treatment adherence scores (mean difference 3.88; 95 percent confidence interval 2.69–5.07). Community delivery of highly active antiretroviral therapy during pregnancy and lactation also led to a 66 percent decrease in stillbirths (risk ratio 0.34; 95 percent confidence interval 0.18–0.65) (Salam, Haroon, and others 2014).

Tuberculosis. Tuberculosis can be managed and prevented through community-based intervention packages, including through variants of the directly observed treatment short course, community outreach, training sessions, and increased awareness to boost the detection rate and decrease relapse rates. Findings from 41 studies on the effectiveness of community-based interventions for tuberculosis show that these interventions were associated with a significant increase in cure and the success and completion of treatment (risk ratio 1.09; 95 percent confidence interval 1.07–1.11). Moreover, detection rates increased with community-based interventions using CHWs as the delivery strategy, with a pooled risk ratio of 3.10 (95 percent confidence interval 2.92–3.28) (Arshad and others 2014).

Nutrition. Evidence suggests that community-based nutrition programs can have a positive impact on health outcomes. India's Tamil Nadu Integrated Nutrition Program delivered nutrition services composed of monthly growth monitoring, short-term supplementary feeding for malnourished children and pregnant and lactating women, deworming and micronutrient supplementation, and education on diarrhea management and feeding. Approximately 25 percent of the project's food requirements were provided by village women's groups in a neighboring state; this arrangement contributed to the incomes of local women and educated them in the production of a low-cost weaning food (Balachander 1993).

A nutrition program in Ethiopia is also illustrative. In the program, monthly community sessions are held to monitor and promote the growth of children ages two years and younger (Getachew 2011; World Bank 2012). The program empowers communities to assess the nutritional status of their children and take action, using their own resources, to prevent malnutrition. Monthly tracking of all children in the community enables the timely identification of severely underweight children and their referral for further examination and treatment. The government of Ethiopia introduced this initiative in 2008 in drought-prone and food-insecure districts. An evaluation jointly undertaken by the World Bank, United Nations Children's Fund, and Tulane University shows that the program contributed to improved feeding and child care and thereby to lower rates of stunting: intervention areas experienced a 3–5 percentage point decrease in stunting compared with the national rate of decline of 1.3 percentage points a year (Getachew 2011; World Bank 2012). The study also finds that the program positively influenced infant and young child feeding, including greater adherence to exclusive breastfeeding for babies younger than age six months, complementary feeding between ages 6 and 23 months, and dietary diversity for older children, thereby reducing morbidity and mortality related to malnutrition (Getachew 2011; World Bank 2012).

A systemic review of community-based interventions to improve child nutrition status suggests that nutrition education in both food-secure and food-insecure populations is associated with an increase in height-for-age *Z* scores of 0.22 (95 percent confidence interval 0.01–0.43) and 0.25 (95 percent confidence interval 0.09–0.42), respectively, compared with a control group (annex figure 14A.1). The review also suggests that simple interventions, such as individual counseling and group counseling, increase the odds of exclusive breastfeeding practices (Bhutta and others 2013; Lassi and others 2013). Table 14.5 highlights several community-based nutrition programs.

COMMUNITY-BASED CARE TO INCREASE THE DEMAND FOR SERVICES—EMPOWERING COMMUNITIES

In addition to delivering health services, CHWs and other community facilitators can be involved in education and health promotion activities to empower communities with knowledge and mobilize them to improve their health practices.

One such mechanism for empowering and educating communities is organized women's groups, which gather around particular health issues. For example, women's groups may seek to increase appropriate care seeking (including ANC and institutional delivery) and appropriate home prevention and care practices for mothers and newborns.

A pooled analysis of RCTs from Bangladesh, India, Nepal, and Pakistan—in which community support groups and group advocacy sessions that targeted women were implemented as part of community interventions—suggests that these interventions led to a 30 percent reduction in neonatal mortality (table 14.6). A decrease in neonatal morbidity through benefits of domiciliary practices, such as early initiation of breastfeeding and health-seeking behaviors, was also observed (risk ratio 1.87; 95 percent confidence interval 1.36–2.58) (annex figure 14A.2) (Bhutta and Lassi 2010).

A 2013 systematic review suggests that women's groups practicing participatory learning and action—specifically identifying and prioritizing problems during pregnancy, delivery, and postpartum period—are associated with a nonsignificant 23 percent reduction in maternal mortality and a 20 percent reduction in neonatal mortality (Prost and others 2013) (table 14.6).

Table 14.5 Characteristics of Selected Nutrition Programs

Program	Institution and evaluation year	Sponsors and funds	Staff and service providers	Objectives of the nutrition program	Coverage of the nutrition program	Program evaluation results
Nutrition centers as part of Viva Criança program, Brazil	1992 Evaluation in 1996	World Bank	A trained nutritionist, CHWs, and support staff	Provide nutrition training for center staff and CHWs and identify, treat, and then follow up moderately and severely malnourished children. Also provide up-to-date nutrition information to mothers and others in the community, and mobilize the community to find and implement strategies to prevent child malnutrition.	A total of 35 centers were developed; only 20 were functioning as nutrition centers.	Case fatality in two centers was 40 percent and more. Entry and exit criteria for rehabilitation were ill defined, resulting in some nonmalnourished children being enrolled. Few staff were adequately trained; knowledge was weak, especially about case management; and mothers were not effectively instructed.
Integrated Nutrition Project, Bangladesh	1995 Evaluation in 2000	Ministry of Health and Family Welfare, World Bank, World Food Program	CHWs and trained nutritionists	Improve the capacity of communities, households, and individuals in the project areas to understand their nutritional problems and to take appropriate action; and improve the nutritional status of the population in the project area, with particular emphasis on children and pregnant and lactating women.	Coverage was 55 of the 464 districts in Bangladesh.	The program improved knowledge by about 10–20 percentage points beyond that seen in nonproject areas regarding exclusive breastfeeding. Roughly 60 percent of malnourished women (with BMI < 18.5) received supplementary feeding.
Iringa nutrition project, Tanzania	1984 Evaluation in 1992	Government of Tanzania, UNICEF	CHWs and trained nutritionists	Reduce infant and young child mortality and morbidity through better child growth and development, and improvement of maternal nutrition. This was achieved by training of CHWs, day care programs, educational activities, village campaigns, and cash training programs.	The program began in 168 villages in the Iringa Region of Tanzania, covering an estimated population of 46,000 children under age five years.	The prevalence of total underweight (weight-for-age < 80 percent of WHO standard) decreased from 55.9 percent to 38.0 percent, and the prevalence of severe underweight (weight-for-age < 60 percent) decreased from 6.3 percent to 1.8 percent.

table continues next page

Table 14.5 Characteristics of Selected Nutrition Programs (continued)

Program	Institution and evaluation year	Sponsors and funds	Staff and service providers	Objectives of the nutrition program	Coverage of the nutrition program	Program evaluation results
Integrated Child Development Services (ICDS) scheme, India	1975 Evaluated in 2005	Ministry of Women and Child Development	CHWs	Improve the nutritional and health status of children younger than age six years, and reduce incidence of mortality, morbidity, malnutrition, and school dropouts. Also aims to enhance the capability of the mother to look after the normal health, nutritional, and developmental needs of the child through proper community education. The package of services provided by the ICDS scheme includes supplementary nutrition, immunizations, health checkups, referral services, nutrition and health education, and preschool education. Iron and folic acid tablets and mega doses of vitamin A are distributed.	Started in 33 blocks and now spans the country. It is delivered through a network of more than 1 million CHWs and reaches more than 70 million children and 15 million pregnant and lactating mothers.	Multiple evaluations suggest that although there had been a vast increase in ICDS blocks, there was a lack of infrastructure and basic amenities. Though immunization activities under ICDS have appreciable credibility, nonformal preschool, nutrition, and health education are not fully functioning as planned. A World Bank evaluation in 1999 suggested that the program had no significant impact on nutritional outcomes.

Sources: Balachander 1993; do Monte and others 1998; Gupta, Gupta, and Baridalyne 2013; World Bank 2005; Yambi and Mlolwa 1992.
Note: BMI = body mass index; CHW = community health worker; UNICEF = United Nations Children's Fund; WHO = World Health Organization.

Table 14.6 Evidence on Community-Based Care through Community Mobilization

Study	Interventions assessed	Outcomes	Estimates
Prost and others 2013	Seven randomized controlled trials undertaken on the effects of women's groups practicing participatory learning and action were assessed to identify population-level predictors of effect on maternal mortality, neonatal mortality, and stillbirths.	Maternal mortality	OR 0.77 (95% CI: 0.48–1.23); seven studies, n = 113,911
		Neonatal mortality	OR 0.80 (95% CI: 0.67–0.96); seven studies, n = 113,911
Bhutta and Lassi 2010	Six randomized controlled trials that built community support and advocacy groups for mobilization on issues related to maternal, neonatal, and child health were analyzed.	Neonatal mortality	RR 0.70 (95% CI: 0.61–0.81); six studies, n = 67,808

Note: CI = confidence interval; OR = odds ratio; RR = risk ratio.

A study from Ethiopia showed promising results when a group of women from the community were empowered and mobilized to recognize and treat malaria (Rosato and others 2008). This process led to an overall 40 percent reduction in mortality in children under age five years (Kidane and Morrow 2000). In communities with underresourced health systems, such as in Jharkhand and Orissa, two of the poorest states in eastern India, 55 percent coverage of women's groups formed to facilitate participatory learning, safe delivery practices, and care-seeking behavior was believed to be a factor in reducing maternal depression. Neonatal mortality rates were reduced by 45 percent in the intervention arm (Tripathy and others 2010).

An effective community mobilization program led to a 28 percent reduction in neonatal mortality in a study conducted in Hala, Pakistan, of LHWs who had received training in home-based neonatal care and TBAs who received voluntary training (Bhutta and others 2008).

The Makwanpur trial was conducted in a rural mountainous community in Nepal, where 94 percent of babies are born at home (Pradhan and New 1997) and only 13 percent of births are attended by trained health workers (Central Bureau of Statistics 2001). With the implementation of facilitated monthly group meetings among pregnant women, a decrease in neonatal mortality was seen in the intervention arm, compared with the control arm, with an odds ratio of 0.7 (95 percent confidence interval 0.53–0.94) (Manandhar and others 2004).

QUESTIONS AND CHALLENGES

Expanding the Community Health Worker Mandate

Shortages in human resources and expanding populations have given new relevance to training CHWs in ever-more complex tasks. For countries with limited resources for training or employing paid labor, task shifting may allow CHWs or less trained TBAs to receive training and perform interventions that might have previously been reserved for more highly trained professionals (WHO 2012).

However, no global consensus exists on the appropriate package of services for CHWs. The case of CHWs and misoprostol is illustrative. The WHO recommends the use of oxytocin (10 International Units, intravenous/intramuscular) as the uterotonic drug for the prevention of postpartum hemorrhage, and misoprostol (600 microgram by mouth) administered by CHWs in the absence of a skilled birth attendant (Department of Reproductive Health and Research, WHO 2012).

An RCT from Afghanistan shows that uterotonics such as misoprostol are widely accepted in communities and can potentially decrease significant postpartum hemorrhage-related maternal morbidity and mortality. Results show that of the 1,421 women in the intervention group who took misoprostol, 100 percent correctly took it after birth. In the intervention area where community-based distribution of misoprostol was introduced, near-universal uterotonic coverage (92 percent) was achieved, compared with 25 percent coverage in the control areas (Sanghvi and others 2010).

A systematic review suggests that in the community, misoprostol distribution rates during home visits were higher compared with facility-based ANC distribution. Coverage rates were also higher when CHWs and TBAs distributed misoprostol compared with ANC providers (Smith and others 2013). The review highlights that misoprostol and other uterotonics may very well be widely acceptable within the community and can be delivered by CHWs. Usage is particularly seen more in the South Asia region, with uterotonic usage rates of up to 69 percent (Flandermeyer, Stanton, and Armbruster 2010).

A community-based, cluster-RCT from Ghana evaluates the use of intramuscular oxytocin with a Uniject device delivered by a CHW. In this trial, women receiving oxytocin had a reduced risk of postpartum hemorrhage (risk ratio 0.49; 95 percent confidence interval 0.27–0.88) (Stanton and others 2013),

suggesting that, with appropriate training, CHWs can deliver injectable uterotonics.

Neonatal resuscitation, the administration of intravenous antibiotics, and the management of postpartum hemorrhage with uterotonics are some of the interventions that may be appropriate for CHWs. Although promising evidence is emerging for their possible new roles, the data are still insufficient to draw a conclusion as to whether CHWs can be handed these tasks. Investigators should focus on this area of research as a promising approach in low-resource settings. However, increasing the number of tasks required from CHWs has also initiated a debate on the potential for overburdening CHWs and compromising quality.

Improving the Quality of Community-Based Care

Ensuring that care provided in communities meets quality standards is a key concern, and training and supervision are crucial mechanisms for ensuring quality care. However, training and supervisory systems are often deficient in the CHW subsystem in LMICs. Effective supervision requires that supervisors be trained and that they be provided with resources for supervision (Mason and others 2006). Training styles have evolved from being primarily classroom based into more interactive sessions, including small group discussions, clinical vignettes, and field training (Mason and others 2006). These modifications allow CHWs, especially those who are less educated or illiterate, to simulate real-life situations and be better equipped to manage such situations. Training should take into account differences in cultural and religious beliefs and particular practices of communities. A program tailored to communities' specific needs and health concerns is preferable.

Updates to technology or medical methods and practices can be communicated to CHWs through regular refresher training courses or through open lines of communication between CHWs and supervisors. Regular follow-up and evaluation of training courses will reinforce knowledge and skills as well as provide opportunities to acknowledge problems and issues that have arisen.

Poor supervision is often cited as a major constraint to improving the quality of essential health interventions and a factor in the poor performance of frontline health workers (PAIMAN 2006; WHO 2006). Effective supervision, however, can be an opportunity to show CHWs that their work is valued and motivate them (Bhutta and others 2010).

The supervision of CHWs requires that supervisors be aware of the issues and problems that CHWs face and understand gaps in capacity. The majority of CHW programs have been run at a small scale by nongovernmental organizations with the capacity to train and supervise; therefore, it was relatively easy to supervise CHWs in those programs. However, once a program is implemented at scale, government bodies need to ensure that supervision and monitoring are performed effectively and are considered to be a core pillar for successful delivery of the program. National CHW programs, which encompass CHWs in remote, rural areas, may be difficult to monitor and supervise effectively and consistently.

Leveraging Mobile Technology

Limited but increasing evidence indicates that the growing use of mobile health (mHealth) tools may increase the effectiveness of CHWs in resource-constrained settings. Mobile technology can be used for a variety of purposes, from helping CHWs collect comprehensive, timely, and precise health data to providing CHWs with information and reminders about health care practices and protocols via text messaging (Freifeld and others 2010; Guy and others 2012; Jha and others 2009; Mukund and Murray 2010). Mobile technology can also play a role in training, peer-to-peer learning, and monitoring of the performance of CHWs, in the following ways:

- A cluster RCT at rural health facilities in Kenya shows that health workers at dispensaries and rural outpatient services who received text messages on their personal mobile phones about malaria case management for six months as reminders provided better case management for malaria in children (Zurovac and others 2011).
- The Tanzania CommCare project used an automated text-message system to remotely monitor the real-time performance of midwives and provide workers with alerts and reminders to their mobile phones about past-due patient visits (Svoronos and others 2010). Compared with a group of midwives who did not receive alerts and reminders, the midwives who received these messages improved the number of timely visits to expectant mothers.
- In the Aceh-Behar midwives study in Indonesia, the use of mobile phones was positively associated with access to institutional and peer information resources, which, in turn, was positively associated with an increase in knowledge about best practices for providing obstetric care (Lee, Chib, and Kim 2011).
- The k4Health project in Malawi introduced a text-messaging network to improve the exchange and use of reproductive health and HIV/AIDS information among CHWs. After an 18-month pilot, the authors found that CHWs who used the text-message network were more likely to contact supervisors for clinical support from the field (Lemay and others 2012).

The potential for CHWs to use mobile tools to improve health service delivery in resource-limited settings is certainly great; however, a stronger evidence base is necessary to guide global health policy and program implementation.

Improving Referral Systems

CHWs are often the first line of care for many patients, such as in Pakistan, where approximately 17 percent of those who seek health care consult CHWs first. For referral systems to be effective, transportation and communications capabilities must be in place, and CHWs must be integrated into the primary health care system (figure 14.1).

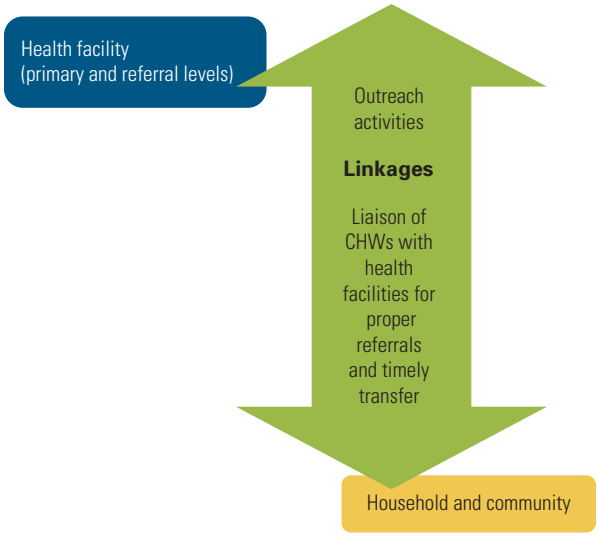
Integrating CHWs into the primary health care system, as well as ensuring sufficient staffing at facilities, is vital for ensuring strong referrals and for alerting facilities of the imminent arrival of patients. The Brazilian Ministry of Health created the Family Health Program in 1993; the program placed health agents (CHWs) in teams of physicians, dentists, nurses, dental assistants, and nursing technicians, thus formally integrating the CHWs into the primary health system (Singh and Sachs 2013).

Enhancing Motivation

In the absence of appropriate compensation, along with weak supervision and monitoring systems, a lack of effort and decline in performance among CHWs has been noted (Bhutta and others 2010). CHWs, especially in low-income countries and lower-middle income countries, may come from lower socioeconomic groups and would benefit from regular salaries. Although some may serve on a voluntary basis, full-time status would help improve performance and encourage CHWs to exert the effort necessary to deliver quality care.

Some countries are exploring the use of nonfinancial incentives to motivate CHWs. Nonfinancial incentives can also play a key role in the overall satisfaction and motivation of CHWs (Bhutta, Pariyo, and Huicho 2010). One such incentive is the certification of training so that CHWs may gain recognition from peers and work toward building a career. Recognition and the knowledge that career advancement is a possibility motivates CHWs to continually improve the quality of the care they provide. Community support, as well as professional support from superiors, is another motivating factor for overall job security and satisfaction.

Figure 14.1 Linking the Places Where Care Is Given



Note: CHWs = community health workers.

Scaling Up

Scaling up health interventions includes expanding interventions, whether on a population or a geographical basis, and sustaining their use. Both require increased resources, funding, and in some cases, technical equipment.

Scale up of community mobilization efforts can be bolstered by partnerships between government and nongovernmental organizations (Coe 2001; CORE Group 2005; Howard-Grabman, Seoane, and Davenport 1994). Strong political will along with mechanisms for monitoring political commitments are essential components of implementing interventions on a large scale. Allowing communities to take an active part in the decision-making and implementation processes permits differences in culture, religion, or beliefs to be addressed and successfully planned for; this approach leads to successful intervention packages and programs that meet the populations' needs and achieve the initial goals for which they are designed. A bottom-up approach from educated communities with adequate support from reliable government and national institutions will be key for sustainable interventions.

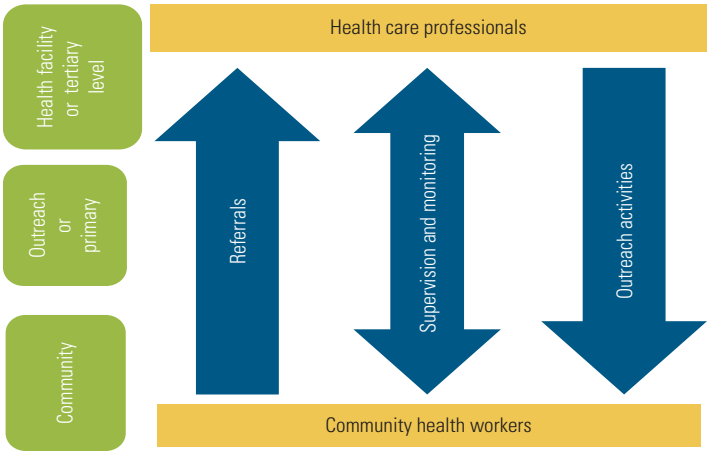
Building Links with Community and Local Health Facilities

Primary care services need to be well linked with the community, and effective communication must be present along with feedback mechanisms so that community concerns may be conveyed to higher authorities.

We have developed an evidence-driven framework based on a continuum of care model for reproductive, maternal, neonatal, and child health (figure 14.2), highlighting several approaches that have been recognized

as successfully reaching communities and providing the best possible interventions. The framework (figure 14.3) portrays the essential components of a promising health care system that should be focused on integrating communities with the primary health care system. Unless these two elements can work together effectively, neither can benefit from the available resources and infrastructure. Community mobilization, home visitation, social marketing, community intervention packages, and community-based programs can be the bridge between these two levels. Once the links are firmly established, the health care system can gain substantially from the resources and support provided by national and local governments and nongovernmental organizations.

Figure 14.2 Links between Health Care Professionals and Communities



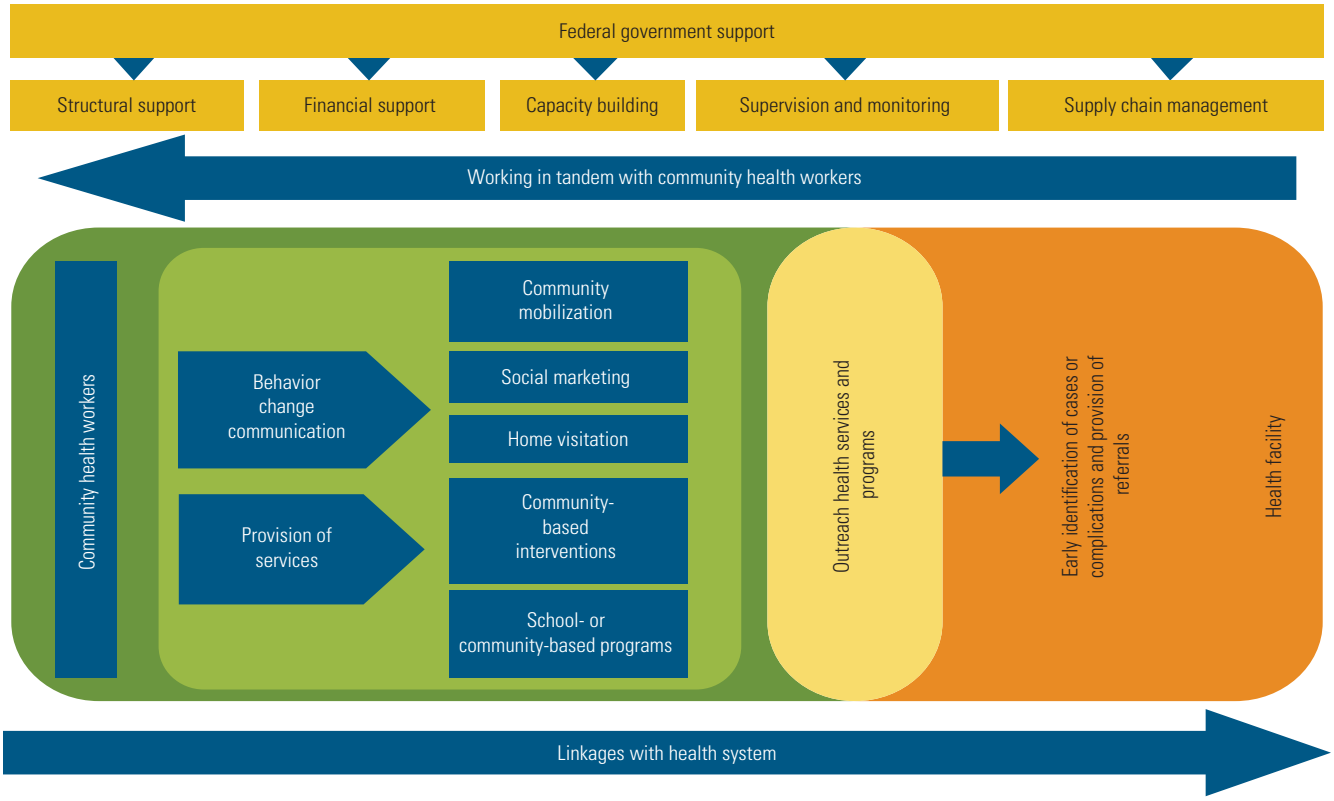
COSTS AND COST-EFFECTIVENESS OF COMMUNITY-BASED PROGRAMS

Cost-Effectiveness of Community-Based Programs

CHW program costs vary widely from country to country. The introduction of community-based interventions requires personnel, resources, training, management, and infrastructure.

Using the WHO-CHOICE model, Adam and others (2005) estimate the most cost-effective mix of interventions for countries with high adult and child mortality in Sub-Saharan Africa and South-East Asia. Interventions for newborn care at the community level were highly cost-effective, followed by ANC, skilled attendance at birth, maternal and neonatal primary

Figure 14.3 Integrated Health Care System and Approaches for Reaching Community

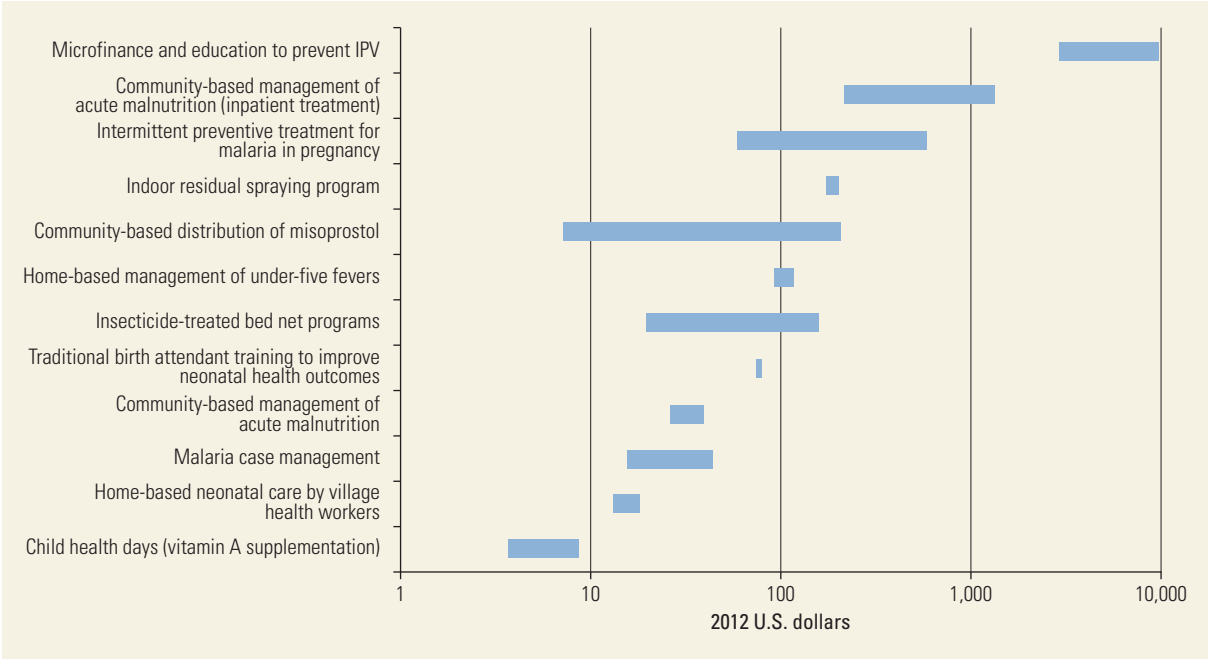


care around childbirth, and emergency perinatal and postnatal obstetric and neonatal care. Using a frequently cited threshold, interventions are considered to be cost-effective when the cost per disability-adjusted life year (DALY) averted is less than per capita gross domestic product (GDP) and very cost-effective when less than three times GDP per capita (WHO 2001).

Community-based strategies that deliver a package of child health interventions including vitamin A (Fiedler and Chuko 2008), ITN distribution (Ross and others 2011), home-based management of fever (Nonvignon and others 2012), treatment for severely malnourished children (Puett, Sadler, and others 2013; Puett, Salpéteur, and others 2013), and training TBAs to improve neonatal health (Sabin and others 2012) are cost-effective at less than US$100 per DALY averted (figure 14.4). Many of the studies rely on CHWs to deliver services, yet studies focused explicitly on the cost-effectiveness of CHWs are scarce. Lehmann and Sanders's (2007) review of the cost-effectiveness of CHW programs notes the dearth of data on the cost-effectiveness of CHW programs, despite assumptions that services provided by CHWs are expected to be less expensive and reach larger numbers of underserved people compared with clinic-based services. A similar finding is noted in a review of the cost-effectiveness of lay health workers delivering vaccines (Corluka and others 2009). Methodologically, cost-effectiveness analyses may also miss key elements of CHW programs that enhance equity, increase communities' self-reliance, and contribute to other social benefits and community norms (Lehmann and Sanders 2007).

RCTs have also been used to generate cost-effectiveness results for community-based interventions. In a multicountry study conducted in Bangladesh (Fottrell and others 2013), India (Tripathy and others 2010), Malawi (Lewycka and others 2013), and Nepal (Manandhar and others 2004), community mobilization through women's groups was effective in preventing neonatal deaths. Using a systematic review and meta-analysis from these RCTs, Prost and others (2013) model the cost-effectiveness of women's groups for newborn care and find that the cost per averted neonatal year of life lost was US$91 in India and US$753 in Nepal, and was considered cost-effective when compared with GDP per capita. In Zambia, an RCT evaluating the Lufwanyama Neonatal Survival Project shows that training TBAs to manage birth asphyxia, hypothermia, and neonatal sepsis reduced all-cause neonatal mortality by 45 percent (Gill and others 2011) and was cost-effective for all scenarios. Scaling up the intervention from 2011 to 2020 was considered cost-effective at

Figure 14.4 Cost per DALY Averted in Community-Based Programs for Reproductive, Maternal, Newborn, and Child Health



Sources: Based on Bachmann 2009; Bang, Bang, and Reddy 2005; Fiedler and Chuko 2008; Jan and others 2011; Nonvignon and others 2012; Puett and others 2013; Ross and others 2011; Sabin and others 2012; Sutherland and others 2010; Wilford, Golden, and Walker 2012; Yukich and others 2008; Yukich and others 2009.
Note: IPV = intimate partner violence.

US$74 per DALY averted at the baseline and improved to US$24 per DALY averted for an optimistic scale-up scenario. A strategy of using trained TBAs to reduce neonatal mortality can be highly cost-effective (Sabin and others 2012). Other community-based programs, such as social marketing or employer-based schemes for ITN distribution, are also cost effective at US$72 per DALY averted (Hanson and others 2003) and US$40 per DALY averted (Bhatia, Fox-Rushby, and Mills 2004), respectively.

Table 14.7 Average Intervention Costs for Community-Based RMNCH Services, 2012 U.S. Dollars

Community-based RMNCH services	Mean cost per beneficiary (range) (US$ 2012)	Sources of costs
Maternal and neonatal		
Volunteer peer counselling	$30.60 ($4.97–$68.04)	Nepal; Borghi and others (2005)
Traditional birth attendants and birth preparedness		Malawi; Lewycka and others (2013)
Home-based neonatal care		India; Bang, Bang, and others (2005)
Community health worker maternal care		Cambodia; Skinner and Rathavy (2009)
		Bangladesh; LeFevre and others (2013)
		Zambia; Sabin and others (2012)
Breastfeeding		
Peer counseling, education, and support	$166.50 ($162.55–$170.44)	Uganda; Chola and others (2011)
		South Africa; Nkonki and others (2014)
Child health		
Deworming campaigns	$3.47 ($0.34–9.69)	Lao PDR; Boselli and others (2011)
Child health days and weeks		Ethiopia; Fiedler and Chuko (2008)
		Honduras; Fiedler (2008)
		Zambia; Fiedler and others (2014)
		Somalia; Vijayaraghavan and others (2012)
		Vietnam; Casey and others (2011)
Immunization		
School-based and community-based vaccine programs	$26.75 ($3.50–$50)	South Asia; Jeuland and others (2009)
Mobile community health workers		Ecuador; San Sebastián and others (2001)
Malaria		
IPT with volunteer health workers	$5.02 ($1.350–$10.10)	Gambia, The; Bojang and others (2011)
Community health worker malaria treatment		Ghana; Nonvignon and others (2012)
		Ghana; Patouillard and others (2011)
Severe acute malnutrition		
Community-based therapeutic care	$153.85 ($116.11–$180.37)	Zambia; Bachmann (2009)
		Bangladesh; Puett, Sadler, and others (2013)
		Ethiopia; Tekeste and others (2012)
Gender-based violence		
Microfinance	$54.12	South Africa; Jan and others (2011)
Gender/HIV training for prevention of GBV		

Note: GBV = gender-based violence; HIV = human immunodeficiency virus; IPT = intermittent preventive treatment; RMNCH = reproductive, maternal, newborn, and child health; USD = U.S. dollars.

Costs of Community-Based Programs

On average, community-based interventions range from US$3 per beneficiary for child health days to US$166 for peer counseling, education, and support to promote breastfeeding. As seen in table 14.7, community strategies can cost as low as US$0.34 per beneficiary for a national deworming campaign in the Lao People's Democratic Republic (Boselli and others 2011) to a high of US$180.00 for community-based therapeutic care to treat severe acute malnutrition in Ethiopia (Tekeste and others 2012). The main cost drivers relate to the intensity of the intervention and the numbers covered. Even in cases in which intensive resources are required, the cost per capita can be quite low.

In Vietnam, weekly deworming and iron and folic acid supplementation delivered by CHWs to women of reproductive age required considerable resources to train caregivers and sustain the program over a year, yet the cost per woman treated was US$0.88 per year (Casey and others 2011).

A key factor in most of the studies described in table 14.7 is the reliance on CHWs to deliver services. McCord, Liu, and Singh (2013) estimate that it would cost US$2.6 billion a year to deploy CHWs to serve the entire Sub-Saharan African rural population, at a cost of US$6.86 per person for each CHW catchment area, and US$2.72 per person per year.

RESEARCH AGENDA

Since 2000, a substantial amount of research has been conducted on community-based health interventions, particularly those carried out by CHWs. Yet numerous research gaps exist that, if studied, could have a significant impact on the delivery of health care. The studies available for review are mostly program evaluations without comprehensive and high-quality study designs. RCTs are limited to evaluation of interventions to improve newborn, child, and maternal outcomes.

The majority of community-based health programs are based in South Asian and Sub-Saharan African countries, and CHWs remain the core of the community-based care concept. Many program evaluations have been conducted to examine the effect of these programs on maternal and child health parameters, yet very few exist that study the quality of life and satisfaction among the CHWs themselves. There is also scarce evidence about whether the CHWs are over- or underutilized, and the impact of incentives, work hours, and job-related satisfaction on the performance of CHWs.

Evidence is also needed on the cost-effectiveness of small and large nutrition and other community-based programs, the role of public and private partnerships, and the effect of political will and stability on health care delivery.

It is important to support routine implementation research while programs are being implemented and to identify hurdles and review and revise programs as necessary. More learning is also needed from community-based programs from HICs, with lessons adapted to LMICs.

CONCLUSIONS

As countries grow as a result of increased global economic development, existing health care systems are ill equipped to deal with the new population increments. Even with the expansion of health care systems, resources may be limited or facilities may be inaccessible to increasing segments of the population. Maternal, neonatal, and child mortality and morbidity continue to be persistent challenges, particularly in rural areas. Issues of cultural barriers, political instability, poverty, and poor educational systems contribute to ill health.

Improving reproductive, maternal, newborn, and child health requires successful community engagement. A combination of efforts is required to mobilize communities to take charge of their own needs, as well as to provide outreach activities to bring care to communities. Based on the evidence and examples mentioned in this chapter, we conclude that a bottom-up approach that actively involves communities, and that employs and recognizes CHWs as a formal cadre of the national health system, will bring about substantial changes to health care. The integration of community care subsystems into the primary care health system will have wide-ranging effects on the sustainability, effectiveness, and longevity of community health systems, bringing all closer to achieving the Millennium Development Goals.

ANNEX

The annex in this chapter is as follows. It is available at http://dcp-3.org/rmnch:

- Annex 14A. Additional Information on the Effect of Select Community-Based Interventions on Neonatal Health Indicators.

NOTES

1. The number of women who die annually during pregnancy and childbirth has fallen globally from 526,300 in 1980 to 303,000 in 2008 (Hogan and others 2010; WHO 2015). A number of countries in Sub-Saharan Africa have

halved the levels of maternal mortality since 1990 (*PLoS Medicine* Editors 2010).

2. See CCM Central (http://ccmcentral.com/about/iccm/). iCCM is typically delivered by community health workers at the community level and encompasses treatment for (1) childhood pneumonia with antibiotics, (2) diarrhea with zinc and oral rehydration solution, and (3) malaria with artemisinin combination therapy. The joint statement on iCCM also supports the identification (but not treatment) of severe acute malnutrition and home visits (but not treatment) for newborns (Bennett and others 2014; UNICEF 2012).

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