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Caregiver Behavior Change for Child Survival and Development in Low- and Middle-Income Countries: An Examination of the Evidence

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In June of 2012, representatives from more than 80 countries promulgated a Child Survival Call to Action, which called for reducing child mortality to 20 or fewer child deaths per 1,000 live births in every country by 2035. To address the problem of ending preventable child deaths, the U.S. Agency for International Development and the United Nations Children's Fund convened, on June 3-4, 2013, an Evidence Summit on Enhancing Child Survival and Development in Lower- and Middle-Income Countries by Achieving Population-Level Behavior Change. Six evidence review teams were established on different topics related to child survival and healthy development to identify the relevant evidence-based interventions and to prepare reports. This article was developed by the evidence review team responsible for identifying the research literature on caregiver change for child survival and development. This article is organized into childhood developmental periods and cross-cutting issues that affect child survival and healthy early development across all these periods. On the basis of this review, the authors present evidence-based recommendations for programs focused on caregivers to increase child survival and promote healthy development. Last, promising directions for future research to change caregivers' behaviors are given.

In June of 2012, more than 80 countries represented by governmental officials and partners from the private sector, civil society, and faith-based organizations gathered for the Child Survival Call to Action (<http://apromiserenewed.org/index.html>). This high-level forum was convened by the governments of Ethiopia, India, and the United States, in collaboration with the United Nations Children's Fund (UNICEF). This Call to Action challenged the world to reduce child mortality to 20 or fewer child deaths per 1,000 live births in every country by 2035. The current rate is approximately 49 children per live births (UNICEF, 2013); therefore, reaching this historic target will save the lives of an additional 45 million children by 2035. In addition to enhancing child survival, it is also important to make sure that infants achieve healthy development. It is widely acknowledged that poverty and its corollaries (e.g., malnutrition, parasites, acute and chronic diseases, exposure to hazardous physical environments, violence, exploitation, neglect) have serious immediate and sometimes irreversible long-term effects on children's development. National and international governments must commit to implementing national plans for survive-and-thrive programs, focusing on the most disadvantaged and vulnerable children and monitoring results (Fox & Obregón, 2014; Pablos-Méndez & Fox, 2012).

To address the problem of ending preventable child deaths and enhancing early child development, the United States Agency for International Development (USAID), in collaboration with UNICEF and other partners, convened an Evidence Summit on Enhancing Child Survival and Development in Lower- and Middle-Income Countries by Achieving Population-Level Behavior Change in June 2013 in Washington, DC (hereafter referred to as the Evidence Summit). One goal of the Evidence Summit was to identify evidence-based interventions to change

caregivers' behaviors associated with preventing mortality and morbidity and optimizing healthy development in children younger than 5 years of age (Fox & Obregón, 2014; Pablos-Méndez & Fox, 2012). This article was developed by the evidence review team that was charged with answering the question, "What are the effective and sustainable interventions to promote and support behavior changes required for and by families, mothers and other caregivers to accelerate reductions in under-5 mortality and optimize healthy and protective child development to age 5?" This article is organized into childhood developmental periods followed by cross-cutting issues that affect child survival and healthy development across all these periods. On the basis of this review, evidence-based recommendations for programs focused on caregivers to increase child survival and promote healthy development are presented. Last, promising directions for future research to change caregivers' behaviors are presented. Parenting is one type of caregiving to a child in a caring relationship and is not limited to biological parents. This article addresses interventions at the level of the caregiver who can be a parent, foster parent, relative, or someone who assumes the parental role.

Method

This article is based on a systematic search of the published literature, nominations of documents in response to the call for evidence (i.e., potentially relevant papers identified by other Evidence Summit participants), and a targeted web search to identify primary documents (Balster, Levy, & Stammer, 2014). Primary documents were published articles and gray literature reports published since 1990 that evaluated behavior change interventions targeting caregivers and children implemented in lower- and middle-income countries (LMICs). Although the search focused on research that was conducted in LMICs, reports of studies in high income contexts were included if they were relevant to the review and it was judged that they could be adapted to developing countries or included important principles (Rotheram-Borus, Lee, Amani, & Swendeman, 2011; Rotheram-Borus et al., 2009). In addition, interventions designed to be delivered by health care providers that could easily be adapted to be delivered by caretakers were included. For the most part, studies were included that had child health outcome data and that had a comparison or control group that allowed ascribing better outcomes or behavior change to the intervention. A supplemental literature search was conducted by the National Library of Medicine at the National Institutes of Health. The search focused on caretaker and parental interventions to increase child survival and promote healthy development.

Role of Parents/Caregivers

The behaviors of parents and other family members are critically important to child survival and development. The important role of parents begins at the point of conception where health decisions and the environmental circumstances in the home and neighborhood affect the fetus and young child (Klebanov, Brooks-Gunn, & Duncan, 1994; U.S. Congress, 1988). Low birth weight children or ones subjected to deprivation or violence in the home can suffer lifelong consequences that impede their ability to thrive and reach developmental milestones successfully (Silverman, Decker, Gupta, Kapur, Raj, & Naved, 2009; Silverman et al., 2011; Silverman, Decker, Reed, & Raj, 2006). Mothers need to seek prenatal care, and if they are HIV seropositive or have other health problems, they may need to adhere to a treatment regimen to ensure a healthy child (Le Roux et al., 2013).

To prevent early childhood death and improve development, individual mothers and caretakers must change their behavior, but there are major challenges to initiating and sustaining individual-level behavior changes (Fishbein et al. 1992; Sulzer-Azaroff & Mayer, 1992). The first step is knowledge development; caretakers must understand that there is a causal link between their behaviors and the survival and development of their children. The next step is the perception of risk; that is, caretakers must be aware that these issues are a problem in their family and community. Then, the caretaker must experience self-efficacy and be confident that they have the knowledge and skills to intervene to ensure child survival and healthy development. Contingencies must be in place to reinforce the desired behavior. Last, caretakers must locate relevant resources to overcome environmental constraints and must decide to engage in more beneficial practices every time they are faced with a health and developmental issue associated with their child. Interventions to change caregiver behavior are only one part of a comprehensive strategy for enhancing child survival and development. They need to be complemented with interventions targeting communities and health care systems (Elder, 2001; Pequegnat, 2011). Other articles in this issue of the journal focus on these other levels of analysis (Farnsworth et al., 2014; Vélez et al., 2014).

Developmental Periods: Perinatal, Infant/Toddler, Young Child

There are different developmental challenges and susceptibilities to illness during each developmental period: perinatal, infant/toddler, and young child. In the earlier developmental periods, such as the first 1,000 days, it is essential to concentrate on interventions for the mother or caretaker. As the child matures, interventions that include both the mother/caretaker and the child are important to develop lifelong healthy habits (e.g., handwashing, nutritious eating, oral rehydration therapy, and linguistic development). The organization of this review follows this developmental trajectory by first examining behavior change that primarily affects child survival and then considers behaviors that are more critical for healthy early development. This distinction is arbitrary given that many relevant behaviors (e.g., breastfeeding) are important for the child both to survive and thrive, so we also consider cross-cutting behaviors.

Perinatal Survival

The first 1,000 days is a critical formative period for children's physical, mental, and socio-emotional development. Each year, 3 million newborns die in the first month of life, and between one quarter and one half of these deaths occur within the first 24 hr after birth, with 75% in the first week and 90% within the first month. Nearly all (99%) newborn deaths occur in LMICs, especially in Africa and South Asia (Lawn, Cousens, Zupan, and *The Lancet* Neonatal Survival Steering Team, 2005). The leading causes of newborn death are preterm birth complications (29%), intrapartum-related complications or asphyxia (22%), and sepsis (15%). Low birth weight is an important underlying indirect cause of death (Liu et al., 2012). Almost all of the babies who die each year can be saved with low-tech, low-cost care procedures that caregivers can be trained to deliver.

Healthy Timing and Spacing of Pregnancy

An important strategy to prevent unintended pregnancy and help ensure newborn and child health involves healthy timing and spacing of pregnancies. Women can time and space their pregnancies to ensure that pregnancies occur at the healthiest times of their lives when they are physically, socially, and emotionally ready. Bearing

children at these times reduces risks of pregnancy-related adverse outcomes for both the mother and child. Studies have found that two pregnancy timing and spacing behaviors are associated with the healthiest outcomes for mothers, newborns, and children: delaying the first pregnancy until at least age 18 years, and waiting at least 24 months after a live birth before attempting a pregnancy, which ensures almost 3 years between births (World Health Organization, 2005). Having a baby late in life (advanced maternal age and high parity) can also have adverse effects on birth outcomes, but we do not focus here on these topics. A study examining adverse pregnancy outcomes in women admitted for delivery in 359 health facilities in 29 countries confirmed that there were higher and statistically significant perinatal outcomes, and higher but not statistically significant maternal outcomes mothers (Ganchimeg et al., 2014). Births spaced fewer than 3 years apart are associated with increased risk of under-5 mortality and morbidity, as well as stunting (Cleland, Conde-Agudelo, Peterson, Ross, & Tsui, 2012; Rutstein, 2008). Births spaced fewer than 18 months apart are associated with increased risk of low birth weight, preterm birth, small for gestational age, stillbirth, miscarriage, and induced abortion (Conde-Agudelo, Belizan, Breman, Brockman, & Rosas-Bermudez, 2005; DaVanzo, Hale, Razzaque, & Rahman, 2007; World Health Organization, 2005).

There is strong evidence from randomized controlled trials and quasi-experimental designs that programs combining comprehensive sexuality education with contraceptive education and service delivery either increase adolescent use of contraceptives and/or reduce the adolescent pregnancy rate (Bennett & Assefi, 2005; Chin et al., 2012; Oringanje et al., 2009). A systematic review of 41 randomized controlled trials that enrolled 95,662 adolescents found that interventions combining education and contraception promotion provided significant evidence for preventing unintended pregnancy over the medium- and long-term follow-up period (Gilliam, 2010). Only three of the trials were conducted in Nigeria and Mexico, whereas all others were conducted in developed countries. A key conclusion from this review (Oringanje et al., 2009) is that interventions to prevent adolescent pregnancy are more effective when they focus not only on sexual issues and consequences but provide skills training focused on personal development and future goals. Furthermore, interventions that encourage stakeholders, parents, health care workers, teachers, church leaders, and even pregnant adolescents to participate in the design of culturally appropriate programs are more effective.

On the basis of a review of interventions from 18 LMICs, the World Health Organization's guidelines on preventing early pregnancy and poor reproductive outcomes in adolescents in developing countries concluded that there is compelling evidence that with coordinated action directed at the levels of policies, families and communities, individuals, and the health system, that access and uptake of contraceptive information and services can be increased (World Health Organization, 2011). An integral part of efforts to prevent unwanted pregnancy is providing emergency hormonal contraception. There is strong global support for both the effectiveness of these interventions and for the conclusion that they do not generally promote risky sexual behavior (Li, Lo, & Ho, 2014)

An initiative included in the World Health Organization review is the PRACHAR Project, an innovative, multifaceted intervention addressing unmarried and married adolescents in Bihar, India (Daniel, Masilamani, & Rahman, 2008). Unmarried adolescents aged 15–19 years were targeted with a 3-day workshop on sexual and reproductive health topics, including contraception, nutrition, and sexually transmitted infections (STIs), including HIV/AIDS. Married young people were reached through special events to celebrate newly married couples, which included activities emphasizing the benefits of delaying childbearing and couples were provided with a small supply of oral contraceptive pills and condoms. Furthermore, male and female

change agents counseled young married men and women individually in their homes on the benefits of delaying childbearing and on other reproductive health topics. The program successfully delayed marriage of both male and female participants, increased contraceptive use after marriage (6–25% in the intervention areas vs. 4–7% in comparison areas), and delayed childbearing. Further strong support for using a multifaceted approach comes from other studies of successful interventions designed to increase knowledge and attitudes relating to the risk of unintended pregnancies, promote delay in the initiation of sexual intercourse, encourage consistent use of contraceptive methods to reduce unintended pregnancies, and make contraceptives available (Biermann, Dunlop, Brady, Dubin, & Brann, 2006; Black et al., 2006; Daniel et al., 2008; Kirby et al., 2007). Preventing child marriage needs to be a key component of an overall strategy to ensure delay in pregnancy and motherhood among young women. A 2012 review of 34 evaluations of 23 child marriage programs implemented in developing countries identified three types of program strategies to prevent child marriage: (a) horizontal programs that work directly with girls to empower them with information, skills, and resources; (b) vertical programs that include school and incentive-based programs; and (c) activist programs that focus on national advocacy and legislative efforts (Lee-Rife, Malhotra, Warner, & Glinski, 2012). Only four studies were categorized as rigorous (included randomization, before and after measurement, controls for selection bias or confounding variables, and reported results of statistical significance tests). The investigators concluded that programs aimed at empowering adolescent girls and providing them with economic incentives to delay marriage have been most effective in preventing early marriage and consequently early pregnancy among girls in LMICs.

We identified 63 studies of interventions explicitly designed to prevent rapid, repeat pregnancies and help women space their births. The studies measured pregnancy rate, or family planning use, occurring at 6, 12, 18 or 24 months after childbirth. Most of these studies were carried out among various at-risk populations in the United States (low socioeconomic and educational status, unemployed, low self-esteem) by domestic agencies between the late 1980s and 2012. These studies included randomized controlled trials ($n = 17$), quasi-experimental studies ($n = 18$), and less rigorous designs ($n = 27$). Of these, there were 13 randomized controlled trials (Barnet et al., 2009; Black et al., 2006; Katz et al., 2011; Kitzman et al., 1997; Kitzman et al., 2000; Olds et al., 1997; Olds, Henderson, Tatelbaum, & Chamberlin, 1988; Olds et al., 2002; Olds et al., 2004; O'Sullivan & Jacobsen, 1992; Schreiber, Ratcliffe, & Barnhart, 2010; Shaaban, Hassen, Nour, Kames, & Yones, 2013) and other evaluations using a quasi-experimental designs (Bensussen-Walls, & Saewyc, 2001; Bierman et al., 2006; Jones & Mondy, 1990; Key, Barbosa, & Owens, 2001; Key, Gebregziabher, Marsh, & O'Rourke, 2008; Seitz & Apfel, 1993; Solomon & Liefeld, 1998; Stevens-Simon, Kelly, & Kulick, 2001; Stevens-Simon, Kelly, & Singer, 1999), all published in peer-reviewed journals. These studies reported that the interventions had a statistically significant effect on reducing the rate of rapid, repeat pregnancy at 6, 12, 18, or 24 months after birth. The caretaker behaviors to help women space their births that are reflected in these studies are discussed in the summary section of this article.

In conclusion, strong evidence suggests that multidisciplinary programs that empower women and adolescents through skill development and goal setting, carried out by highly capable caregivers, are more likely to achieve positive reproductive health behavior change compared with programs that do not include such elements.

Childbirth and Neonatal Survival

In the immediate postnatal period, caregiver behaviors of importance to child survival and infant health include resuscitation, breastfeeding, prevention and management of hypothermia, Kangaroo Mother Care, appropriate care-seeking

and diarrhea prevention and treatment (Conde-Agudelo, Diaz-Rossello, & Belizan, 2011; Darmstadt et al., 2006). One of the barriers to remediating early child death is the belief that only high technology, clinic-based interventions can reduce mortality (Darmstadt, Kumar, et al., 2005; Liu et al., 2012). An example is diarrhea, where many health care providers believe that only intravenously delivered solutions work and that this treatment is expensive, requires skilled care, and is not easily available to poor mothers in LMICs; however, most mothers can treat their children with packets of oral rehydration salts, which are sold locally at minimal cost. Jones and colleagues (2003) estimated that implementing evidence-based interventions with caretakers focused on diarrhea, tetanus, birth asphyxia, serious infectivity, prematurity, low birth weight, clean home delivery, and clean cord care with coverage at 90% could avert 35 to 65% of the neonatal deaths (Lawn et al., 2005). There are several studies of interventions that have been shown to be effective in changing caregiver behaviors with demonstrated health effects.

A study in Bangladesh compared the home care model where trained community health workers delivered behavior change communication and essential newborn care in visits to pregnant women during the antenatal and postnatal periods to promote preparedness for birth or newborn care, provide iron folate supplements, and counsel on breastfeeding issues. The community health workers also provided home screening, management, or referral of sick newborns for additional care. This intervention resulted in neonatal mortality being reduced by 34% (Baqui et al., 2008).

In another study, community health workers provided an essential cost-effective newborn care preventive package using behavior change management through group meetings and home visits in India (Darmstadt, Bhutta, et al., 2005). The study demonstrated improvements in birth preparedness, hygienic delivery, thermal care (including skin-to-skin care), umbilical cord care, breastfeeding, and care seeking in the community health worker intervention condition. The neonatal mortality rate declined by 51%. Other evidence-based interventions on the effectiveness of other thermal care are associated with stimulation to improve immediate newborn care (Belsches et al., 2013).

In newborns, a skin-to-skin intervention to ensure thermal sufficiency is especially important immediately after birth and it is associated with early bonding between the mother and child that stimulates the baby and is more likely to lead to breastfeeding. Kangaroo Mother Care was developed by pediatricians in Colombia in 1978 (Ruiz-Peláez, Charpak, & Cuervo, 2004). They were concerned with a shortage of incubators and the impact of separating women from newborns in neonatal care units. Kangaroo Mother Care provides stable conditions for low birth weight babies to thrive, strengthens parental participation, and encourages breastfeeding, which is better than traditional care (Charpak, Ruiz-Peláez, Figueroa, & Charpak, 2001). In Malaysia, a randomized controlled trial assessed counseling to mothers on providing short-duration Kangaroo Mother Care for very low birth weight newborns (<1501 g). The counseling resulted in significant improvements in head circumference and breastfeeding rates (Boo & Jamli, 2007).

Skin-to-skin care can prove highly acceptable to women after exposure to behavior change communication messages, as evidenced by a study in India, whereby community health workers provided community mobilization promoting birth planning and essential newborn care including adoption of skin-to-skin care (Darmstadt et al., 2006). Another study in Chile assessed infant massage provided by mothers as another way to have skin-to-skin stimulation and reported improvements in early weight gain, but no improvements in later weight gain (Serrano, Doren, & Wilson, 2010).

In addition to providing thermal and touching interventions, teaching caregivers to identify symptoms of illness and to seek immediate care is crucial for survival of

children at all ages but especially important for neonates. There is limited evidence on effective interventions to improve knowledge of signs of complications or appropriate care seeking. In one study in Benin, job aids were used during antenatal care to provide information on danger signs of complications, birth planning, clean delivery and newborn care. Although the behavioral effect of this program is unclear, the use of these job aids at least increased knowledge (Jennings, Yebadokpo, Affo, & Agbogbe, 2010). In a high-quality study in India, community-based public meetings to disseminate information on entitlement to health services and village resources resulted in improvements in antenatal newborn care examinations, tetanus toxoid vaccinations, and infant vaccinations (Pandey, Sehgal, Riboud, Levine, & Goyal, 2007). In a review of antenatal newborn care interventions, the investigators concluded that the benefits of various antenatal newborn care education interventions remain unclear. Additional research is needed to understand whether education interventions actually change health-seeking behavior (Gagnon & Sandall, 2007).

Caretakers could be alerted to symptoms of sepsis. One study conducted in Bangladesh assessed education for health providers and caregivers on infection prevention in a tertiary care facility. The investigators demonstrated declines in episodes of suspected sepsis and deaths with clinical or culture-proven sepsis (Darmstadt, Nawshad Uddin Ahmed, et al., 2005). In community and primary care settings in developing countries, chlorhexidine application to the umbilical cord reduced neonatal mortality and omphalitis. However, in hospital settings, there is insufficient evidence to support the application of antiseptics to the umbilical cord when compared to dry cord care (Imdad et al., 2013). A study in Tanzania assessed the provision of clean delivery kits and counseling on the World Health Organization “six cleans” during antenatal care. There was a positive effect on reducing cord infection among women who received and used the kits, but it was not significant. One high quality study in Kenya and Tanzania assessed an intervention to improve neonatal tetanus incidence in an area where tetanus toxoid vaccinations were not available. The study team worked with local village leaders and traditional birth attendants to develop messages on appropriate materials to apply to the umbilical stump after birth. Traditional birth attendants were trained to apply plain water or milk (in the absence of water) to the stump, as opposed to cow dung. As a result, there were significant improvements in neonatal death rates resulting from tetanus and improvements in overall neonatal mortality (Meegan, Conroy, Lengeny, Renhault, & Nyangole, 2001).

Another important behavior of caregivers that contributes to child survival is using the correct infant sleeping position. Two studies assessed educational interventions in Argentina and Brazil to encourage caregivers to put their infants to sleep on their backs, which resulted in significant improvements in sleeping position (Eymann, Ricciardi, Caprotta, Fustinana, & Jenik, 2008; Issler, Marostica, & Giugliani, 2009). More studies are needed in LMICs where cultural preferences around sleeping position may be difficult to change.

In summary, there is evidence that education, counseling, and community involvement are all effective interventions to promote neonatal survival and health. The World Health Organization and UNICEF (2009) released a joint statement on the home-visit strategy for the newborn that recommends at least two home visits after birth. Training of health care workers in clinics and the community in antenatal newborn care is an effective way to promote safe birth practices, prevent infection, and provide resuscitation skills. For neonatal care, home visits by community-based health workers to provide counseling, to caregivers to assess the newborn, provide first-line treatment, and refer for facility-based care are effective interventions for neonatal health and to promote breastfeeding.

Many of these interventions can be provided by family members or caregivers during labor and delivery, and the postnatal period, to reduce neonatal mortality. In a review (Partnership for Maternal, Newborn, & Child Health, 2011) of essential interventions for reproductive, maternal, newborn and child health, the following parental and caregiver behaviors were recommended to improve neonatal health and survival: (a) participate in interventions for cessation of smoking; (b) prevent and manage STIs and HIV; (c) seek tetanus toxoid immunization; (d) prevent malaria by using medicines and insecticide treated nets; (e) take calcium supplementation to prevent high blood pressure; (f) provide immediate thermal care; (g) initiate early breastfeeding within one hour of birth and exclusive breastfeeding for 6 months; (h) practice hygienic cord and skin care; (i) seek and accept routine immunization at appropriate times; and (j) engage in case management of pneumonia/sepsis. The majority of these interventions are based on supportive behaviors among family members and caregivers. Nonetheless, given that health behaviors and early caregiving behaviors are often rooted in traditional and cultural beliefs and practices, they can be difficult to influence (Winch et al., 2005).

Infant/Toddler Survival and Developmental Issues

The early years are essential for establishing the health and welfare of children for long-term survival and healthy development (Trivette, Dunst, & Hamby, 2010). These early experiences establish the basis for later performance and outcomes in adolescence and adulthood (Barnett, 2008; Grantham-McGregor et al., 2007; Keating & Hertzman, 1999). Young children who lack bonding with their caretaker, early cognitive stimulation, and adequate nutrition will suffer developmental delays. These problems are exacerbated when young children are living outside of family care or are victims of adversity (Mahomes, Fluke, Rinehart, & Huebner, 2012; Shonkoff & Garner, 2012). These deprivations become more difficult to remediate as the child ages. Children from poor, disadvantaged, and undereducated families begin to experience a wider gap as compared with more advantaged children (Fernald, Gertler, & Hidrolo, 2006; Paxson & Schady, 2007). Good nutrition, beginning prenatally, helps ensure the child's growth and energy for learning, while patterns of caretaking established in this early period set the parameters of the child's rearing environment for development (Belsky & de Haan, 2010). The plasticity of brain development during this early developmental period makes it both receptive to positive influences and more vulnerable to negative ones (Dennis, 2000; Shonkoff & Garner, 2012). We reviewed evidence on interventions to increase breastfeeding and the provision of other nutrients, and environmental stimulation.

Breastfeeding

Breastfeeding has been widely reported to reduce the risk of infection and to ensure immunization protection from the mother to the recipient infant. The effect of breastfeeding in protecting against infection is impressive even in settings where poverty, malnutrition, and poor hygiene are prevalent.

A large cluster-randomized trial entitled the Promotion of Breastfeeding Intervention Trial (PROBIT) was conducted in 31 maternity hospitals and polyclinics in the Republic of Belarus (Kramer et al., 2001). Enrolled participants included 17,046 pairs of healthy mothers who intended to breastfeed their full-term infants. The intervention was modeled on the Baby-Friendly Hospital Initiative of the World Health Organization and UNICEF, which emphasized health care worker assistance with initiating and maintaining breastfeeding and postnatal breastfeeding support or a standard-of-care control. This study provided strong evidence that this

intervention could increase the duration and exclusivity of breastfeeding and decrease the risk of gastrointestinal tract infection, respiratory infection, and atopic eczema in the infants' first year of life.

There are a variety of other interventions that have been studied with the majority focusing on breastfeeding counseling by health care workers to mothers in groups or in one-on-one sessions during antenatal newborn care. In Bangladesh, Akhter and colleagues (2012) demonstrated that nutrition counseling during the third trimester of pregnancy resulted in statistically significant increases in breastfeeding within 1 hour of birth. These counseling sessions were often augmented with brochures and pamphlets and media to provide additional information. In Bolivia and Madagascar, these combination interventions resulted in significant improvements in timely breastfeeding up to 1 month (Baker, Sanei, & Franklin, 2006). The counseling was delivered by health care workers, nurses or those providing antenatal newborn care. There were also studies that included postnatal home visits by community-based midwives or health workers to promote breastfeeding. In a study conducted by Omer, Mhatre, Ansari, Laucirica, and Andersson (2008) in Pakistan, home visits by lady health workers during pregnancy and the postnatal period using locally embroidered communication tools resulted in increased rates of colostrum feeding as well as maintenance of exclusive breastfeeding up to 4 months of life. To engender community support, a study in Thailand provided education to women as well as community leaders and youth on breastfeeding, which was associated with significant improvements in colostrum feeding (Saowakontha, 2000).

Community-based interventions that include prenatal counseling, training, and health services for pregnant mothers, combined with postnatal home visits demonstrated a positive impact on long-term exclusive breastfeeding (Akhter et al., 2012; Baker et al., 2006; Omer et al., 2008; Spiby et al., 2009). Inclusion of fathers and other community members in breastfeeding promotion may significantly increase colostrum feeding and exclusive breastfeeding (Saowakontha et al., 2000; Susin & Giugliani, 2008). C. P. Green (1999) reviewed 51 studies (intervention versus control and baseline comparison designs) focused on interventions to promote early initiation of breastfeeding, feeding colostrum, exclusive breastfeeding, and continued breastfeeding. Many of these studies showed improvements in the quantity and quality of breastfeeding behaviors through a combination of counseling, home visits, group sessions, and changes in policy (e.g., hospital breastfeeding policies), supported in some cases by print and mass media.

Feeding and Stimulation

A promising strategy to ensure that developmental delays do not occur is the early role of touch in stimulating babies and feeding enhancement which are both associated with better physical, emotional, and cognitive development. Long-term benefits of early stimulation and nutrition interventions were reported by Walker, Chang, Vera-Hernandez, & Grantham-McGregor (2011) and others (Gertler, 2000; Super, Herrera, & Mora, 1990). Infants who received stimulation in early childhood were reported to be less involved in fights and serious violent behaviors and had higher IQ scores and school achievement later in life. These studies indicate that early stimulation can even have a lasting and positive impact on next the generation of parents and their behaviors for nonviolent, responsive, and sensitive feeding of their children.

Poor mothers of young children in rural Bangladesh attended a year of educational sessions on responsive stimulation and feeding (Aboud, 2007). The mothers who were trained received higher scores on child-rearing knowledge and on the Home Observation for Measurement of the Environment (HOME) Scale, a systematic assessment of a caring environment in which the child is raised. However, the

trained mothers did not communicate differently with their children while doing a picture-talking task, and children did not show benefits in nutritional status or language comprehension. Although the parenting sessions conducted by peer educators were informative and participatory, the mothers did not have time to practice or problem-solve, which is essential to bring about behavior change in parenting style.

These results informed Aboud and Akhter's (2011) subsequent study of a village-level family nutrition intervention for parent education and support with peer coaching and modeling in Bangladesh. The study tested whether a responsive stimulation and feeding intervention delivered to mothers of children 8–20 months old in Bangladesh would improve developmental and nutritional outcomes. One treatment group received 18 sessions, which included modeling and coaching practices in feeding and verbal responsiveness with the child during play. The other group received the sessions plus 6 months of a food powder fortified with minerals and vitamins, while the control group only received 12 information sessions. At follow-up, responsive stimulation-feeding groups had better scores on the HOME scale. The children were engaged in more responsive talking, expressive language, mouthfuls of food eaten, and handwashing. Micronutrient fortification resulted in more weight gain but not greater height. The second study tested the relative effects of each element (nutrition and coaching), separately and together, in comparison with information sessions alone over 7 months. Families in the villages receiving the combined intervention had higher scores on the HOME scale, and these mothers exhibited more responsive talking and the children ate more food. Mothers in both intervention groups recalled more information at follow-up than did the comparison group. These results corroborated Engle and colleagues' (2011) assertion that being coached helps caregivers remember information provided to them.

Safe, appropriate, high quality complementary food and micronutrients, along with responsive and sensitive child care and feeding practices are also important for preventing malnutrition, especially among the most disadvantaged children in LMICs. Evidence from Bangladesh (Aboud, 2007; Aboud, Moore, & Akhter, 2008; Aboud, Shafique, & Akhter, 2009; Brown et al., 1992), Colombia (Super et al., 1990), Jamaica (Walker, Chang, Powell, & Grantham-McGregor, 2005), and Pakistan (Qazi, Khan, Rizvi, Zhatoon, & Peterson, 2003) verify that providing guidance and support to caretakers results in behavior change supporting responsive (stimulating) feeding practices. These practices improve child health, nutrition, and developmental outcomes. Some researchers (Aboud & Akhter, 2011; Affleck & Peltó, 2012) have reported that integrating responsive stimulation and feeding interventions resulted in improved language development, responsive talking, mouthful eating, handwashing, and more weight gains in young children. Mothers' education correlated significantly with nutritional and developmental gains of their children.

Additional support for this approach resulted from a longitudinal, randomized, controlled trial that was conducted with 122 young children and their caregivers in South Africa (Potterton, Stewart, Cooper, & Becker, 2010). Children in the experimental group were given a home stimulation program delivered by their caregivers that was updated every 3 months. The home program included activities to promote motor, cognitive, speech, and language development. Children in the comparison group received no developmental intervention. The children in this study came from poor socioeconomic backgrounds and their nutritional status was suboptimal. At baseline, 52% of the children were experiencing severe cognitive delay and 72% severe motor delay. Children in the experimental group showed significantly greater improvement in cognitive and motor development over time than children in the comparison group.

Inadequate feeding and care may contribute to high rates of stunting and underweight and cognitive development among children in families. A cluster-randomized

trial conducted in rural India tested the hypothesis that teaching caregivers appropriate complementary feeding and strategies for how to feed and play responsively during home visits would increase children's dietary intake, growth, and development when compared with home visit complementary feeding education alone or routine care (Vazir et al., 2013). Biweekly visits by trained village women provided the complementary feeding and play messages to the caregivers. This study demonstrated that mental development scores can be improved with a low-cost education intervention strategy, even when there were no improvements in growth. These findings have important implications for helping undernourished children from rural communities begin school at appropriate developmental levels for their age.

These studies together demonstrate that good evidence-based interventions exist to change feeding practices and that home stimulation programs taught to caregivers can significantly improve cognitive and motor development in young children infected. Early stimulation should be an important component of nutrition interventions with infants. The evidence from these trials strongly support the use of skin-to-skin care (Kangaroo Mother Care) and feeding as effective, low-cost interventions in both healthy and low birth weight infants. Many of these evidence-based interventions have the potential to be scaled up in LMICs, especially for families with pre-term or low-birth weight babies.

Parent and Caretaking Skills Development

Improving parenting skills can contribute to better clinical outcomes in children's attachment and engender a strong child–parent relationship. Many programs begin engendering parental skills development to ensure attachment while mothers are still pregnant while others are designed to improve parent and caretaking skills when the children are older. Most of the interventions to improve parent and caretaking skills have been delivered during home visits. Parent support programs to increase parent and caretaking skills to enhance child development from birth to 3 years of age have used a variety of approaches to enhance the ability of the mother or primary caregiver to engage in positive interactions with their children.

A study was conducted in Sri Lanka to evaluate a brief informal training program with mothers shortly before their hospital discharge to improve essential newborn care (Senarath, Fernando, & Rodrigo, 2007). A 4-day training program for maternity ward staff was conducted and the staff worked with the mothers to improve their knowledge and skills to care for their newborns. Three months after delivery, 150 mother–newborn pairs were interviewed at home. Mothers achieved significant improvement in umbilical cord care practices at home. There was a 35% reduction in the proportion of newborns that developed any adverse health events at home. Findings document that mothers can improve the clinical outcomes of newborns.

One of the earliest studies to evaluate home visits with mothers to promote activities that encouraged exploration of the environment by their children was conducted in poor neighborhoods in Bogotá, Colombia (Waber et al., 1981). Children who also received food supplementation performed better than those who did not, especially on motoric subtests. The effect of food supplementation on behavior appeared to be contemporaneous. The effects were stronger for girls than for boys. Although these interventions reduced the gap in cognitive performance between lower and upper socioeconomic classes, disparities in performance still existed.

A program for pregnant adolescent mothers (14–19 years of age) in Chile (Aracena et al., 2009) included 12 home visits by health educators beginning prenatally and continuing through the first year after childbirth. Health educators delivered an intervention to mothers to improve their parenting skills and health care

practices, such as handwashing. Results included better mental health and nutrition for the mothers, and better communication development for their infants in comparison to mothers who received only standard-of-care at health centers.

Another study was conducted with high-risk pregnant American Indian adolescents who share many of the risk factors of pregnant adolescents in the developing world (Barlow et al., 2006). The goal was to assess the impact of an intervention delivered by paraprofessionals to promote child care knowledge, skills, and involvement during home visits. Pregnant American Indian adolescents were randomly assigned to intervention or control groups. The paraprofessionals delivered 41 prenatal and infant care lessons in participants' homes when the fetus was approximately 28 weeks old until 6 months after childbirth. Mothers in the intervention when compared with the control had significantly higher parent knowledge scores at 2 and 5 months after childbirth. Intervention group mothers scored significantly higher on maternal involvement scales 2 months after the child's birth and scores approached significance at 6 months after childbirth; however, there were no differences between groups on child care skills.

Another study conducted in South Africa with 449 pregnant and poor women in a periurban settlement assessed the efficacy of an intervention designed to improve the mother-infant relationship and strengthen the infant attachment (Cooper et al., 2009). The intervention was delivered during late pregnancy and for 6 months after childbirth. Women were visited in their homes by trained lay community workers who provided the intervention that was designed to promote sensitive and responsive parenting. The intervention was associated with significant benefit to the mother-infant relationship. At both 6 and 12 months, compared with control mothers, mothers in the intervention group were significantly more sensitive and less intrusive in their interactions with their infants. The intervention was also associated with a higher rate of secure infant attachments at 18 months.

A Jamaican study evaluated the program called Roving Caregivers, an intervention model first piloted by a nongovernmental organization (Powell, 2004). Visits were conducted by community health workers who demonstrated play activities and involved the mother, or primary caregiver, in play sessions with the child. The interventions combined language activities, games, songs, simple jigsaw puzzles, and crayon and paper activities. Homemade toys and simple picture books were used and left in the homes that were exchanged at the next visit. Emphasis was placed on enriching verbal interaction between the mother and child. Mothers were also encouraged to use positive feedback and praise and to avoid physical punishment. The overall evaluation of Roving Caregivers in St. Lucia did not find benefits except among those children who were younger when the program began benefits (Janssens & Rosemberg, 2011). The program was culturally adapted for Bangladesh which included traditional games and songs. Visits were conducted by village women in one study and female health workers in another. In addition to the home visits, in both studies mothers attended centers where there were individual play sessions (Nahar et al., 2012) or group sessions on topics concerning child development and the importance of play (Hamadani, Huda, Khatun, & Grantham-McGregor, 2006).

Further evidence for the value of early intervention with the caretaker during home visits to enhance healthy development of children comes from a report on a home-visiting program in Colombia (Atanasio, Grantham-McGregor, Fernandez, Fitzsimons, & Rubio-Codina, 2013). Mothers and their 12- to 24-month-old children received weekly home visits by locally trained and supervised workers over the course of 18 months. Adopting the holistic approach used successfully in Jamaica (Walker et al., 2005; Walker et al., 2011), the home visits incorporated child development activities through joint participation with mothers who were empowered as the primary change agent for their child and were supported by other family

members. The investigators reported an increase over the course of the intervention in both play materials and activities incorporated by the family that enriched the child's learning environment.

All evaluations of parental support provided through home visits demonstrated significant benefits for child development. A few had small effect sizes, but typically effects were medium to large. Home-visiting programs benefited development in children recovering from severe malnutrition (Grantham-McGregor, Schofield, & Powell, 1987; Nahar et al., 2012); undernourished children (Grantham-McGregor, Powell, Walker, & Himes, 1991; Hamadani et al., 2006; Powell, 2004), children with iron deficiency anemia (Lozoff et al., 2010); low birth weight infants (Walker, Chang, Powell, & Grantham-McGregor, 2004), and disadvantaged children in poor communities (Powell & Grantham-McGregor, 1989; Eickmann et al., 2003; Powell, 2004; Vazir et al., 2013). The evaluations of home-visit interventions provide strong evidence that they can be successfully implemented by women who have completed only primary education or partially completed secondary education.

In a recent review of parenting programs to enhance learning in children younger than 3 years of age, Walker and Chang (2013) emphasized that empowering mothers as educators and providing opportunities to practice new behaviors are key elements in successful home-visiting and educational programs (Dancy & DiIorio, 2011). Walker and Chang (2013) asserted that visits should be at least twice monthly to ensure sustainable changes in their parenting practices was corroborated by Powell and Grantham-McGregor (1989).

Despite the consistent evidence that providing parenting education through home visits benefits child development, this is a high-intensity intervention that is difficult to scale up in resource poor communities. To address this problem, some home-visit interventions have been combined with group sessions. An intervention evaluated in Brazil combined group sessions to demonstrate and practice play activities and interaction with home visits to reinforce the workshops through play sessions with the mother and child (Eickmann et al., 2003). Individual play sessions with mother and child can also be conducted at visits to a community clinic (Nahar et al., 2012). Alternative strategies to reach greater numbers of children are needed, but evidence of their impact on child development is limited. One approach is to provide parents with individual counseling and training when they access health services. This model has been developed by the World Health Organization's Care for Development counseling materials, which forms part of the Integrated Management of Childhood Illness strategy (UNICEF, 2012a, 2012b). The package provides guidelines for health professionals to counsel parents on how to promote development and includes cards for mothers with age-specific messages and illustrations of activities. Counseling sessions lasted for only 5 to 10 minutes and were conducted with individual mothers when they brought their well or sick child to visit the health service.

The efficacy of the Care for Development materials was tested by Jin and colleagues (2007) in 100 families with a child younger than 2 years of age from seven randomly selected villages in an impoverished rural county in Anhui Province, China. Two counseling sessions were delivered to 50 families randomly selected from among the study participants. All children were assessed with Gesell Developmental Schedules and families' knowledge, attitudes, and child development practices was collected on a questionnaire that was administered at the beginning and conclusion of the study. Children in families who received counseling had significantly higher development quotient scores in cognitive, social, and linguistic domains. Questionnaire data on childrearing suggested that responsive and consistent caregiving correlated with higher scores.

Engle and colleagues (2011) in collaboration with investigators from Kyrgyzstan (Kyrgyz Republic) and Tajikistan conducted a process evaluation of the Integrated

Management of Childhood Illness. Even though there was not strict fidelity in the implementation of the intervention, there was evidence that families who received the intervention were more likely to initiate new activities with their children and the children had improved levels of development. Children's scores were significantly higher in intervention groups than control ones for communication, gross motor skills, and social development, but not for fine motor skills or problem solving. This intervention can be delivered to caregivers in about 5 minutes, so it is very cost-effective and feasible in clinics.

Another study in China evaluated the effectiveness of the Positive Parenting Program (Triple P) with a sample of parents of children with early onset conduct-related problems (Leung, Sander, Leung, Mak, & Lau, 2003). The participants consisted of 91 parents whose children attended maternal and child health centers and child assessment centers for service and were between 3 and 7 years old. Participants were randomly assigned to the intervention and a waitlist control group. There were no significant differences in preintervention measures between the two groups. However, at postintervention, participants in the treatment group reported significantly lower dysfunctional parenting styles, and higher parent sense of competence, which contributed to lower levels of child behavior problems, compared with the control group. This is critical for school age children who will benefit more from instruction if they are not acting out in class.

A meta-analysis of studies evaluating the impact of the Triple P on parent and child outcome measures was conducted to identify variables that moderate the program's effectiveness (Nowak & Heinrichs, 2008). The results (of the analysis of 55 studies) confirm that the Triple P program is associated with positive changes in parenting skills, parental well-being, and child problem behavior in the small to moderate range, varying as a function of the intensity of the intervention. The larger effects were found on parent report in comparison with observational measures and more improvement was associated with intensive formats and initially more distressed families.

As part of an interactive early intervention project in Ethiopia (Klein & Rye, 2004), basic principles of developmentally appropriate parental behavior in Western cultures were integrated within the framework of indigenous practices of childrearing. The resulting intervention was called the Mediation Intervention for Sensitizing Caregivers, which was designed to improve the quality of adult-child interactions and consequently, to promote children's learning potential. The indigenous childrearing practices and philosophies of parents, their expectations for their children, and children's language, motor, and socioemotional development were examined. Parent-child interactions were videotaped and analyzed and used to tailor the intervention for the family. One year after the intervention, mothers in the intervention group were more sensitive, responsive, and optimistic about their potential to affect their child's development than were the mothers in the comparison group. Six years after the intervention, significant changes were still noted in the quality of adult-child interactions and in developmental measures of the children. The findings confirmed that an individual intervention that can increase age-appropriate, sensitive and effective caregiving interactions can have lasting positive effects on children's cognitive and socioemotional development.

In another study, mothers or caregivers of HIV-infected children were coached in individual stimulation plans when they attended the clinic for the child's regular 3-month visit (Potterton et al., 2010). Activities centered on developmentally appropriate play that could be part of the family's usual daily routine. After 1 year, significant benefits to mental and motor development were seen from the intervention, although both intervention and control groups remained severely delayed, which may have been more likely the result of HIV disease than of poor parenting.

More evidence is needed on the use of individual counseling of parents during health visits to promote child development. Counseling sessions need to be long enough so that caretakers can observe the health professionals' demonstration of activities and practice so that they can engage in those behaviors at home. In the available studies, interventions were conducted by health professionals, which would have implications for scaling up. The number of parents and children reached by interventions to improve parenting behaviors could also be increased by delivering them through group sessions. For a parenting program in Bangladesh, groups of about 20 mothers attended 90-minute educational sessions on health, nutrition, and promotion of child development (Aboud, 2007). Sessions were conducted by women with some secondary education who were given training and supervision. Mothers attended an average of 16 sessions. No benefits were seen for children's receptive vocabulary, which was the only measure of child development, or for mother-child verbal interaction. Small to moderate effects on mothers' knowledge and stimulation in the home were seen. Within the sessions, adaptive behaviors were encouraged and attempts were made to engage the mothers in discussion and problem solving. This may have had limited results as fewer materials were used; the group format should have been expected to provide more opportunity for interactions and role modeling.

A community-based group parenting program called Pastoral del Nino was conducted in rural Paraguay with 106 infants and toddlers, from birth to 24 months (Pearson, Berghout Austin, de Aquino, & de Burro, 2008). Parents attended monthly meetings at which they were encouraged to promote development by playing and chatting with their children in order to improve cognitive development and the caregiving environment. Volunteers also conducted home visits. The infants and toddlers who participated in the Pastoral del Nino intervention scored significantly higher at 0-4 months and 20-24 months on cognition. Infant and Toddler (IT)-HOME scores were significantly higher for Pastoral children at 0-4 months, 5-9 months, 10-14 months, and 15-19 months. Overall, best predictors for cognitive development scores included health, nutrition, and education variables, while best predictors for IT-HOME scores also included caregiver education.

The World Health Organization developed the Care for Development Intervention and subsequently developed an additional module which was designed to increase caregivers' play and communication with their children during visits for acute care. The purpose of this study conducted in Turkey was to determine the efficacy of the module when implemented with caregivers during a young child's (younger than 24 months) visit for acute minor illness (Ertem et al., 2006). One month after the clinic visits, an adapted HOME Scale was administered in the caregivers' homes. The results support the assertion that the intervention is an effective method of supporting caregivers' efforts to provide a more stimulating environment for their children and can be delivered by health care professionals during visits for acute minor illness, which increase the potential coverage of the approach. Similar results were obtained in a study in Uzbekistan (Zaveri, 2006).

The effectiveness of interventions to increase parenting skills justifies the integration of training in early infant stimulation programs into existing health services. For example, a structured intervention stimulation program was introduced into an existing government-supported Mother and Child Health service (Palti, Zilber, & Kark, 1982). Its focus was on verbal and play interaction between mother and children between 1 and 12 months of age. The evaluation of activities of the program indicated that the amount of stimulation was greater during the first 6 months of life than later. The effectiveness was assessed by the Developmental Quotient at 2 years of age. The difference in the mean Developmental Quotient between the treatment and control group was statistically significant. In the control group, statistically

significant differences in mean Developmental Quotient by educational standard of mother, country of origin, and birth order were noted. This additional example of the feasibility of the program in a routine preventive service suggests that this program could be scaled up and incorporated into health services.

In conclusion, the studies reviewed provide evidence that interventions delivered to individual caregivers at clinic visits can improve parent–child interactions and learning opportunities for children from birth to age 3 years using a variety of approaches that benefit the cognitive development of children from poor families in LMICs. Children who receive interventions earlier are more likely to benefit more from preschool and subsequently from later schooling. Because early cognitive ability at school entry predicts school outcomes such as achievement levels and grade level attained (Grantham-McGregor et al., 2007), it is therefore possible that gains in early development will be associated with long-term gains in education. Increased educational gains will result in higher earning power, higher functioning in society and better parenting of the next generation. Although some of these interventions are resource intensive, others can be delivered in the context of normal health services so can be very cost-effective.

Young Child Survival and Developmental Issues

The role of caretakers continues to be integral to the biological, psychological, and emotional development as the child moves beyond the home and into a more formal educational environment. Healthy development is a continuous process that has some predictable developmental outcomes but each child will express these in unique ways based on caretaking experiences and environmental influences. Healthy child development describes the successful achievement of more complex tasks as children grow older. The parent and caretaking developmental programs discussed in the previous section are still important during this period. However, the children are now being groomed to enter preschool. We review several behavior change interventions designed to enhance the process of preparing to leave the home and attend school.

Conditional Cash Transfer Programs

Conditional cash transfer programs provide money to poor families to target poverty and increase family capital contingent on caretakers engaging in certain target behaviors, such as sending children to school, taking them for health clinic visits, and ensuring vitamin supplements and nutritious food. There is promising evidence for the benefits of conditional cash transfer programs for families with young children.

Mexico has had a dynamic conditional cash transfer program originally called Progresa when it was established in 1997, and later renamed to Oportunidades in 2002. After 10 years, the effect of the conditional cash transfer on children was assessed (Fernald, Gertler, & Neufeld, 2009). From April 1998 to October 1999, low-income communities were randomly assigned to be enrolled in Oportunidades immediately (early treatment) or 18 months later (late treatment). In 2007, children were assessed for outcomes including physical growth, cognitive and language development, and socioemotional development. The primary objective was to investigate outcomes associated with an additional 18 months in the program. Early enrollment reduced behavioral problems for all children in the early versus late treatment group, but no difference between groups for mean height-for-age, assessment scores for language, or cognition. An additional 18 months of the program before age 3 years for children whose mothers had no education resulted in improved child growth of about 1.5 cm assessed as height-for-age. The money itself also had significant effects on most outcomes, adding to existing evidence for interventions in early childhood.

Conditional cash transfer programs led to improvements in cognitive and linguistic skills in Ecuador (Fernald & Hidrobo, 2011), Mexico (Fernald, Gertler, Neufeld, 2008; Fernald et al., 2009), and Nicaragua (Macours, Schady, & Vakis, 2012).

Although a study of an unconditional cash transfer program in rural and urban areas found no effects of the intervention on height for age or hemoglobin, it did find that young children in the rural (but not urban) communities who had received the cash transfer earlier were more advanced in language development, more likely to receive vitamin A or an iron supplement, and were more likely to have been bought a toy in the previous 6 months (Fernald & Hidrobo, 2011).

Oportunidades has been a model and has been adapted in other places: Chile, Honduras, Jamaica, Malawi, Nicaragua, Peru, and Zambia. When these programs are evaluated, it should provide guidance to other LMICs about how this kind of program could help increase child survival and healthy development. This is potentially a cost-effective program that could be scaled up and benefit the entire family.

Childhood Education

As children move along the developmental continuum, intervention programs need to be more complex and focused on higher level skills in order to achieve the major Millennium Development Goal that all children attain at least by primary schooling (United Nations, 2012). Stunting associated with poverty and an iron, zinc, and iodine deficiency and few learning opportunities contribute to poor overall development and low scores on cognitive tests before entry into school and later achievement (Bradley & Corwyn, 2002; Paxson & Schady, 2007; Shonkoff, Richter, van der Gaag, & Bhutta, 2012). Multidimensional educational programs to be delivered by caretakers or in preschools have been developed in some countries that have been effective with children from limited backgrounds. A new follow-up assessment of the long-term outcomes of the Turkish Early Enrichment Project, an intervention carried out in from 1983 to 1985 with 4–6-year-old children from deprived backgrounds, confirms long-term benefits of early interventions. Evaluations were carried out at the completion of the intervention and also 7 years later. The evaluation was conducted with data from 131 of the original 255 participants (Kagitcibasi, 2009). The results support more favorable outcomes for children who received either mother training or educational preschool, or both, compared with those who had neither, in terms of educational attainment, occupational status, age of beginning gainful employment, and some indicators of integration into modern urban life, such as owning a computer. A majority of the children who received early enrichment had more favorable trajectories of development into young adulthood in cognitive achievement and social developmental domains than comparable children who did not receive enrichment.

One study evaluated the Better Parenting Programme, a 16-hour intervention that has been implemented nationally in Jordan to enhance parents' knowledge, attitudes, and behaviors related to caring for young children (Al-Hassan, Obeidat, & Lansford, 2010). Participants were 337 caretakers who were randomly assigned to an experimental group which delivered the Better Parenting Programme or a control group. Before and after the Better Parenting Programme, all participants completed questionnaires to assess their knowledge regarding key areas of child development, activities with their children, discipline practices, and perceptions regarding behaviors that constitute child abuse and neglect. Over time, participants in the experimental group (but not the control group) improved on parenting knowledge, spending time playing and reading books with their children, using more explanations during the course of disciplining their child, and accurately perceiving behaviors that constitute child neglect. Results suggest modest beneficial effects of participation in the Better Parenting Programme.

The Educa a Tu Hijo (Educate Your Child) program is a noninstitutionalized, multisector, community-based program run by the Ministry of Education with 70% of Cuban children younger than 6 years of age participating in the program, along with pregnant women. This case study by Tinajero (2010) reported the results of the impact of the Educate Your Child program in Cuba between 1992 and 1998. The study found that the program had a positive impact on caregivers' ability to foster healthy development in their children and contributed to the children's readiness for early childhood school, and later performance in primary and secondary education. It provided evidence that the integration of health and education programs can have a more significant effect on the development of young children. Following the success of Educate Your Child in Cuba, the program's method was replicated in Brazil, Chile, Colombia, Guatemala, Mexico, and Venezuela.

The Early Childhood Development Parental Education Program was initiated in 2004 in rural Gambia (Sidibeh, 2009). The program was delivered in 69 communities in three regions to caregivers and community leaders to educate them about child development, such as physical wellbeing, emotional maturity, social competences, cognitive development, and language and communication. For the purpose of the evaluation, 43 interventions and 27 control communities were randomly selected after 4 years. Both qualitative and quantitative approaches were developed to evaluate its impact. Data were collected through interviews, focus group discussions and direct observation of parents and other key family members. Questionnaires on the various aspects of holistic development of children including nutrition, health, psychosocial development and protection were developed to guide interviews and focus group discussions. Findings revealed that many parents and caregivers in both the experimental and control communities have been able to build on their traditional child rearing knowledge and practices and demonstrated improvement in skills in early child care and development.

Cross-Cutting Interventions in Survival and Development

There are some behaviors that need to be changed in caregivers that have an impact on child survival and healthy development across the perinatal, infant/toddlers, and young child age range. These cross-cutting interventions are handwashing, symptom identification and care seeking, insecticide-treated nets to prevent malaria, and oral rehydration therapy.

Handwashing

Behavioral interventions designed to increase handwashing and other water-sanitation behaviors conducted in the 1980s and 1990s successfully reduced the incidence of disease, such as diarrhea through targeted education programs (Stanton, Clemens, Khair, Khatun, & Jahan, 1987). Proper handwashing was shown to reduce rates of diarrheal and respiratory disease by up to 33% (Fewtrell et al., 2005; Haggerty, Muladi, Kirkwood, Ashworth, & Manunabo, 1994; Zwane & Kremer, 2007). The challenge is the sustainability of habitual handwashing after a behavior change intervention (Briscoe & Aboud, 2012; Cainscross, Shordt, Zacharia, & Govindan, 2005; Luby et al., 2009; Luby et al., 2010; Parker et al., 2006; Vindigni, Riley, & Jung, 2011).

Multiple strategies have been developed and tested in interventions to teach handwashing skills for parents and caretakers. These interventions can be delivered to individuals, families, and communities. Mass media interventions can be delivered

to communities and they have the capability of reaching a large number of people to motivate them to engage in hygienic practices but may have limited ability to teach hygienic skills (Naugle & Hornik, 2014). In both one-on-one and group programs and in mass media, the selection of the message is critical (Curtis et al., 2001; Haggerty et al., 1994; Luby et al., 2005; Monte et al., 1997; Waterkeyn & Caincross, 2005). There are framing issues in developing the messages that can ensure the intervention is more effective in changing behavior. In a study in several rural Indian villages, Biran and colleagues (2009) used a neutral message in a randomized controlled trial of a program to build awareness of germ theory and its association with the spread of disease. There was a 32% increase in germ awareness but only a 1% increase in handwashing. In a study in Burkina Faso, Curtis and colleagues (2001) used a negative-framed message that resulted in an 18% increase in handwashing with soap after cleaning a child's bottom and 16% increase in the proportion of individuals who washed hands with soap after using the latrine. In another study involving eight rural villages in Zimbabwe, Waterkeyn and Caincross (2005) also used a negative-framed message in community-based education meetings. Soap was provided to all households, and handwashing facilities were established. A 2% to 15% increased rate in handwashing and soap use was observed in the intervention communities. Luby and colleagues (2005) conducted a study in Karachi, Pakistan using a positive-framed message. There was a 53% lower incidence of respiratory illness and 50% reduction in diarrhea in children younger than 5 years of age in the intervention groups. Beneficial results were also achieved by Haggerty and colleagues (1994) conducting a study in rural Zaire using a positive-framed message in an educational randomized controlled trial at informal community meetings. There was a 50% reduction in the incidence of diarrhea in both the intervention and control groups, but the intervention reduced the severity of diarrheal incidents by 11%.

One excellent example of an intervention strategy similar to others is the Karachi Soap Health Study (Luby et al., 2005). Neighborhoods were randomized to receive either antibacterial soap (1–2% triclocarban) or plain soap. Fieldworkers visited caregivers weekly for one year to help them develop handwashing skills to teach their children including inculcating the habit of using soap multiple times a day and to ensure recording any health-related symptoms experienced by members in the households. Children younger than 5 years in households that received plain soap and handwashing promotion had a 50% lower incidence of acute lower respiratory infections (pneumonia) and a 53% lower incidence of diarrhea than controls. The use of soap by caretakers tripled in the intervention neighborhoods, but it is interesting that the incidence of disease did not differ significantly between households given plain soap versus antibacterial soap. Results did not begin immediately because of time required to change handwashing practices.

Several other studies have demonstrated the efficacy of media (TV, radio, slide shows, videotapes, pamphlets) on increasing handwashing among mothers with children younger than 5 years of age (Curtis & Cairncross, 2003; Pinfold & Horan, 1996; Scott, Schmidt, Aunger, Garbrah-Aidoo, & Animashaun, 2007; Wilson & Chandler, 1993). For example, Scott and colleagues (2007) conducted an observational study of the Ghanaian National Truly Clean Hands campaign that was conducted in 5 of Ghana's 12 regions from December 2003 to May 2004, and evaluated beginning in July 2004. A mass media campaign created by a professional advertising agency was conducted on TV and radio, and at community events. A single key message ("Without soap, your hands are not truly clean") was selected and a song ("Hororo Wonsa" [truly cleaned]) played in the background of all ads to brand the campaign. Seventy percent of women reported that they heard the campaign. The impact of a

single mass media channel was stronger than community events and resulted in a 10% increase in handwashing with soap. Exposure to the TV advertisement resulted in more handwashing with soap after using the toilet and before preparing food. Many respondents reported that they were impressed by the campaign content because they had mistakenly believed that water was sufficient to clean their hands. Fewtrell and colleagues (2005) demonstrated that there was no statistically significant difference between programs of handwashing with soap and poor quality water and handwashing with soap with clean water on disease outcomes; therefore, water quality has not yet been established as an important issue.

There are multiple demonstrations of caretakers and children acquiring the skill of correct and consistent handwashing and other hygienic practices after brief one-on-one and group instruction from a health care provider (Blanton et al., 2010; Briere et al., 2012; Briscoe & Aboud, 2012). Reinforcement of proper handwashing habits by health personnel and trained lay persons was important in ensuring that these programs were sustained. There also needs to be access to free or inexpensive soap, clean water, and latrines. These results are based on both intervention studies that have a disease outcome and those that have handwashing as the outcome (Kariuki et al., 2012; Wilson, Chandler, & Muslihatun, 1991). Handwashing behavior change interventions have adopted multiple simple techniques which are described below.

A study in Kenya conducted in a maternal and child health clinic used nurses to train their caretakers in chlorination of household water and in the six steps of proper handwashing (Parker et al., 2006). After receiving a 4-hour training course, nurses delivered positively framed diarrhea prevention messages and taught their clients how to wash their hands in 5-minute one-to-one encounters and 30-minute group sessions (lectures, demonstrations, discussions, and question-and-answer sessions) as part of their regular clinic visit. Evaluations were conducted on a random basis including interviews about knowledge and practice and the observed availability of household items for purifying water and washing hands. After 2 weeks, all six handwashing steps were correctly demonstrated by 44% out of 93 clients, and by 34% out of 51 clients one year later.

In conclusion, correct and consistent handwashing skills can be taught to caretakers and their children. This is a basic skill that is critical to their hygiene and health interventions across the lifespan.

Symptom Identification and Care Seeking

Appropriate symptom identification and care seeking for illness are crucial for survival of children across the age span, but there was limited evidence on behavior change interventions to improve caregiver knowledge of signs of complications or engage appropriate care seeking. In one study in Benin, job aids were used during antenatal newborn care to provide caregivers information on danger signs of complications, birth planning, clean delivery and newborn care. Although the behavioral impact of this program is unclear, the use of these job aids at least increased knowledge and awareness of symptoms among caretakers (Jennings et al., 2010). As shown in a high-quality study in India, community-based public meetings to disseminate information on entitlement to health services and village resources resulted in caregivers identifying symptoms and seeking antenatal care examinations, tetanus toxoid vaccinations, and infant vaccinations (Pandey et al., 2007). In a review of antenatal educational interventions, the investigators concluded that the benefits of various antenatal care education interventions remain unclear. Additional research is needed to understand whether educational interventions actually change health-seeking behavior (Gagnon & Sandall, 2007).

Use of Insecticide Treated Nets for Malaria Prevention

Based on strong evidence that insecticide-treated nets reduce malaria transmission and related morbidity and child mortality (Lengeler, 2004), local and international organizations in Africa have been promoting and distributing insecticide-treated nets for more than 10 years. Although this has resulted in greater availability of insecticide-treated nets in Sub-Saharan African countries and elsewhere, promoting the requisite behaviors of correct and consistent use of insecticide-treated nets by caretakers has proven challenging (Macintyre et al., 2006). Given the recognized gap between insecticide-treated net ownership and use, designing effective strategies to promote use is critical, especially in households with children younger than 5 years of age and pregnant women (Eisele & Root, 2008). In a recent effort to develop correct and consistent use strategies, Eisele and Root (2008) conducted an extensive review of the literature to document the factors associated with insecticide-treated net use among these vulnerable groups. They concluded that there is insufficient empirical evidence to determine the effective strategies to increase insecticide-treated nets use in households that own such nets. Nevertheless, there is growing evidence that family members who are most vulnerable to malaria get preference in the households with insufficient insecticide-treated nets. Baume and Marin (2007), in a study that reviewed data from nine large-scale household surveys with 12,500 respondents conducted in six African countries (Ethiopia, Ghana, Mali, Nigeria, Senegal, and Zambia) in 2000 and 2004, concluded that children younger than 5 years old and pregnant women—the two most vulnerable groups—were most likely to be under the bed net. In all countries, children younger than 2 years of age were more likely than were any other family member to be under a bed net that commonly covered two to three people. If a baby net was used, fewer people used the family net. They also found that pregnant women were more likely to use a net in 2004 than in 2000. This study enumerated all household members and bed nets owned and analyzing only net-owning households. Similar findings have been reported in Gambia (D'Alessandro, Aikins, Langerock, Bennet, & Greenwood, 1994) and Uganda (Mugisha & Arinaitwe, 2003).

The challenge is to close the gap between insecticide-treated net ownership and correct and consistent use, yet few rigorous studies exist. Deribew and colleagues (2012), in a cluster randomized trial that was tailored to heads of households about the proper use of nets, showed a positive effect in the utilization of nets in 11 villages in Ethiopia. The utilization of nets in all age groups in the intervention villages was increased by 17.7% at 6 months and 31% by 1 year. Similarly, Bowen and colleagues (2007) used national survey data collected at baseline before and after a communication campaign (which consisted of radio, TV, and SMS messages) on insecticide-treated net use by adults and their children who were younger than 5 years of age. They found that exposure to the communication campaign was associated with a 6.6% increase in bed net use on the previous night among all respondents, and a 12% increase in previous-night net use among respondents' children.

There is also increasing support for using community health advisors to conduct community events, going house-to-house to provide caregivers with accurate information on malaria transmission, explaining how insecticide-treated nets protect against malaria, and teaching how to hang nets properly. These prevention efforts must be complemented by effective services to help caregivers identify symptoms of malaria infection so that they can seek early treatment, which can prevent serious illness and death of children. A recent study of net utilization promotion was conducted in Ghana. An intensive campaign was undertaken which lasted for 8 weeks during the malarial season (Elder, Botwe, Selby, Franklin, & Shaw, 2011). The intervention consisted of three main components: community dramas, mobile

information vans, and community health volunteers. These three modes were used to communicate bed net use messages to the communities in the intervention district. Evaluation teams randomly sampled individuals from both intervention and control communities for the pre-post evaluation. Both qualitative and quantitative results showed that the promotion of net utilization exceeded the program planners' predictions. The social norms about bed net use changed and community members became convinced that bed nets were necessary. Instead of just promoting usage, the program increased demand for new bed nets. Overall, the increase in the use of insecticide-treated nets the night before increased at a statistically significant rate in the intervention communities compared to control communities in a neighboring district. The number of bed nets being used in the control district decreased by 7% while increasing by this same amount in the intervention district.

In conclusion, there is limited but growing evidence that the promotion of insecticide-treated nets, through community events, health care workers visiting homes combined with policy changes that make bed nets widely available, can be accomplished and thus are recommended. Behavior change interventions that included modeling of appropriate net use appeared to be effective, and have moderate research support. In addition, there is increasing support for utilizing community health advisors to conduct community events and to go house to house to provide caregivers with accurate information on malaria transmission, explain how insecticide-treated nets protect against malaria, and help them hang their nets properly. These prevention efforts must be complemented by effective services to help caregivers identify symptoms of malaria infection so that they can seek early treatment which can prevent serious illness and death of children.

Oral Rehydration Therapy

Diarrhea is not a disease but rather a symptom associated with bacterial and other microbial infection, food poisoning, and other illnesses associated with childhood (Ruxin, 1994). Because it causes dehydration, diarrhea can quickly compromise bodily functions. Children younger than 5 years are especially susceptible to diarrhea and their mortality rate can be as high as 50%. Oral rehydration therapy was widely introduced in 1979; giving the mixture of sugar, salts, and water (called oral rehydration salts) quickly demonstrated its effectiveness as a method to control diarrhea by reducing the number of deaths from 4.6 million in 1980 to 1.5 million by 2000 (Victoria, Bryce, Fontaine, & Monasch, 2000). Unfortunately, an analysis of 40 countries documented that adoption of oral rehydration therapy increased by less than 1% per year from 1986 to 2003 and has even declined in some countries (Forsberg, Petzold, Tomson, & Allebeck, 2007).

There are many activities to prevent and treat diarrhea in young children that require caretaker behavior change (Stanton, Black, Engle, & Peltó, 1992). To prevent diarrhea, caretakers need to wash their hands with soap and water after using latrines and changing diapers, must change hygiene practices, and prepare food with clean hands. To treat diarrhea, caretakers need to recognize the signs of dehydration and know when to intervene with oral rehydration therapy and when to go to the health care center for treatment (Yoder & Hornik, 1994). However, caregivers need to be educated about the causes of diarrhea because they do not associate diarrhea with dehydration but often hold the belief that diarrhea is caused by teething, exposure to cold, poor quality milk or breast milk, consumption of candy, uncooked food, food with "hot" qualities, or supernatural forces (Ene-Obong, Iroegbu, & Uwaegbute, 2000; Mull & Mull, 1988). When mothers in Mexico were asked how they evaluated the signs of severity, they mentioned nature of stool, mood of the

child, associated fever, cough, and vomiting, but not the cause or duration as indicators of severity (Martinez & Saucedo, 1991).

The Egypt National Control of Diarrheal Disease Project implemented a program between 1983 and 1991 which is considered the most successful USAID-supported oral rehydration therapy program (USAID, 1988). Between 1990 and 1991, a follow-up study was conducted to identify factors associated with infant and child mortality in the original rural villages (Langsten & Hill, 1995). This analysis indicated that children who were 6–23 months, from poor households, and boys were more likely to receive oral rehydration salts but mothers' education had no impact. Government clinics were more likely to prescribe oral rehydration salts than private health centers. In a study of home treatment practices in Egypt, 75% of mothers who knew about the value of oral rehydration salts could prepare the solution correctly but only 22% of children with diarrhea received oral rehydration salts and only 5% of oral rehydration salts alone without other drugs (Jousilahti, Madkour, Lambrechts, & Sherwin, 1997). The investigators were concerned that the antibiotics should be taken off the market and oral rehydration therapy should be stressed in the curricula in medical universities in order to change the behavior of health care providers.

There are several problems with scaling up oral rehydration therapy. Despite the demonstrated efficacy of oral rehydration therapy, the medical community continues to treat diarrhea with rapid intravenous rehydration and antibiotics (Paredes, de La Pena, Flores-Guerra, Diaz, & Trostle, 1996). They need to change their prescribing behaviors so that caretakers do not feel that modern medicine is necessarily better than a homemade solution (Langsten & Hill, 1995).

Under the multilateral sponsorship of the World Health Organization/Pan-American Health Organization, UNICEF, USAID, the Ministry of Haiti implemented a 5-year program with the goal of reducing diarrheal mortality in half. Program staff disseminated information and social marketing of packets of oral rehydration salts. Other promotional programs included public education, mass media, commercial advertising and sales, community outreach, and programs to educate caretakers. In this context, a study was conducted in Haiti to evaluate the mother's knowledge and use of oral rehydration therapy for the treatment of diarrhea episodes (Coreil & Genece, 1988). The investigators determined that the characteristics of the caretakers themselves and not the episodes were most important in these decisions. They also found that urban caretakers were more informed than rural ones and were more likely to use the method. This is partly due to the fact that the preferred method of delivery was the packets which were more available in urban areas in clinics, grocery stores, and pharmacies. To be scaled up, caregiver demand for evidence-based oral rehydration therapy interventions will need to be coupled with better availability of the products.

Studies have found that the adoption of oral rehydration therapy was based on the mothers' understanding that the fluids addressed the problem of dehydration and would therefore cure their child (De Zoysa, Carson, Feachem, Linsay-Smith, & Lowenson, 1984; Frankel & Lehman, 1985; Green, 1986). Because a mother's skepticism about a treatment can delay her implementation, interventions with caretakers must stress the effectiveness of oral rehydration therapy. However, health professionals have often been focused on the techniques of using the product and not the mothers' belief in the procedure. In a study in Mali, most caretakers were aware that oral rehydration salts could replace fluids but they viewed it as insufficient because it did not stop the diarrhea (Ellis, Winch, Daou, Gilroy, & Swedberg, 2007). This led them to seek antibiotics from local markets. Zinc was therefore added to the oral rehydration therapy regimen to reassure caretakers that the treatment was working. The investigators indicated that, to gain acceptance for combining zinc

with oral rehydration salts, the fathers and grandmothers and traditional healers should also be convinced because this treatment is more expensive than the traditional medicines or antibiotics. In a study evaluating pooled data from clinical trials, children who received zinc had a 15% lower probability of having diarrhea, a 24% lower probability of continuing diarrhea, and a 42% lower rate of treatment failure or death in diarrhea trials (Bhutta et al., 2000).

Thus, there is evidence that behavior change interventions that target caregiver knowledge about oral rehydration therapy can enhance its utilization. Although oral rehydration therapy can prevent diarrheal deaths, it is not a final solution to the global threat of diarrhea. However, this therapy provides time to develop clean water, sanitation systems, and other infrastructure projects that require more time and resources.

Summary

Reducing early childhood deaths from preventable causes has been a priority for international and national organizations, and substantial gains have been made over the past three decades (Liu et al., 2012). However, 3 million newborns continue to die every year from causes we know how to prevent. In addition, Walker and colleagues (2007) estimated that more than 200 million children worldwide still do not achieve their developmental milestones. In 2014, a recommitment was made to the Child Survival Call to Action in the Acting on the Call meeting held in Washington (http://www.usaid.gov/sites/default/files/documents/1864/USAID_ActingOnTheCall_2014.pdf) which continues to support the important role for behavior change in meeting the goal of ending preventable child mortality. In addition, earlier interventions to address the needs of those children who survive but may not thrive (Myers, 1992) have recently been renewed with an increased sense of urgency (Alderman, 2011; Britto, Engle, & Super, 2013; Engle et al., 2011; Shonkoff et al., 2012; UNICEF, 2012; Walker et al., 2007).

We have reviewed a large body of research showing that there are effective behavior change interventions targeting caregivers that can enhance child survival and early development. Looking primarily at the extensive literature on healthy timing and spacing of pregnancy, we see that effective interventions are focused on implementing multidisciplinary, goal-oriented programs that included the following components: (a) multiple caregiver contacts in homes, health care settings, schools, or community meeting places during the antenatal and early childhood periods (Fischer, 1997; Key, Gebregziabher, Marsh, & O'Rourke, 2008; Seitz & Apfel, 1993); (b) multidisciplinary caregiver teams, including case management by social workers, with trained nurses, trained paraprofessionals, and volunteers (Sant'Anna, Carvalho, Melhado, Coates, & Omar, 2007; Schaffer, Jost, Pederson, & Lair, 2008); (c) home visits by caregivers, often over a 2-year postpartum period (Kitzman et al., 1997; Olds et al., 2004); (d) motivating caregiver behavior, sometimes referred to as mentoring (Black et al., 2006; Gray, Sheeder, O'Brien, & Stevens-Simon, 2006); (e) use of standardized curricula and protocols (Barnet, 2008); (f) goal-orientation interventions (e.g., skill-development and education [O'Sullivan & Jacobsen, 1992; Seitz & Apfel, 1993]); (g) employment/career planning (Key, Barbosa, & Owens, 2001); (h) health, and/or fertility education (Biermann et al., 2006); and (i) achievable parenting goals.

Interventions for parent education and support can lead to improvements in children's cognitive and psychosocial development, where a greater benefit may be observed for more disadvantaged younger children. These programs should be based on systematic curricula and training for both health care workers and parents, and use active strategies such as practice or coaching. Effect sizes were larger for

interventions that included programs for both parents and children rather than for parents alone.

Preschool can be an important point of intervention for vulnerable children, particularly if it is of higher quality and intensity. Promising but not definitive evidence for the benefits of cash transfer programs to the family were evident. Last, other early education experiences through media (e.g., *Sesame Street*) were found to promote children's readiness for school.

Parenting programs which combine home-visiting and community-based interventions and provide counseling to parents and caregivers on early stimulation (play and communication) behaviors along with child health and feeding practices are the most common programs that can be scaled up. Evidence from Bangladesh, Brazil, Chile, Colombia, Jamaica, and Peru parenting programs are among the most promising ones. They provide methods that can be adapted to other countries and settings.

Both mass media campaigns and one-on-one and group interventions can dramatically increase handwashing of caregivers. These are scalable and cost-effective and can create awareness of the importance of correct and consistent handwashing. They can also increase health-seeking behavior if the child is exhibiting symptoms of illness. To be successful, evidence-based interventions must be adapted to the culture, especially in framing a positive message.

Although many of the behavioral and biomedical interventions discussed in this article have demonstrated evidence of efficacy, they need to be continually implemented. Every year, a new cohort of mothers/caretakers and their children enter the health care system. Studies need to be conducted to tailor the evidence-based interventions for these new mothers/caretakers and children and to integrate new treatments that have come online. If there is not a proactive program to ensure that child survival and healthy development programs are continuously offered, we will not continue to have advancement in health statistics in LMICs.

Evidence-Based Recommendations

There is a large research literature supporting the effectiveness of behavior change interventions that promote child survival and healthy development. For many target behaviors, there are a variety of proven interventions for implementers to choose from or to integrate into comprehensive programs. Our assessment is that we do not lack effective behavior change tools, but that these tools have not been widely enough used and prioritized within global health. We have tried to identify some of the most salient components of effective interventions in our review. There is strong support for scaling up interventions to promote healthy timing and spacing of pregnancy. These include interventions to increase the use of family planning and preventing pregnancy before age 18 and waiting at least 24 months after a live birth before attempting a pregnancy. In addition, there is evidence that education, counseling, and community involvement are all effective interventions to promote neonatal survival and health. We found evidence supporting the Partnership for Maternal, Newborn and Child Health (2011) list of essential interventions for reproductive, maternal, newborn and children targeting parental and caregiver behaviors. For neonatal care, home visits by community-based health workers can develop caregiver skills to identify complications with newborns, provide first line treatment, and make informed decisions on referral for facility-based care. Many studies also show that there are effective interventions to promote the quantity and quality of breastfeeding behaviors through a combination of counseling, home visits, group sessions, and changes in policy, sometimes supported by print and mass media. The findings from trials also support the importance of skin-to-skin care (Kangaroo Mother Care) for increasing neonate survival and there are effective, low-cost

interventions to increase this behavior, which have the potential to be scaled up. There is growing evidence that the promotion of insecticide-treated nets, through community events, health care workers visiting homes combined with policy changes that make bed nets widely available, can be accomplished. We also conclude that behavior change interventions that target caregiver knowledge about oral rehydration therapy can enhance its utilization. Priority should be given to early childhood programs for caregivers because this is the most effective and cost-effective period. The number of contacts between parents and health care workers should be frequent (a minimum of twice a month) and should provide sufficient time to allow the caregiver to practice the new skills. Interventions with caregivers should target improvement in a range of functioning in young children from eating more food, improving cognitive development, language skills, and social emotional-development to readiness for school. Quality early child development programs for caregivers should be given priority because they can contribute to overcoming inequalities and the perpetuation of economic disparities.

Promising Research Directions

In most cases, several interventions have been shown to be effective for changing caregiver behaviors to enhance child survival and development. Although this gives implementers a choice of interventions, there are no comparative effectiveness trials that might allow the selection of the most effective approach in a given situation. Similarly, there is a paucity of cost-effectiveness studies and implementation science research in this area to assist in program selection and scale up. In addition, studies reviewed in this article tend to assess one intervention for caregivers at a time. Research is needed on combination interventions that can be delivered by caregivers and target multiple outcomes in young children. More implementation studies that scale up evidence-based interventions need to be conducted to identify what factors are associated with successful countrywide programs that increase child survival and healthy development. As a first step, evidence-based interventions that were scaled up but did not work should be assessed to identify the barriers and facilitators of scaling up. We found few studies of behavior change interventions designed to increase caregiver recognition of symptoms of illness or to increase early engagement of health professions early in disease progression.

Another step in scaling up is to adapt and test evidence-based interventions for health care workers that can be delivered to caretakers to ensure child survival and healthy development. Related to this is the development of user-friendly manuals based on research protocols that health care workers can implement with caregivers. Another promising direction is to study the role of frequency of contact, length, quality of relationship between caregiver and intervener on the effectiveness of the prevention program in child survival and healthy development which affects the cost-effectiveness of studies and their sustainability in developing countries.

Another area where progress could be made is to develop behavior change programs for caregivers for interventions that are known to be effective but where uptake has been low (e.g., oral rehydration therapy, immunizations, delay of marriage, prevention of pregnancy before age 18 years, and family planning). For example, some interventions have shown to be effective in delaying early marriage and early pregnancy in adolescents, but they have been applied in research studies and in small scale and time limited projects. Implementation research is needed in different contexts to test best approaches to expand the coverage of these interventions while maintaining quality. While cash transfer programs have provided some evidence of addressing the basic causes of poor child development, more research needs to be conducted to determine which kinds of programs are effective

in supporting child's health care, education, and cognitive development. Media is an underinvestigated strategy for improving child survival and healthy development in children by offering programs for improving child rearing skills for caregivers and programs for improving language and child development in preschool children (e.g., *Sesame Street*). Media can be instrumental in changing community norms which leads to community mobilization that changes countrywide policies. More research needs to be conducted on culturally-appropriate messages to caretakers about child rearing strategies and practices that enhance child survival and healthy development and methods for delivering those messages (e.g., handouts in clinics, educational media, soap operas).

Conclusions

The Child Survival Call to Action is a challenge to the world to reduce child mortality to 20 or fewer child deaths per 1,000 live births in every country by 2035 which means that an additional 45 million children's lives will be saved. On the basis of this review, there are some important conclusions about what evidence-based approaches will work. Raising healthy, developmentally robust children is an achievable goal if both developing and developed countries work together to implement the evidence-based interventions that have been discussed in this review. Priority needs to be given to the countries where the most deaths of children occur (Asia and Africa) and the perinatal period needs to be targeted with interventions that address the causes of these preventable deaths. However, it is not sufficient to simply save the lives of these children if the programs are not also implemented to ensure that these children achieve their developmental milestones and mature into productive citizens of their countries. While evidence-based behavior change interventions targeting caregivers are necessary, adopting prevention programs piecemeal is not sufficient to achieve the goals of the Child Survival Call to Action. There are multiple social ecological approaches that provide a framework in which to embed the evidence-based prevention programs at different levels identified in this review that can mobilize different systems to have the greatest impact on children and families and take into account the broader forces of population dynamics, inequalities, and sustainability of the environment (Elder, 2001).

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